DESIGN PROPOSAL

FOR A

GROUNDNUT PROCESSING

INDUSTRY AT

BIDA

WITH FOCUS ON

EFFECTIVE CIRCULATION

BY

GANA C.S.

M. TECH/SET/698/2000/2001

A PROJECT SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF THE MASTERS IN TECHNOLOGY (ARCHITECTURE)

M. TECH (ARCH)

DEGREE

TO

DEPARTMENT OF ARCHITECTURE,

SCHOOL OF ENVIRONMENTAL TECHNOLOGY,

FEDERAL UNIVERSITY OF TECHNOLOGY,

MINNA,

NIGER STATE

JANUARY 2002.

DECLARATION

I hereby declare that this thesis has no bearing on any person or group of individuals, which has been presented and accepted for a higher degree. I have composed it and it is a record of my research work. References made to published literature have been duly acknowledged.

Gana C. S

Student

5th March 2002

Date

I confirm the above declaration.

Supervisor

Date

DEDICATION

This work is dedicated to the Supreme Architect of all, God Almighty. The universe is his design.

ACKNOWLEDGEMENT

My gratitude goes to the people who offered themselves willingly to make this work possible, first and foremost, to my parents Dr and Mrs E.S. Gana who have supported my Education.

To my Supervisor, Arc A. Mohammed who took the pain to go through my write up and drawings, my Head of Department, Dr (Mrs) Zubairu and my Dean Prof. Solanke for their advice, lectures and leadership and also to my lecturers for their efforts.

I am also indebted to certain individuals along the way through whom I gained relevant information pertaining to this work, among whom are Mr Samson Tsado, Mrs C.Kolo, Auntie Christie, Mrs Martha Gana, Alh. Abubakar Abdullahi of Raw Material Research Development Council, (RMRDC) Minna.

I say a big thank you to my course mates particularly Ogohi Odekina and Olumide Jejeloye who were always ready to render their hands of assistance.

I also appreciate the staff of Korlems Komputer Konsult, Minna, who saw to the typing of my project.

I greatly appreciate my three brothers Gabriel, Thomas and Nathan. They were always there for me.

Space will not allow me to go on but I know I owe you all millions of thanks

Finally to the wonderful person God has blessed me with Michael Adejumo. Thanks for your support and concerns.

ABSTRACT

Groundnut used to be a major cash crop of Nigeria but due to the discovery of crude oil and its products, was no longer given full attention.

This project is proposing a comprehensive groundnut processing industry with focus on effective circulation of the whole industry layout. This industry is designed to extract oil from the groundnut seeds and at the same time process the groundnut paste into edible and portable finished products.

The research methods employed in the course of this work are descriptive and analytical surveys with respect to the economical value of groundnut production and consumption. Based on data collected, the production and use of groundnut products comes in second immediately after the oil palm. There is therefore the need to look into means of establishing more groundnut processing industries particularly in the Northern and Middle belt zones of Nigeria which generally have few industries.

A bulk of this research work is obtained form published books, journals and interviews with persons who are into groundnut processing and production.

TABLE OF CONTENTS

CHAPTER TWO

CHAPTER TWO

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

CHAPTER SEVEN

CHAPTER EIGHT

CHAPTER NINE

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ABBREVIATIONS

1. OSAN - OIL SEED ASSOCIATION OF NIGERIA
2. FAO - FOOD AND AGRICULTURAL ORGANISATION.
3. RMRDC - RAW MATERIAL RESEARCH DEVELOPMENT COUNCIL.

CHAPTER ONE

1.1 INTRODUCTION

Groundnuts are valuable food widely cultivated in the Northern part of Nigeria, viz: - Kano, Sokoto, Kebbi and Niger states. The nuts were at one time a major cash crop of Nigeria, however the discovery of crude oil brought about its neglect. The production and processing was left in the hands of the local people without making available improved ways of its production.

Taking a closer look at Niger state, groundnut is widely grown within the Lavun, Bida, Gbako, Edati Kagara and Kontagora Local government areas by peasant farmers.

A minute percentage of the nuts are eaten and in its boiled or roasted forms on a larger percentage processed into groundnut cakes commonly known as 'Kulikuli', other products include 'Dankuwa', groundnut flour used for pap

and soup, the main product which is oil is extracted and used for domestic cooking. Local women do all these processing

The processing of groundnut provides means of transforming the nuts into various forms to be used at both the local and industrial levels within a hygienic environment. Every part of the plant right from shoot to the roots will be made use of thereby leaving no waste product.

1.2 AIMS OF STUDY

The aims of this project are as follows: -

- To make good use of the vast land in the groundnut growing regions within Niger State
- To improve on the processing of groundnut by making use of effective quality control units which will cater for the product's quality.

- To provide an effective means of circulation within the production hall with respect to the various machineries to be used and patterns of arrangement within the hall.
- To create conducive working environment for the staff and machineries by the provision of adequate ventilation and lighting facilities.
- To bring about an appropriate zoning of the various departments within the production hall.
- To generate revenue for the state.
- To improve on the packaging of the finished products
- To provide employment opportunities for the state indigenes
- To encourage mechanized cultivation of groundnuts by both the government and individuals.
- To reduce the dependence on the oil sector in Nigeria.
- To create the awareness and reliance on our locally produced foodstuffs

1.3 OBJECTIVES OF THE STUDY

- To provide a hygienic and functional production line within the production hall.
- Grouping together related departments in order to provide a reasonable working environment.
- To provide awareness on the production of high yielding groundnut species.
- Buying of the local farmer's products for mechanized processing thus reducing unhygienic ways of production
- Create an effective management cadre that will see to the running and maintenance of the industry.

1.4 RESEARCH METHODOLOGY

The research method employed for this thesis is mainly descriptive and analytical survey.

It is descriptive in the sense that case studies of existing industries were carried out and interview carried out with

people who had to do with the processing of groundnut. Statistical analysis on the production rate of groundnut and its processing was also carried out.

Alongside this means of research, a literature review on groundnut production and processing was done in the next chapter.

1.5 SCOPE OF STUDY.

The scope of this research work is centred on the effective means of circulation within the production hall and the entire site of the industry (that is the site plan).

Processing industry as the name implies takes care of the processing of groundnut right from its raw nature that is from the farm, to its complete processed form into some specific products.

This will be made possible through the provision of the following facilities on site.

i) Administrative Block: - this is where all administrative work will take place.

ii) Production Unit: This section houses the actual processing of groundnut from its raw form to the finished and packaged product.

iii) Worker's Welfare Unit: - This unit will cater for the workers' physical and mental comfort. It includes the clinic and restaurant.

iv) Auxiliary Facilities: - They include the gatehouse, car parks, generator house, refuse disposal and other units shown on site.

1.6 IMPORTANCE OF THE STUDY

This study owes its relevance to the fact that it aims at reducing Nigeria's dependency on petroleum products as the main source of its income. One of the secrets of the

developed countries is seen in how they handle their agricultural products to the extent of exporting the processed products in their improved forms to other nations. A nation with numerous agricultural produce when given the right opportunities and priorities make the nation great.

Architecturally, this design project is able to provide a properly organized production process and zoning to ensure effective circulation, which will in turn create an effective and conducive working environment.

This study is also able to serve as a source of information to other industrial projects of same field to bring about an increase to the technological know-how of groundnut processing.

1.7 LIMIT OF STUDY

This research work suffered the following limitations: -

(i) Inadequate and poor documentation on groundnut production.

(ii) Owners of existing industries gave limits to information given out and photographs were strictly forbidden some of the industries.

1.8 DEFINITION OF TERMS

1.8.1 Groundnut: - They are leguminous plants that grow in the ground attached to the plant roots and having their shoot system growing to a height of about 30cm above the ground.

1.8.2 Industry: - This is a place where goods are being fabricated or processed from their raw materials be it manually or mechanically in order to bring about a new product.

1.8.3 Groundnut Oil: - This is the oil extracted from the groundnut seeds.

1.8.4 Groundnut Cake: - Is the residue left after the oil must have been extracted from the groundnut seed.

1.8.5 Oil Refining: - This is bringing oil to a fine and pure state free from impurities.

1.8.6 Slush: - This is the refuse fat left after the oil must have been refined.

1.8.7 Deodorization: - this is the process whereby every form of odour is being expelled from the oil.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 IMPORTANCE OF OILSEED INDUSTRY IN NIGERIAN ECONOMY

Nigeria is a renowned consumer and potential exporter of oilseeds and their products. Not until the advent of crude oil in the 1970's, Nigeria earned substantial foreign exchange revenue from oilseed crops like Groundnut, Cotton, Soya Bean, Palm Oil, Sesame and many others which financed the country's development programmes. Apart from being valuable commodities in international trade, oil seeds and their products formed a substantial volume of inter and intra-regional trade. The turn over could be as high as $400 million per annum. This represent about 8% of the national Gross Domestic Product.

2.2 MAIN OILSEEDS CROPS IN NIGERIA

2.2.1 GROUNDNUT

Groundnut is consumed directly or crushed into oil and cake. It is the only oilseed whose byproduct (groundnut cake) is consumed directly by human beings.

Groundnut is found mostly in the savannah zones of Nigeria. Its production is organized around small-scale farmers who produce for cash exchange. The Nigerian Oil Mills Ltd based in Kano crushes the largest amount of groundnuts in Nigeria.

2.2.2 OIL PALM

Oil Palm is the most prominent oil crop in Nigeria's oilseed industry. Its characteristic features when compared to other oil seeds are as follows: -

- It has the largest area under cultivation.
- It produces the largest oil output by volume

- It employs the highest number of people both at the primary and industrial level.
- It has the highest number of product derivatives.

2.2.3 COTTON SEED

Until recently, cotton production in Nigeria was at a low level. Cotton production being a capital-intensive programme is not a high priority crop among farmers in the production zone. Resources are shifted to it only when the profit margin is expected to be exceptionally high. Plans are however under way to make it a substantial raw material in the production of cosmetics.

2.2.4 SOYA BEANS

Soya bean has both high oil content and high nutritive value, which has made it an emerging oilseed in Nigeria. Its potential as a viable source for filling the national supply-

demand protein gap is assuming greater significance. Its characteristic features include: -

- Ease of production.
- Quick rate of return, being an annual crop.
- High protein value and food fortifying feature.
- Durability during storage.

2.2.5 SESAME

This crop is mainly cultivated in the far North (Kano, Jigawa States) and Middle belt (Benue, Plateau, Niger, Kwara and Taraba States) zones where it is locally consumed. Pilot plant extraction of sesame oil is being carried out in Lagos.

2.3 SHEA NUT

Shea nut is presently known to exist only in the wild. It thrives well within the guinea and dry savannah areas and lower sahel regions of Northern Nigeria.

Shea nuts greatest domestic use is as shea butter oil, which is mostly used, in traditional medicines fuel and cosmetics. Consumption as vegetable oil is restricted to only a few communities. Shea nut also has limited commercial utilization in the soap industry.

Since the research is directed towards the processing of groundnut, the write up will be narrowed to groundnut production, processing and importance.

2.3 GROUNDNUT PRODUCTION

Groundnut botanically known as Arachis hypogea is a leguminous plant one of the most important cash and food crops in Nigeria. It has high oil (42-52%) and protein (25% - 32%) content. The skin is high in vitamin B. It constitutes a principal source of protein and dietary oil for both subsistence farmers and urban dwellers.

Groundnut until recently was one of Nigeria's leading export crops. It grows very well within the Sudan and Guinea savannah zones, with an annual rainfall in the region of 500-1500mm.

Groundnut has its origin from Brazil before being introduced in West Africa. It is an annual plant and grows to maturity between four and five months.

There are two main types of groundnut plants based on its growth.

(a) The bunch or erect type, in which the main stem and branches grow upright so that there is little spreading of the shoot

(b) The creeping type, in which the branches trail along the ground which brings about the spreading of the shoot.

The branch type of groundnut plant has its nuts close together at the base of the plant, which makes it easier to harvest

mechanically. The creeping type has its nuts scattered over a wider area around the plant and this happen to be the most widely grown in West Africa.

2.3.1 CLIMATE AND SOIL

Groundnuts are best grown on sandy loom soil, clay soils should be avoided because its sticky nature makes harvesting tedious. Acidic soils (pH less than 5) are also unsuitable for groundnut cultivation. Groundnuts are relatively draught tolerant and are commonly grown in areas of moderate rainfall.

2.3.2 CULTIVATION

Seeds to be planted should be stored in its shell dried in a dry environment. The shells are removed shortly before planting and diseased ones picked.

The seeds are commonly planted on ridges, however some are planted on flat land at a spacing of about 23cm. Two or three seeds are put in a hole at a depth of 5cm.

It is best to plant at the start of rains because it ensures maximum yield.

The seed germinates after five days and flowering occurs after about 1½ months. The crop takes about four to five months to reach maturity, requiring about two or three times weeding at various intervals depending on the nature of the weeds.

The best fertilizer to be applied is the phosphate at the time of planting. The fertilizer is placed at about 7cm from the planting hole and lightly covered with soil. A bag, which is equivalent to 55kg of phosphate fertilizer commonly known as SSP, will be required per hectare.

2.3.3 HARVESTING

As the crop matures, the lower leaves begin to drop off. At the end of the four or five months after planting, if harvesting is delayed the produced groundnut seeds begin to germinate. It is best to uproot the plant by using a hoe or using a specially designed plough, which runs under the plant and loosens the soil so as to enhance easy uprooting.

The uprooted plants with the groundnut pods are left for a few days to wither, after which they are gathered together and pods removed by beating it against a stick or hand picked. The harvested pods are left for drying after which the shells are removed by hand or machine.

The average yield of groundnut in West Africa ranges from 400kg to 900kg per hectare.

Well-dried groundnut seeds are stored in jute bags pending when they will be used.

2.4 DISEASE AND PESTS OF GROUNDNUT.

(a) Rosette: - is a viral disease, which is spread by aphids. It attacks the plant at its flowering stage, resulting in stunted growth, mottling of leaves and finally death of the plant. Employing the practice of crop rotation, burning infected crop residues and using resistant varieties can control the disease.

(c) Leaf Spot: - is a fungus disease that appears five to six weeks after planting and become severe as the crop matures. It causes spotting on the underside of the leaves and common in wet weather. Fungicide sprays are used to control the spread of the disease.

(d) Wilt: - is caused by fungus. It attacks isolated plants causing them to wilt and die. Uprooting and burning infected plants control it.

(e) Pests: - Pests, which attack groundnuts in the field, include aphids that spread the rosette disease, birds and rodents, which dig up sown seeds, or maturing seeds.

2.5 ECONOMIC IMPORTANCE OF GROUNDNUT

Today, most of the groundnut crop in Nigeria is processed locally particularly into groundnut oil. The groundnut seed contains about 27% protein, 45% oil and 10% carbohydrate. It is therefore a valuable food item both for human and animals.

The seed may be eaten raw, boiled or roasted, made into paste or used for soups and stews.

Groundnut oil is an important product derived from groundnut seeds. It is extremely used in Nigeria As cooking oil, and industrially for making margarine, soups and other products. The residue (groundnut cake) left after the

extraction of oil is very rich in protein and as such eaten by man and animal as livestock feed. The stems and leaves left are not behind; they are also used for livestock feed.

2.6 TRENDS AND ESTIMATES OF GROUNDNUT PRODUCTION FROM 1960 TO DATE

Although groundnut is a native of South America, the Portuguese who brought the crop from Brazil into West Africa introduced it into Nigeria in the 16^{th} century. The crop is now found in all tropical and subtropical countries of the world.

The favorable climate and edaphic conditions with good rainfall, abundant sunshine , availability of a ell drained light loose and friable sandy loam well supplied with calcium has encouraged the practice and cultivation of groundnut in the Sudan and Guinea savannah ecological zones. Nigeria enjoyed a strong comparative advantage on the world scene

as evidenced by doubling of groundnut production from the mid 1950s to the mid 1960s.

Groundnut production rose to a to a record high in the mid 1960s when Nigeria was the World's third largest exporter of groundnut, followed by Senegal. Some factors that have significantly affected groundnut production are

(a) Since 1970, there have been noticeable changes in weather conditions towards a long dry spell in the middle of the growing season. The resulting losses in yield have been one of the major factors leading to the decline of groundnut production in Nigeria.

(b) Te sudden and thereafter repeated outbreak of rosette virus disease throughout the major producing areas, causing an almost complete crop failure in 1975. These factors amongst others contribute to the complete disappearance of the erstwhile 'Groundnut Pyramids' of Northern Nigeria.

(c) In areas where the rainfall pattern and the growing season were not seriously affected the major pests (especially termites and millipedes) and foliar disease have been on the increase.

2.6.1 NON TECHNICAL FACTORS AFFECTING GROUNDNUT PRODUCTION]

These constraints have been broadly categorized in two groups namely production constraints and post harvest constraints.

Production Constraints

(a) Low farmers confidence in the crop due to the problems of draught, pests and diseases.

(b) General lack of motivational, high labour requirements and relatively poor returns (profitably)

(c) Lack of organized credit and input delivery system.

(d) Weak, inefficient and inexpensive extension support services

(e) The need to upgrade groundnut cultivation from manual to improved semi- mechanized so As to improve time, labour and cost efficiency.

(f) Despite relatively poor profitability and other short comings, farmer preference for groundnut in a rotation system due to its nitrogen fixing properties and potential for soil enrichment.

Post Harvest Constraints

It is essential to harvest groundnut under dry conditions and to reduce the moisture content from about 30% to 8% as quickly as possible. Drying is carried out naturally by spreading under the sun, in industrial dryers and a times a combination of the two methods.

Groundnut is normally shelled at the oil mill despite the fact that shelling and collection centres would reduce transport cost. Transporting the nuts in shell reduces kernel damage

(damaged kernels contains 45 to 50% protein and 6.5 to 8.0% crude fibre. Meals obtained from undecorticated kernels are at lower nutritive value and contain about 30% protein and 23% crude fibre. Groundnut protein is deficient in both lysine and methionine/cytine and consequently does not meet the full requirements of monogastric animals, especially chicken and young pigs.

2.7 MAIN FEATURES OF GROUNDNUT PROCESSING

Oilseed processing is one of the key sub sectors of the Nigerian economy. However, both government and private endeavours in recent time have not been successful in redressing the situation whereby demand outstrips supply. Survey sources suggest that current level of oil consumption is at least 20% above the supply.

In the processing of groundnut, three types of processing methods are utilized, namely

- Traditional Method
- Semi-Mechanized
- Fully Mechanized

2.7.1 TRADITIONAL PROCESSING

In the traditional method, operated at the family level, all stages of processing are done manually. The Groundnut seeds are shelled from the pods, dried under the sun after which it is roasted in a dry pot over burning fire. The roasted groundnut seeds are threshed and winnowed in order to get rid of the pills, and grinded with the aid of the common grinding machine. The groundnut paste is then poured into a large bowl depending on its quantity and turned manually with a turning stick. Warm water is added at various intervals, this quickens the extraction of the oil from the paste. This process is tedious in the sense that the turning of the paste will have to take a long time and requires more energy. After the oil has been extracted, the groundnut paste

is cut out in tiny bits of various shapes and fried into a crunchy like biscuit known as groundnut cake or 'kuli kuli'

The oil extracted from the groundnut paste is consumed in its raw state without undergoing any form of treatment or purification. Total oil output under the traditional method of processing is difficult to quantify as it is mainly consumed or traded between families or communities.

2.7.2 SEMI-MECHANIZED PROCESSING

Groundnut seeds processed semi-mechanically follow the same process as that of the traditional method, however manually fabricated equipment are made use of, which makes the whole work faster and less tedious. We have the electric fryer in place of the pot on fire, which does the frying; there is the thresher which shells the seeds from their pods and the extractor which extracts the oil out of the paste.

It should also be noted that the oil extracted here is not refined , or treated in any form

2.7.3 FULLY MECHANIZED PROCESSING

This method of processing makes use of tested and approved machineries, particularly after the extraction of the oil. Aside the thresher, crusher and winnowing, there are the oil expeller, filters, purifier, deodorizer and the packaging machines.

Processing of groundnut is done under high sanitary conditions, in the course of refining the oil deposits of impurities are obtained at various temperature levels, these deposits include soap stock which is sent to soap manufacturing industries, there is also the slush which is sent to animal feed making industries together with the groundnut paste left after oil extraction. The packaging of extracted oil is done in plastic bottles and kegs of various sizes usually in

the range of 2 litres, 5 litres, 10 litres and 20 litres. Quality of oil extracted is guaranteed in that the packaging is done hygienically and neatly after a series of laboratory tests must have been carried out which ensures its preservation and consumption.

Extraction efficiency is higher here than under the semi-Mechanized processing, however the major drawback to the widespread use of these required machineries among small holders is its high cost, which makes it economically suitable only for large size industrialists or the government at either the state or federal levels.

It should be noted that the outputs of this processing method, that is after extraction is crude oil. To add value and improve its qualities, the oil has to be refined the essence of refining is to obtain a product with the desirable colour, taste smell and stability.

Two methods of refining exist in the industry namely the alkaline or chemical refining and physical refining.

(i) Alkaline Or Chemical Refining: - In this method the free fatty acid in the oils is saponified (de-acidified) with alkaline the sodium salt (soap) is then removed using gravity separation or centrifugal separation.

(ii) Physical Refining: - This can be divided into bleaching and deodorization. Bleaching is the removal of colouring matters like carotenes; In addition the process removes traces of gums, sodium salts of fatty acids (soap) and other products. The bleaching process is effected by mixing the oil with natural or activated bleaching clay in a reactor at a temperature of 90 – 100°C, under vacuum. The clay is then removed by passing the mixture through filters.

Table 1

OIL TYPE	1975-1979 %	1980-1984 %	1985-1989 %	1990-1992 %
Palm Oil	64.21	65.94	62.64	57.89
Groundnut Oil	16.04	13.78	18.63	23.89
Cotton Seed	1.59	0.64	1.06	1.97
Shea Butter	2.98	3.26	3.31	3.40
Soya Bean	15.18	16.38	14.36	12.85
TOTAL	100	100	100	100

Source: - OIL SEED ASSOCIATION OF NIGERIAN

Survey, 1996

Table 2: - ANNUAL GROWTH RATE OF OILSEEDS PRODUCTION IN NIGERIA

OIL TYPE	1975 –1979		1980-1984		1985-1989		1990-1992	
	('000T)	RATE	('000T)	RATE	('000T)	RATE	('000T)	RATE
Palm Oil	665.0	0.38%	696.0	0.75%	796.2	3.20%	856.7	3.20%
Groundnut Oil	163.7	1.92%	145.4	3.01	236.8	13.82	353.5	0.2%
Cotton Seed Oil	16.2	4.40%	6.7	9.30%	13.5	38.24%	29.3	1.17%
Shea Butter	30.4	3.19%	34.4	3.54%	42.1	1.92%	50.3	1.925
Soya	155.0		172.9		182.5		190.1	

Beans &Other Oils								
All Oils	1020.3	0.60%	1055.4	0.98%	1271.1	4.80%	1479.9	2.46%

Source: OIL SEED ASSOCIATION OF NIGERIAN Survey, 1996

Table 3: - HECTARES AND PRODUCTION OF MAJOR OILSEED CROPS IN NIGERIA

OILSEED CROP	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
Oil Palm	500	615	650	680	700	700	730	760	792	825	837	A P
Groundnut	600 591	594 621	793 896	597 687	707 815	800 895	707 992	1127 1361	1046 1297	1142 1416	1153 1453	A P
Soya Bean	200 43	205 60	210 68	324 107	442 150	750 300	729 218	468 145	113 154	543 163	593 178	A P

Cotton	900	950	666	574	451	353	575	643	653	362	411	A
	808	114	100	195	194	182	276	309	346	192	218	P
Sheanut												A
	103	103	104	109	110	253	289	326	331	336	353	P

A = area in '000ha

P = Production in '000 Tonnes

Source: - FAO (1994)

CHAPTER THREE

3.0 EFFECTIVE CIRCULATION WITHIN THE PRODUCTION HALL

Circulation can be defined as movement from a place to another in the performance of a function. Effective circulation within the production hall aims at the movement of machinery in the course of a conveyor belt as well as the comfortability of the workers.

Mechanical services are a major feature of any production hall and in order to achieve good design, location and accessibility, must be given a lot of thought. It is advisable that a basic installation layout of machineries within the production hall be developed. This might however not be easy in that different types of machines will have to come in depending on the type of production. This problem can however be solved by having a standard layout for each type

of production such as electronic assembly, food processing and many others.

3.1 DEFINITION OF PRODUCTION

In economic theory production is defined as the processing of creating economic goods, material goods and personnel services. In daily business, the term lacks a definite definition, for instance the businessman views it as increment of a thing, making or transforming something. The agriculturist sees it as the catering and harvesting of his farm produce. However, production as regarded, includes agriculture and manufacturing but excludes transportation, trade, and marketing. A similar definition is other encountered in business low and governmental regulations.

In the early 18th century, the physiocrats in their desire to reduce the excessive emphasis placed on manufacture and commerce by the mercantilist philosophers who preceded them held that agriculture and extractive industries

constituted the sole source of wealth and all other productive activity depended on it.

Other economists like Adam Smith and John Stuart Mill adopted and broadened this idea by including manufacturer as an element in the creation of wealth. They also introduced the concept of vendability – production for the market rather than in accordance with the dictates of a natural economy.

In the latter part of the 19th century the economists William Stanley Jevons and Karl Menger widened the meaning of production to include services rendered by persons engaged in transportation, trade and many others. This broadening of scope came about largely as a result of the concept of utility - the to satisfy human want thus bringing to an end the controversy of whether the labour of a shoemaker is productive or not while that of a bootblack is unproductive.

Production therefore involves the creation of utilities increasing the power of economic goods to satisfy human wants by changing goods from one form to another, moving goods from one place to another, holding goods over from one time to another and transferring them from one owner to another.

There are four recognized factors of production namely: -

i) Nature: - land and other natural resources that are applied and used in the creation of economic goods without the aid of man.

ii) Labour: - All human effort (physical and mental) used in the production of economic goods.

iii) Capital: - Economic goods that are man-made for use in further production, for example raw materials, factory buildings, machinery and tools.

iv) Enterprise: - The initiating and innovating activity (as distinguished from a routine managerial function) that

organizes the other factors as production into an operating unit and assumes responsibility for operations.

3.2 TYPES OF ARRANGEMENT IN PRODUCTION HALL

Utility services within the production hall require great emphasis, which is usual in the design of average building. Heating, ventilating and air conditioning systems and multiple pipes of various services such as water and gas create a demand for cubic space as well as floor space. In recent designs, utility systems have taken a higher percentage of the gross area thereby leading to a reduction of net space. This aspect of the production hall comes as a surprise to architects and engineers whose experience has been mainly with commercial buildings, which requires less utility service capability. Associated with this need of space for utility service is the need to provide functional space for the unseen occupants of the building, which are the maintenance and

operating engineers, and the craftsmen who provide for the continual changes and adjustments in utility systems, which mark maximum productivity of the end product.

3.2.1 ARRANGEMENT FORMAT

Selection of utility distribution system strongly influences the configuration, design and cost of the production hall. The type of utility system used should be selected as early as possible in the planning process, before the hall arrangement is fixed. The production halls arrangement and equipment location should follow the utility distribution pattern; once this has been standardized utility services are usually provided within a production hall by a horizontal or vertical distribution system of the machines or a combination of the two. The shapes formed as: -

i) I – Shaped arrangement.

ii) U – Shaped arrangement.

iii) O – Shaped arrangement.

3.2.1.1 I Shaped Arrangement.

This arrangement shape of the machineries allows the design have space on both sides of the hall. The machineries are positioned at the center of the hall and runs straight from the beginning of the hall towards the end. The horizontal distribution of utilities from the central core drives the conveyor belt downwards to individual case work. This design provides assess for maintenance and service personnel to the utility piping and duct work through out the life of the structure. It has a high degree of flexibility for meeting the needs of changes in the process and has a high capability to meet a wide range of criteria with regard to environmental and ventilation, temperature controls, lighting, electric power. This system results in functionally inefficient production. It comes in handy where future expansion, either Horizontal or vertical is anticipated. In its

simplest form the system provides for a single large space on each side of the production hall.

Advantages

1. Excellent flexibility
2. Moderately high initial cost
3. Low maintenance cost
4. Modifications do not interfere with conduct of work in adjacent.

Disadvantages

1. Energy is not effectively conserved.
2. Restriction of air spaces.

3.2.1.2 U – Shaped Arrangement

This system provides concealed utilities with duct work and services in a serials of regularly spaced shafts located in aisle between the two vertical mains of machinery. All service mains and ducts are brought vertically to the conveyor belt

upwards and downwards by the mechanical systems. Distribution of utility services from the vertical shafts into the processing area is generally in the conveyor belt within the semi – circle. The U – Arrangement system is not a good selection for buildings with only one or two storeys, it is most efficient in multi storey buildings especial in those of long rectangle shape.

Advantages

1. Moderate space for transportation.
2. Moderate initial cost.

Disadvantages

1. Difficult to service and maintain.
2. High cost of maintenance
3. Available space usually dose not permit individual supply of raw material.
4. Not Flexible.

3.2.1.3 O – Shaped Arrangement

This system probably provides maximum flexibility and capability of work in the production hall. Utilities consisting of the duct work and piping systems are arranged circularly. From the supply, the service mains and ventilation ducts are brought to each individual utility by means of a centrally located vertical shaft. Distribution is made laterally on each utility with a circular – revolutional conveyor belt. Although this system has almost unlimited flexibility, its cost is high and also has an extremely high maintenance cost.

Advantages

1. Excellent flexibility to the any portion of the production Hall.
2. Raw materials and end products are easily transferred.

Disadvantages

1. High cost of installation.

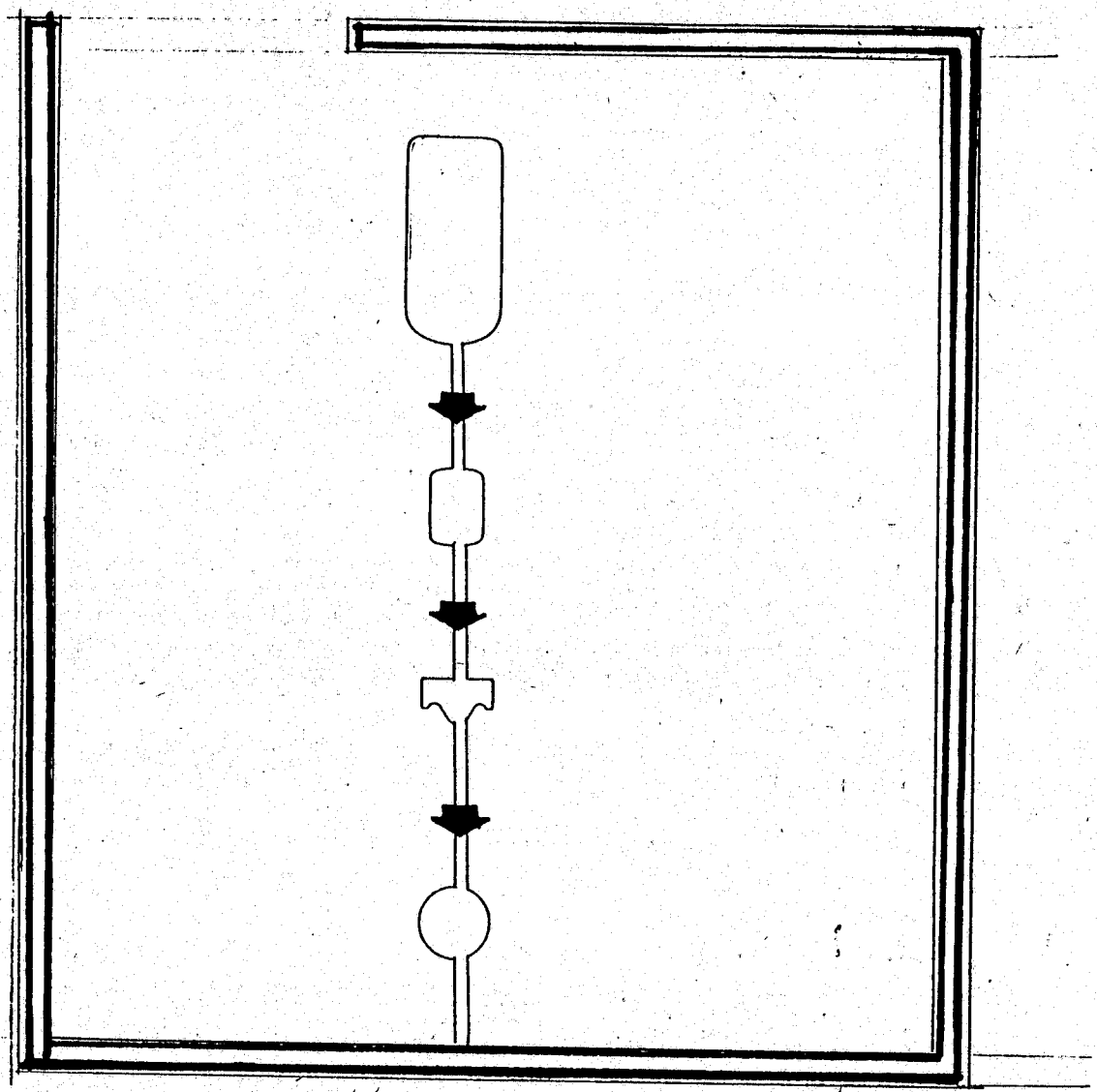


FIG 3.1

'I' SHAPE ARRAGEMENT IN A PRODUCTION HALL

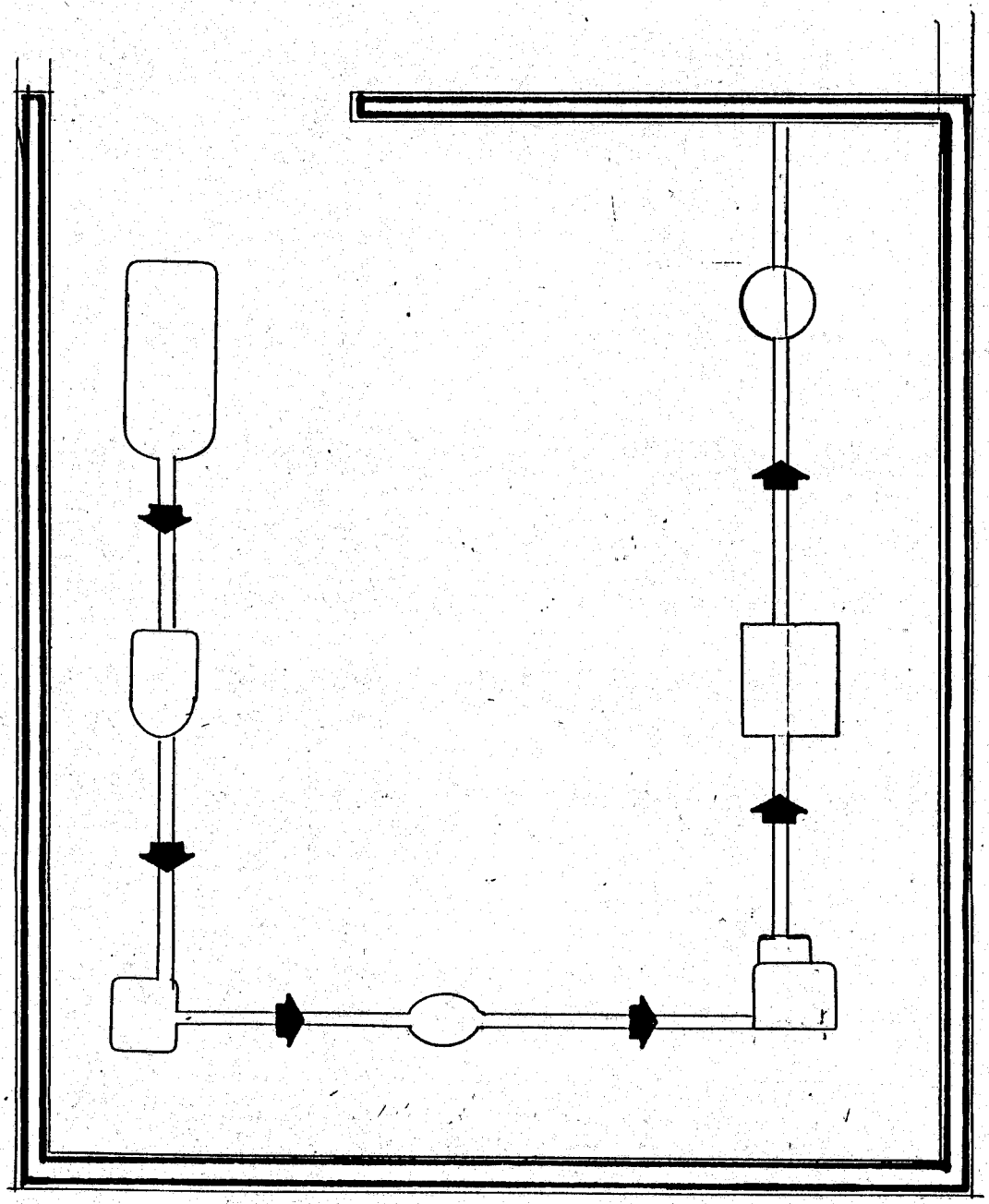


FIG 3.2

'U' SHAPE ARRANGEMENT IN A PRODUCTION HALL

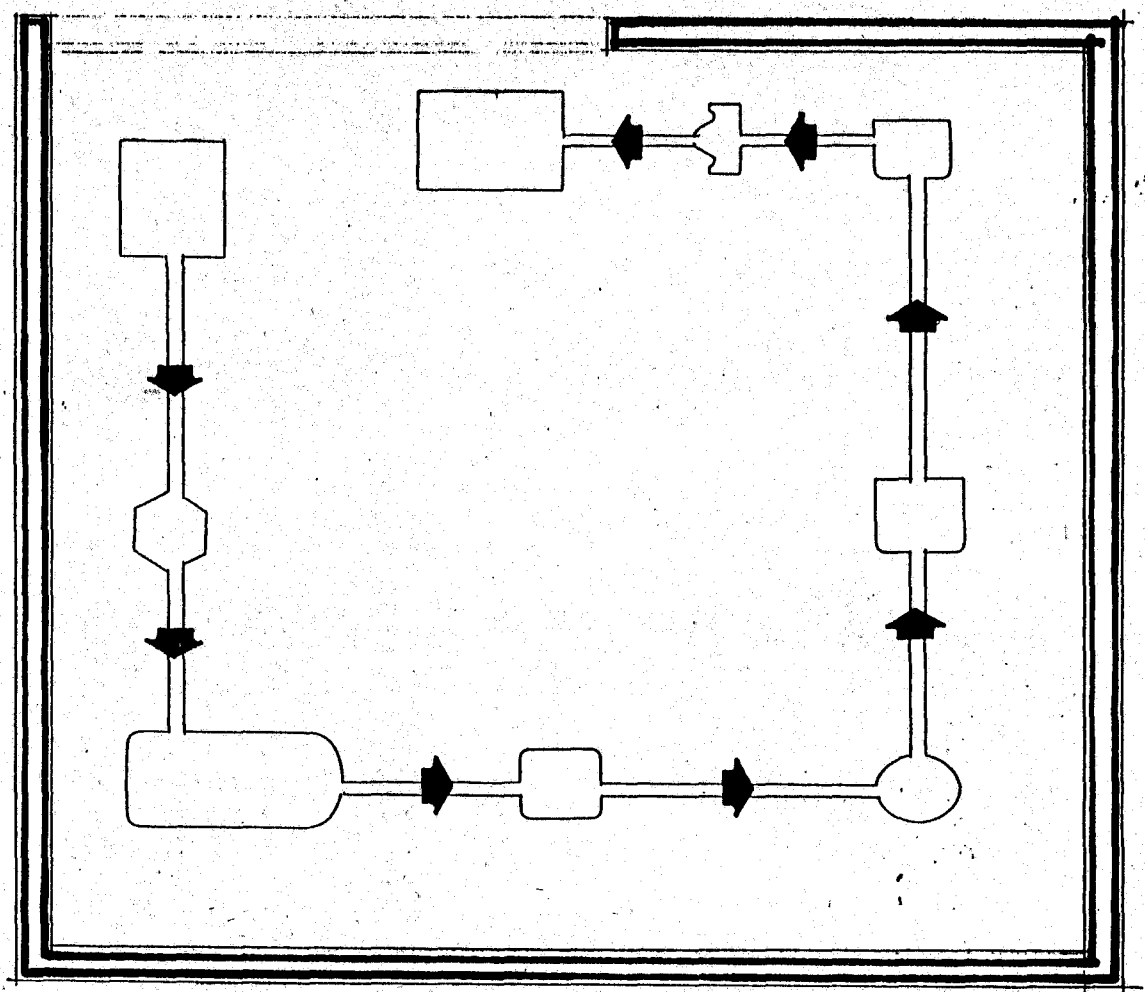


FIG 3.3

'O' SHAPE ARRANGEMENT WITHIN A PRODUCTION HALL

2. High maintenance cost.

3.3 IMPORTANCE OF VENTILATION, LIGHTING AND MOVEMENT IN THE PRODUCTION HALL.

Ventilation, lighting and movement are vital within the production Hall because they go a long way in determining the efficiency of the final product. Ventilation is the free passage of fresh air through an enclosure. Lighting is the brightness given by the sun, moon or any artificial light that makes things to be easily seen. While movement is a change from one place to another to perform function.

3.3.1 IMPORTANCE OF VENTILATION

Until recently ventilation has been the major cooling technique throughout the world. Comfort ventilation brings in outdoor air which when passed over human skin increases evaporation cooling. With this movement cool height air is introduced into a building to flush out its heat, while during

the day very little out side air is brought indoors so that heat gain in the building can be immunized. Mean while the mass of the relatively cool. Cool structure acts as a heat sink for the people within. This passive cooling technique is useful for certain periods in most climates but it is especially appropriate in hot and humid climates, where it is typical for air temperature to be only moderately hot and ventilation is required to control indoor humidity.

Comfort ventilation can rarely be completely passive because in most climates winds are not always sufficient to create the necessary indoor air velocities. Window or whole house attic fans are usually needed to supplement the wind. For comfort ventilation, the airflow techniques mentioned above should be used to maximize the airflow across the interior of buildings. If the climate is extremely humid and little or no heating is required, then lightweight construction is appropriate. In such climates any thermal mass used will only

store up the heat of the day to make the heights less comfortable. Comfort ventilation is most appropriate when the indoor temperature and humidity are above the outdoor level. This is often the case because of internal heat sources and the heating effect of the sun. To a limited extent, comfort ventilation is also appropriate when the indoor temperature is above the comfort level but below the outdoor temperature because of the physiological cooling effect of air motion. Ventilation benefits under this condition are limited because the building is actually being heated by the hot outdoor air. Thus except the indoor humidity is very high it is often wiser to close the windows and use interior circulating fans to create a cooling effect.

3.3.2 IMPORTANCE OF LIGHTING.

Light is defined as that portion of the electro – magnetic spectrum to which our eyes are sensitive. Lighting is necessary for satisfying aesthetic and biological needs as well

as the lighting required to perform certain tasks. The location and brightness of objects in the field of view will have a major impact on the quality of the lighting environment. There are many factors that affect the performance of a visual task (task where visibility is important). Some of these factors are inherent in the task, some describe the lighting conditions and the remainder reflects the condition of the observer.

The daylight that enters a window can have several sources; direct sunlight, clear sky, clouds or reflections from the ground and nearby buildings. The light from each source varies not only in quantity but also in qualities like colour, diffuseness, and efficacy. The general goal for day lighting is the same as those for electric lighting; to supply sufficient quality light while minimizing direct glare, veiling reflections and excessive brightness ratios. Thus, the goal is to get more light deeper into the building or raise both the illumination

level as well as to reduce the illumination gradient across the room.

For both electric lighting and day lighting, it is very valuable to develop an initiative understanding of the lighting distribution from various sources.

Rules For Lighting Design.

i) First establish the lighting programme by fully determining what the seeing tasks is in each space. For example, is the illuminating mainly for vertical or horizontal surface? Willl day lighting be used to reduc the need for electric lighting.

ii) Illuminate those things that need to be seen since this usually includes the ceiling, wall and some furnishing, the light reflected from these surfaces can supply much of the required illumination.

3.3.3 IMPORTANCE OF MOVEMENT

Movement is the change of position of a body in space as time passes. This change of position is described with respect to a place or thing whose position is assumed to be fixed. For example, the motion of an automobile is described with respect to the surface of the earth, and this surface then is called the frame of reference for the motion in question. Actually, the earth is in motion and any other chosen frame of reference is also in motion. As a result, all motion is relative, that is the motion of the body is relative to the motion of some object, even though the object is conventionally regarded as being at rest.

There are three basic types of motion namely: -

i) Rectilinear motion, which is in a straight line and the direction of motion, is unchanging.

ii) Curvilinear motion is along a curved path, and the direction of motion is continuously changing.

iii) Rotational motion is the movement of a body spinning about a fixed axis.

3.4 REQUIREMENTS Of A PRODUCTION HALL.

Early factories were generally three or four storeys high. Because of limited transportation facilities they have to be built in cities where land costs were relatively high. With the coming of in expensive widespread transportation for employee's and of steel reinforcing or supports for buildings, companies began to build out of town. Land values were lower and the plant could spread out. Today's trend toward large one storey building is thus a product of changing conditions. This does not mean that every new plant should be one storey high, as some industrialists advocate. Plants built around a higher one-storey process should certainly have upper floors. Nevertheless gravity must not be underrated, even though power costs may be low.

Single storey construction possibly including a basement or balconies should be used when the following exists: -

i) Product is large, heavy or relatively in expensive.

ii) Weight of equipment causes heavy floor loads.

iii) Land value is low.

iv) Land is available for expansion.

v) Large unobstructed space is needed.

vi) Product is not adapted to gravity.

vii) Frequent changes in layout are anticipated.

Early buildings were narrow because they need natural lighting. They expanded by extending their ends and by adding across buildings in a rectangular fashion. Today artificial lighting is relatively less expensive. The number and frequency of production changes are greater.

Therefore, emphasis today is on plants that are relatively square and obstructed by walls. Such plants are built in rectangular sections and expansion is by building additional

sections onto the sides or end. Where land is limited, as in river valleys or where property lines run at curious angles the building must suit the limitations of the land itself. Dirty odourous, noisy or vibration-producing operations should be segregated in separate buildings. Hazardous operations with fire or explosion possibilities also fall in this class.

Service buildings that do not directly participate in the flow of production can also be set apart. The following list should be used to guide decisions in the matter of building shape.

A Use a relatively square building when there are: -

i) Frequent changes in product design.

ii) Frequent improvements in process.

iii) Frequent rearrangement of layout.

iv) Restrictions on building materials or savings desired in amount of materials used.

B Use other shapes or separate buildings when there are: -

i) Physical limitations of land.

ii) Property lines at curious angles.

iii) Buildings that house operations not part of production.

iv) Buildings that house operations that cause dirt, odours, noise or vibration.

v) Buildings that house operations susceptive to fire or explosion.

To a large extent the design of a production hall will be dictated by the heating, ventilating and air conditioning systems and the utility distribution. If these factors are carefully planned first, the design will be an efficient one and it will still be possible to plan for structural flexibility and growth needs as well as for engineering capability.

CHAPTER FOUR

4.1 Dan Mai And Sons Oil, Kallabaina-Marrrina, Sokoto State.

This Industry is located within Marina area of Sokoto along Kallabaina quarter's road. This industry is owned by an individual and established to process groundnut seeds. The products of the factory are the groundnut oil and cake respectively.

4.1.1 FACILITIES.

The Facilities provided within the industry are:-

The administrative block and the production hall itself, which houses the warehouse. Both manual and electrical machine are made use of in case of power failure.

4.1.2 MERITS

1. Good and functional production line.
2. Provision is made for packaging.
3. Render commercial services.

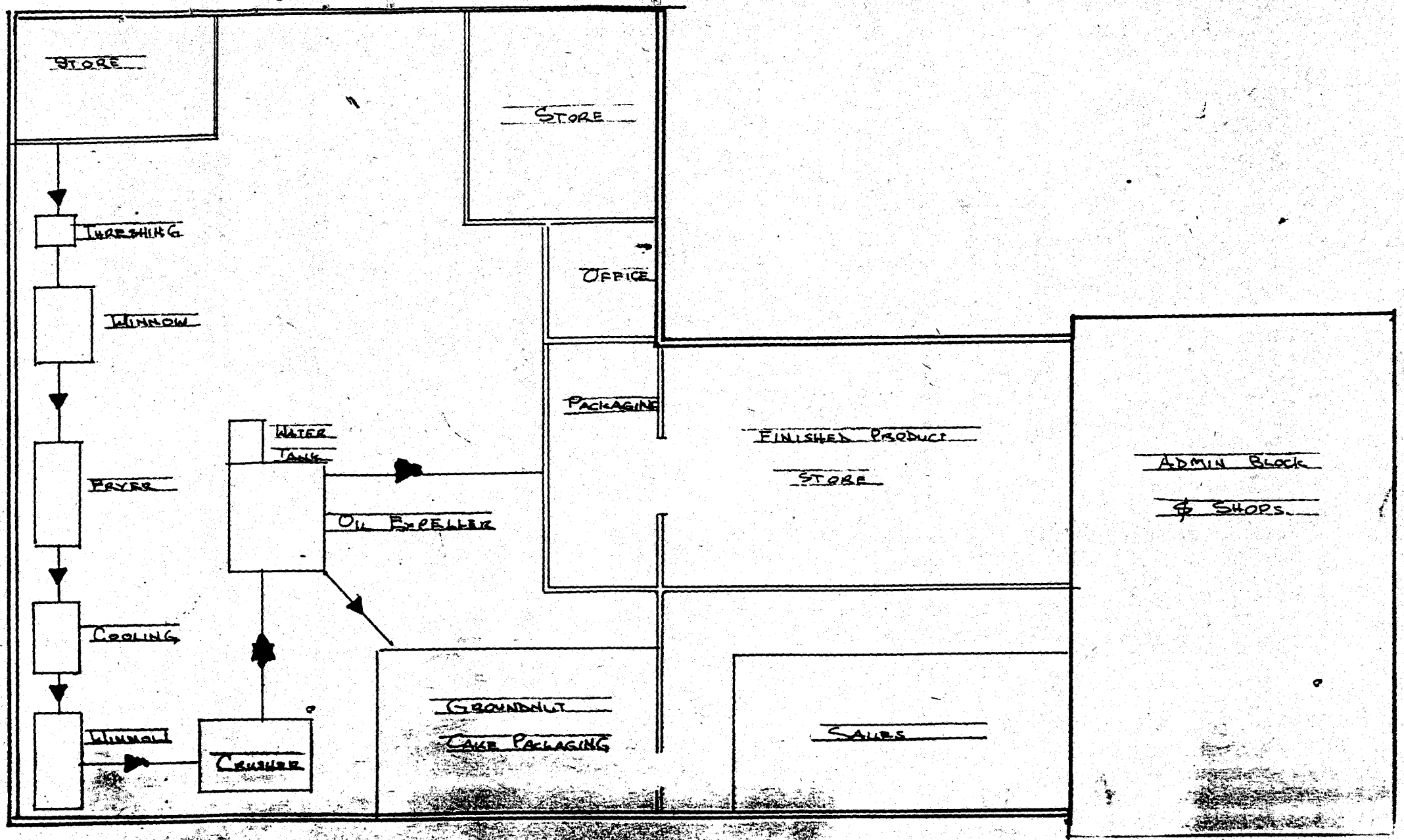


Fig 4.1

FLOOR PLAN

4. Fairly organized.

4.1.3 DEMERITS

1. Inadequate lighting and ventilation system.
2. Low overhead height for the production.
3. Poor Landscaping.
4. Absence of Generator.
5. Inadequate managerial measures.
6. Lack of staff Facilities.

4.2 CASE-STUDY 2:- Golden nuts Oil, Niger North, Gidan Aliyu Ndanusa, Minna, Niger State.

This industry is located along Bosso Road Opposite the Murtala Mohamed Recreational Park Minna. It is Privately owned Industry and has a capacity to produce.... Metric tons of edible oil daily. Its product includes groundnut oil,

groundnut cake, and soap slush and groundnut chaff for animal feed.

4.2.1 FACILITIES.

The industry comprises of: -

i) Administrative Block.

ii) Production Hall.

iii) Maintenance Workshop.

v) Generator House.

The site layout is made up these units closely linked to each other. The site is fenced and surrounded by residential houses.

All the units are made of sand Crete blocks. A deck covers the production hall.

4.2.2 MERITS.

1. Functional Production Line.
2. Stable building structure.
3. Good packaging and sanitation.
4. Use of generator.
5. Can be easily accessed.
6. Placing of fire extinguishers at strategic points.
7. Adequate overhead height is provided within the production hall.

4.2.3 DEMERITS.

1. Uncompleted factory building.
2. Poor landscaping.
3. Restriction in circulation on site.
4. Inappropriate location within a residential area.

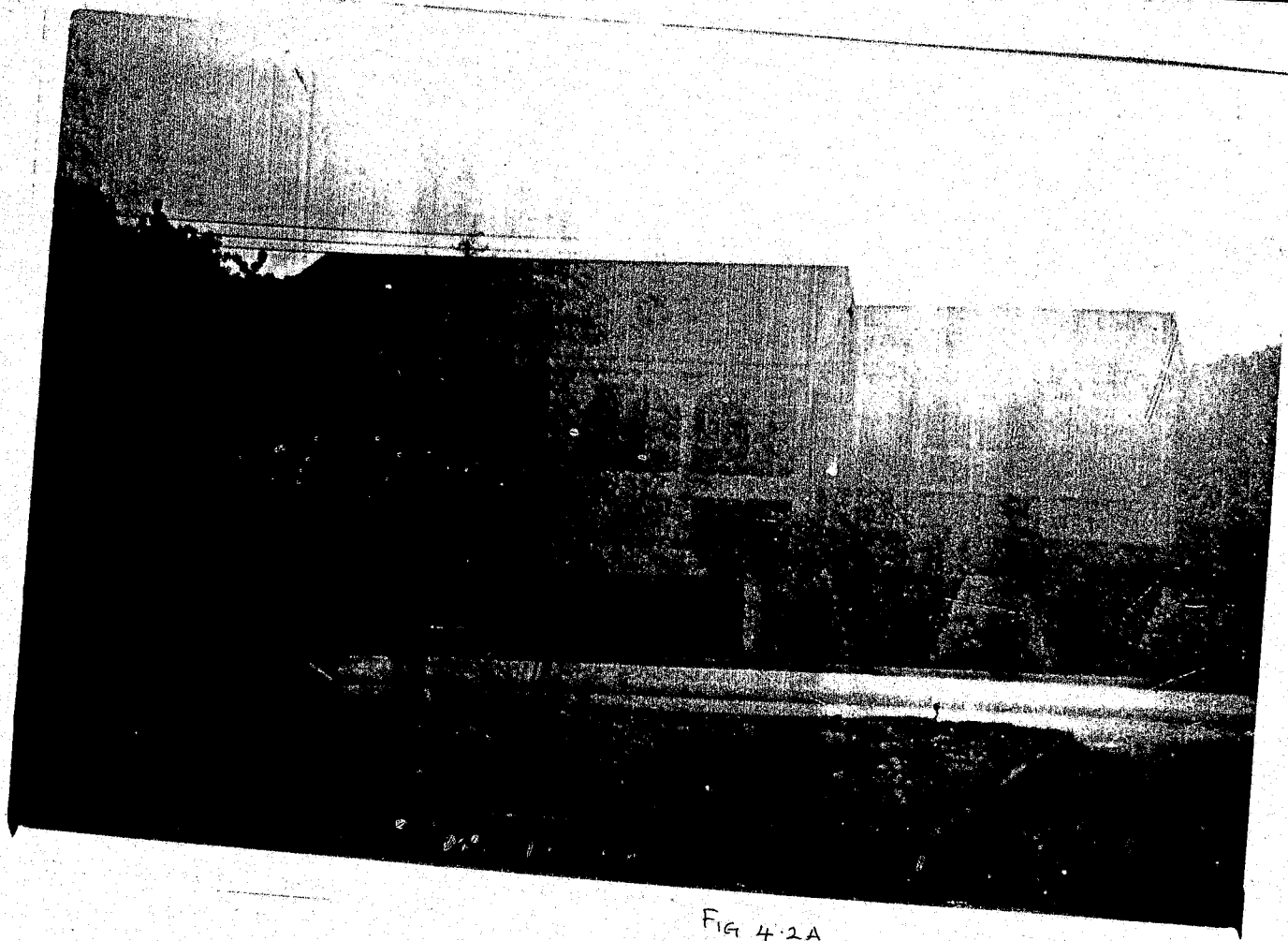


FIG 4.2A

FIG 4.2B

4.3 CASE STUDY THREE: - Fati Groundnut processing Factory, Bida.

This groundnut processing factory is located behaind the post office market at Bida. It is a cottage industry established in 1992. It was established solely for the processing of groundnut into groundnut oil and cake.

4.3.1 FACILITIES

The industry consist mainly of the production unit and a store which is partly used as an office.

4.3.2 MERITS

1. Located close to the market.
2. Provide commercial services to the public.

4.3.3 DEMERITS

1. Very poor hygienic measures.
2. Incomplete production line.
3. Poor building design
4. Lack of adequate lighting and ventilation
5. Bad accessibility.

6. absence of generator house.

7. No landscaping

8. No staff facilities.

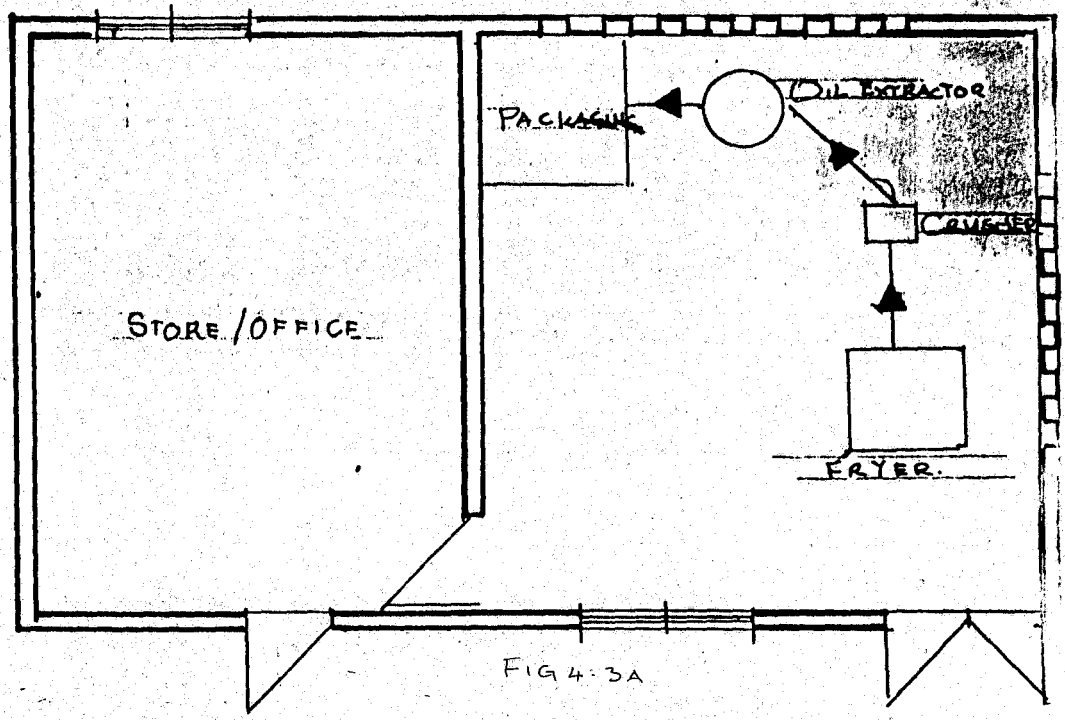


FIG 4·3A

FLOOR PLAN

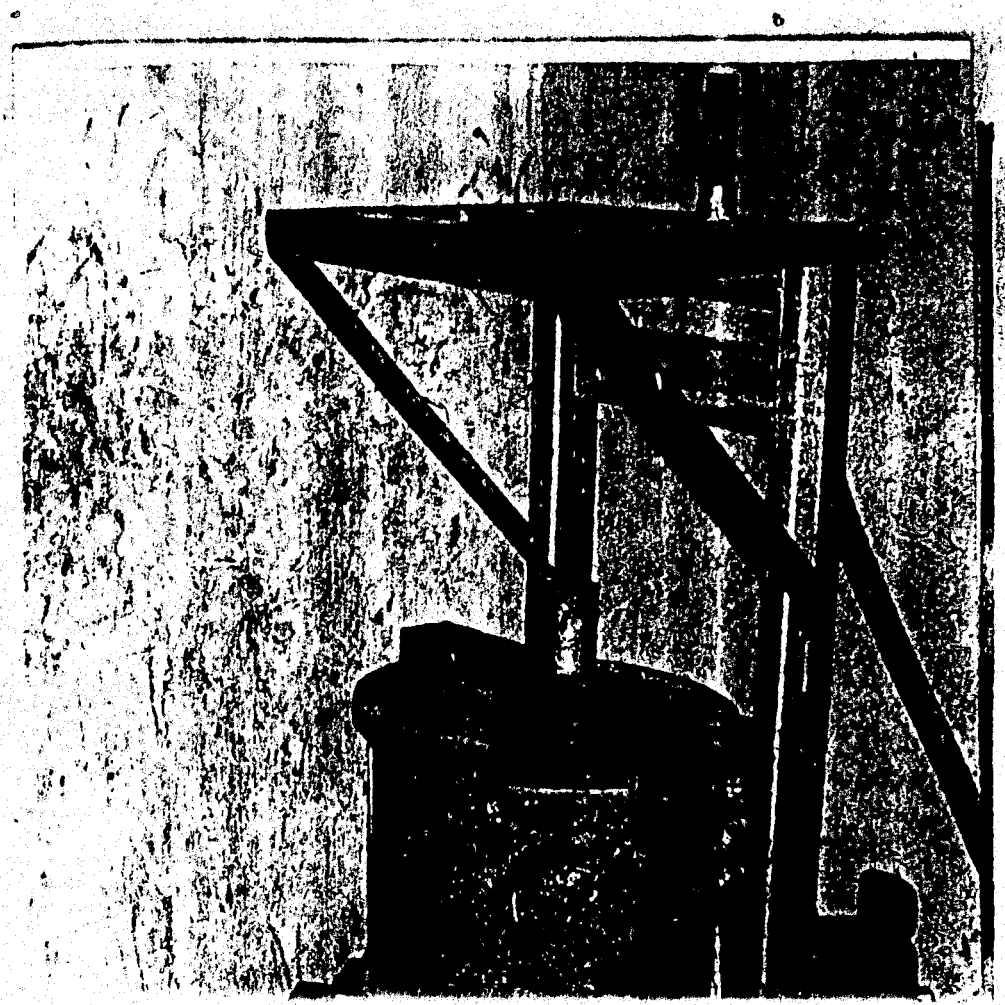


FIG 4.38

FIG 4.3C

FIG 4·3D

CHAPTER FIVE

5.0 GEOGRAPHICAL LOCATION.

Bida is one of the twenty-five Local Government Areas of Niger State. It is bordered northwards by Lemu and Kataeregi, Eastwards by Agaie and westwards by Lavun Local Government Area. Bida is strategically located within the Guinea Savannah region at the southeast of Niger State. It is sited between longitude 6^0 East and 6^02"East, and between latitudes 90^0 North and 9^015" North of the Equator. Bida enjoys guinea savannah climates with dry season prevailing winds from the northeast direction as well as extensive heat radiation from the sun. Raining season in Bida lasts between April and October. This is immediately followed by excessive cold during harmattan, which lasts till January. February marks the beginning of the extensive heat period, which ends in May when the rains begins.

Bida is one of the towns located within the hot zone of the state with relative low drying power and about sixteen (16) hour sunshine and solar radiator.

Bida town has an annual rainfall of about 1,600mm at the beginning of the rains and about 3,999 towards its end. The mean rainfall being about 1,200mm

5.1 TEMPERATURE

Bida has its mean annual temperature to be 30°C. It rises to about 35° between February and April when the intensity is high and falls to about 260° between December and January

5.2 CLIMATIC CONDITION

5.2.1 RAINFALL

Bida has a mean annual rainfall of 1200mm; the highest mean monthly rainfall is in September with about 3,999mm and least at about 1,600 at the beginning of the rains

The rainy season is characterized at its start by windstorm and slight drizzles, which terminates by May ending. The windstorm resumes again by mid October

Architecturally there is the need of having a safe durable structure or building that can overcome the rainfall effects. Windscreens, bracing and parapets could be used to protect the building from storms.

5.2.2 TEMPERATURE

The mean temperature of Bida is highest in March at 35°C and lowest between December and January at 26°C. The

town experiences very hot and uncomfortable weather between Februarys to early April, the temperature falls during the rainy season due to cloud cover, increased vegetation, which causes a cooling effect.

Temperature variation can architecturally be handled by means of natural cross ventilation and artificial ventilation. Landscaping elements apart from aesthetic function were also used to achieve temperature balance.

5.2.3 WIND

Bida town is characterized by two air masses, the tropical maritime and the tropical continental air masses. The tropical maritime dominates over the Atlantic Ocean to the south of the country thereby making it warm and moist. It flows inland from the southwest to the Northeast.

The changes in seasonal weather conditions are attributed to the two air masses. The tropical Maritimes brings about wet season and is termed the southwest tradewind, which brings about the Northwest tradewind, which brings about the Harmattan. The duration and intensity of each wind cover an area is a function of the interfaces between the two air masses.

Orientation on buildings and the use of lands. Capping trees are used as screens against the wind. This however is determined in the types sizes, position of windows and also the roofing materials.

5.2.4 SUNSHINE AND CLOUD FORMATION.

The annual variation of sunshine between November and April follows a trend, which is 214 hours in the state. The approach of the rainy season increases the trend in

cloudiness. The sunshine experiences a major decline as the rains reaches its lowest value in August.

5.3 SOCIO-CULTURAL LIFE

5.3.2 ETHNIC GROUPING

The indigenes of Bida are mainly the Nupe people. They however maintain good relationship with other minor ethnic groups like the Basanges, Dibos, Kakandas and the Igala people. Commercial activities also brought in other ethnic groups like Yorubas, Ibos and Hausas.

5.3.3 RELIGION

About 85% of the indigenes of Bida are Muslims. The traditional Nupes culture was established under the influence of Islam, as the political authority came into being during the spread of Islam in Northern Nigeria. This explains why most traditional festivals and cultural identity have their origin related to Islam.

5.4 ECONOMY AND COMMERCE

Bida town is one of the most populated towns in Niger State, and its land represents the main asset of the people.

Quite a large number of industries are in small scales consisting of traditional craftwork repairs and service workshops. Most people of the land depend on agriculture as a means of livelihood, the farms are however small and the mode of cultivation is manual which makes the work laborious.

Economically, activities in Bida are centered on commercial activities like buying and selling of finished and unfinished goods. Agricultural products like rice, melon, maize, guinea corn, fish, palm oil and vegetables form the bulk of goods sold within the town.

There are only a few deposits of mineral resources in commercial quantities. We have the clay, sand and silica,

which are locally, use for the construction of buildings. Bida brass and glass industry is yet another area of commerce and a cherished asset of the indigenes. The industry though still local in nature have produced products of different varieties ranging from those for domestic usage to those specially made for interior decoration purposes. This to a large extent has boosted the economy of Bida.

The major commercial areas within Bida and Esso are towards the Emir's palace where markets are located.

5.5 TRANSPORTATION AND TRAFFIC FLOW

Bida is one town that has its roads busy with traffic. The Abuja-Lagos trunk A road is a popular route for Abuja and Lagos liners. Bida also links up with other towns within the state; they include Zungeru, Kutigi, Mokwa, Agaie, Lapai, Kateregi, and Lemu. There is still need for the repair of the

trunk a road, which links Bida up with Minna, the state capital.

It is sad to say that the road that links the various localities within the town are taken over by potholes, erosion cuts and narrowness of the roads do not allow free movement by vehicles not to mention pedestrian paving for human traffic.

5.6 EXISTING LAND USE AND FUTURE TRENDS

5.6.1 HOUSING

Bida, which happens to be an ancient town, still lacks proper planning. The town happens to be congested with little space for development. Only the Government reserved area (G.R.A) is adequately defined.

Localities, which still require an upgrading in their level of development, include Esso, Wadata, and the post Office area.

5.6.2 OCCUPATION.

Farming is the main occupation of the people with only about 15% engaged in white-collar jobs, businesses and crafts. As a matter of fact, the non-indigenes, particularly the Yorubas and Ibos are those engaged in one form of business or another.

5.6.3 INDUSTRY.

Bida like other towns within Niger State is not an industrious one despite the fact that there exist raw materials that can bring about the existence of industries. Such industries such as Vesper coupling company, paper mill, flourmill and groundnut oil industry have existed in Bida. Their gradual collapses have been attributed to apparent mismanagement. However, a small-scale detergent industry (Niger Detergent) exists today. Individuals have also embarked on cottage

industries as a means of livelihood. These industries include brass work, weaving, and manual processing of groundnut into oil and the groundnut cake known as "Kuli".

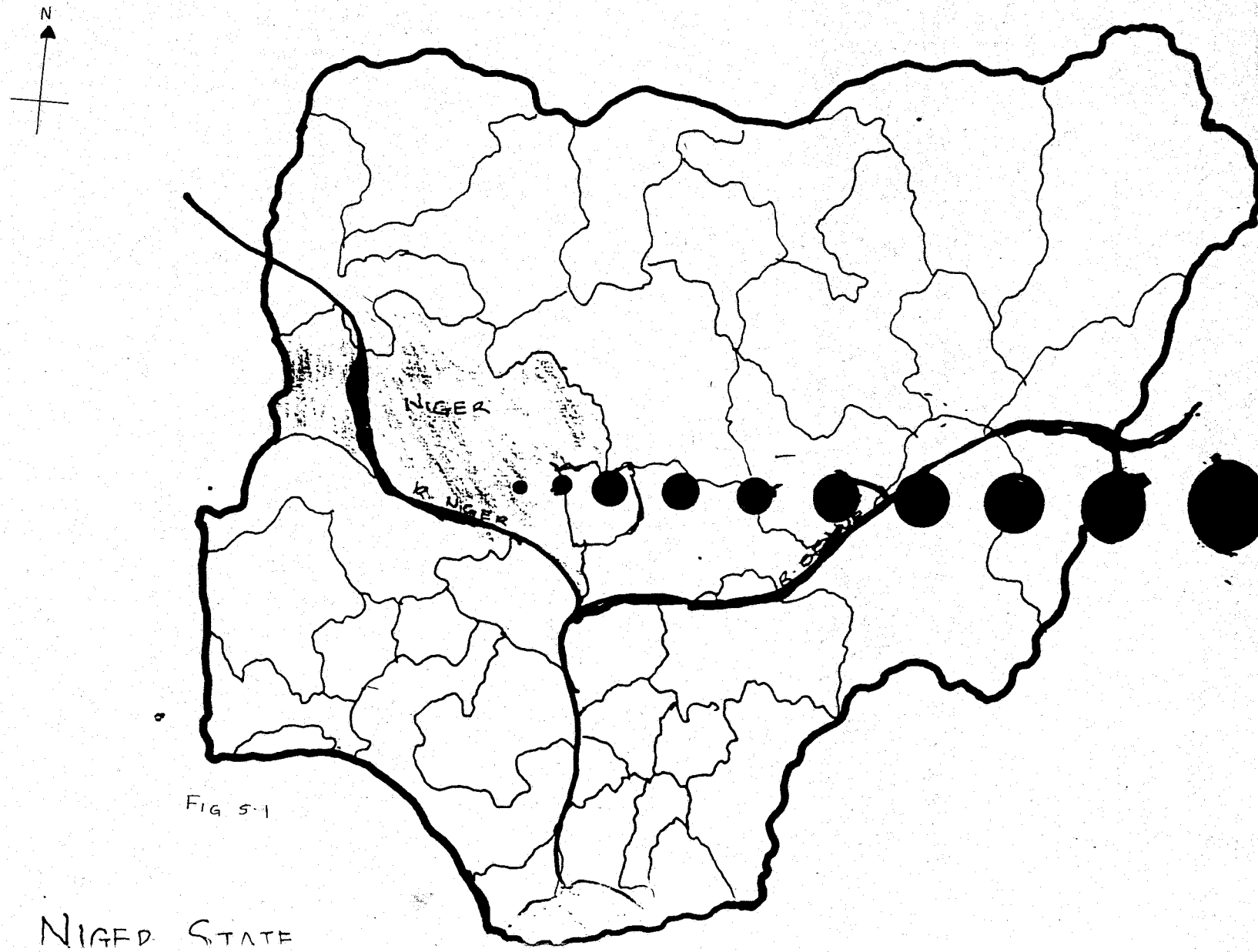


FIG 5·1

MAP OF

NIGERIA SHOWING NIGER STATE

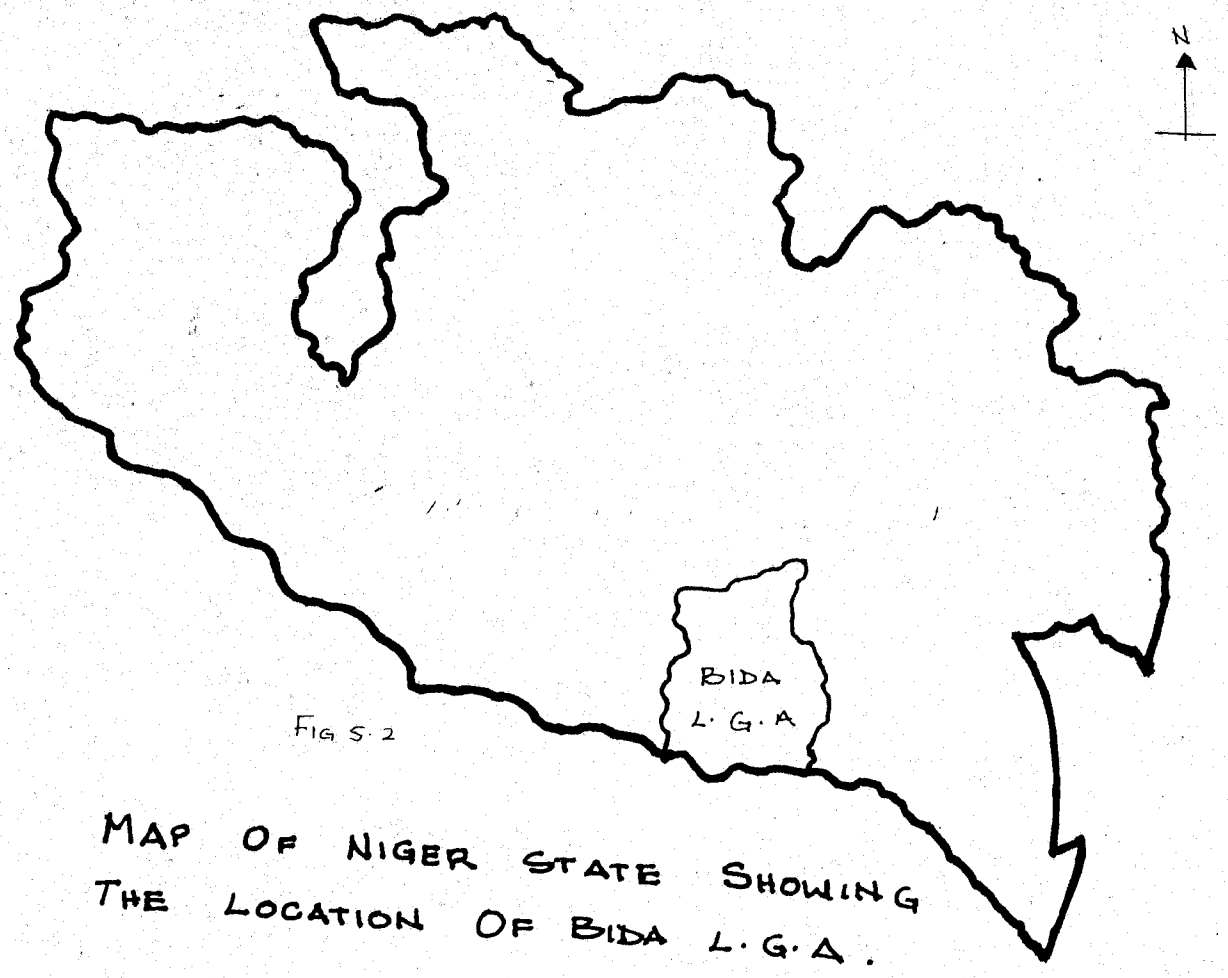
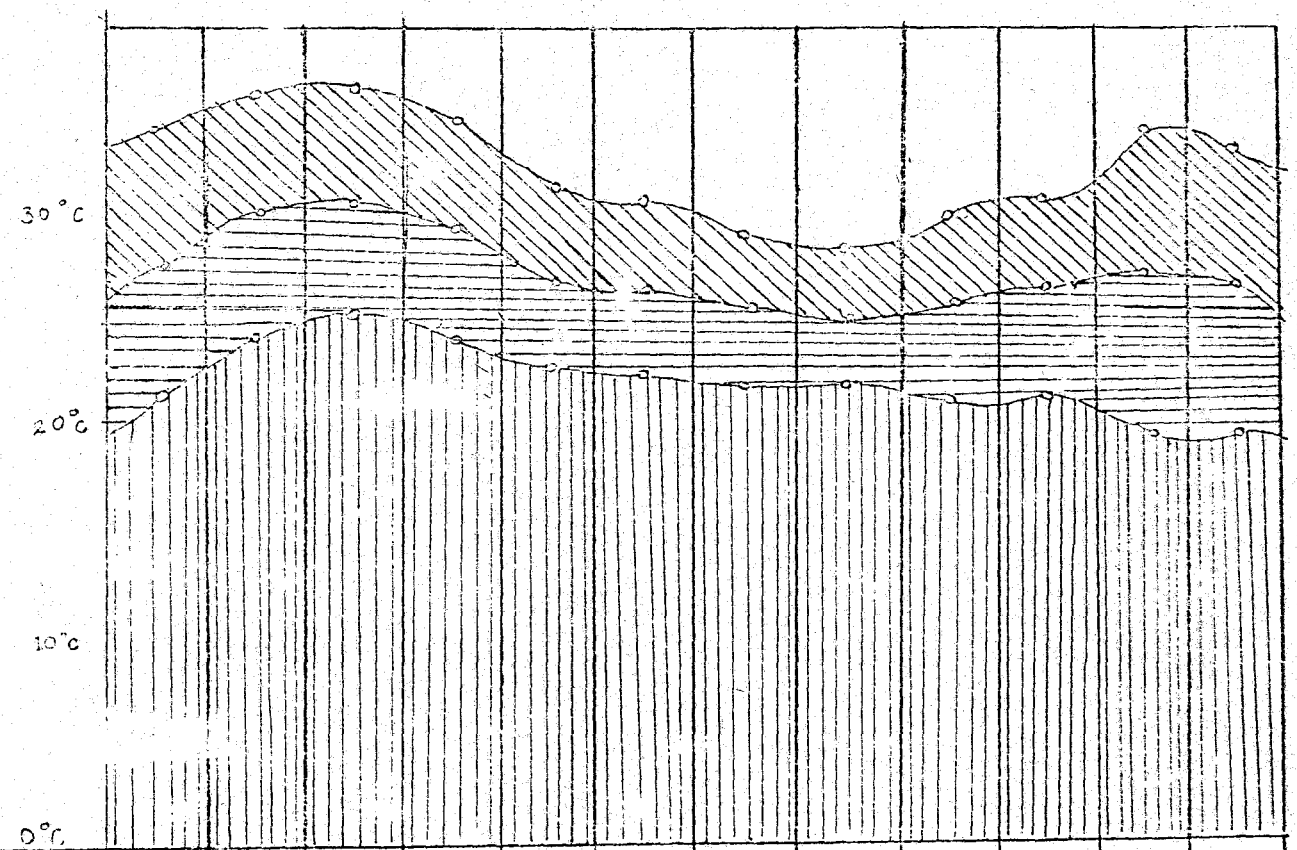


FIG 5.2

MAP OF NIGER STATE SHOWING THE LOCATION OF BIDA L.G.A.

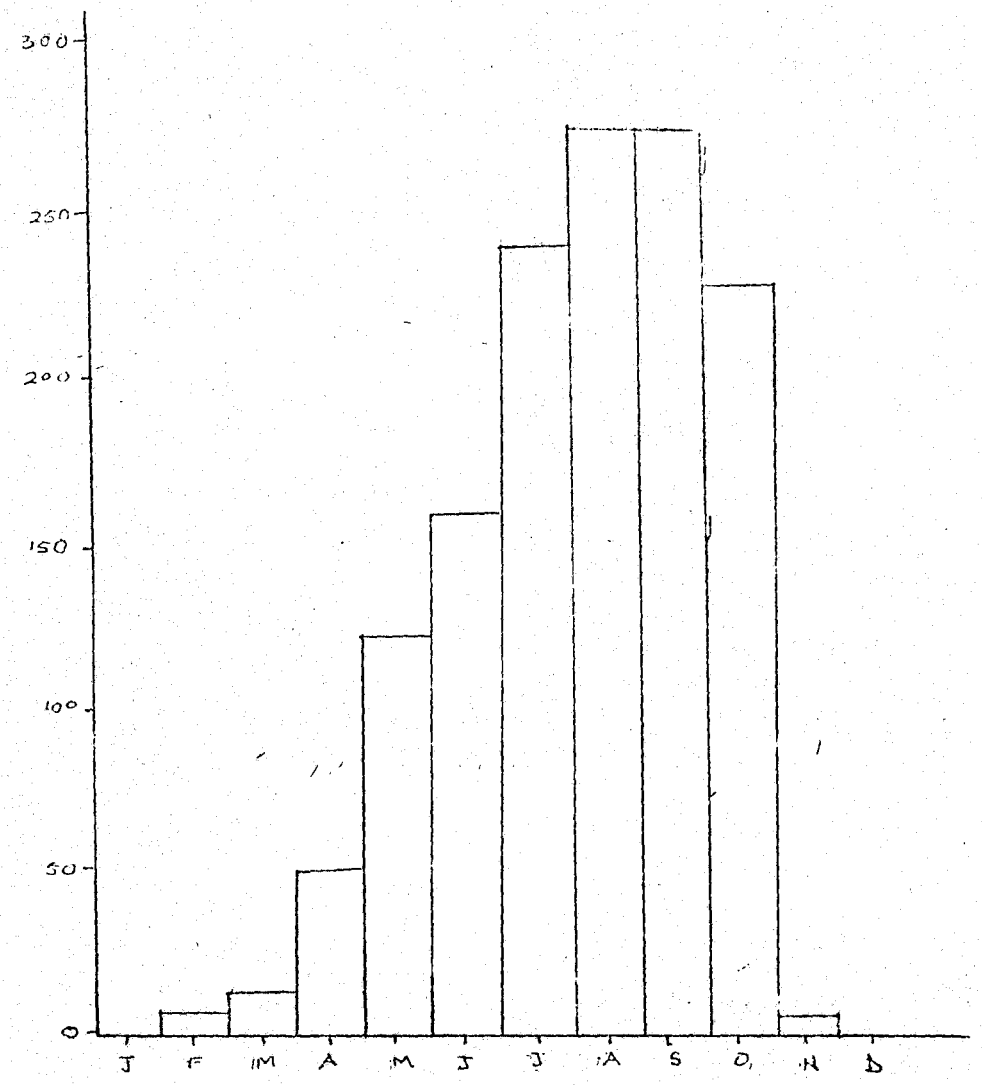


MONTHS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAX. TEMP °C	33·4	37·4	37·6	35·6	31·8	31·6	29·7	29·9	30·8	31·7	35·4	34·1
MEAN TEMP °C	28·4	31·0	31·6	30·0	27·4	27·1	25·9	25·6	26·0	26·6	27·4	26·3
MIN. TEMP °C	21·4	24·6	25·6	24·4	23·0	22·9	22·1	22·2	24·1	21·6	19·5	19·0

FIG 5·3

TEMPERATURE DATA OF NIGER STATE (1991)

BAR CHART SHOWING ANNUAL RAINFALL FOR NIGER STATE.



MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
mm	0·4	6·4	13·8	51·4	125·3	166·3	242·3	274·6	230·3	230·3	7·4	1·3

FIG 5·4

CHAPTER SIX

6.0 SITE ANALYSIS.

A successful project requires good siting. To this effect, analyses of the environmental conditions, which include geographical features and available services, have to be carried out.

6.1 CRITERIA FOR SITE SELECTION.

For the purpose of this project, the following factors were considered.

(a) The availability of raw materials.

(b) Accessibility and proximity.

6.2 SITE LOCATION.

The site chosen for the project is situated in Bida, Bida Local Government area of Niger State.

It lies towards the outskirts of the town, along the Minna Bida road. It is about half a kilometer from the first T-junction on approaching Bida town.

To the sites South end is a petrol filling station to the East and North are Farmlands, while the roads runs along it to its Western side.

6.3 SITE CHARACTERISTICS.

6.3.1 TOPOGRAPHY.

The topography of the site is fairly flat but slopes slightly towards the East and it is consequently drained in this direction.

6.3.2 VEGETATION.

Since Niger State as a whole is within the Savanna vegetation Zone, the processed site for the project comprises of short

grasses inter-spaced with trees of medium size. The site is used as a farmland during the rains.

6.3.3 SOIL.

The proposed site soil is brownish loam, which facilitates the growth of plants. The bearing capacity of the soil will therefore adequately receive the design structures, which will be making use of the strip foundation.

6.3.4 WIND.

The alternating wind system influenced by seasonal shifting of pressure belts prevail in the region. The cool Southwest wind resulting from the formation of warm and moist tropical maritime air mass over the Atlantic Ocean is predominant between May and September. This wind blows towards the Northeast direction and influences the rainy season. The dry dusty tropical continental air mass formed over the Sahara results in the predominance of the November and March. The wind blows towards the Western direction ushering the harmattan season.

6.3.5 TEMPERATURE.

The temperature of the region is characteristically high almost throughout the year. The maximum temperatures are usually experienced during the months of March and April when daily may rise to 32^0c. The minimum temperatures occur during the harmattan months of December and January when temperatures could drop below 10^0c. In general, the temperature of the site varies between 12^0c and 15^0c during the wet season and about 10^0c during the dry season.

This variation in temperature of the region indicates that the region is a hot environment. It is therefore that adequate attention be given to ways of reducing heat production and radiation gained on site through orientation and design of buildings adjoining open spaces.

The hot environment also suggests the need to consider provision of shade trees. Sun shading devices are to be

provided for the windows to reduce the rate of penetration of heat from the sun.

6.4 ACCESS AND CIRCULATION.

The site is easily accessible in that it is along the Bida –Minna road just by the road and about half a kilometer into the town.

6.5 UTILITIES.

Bida as one of the major towns in Niger State enjoys the availability of service utilities. There is adequate provision of pipe borne water, telephone, fax, and Internet services. Bida also enjoys electric power supply.

The site for the project can easily be provided with these services, due

to the availability of existing building properties adjoining it.

There is a filling station just before the site, which makes use of electricity, telephone services and pipe borne water, as such, the need to obtain a transformer and have completely new drawn out cable wires, and pipes can be minimized.

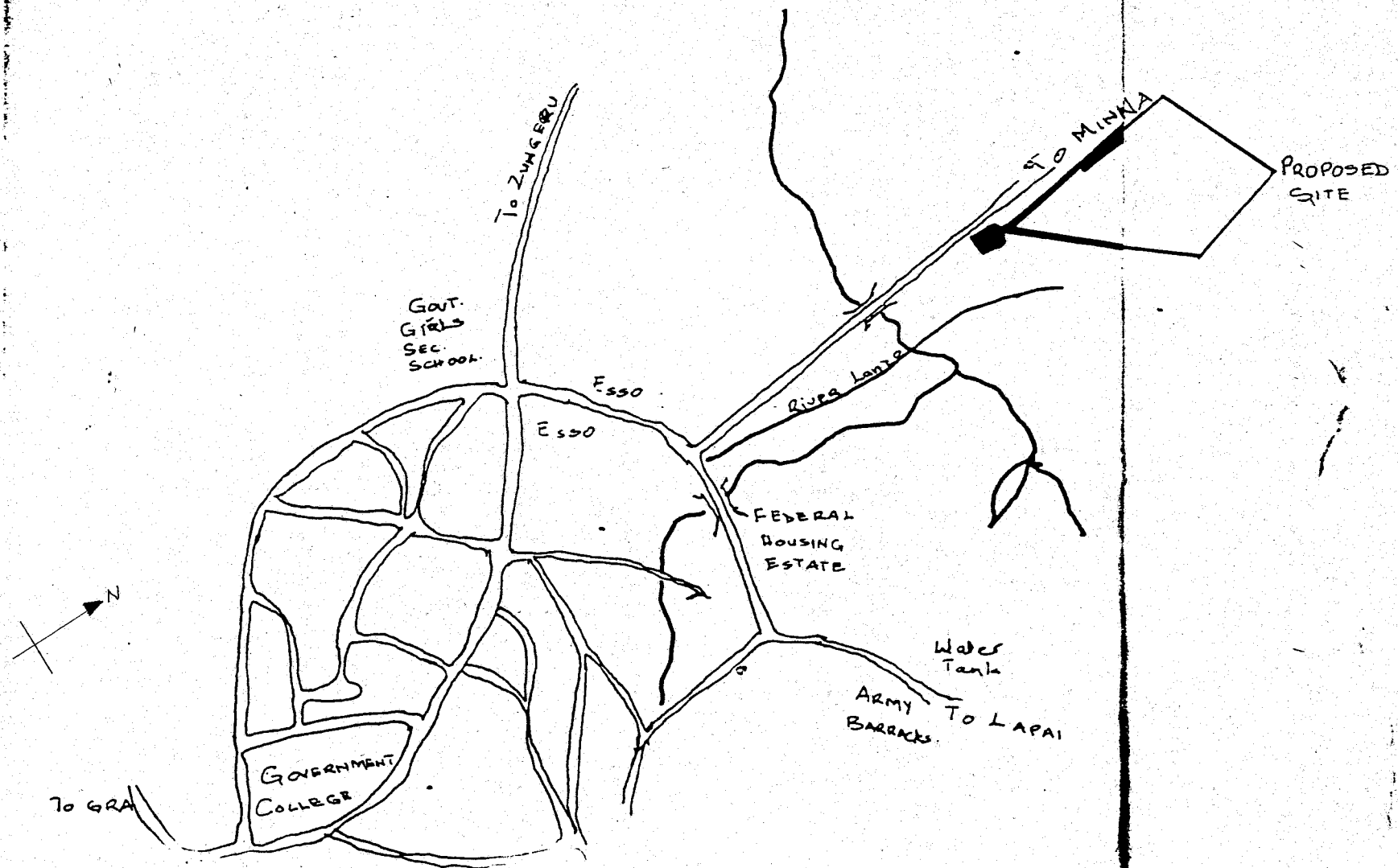

To Zungeru
Govt. Girls Sec. School
Esso
Esso
To Minna
Proposed Site
River Lanja
Federal Housing Estate
N
Water Tank
Army Barracks
To Lapai
Government College
To GRA

FIG 6.1

CHAPTER SEVEN

7.0 DESIGN CONCEPT AND CONSTRUCTION.

7.1 CONCEPTUAL ANALYSIS.

Architectural concepts are response to certain important symbols. The formulation of these concepts and its development is in a logical sequence in response to these symbolic themes.

Two concepts were employed for this project namely: a two seed groundnut pod and the groundnut pyramid, which was one of the features of Nigeria.

The shape of the groundnut pod was used for the plan of the welfare unit, while the pyramid was implemented for the elevation of the production unit.

7.1.1 Concept Formulation.

Industrial buildings are usually guided by elements of functionality. The plan concept is based on an integration of

functionality and circulation. These elements are arranged in such a way that will create interpenetrating and interdependent spaces. This is achieved by the use of simple and straightforward road network, which allows for easy circulation and accessibility.

An integration of the various elements on the site together with the road network depicts circulation and the use accessibility that depicts functionality led to the evolution of a form for the site plan.

7.2 SITE PLANNING.

Site planning in its simplest form is the disposition of space for appropriate use, the position of a structure to provide effective relationship with another. It also involves the provision of both pedestrian and vehicle access to structures in a safe manner, the design of streets and parking facilities and also enhancing the site through landscaping.

Zoning on sites aims at achieving a layout that creates a sensible relationship of facilities within the site.

On the site plan, the whole site is divided into three zones viz: Administrative zone, production zone and the welfare zone.

The administrative zone houses the admin Block. This is where all administrative work takes place. Adjacent to it is the production zone where the industry is located. The welfare zone has on it the Clinic, Restaurant, for the staff. A corner shop is also situated in this zone. The corner shop provides an avenue whereby finished groundnut products can be sold to consumers at retail prices.

7.3 DESIGN CONSIDERATION.

7.3.1 Administrative Unit.

This unit houses the various departments of the whole industry. On the ground floor, there are: - the sales department, production department, accounts department, mails department, the booking office, quality control office and the raw material records. Other facilities are the computer room, typing pool, file archives, library, stores and eating area.

On the first floor plan are the conference room, technical department, staff welfare department, the general manager and managing director's office, a waiting area, stores and other offices.

7.3.2 Production Unit.

This is the unit where the actual processing of the groundnut takes place. It comprises of the production hall, delivery bay, raw material and finished product stores, maintenance department, courtyard for threshing and winnowing, quality

control laboratories, sales office and changing rooms for the workers.

7.3.3 Welfare Unit.

This unit is designed specifically for the welfare of the workers and it comprises of a restaurant with an attached sit out and a clinic.

7.4 MATERIALS AND CONSTRUCTION.

In the choice of materials and application, cost, availability, mode of construction, maintenance, structural stability and aesthetics were considered. The following materials were used in the design.

1. Concrete.

Concrete is a mixture of cement, fine aggregate, coarse aggregate and water, which sets to form a hard stone like material. It is weak in compression but strong in tension. It

can be pressurized in-site and reinforced or pre-casted. Concrete is used in the construction of foundation footings, floor slabs and roof decks. It's plastic nature and workability allows its use for almost any form of structure whether circular, square, rectangular or any form or shape

2. Metal.

Metals are heterogeneous materials formed under intense temperature. They could be classified into ferrous and non-ferrous metals.

Ferrous metals include steel, which is heavy. It is used as a structural framing as well as a range building products such as windows, doors, and fastenings.

Non-ferrous metals include aluminum, copper, and lead to mention but a few. They are relatively soft yet strong, lightweight and also workable. They are utilized as extruded forms in aluminum, windows, doors and roofs. Copper could

similarly be used as electrical wires and flashing as sheet forms while lead is used as a plumbing material.

3. Glass

Glass is an amorphous material that has undergone great pressure and coded. It is characterized by its transparency, brittleness, hardness and chemical composition. They could come in sheet form, block form which is a structural purpose glass or as a facing glass. its utilization is dependent on its purpose. It could be for door (and) window frames or even as walls.

7.5 CONSTRUCTION.

The construction specification of the project is in the selection of the process of construction right from the ground to the top of the structure and it involves the following elements.

a. Site Clearance.

This is the preliminary stage of construction and it involves the removal of glass, shrubs, trees that are not wanted depending on the design being carried out and the removal of the top soil to reduced levels free from vegetative matter.

b. Foundation.

Foundation is the base on which the building rests. Its purpose is to transfer the load of a building to a suitable sub soil level.

Factors that determine the type of foundation are soil type, cost limitation and storey height.

The need for expansion joints are introduced and certain intervals and the foundation depth and width is subject to the structural engineers details

c. Walls

Walls are vertical elements acting as barriers. They could be load bearing or non –load bearing walls (partition walls). They are erected by laying Sand Crete blocks with the

help of cement mortar to hold them in position. These layers of blocks are plastered and pointed to give it a better appearance.

d. Doors And Windows.

Doors and Windows are provided for physical, visual and light penetration into building interiors while enclosing the interior space.

e. Roof.

Simple pitch roofs with long span aluminium sheets are used in most of the units. Concrete slab was used over some areas. For large areas like the production unit steel roofing members were made use of.

f. Finishes.

i) Floor Finishes.

Floor finishes used include terrazzo, ceramic tiles and carpets.

ii) Wall Finishes.

The walls are to be painted with light cool colours of oil paint. Wall ceramic tiles were also used on some areas

iii) Ceiling Finishes.

Board finishes are used for the ceiling. These boards should be able to control temperature within a room, that is they should have thermal insulating properties.

7.6 SPACE REQUIREMENTS

a) Administrative Block.

Function	No. Of Units	Area/m^2	Total Area.
Entrance Porch	1	14.4	14.4
Reception	1	30	30.0
Sales Dept	1	20	20.0
Production Dept	1	20	20
Asst. Sales Manager	1	20	20
Mails Dept	1	20	20
Book Keeping	1	20	20
Accounts	1	20	20
Booking Officer	1	20	20
Raco Material	1	20	20
Quality Control	1	25	25.0
Secretary	4	12	48.0
Library	1	54	54.0

Computer Room	1	20.9	20.9
Typing Pool	1		
Stores	5		
File Achieves	1		
Cafeteria	1		
Kitchen	1		
Changing Rooms	2		
Store	1		
Toilets	14		
General Manager	1		
Managing Director	1		
Conference Room	1		
Stair Case	1	11.04	
Lobby	1		

b) PRODUCTION UNIT

Function	No Of Units	Area/m^2	Total Area
Entrance Porch	1	12.5	12.5
Changing Room	2	16	32
Quality Control	2	10	20
Raw Material Store	1	90	90
Delivery Bay	1	50	50
Production Hall	1	475.4	475.4
Courtyard	1	187	187
Maintenance	1	20	20
Wash Up	1	20	20
Finished Product Store	1	142	142
Loading Bay	1	71.1	71.1
Sales Office	1	9	9
Sales Entrance Porch	1	63	63
WC/Shower	2	4	8
LOBBY	-	-	122.4

c) WELFARE UNIT

Function	No of Units	Area/m^2	Total Area.
Entrance Porch	1	50.4	50.4
Restaurant	1	146.2	146.2
Courtyard	1	12.8	12.8
Toilets	5	2.16	10.8
Kitchen	1	40	40
Dry store	1	8.4	8.4
Cold Store	1	3	3
Changing Room	2	8.8	17.6
Sit Outs	1	83	83

CLINIC

Reception	1		
Dispensary	1	12	12
Card Room	1	11.6	11.6
Medical doctor	1	34	34
Rest Rooms	2	45	90

Toilets	2	2.16	4.32

CHAPTER EIGHT

8.0 DESIGN SERVICES

Services are adequately taken care of in the building system. Cable wires and pipes are conveniently situated both to deliver and conform to the nature of the building function.

8.1 ELECTRICAL LIGHTING.

The electrification of the site is not a problem since the site has a transformer close to it. The electrification are done by conduit to conceal any exposed wiring, a stand by generator is also located on site to serve the industry in time of power failure.

8.2 HEATING, COOLING AND VENTILATION.

Ventilation is natural; effort is made in the design to provide natural cross ventilation on the site thereby reducing cost. This also helps to reduce energy consumption.

In achieving thermal comfort within this design, proper planning of the building, location and orientation spacing between buildings, choice of building material and construction assembly which can control heat and air from solar radiation of landscape features.

8.3 WATER SUPPLY

There is the need for adequate water supply to all parts of the industry plumbing works in the building have to do with the consumption, circulation and storage of water. Water supply should be in the right quantity. The service pressure of a water system must be great enough to absorb pressure cases due to vertical travel and friction

8.4 DRAINAGE AND SEWAGE DISPOSAL.

The various plans of all the units makes possible for all plumbing systems to be aligned within a point, for instance all toilets are zoned together for easy maintenance, cost control and concealment. Sanitary drainage will require large

pipes and adequate installation space, all these are noted and the typical toilet and sanitary drainage system layout straightforward and directioned properly sloped.

8.5 REFUSE DISPOSAL.

Central refuse dump is provided so as to make a daily removal possible and efficient.

8.6 ACOUSTICS

Sand travels in a wave like manner and needs a medium to travel. The sand heard could be constructive or destructive. Hearing the proper and pleasing sands at the appropriate time is important. Proper zoning has to be implemented so that unaccented noise does not result into unwanted reactions.

8.7 FIRE SAFETY.

Fire is an unwanted destructive element to buildings. In order to control the building and intoxication elements of every fire out break, which is smoke, fire detectors are placed in all the units and fire extinguishers at strategic positions within the structures.

8.8 SECURITY.

Having a fence around the whole site and positioning of security men at the gate to control entry into the site guarantee the security of the site.

8.9 COMMUNITY.

It is essential that the industry should be situated away from the town. As a matter of fact this one is located within the industrial area of Bida town.

8.10 MAINTENANCE.

Maintenance is the important aspect in the long life of any building; as such it is necessary for programmes to be made in order to achieve maximum result. Such maintenance programmes will range from periodic maintenance programme to weekly, monthly or annually.

Standby programmes should also be available for unforeseen emergencies that might occur during a buildings' lifespan.

8.11 SOLAR CONTROL.

The sunlight on buildings is prevented from causing discomfort within the building through the use of trees on site.

CHAPTER NINE

9.0 AESTHETICS.

Architecture is beauty and functionality; the aesthetical integration of an articulated landscape cannot be over emphasized with its proper selection and utilization.

An aesthetically pleasing environment is of major consideration in this design. Despite the use of building materials, which are of low cost in this project, the aesthetical values of the units are emphasized.

9.1 GENERAL APPRAISAL.

A general appraisal is associated to the design thesis in the area of effective circulation on the site and individual units. The relationship between each structure, their placement, configuration and landscaping were dully considered. The choice of materials selected, it's usage and maintenance were also fully taken into consideration.

9.2 CONCLUSION.

A detailed study of existing groundnut processing industries were mades and it was obvserved that little attention was given circulation in the production hall and the site at large; production lines were not clearly spelt out thereby making the production hall appear clumsy. This study was able to outline concise industrial layout and detailed productions lines for each of the products in order to achieve effective means of circulation.

9.2.1 RECOMMENDATION

Considering the available resources, it will be of great benefit to people of Niger state if the state government and other priate bodies would take it opon themselves to see to the emergence of such an industry within the state so as to aid the industrial development of the state and at the same time part-take in the povert alleviation programmes by providing job employment opportunities.

9.2.2 SUGGESTION FOR FURTHER STUDIES

Some of the characteristics of interest in groundnut processing may include sanitary measures to be taken in the course of processing, lighting and ventilating systems of the production hall.

REFERENCES

1. Gary, H. (1984) Site Planning,
Halliday Lithograph, U.S.A, 3rd Edition..

2. John, H.
Joseph, D.C. Time Saver Standard For Building Types,
Published by the Kingsport Press, U.S.A.

3. Neufert, (1970) Architects Data,
Published by William Clowes Ltd, London.

4. Nobert, L. (1983) Heating, Cooling And Lighting,
(Design Methods For Architecture),
Longman Publishers, London.

5. Encylopedia Americana (1829).
U.S.A, Vol. 13

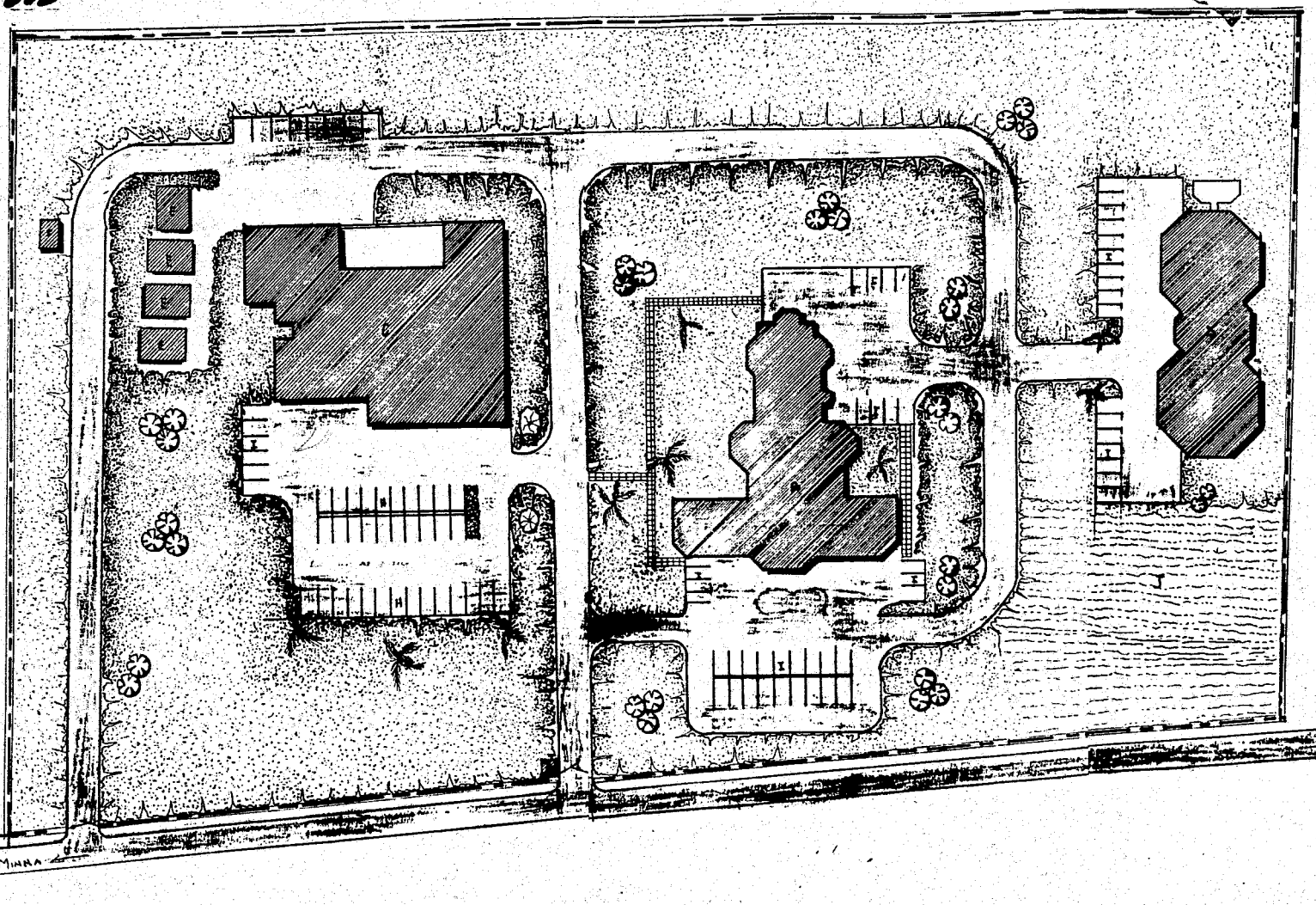
JOURNAL S

1. OSAN (1997) The Oil Seed Situation in Nigeria

2. SHIRU, A (2001) Groundnut Production And Its Economic Values.
Unpublished.

3. Niger State Ministry Of Information, Hand Book Minna.

SITE PLAN

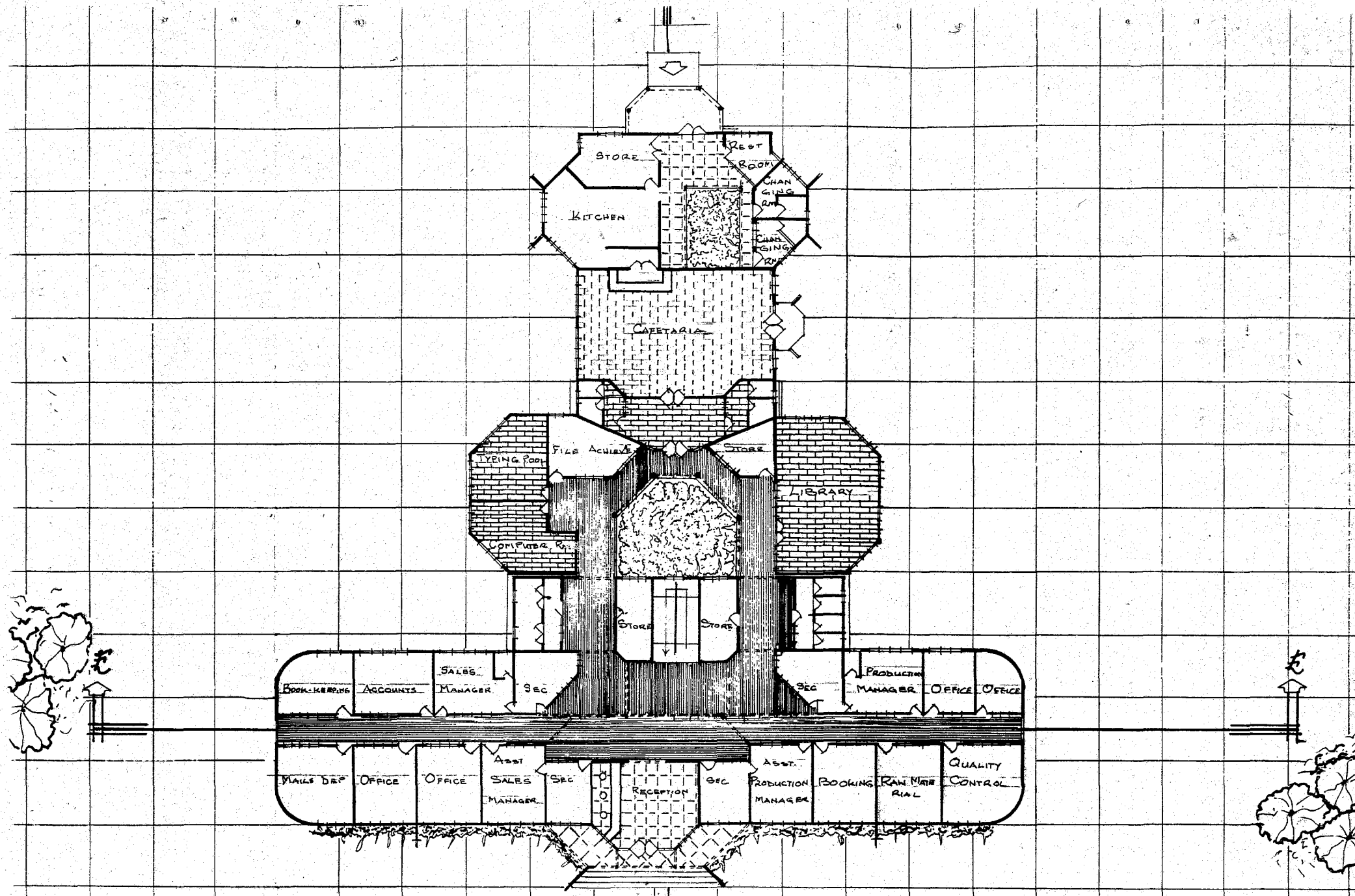


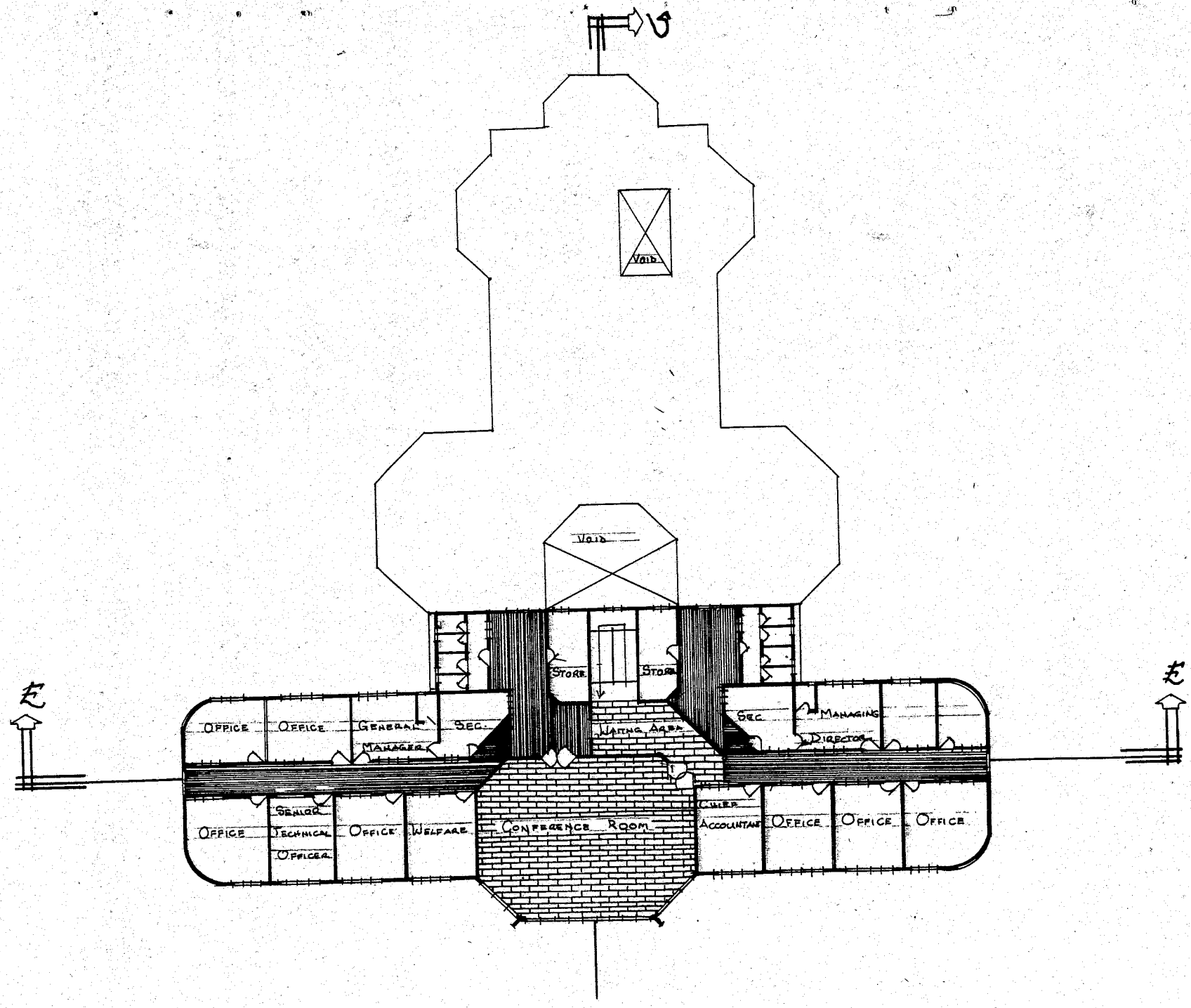
	LEGEND
A	GATEHOUSE
B	ADMIN BLOCK
C	PRODUCTION UNIT
D	WELFARE UNIT
E	RAW MATERIAL STORE
F	POWER HOUSE
G	SERVICE ENTRANCE
H	TRUCK PARKS
I	CAR PARKS
J	GROUNDNUT FARM

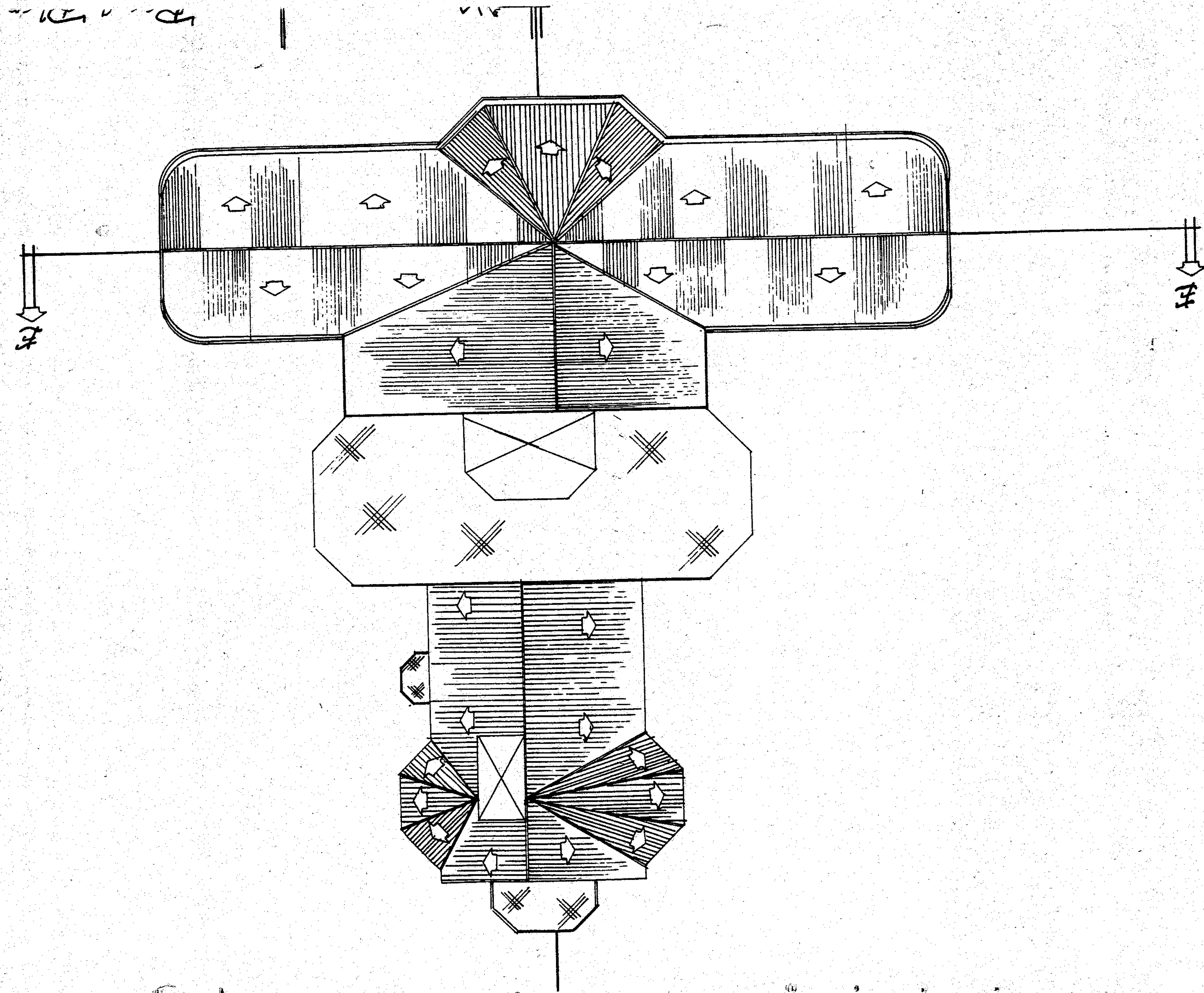
GANA C.S

DESIGN PROPOSAL FOR A GROUNDNUT PROCESSING INDUSTRY BIDA

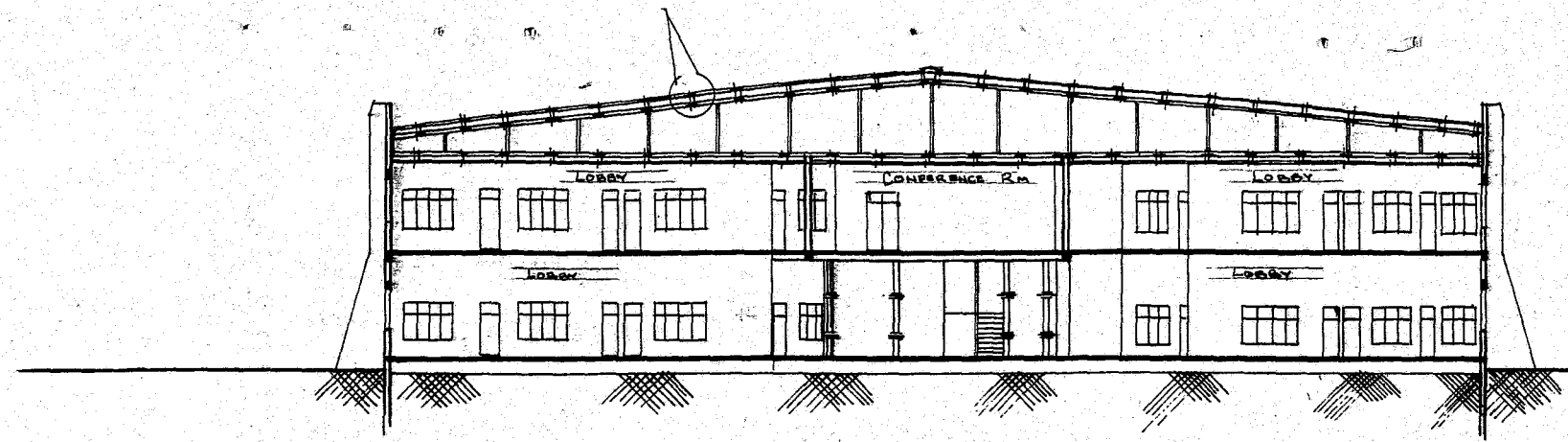
With emphasis on effective circulation.


STORE
REST ROOM
CHAN GING RM
KITCHEN
CHAN GING RM
CAFETARIA
TYPING POOL
FILE ACCESS
STORE
LIBRARY
COMPUTER R.
STORE
STORE
BOOK-KEEPING
ACCOUNTS
SALES MANAGER
SEC
SEC
PRODUCTION MANAGER
OFFICE
OFFICE
MAILS DEP
OFFICE
OFFICE
ASST SALES MANAGER
SEC
RECEPTION
SEC
ASST. PRODUCTION MANAGER
BOOKING
RAW MATERIAL
QUALITY CONTROL

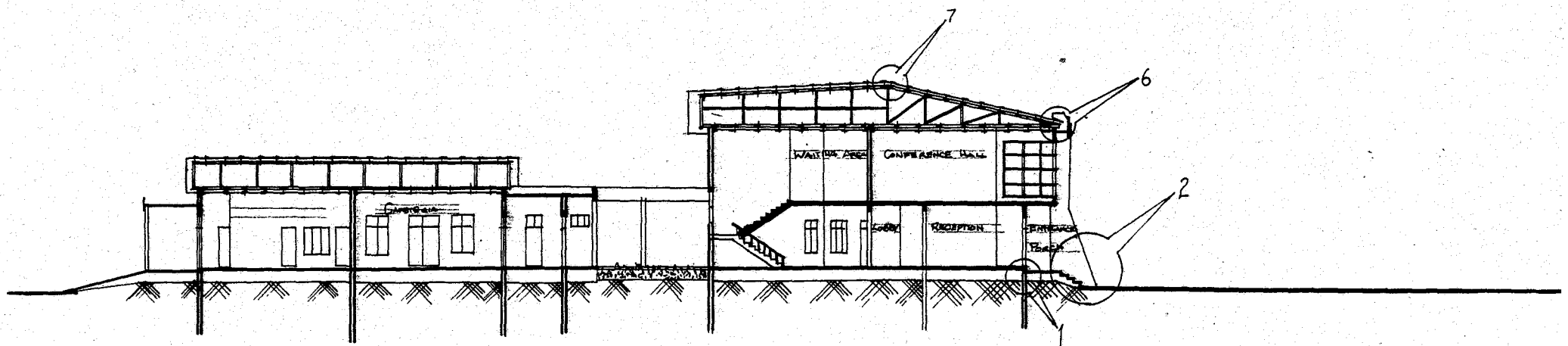

Void
Void
Store
Store
Office
Office
General
Manager
Sec.
Waiting Area
Sec
Managing
Director
Office
Senior
Technical
Officer
Office
Welfare
Conference Room
Chief
Accountant
Office
Office
Office

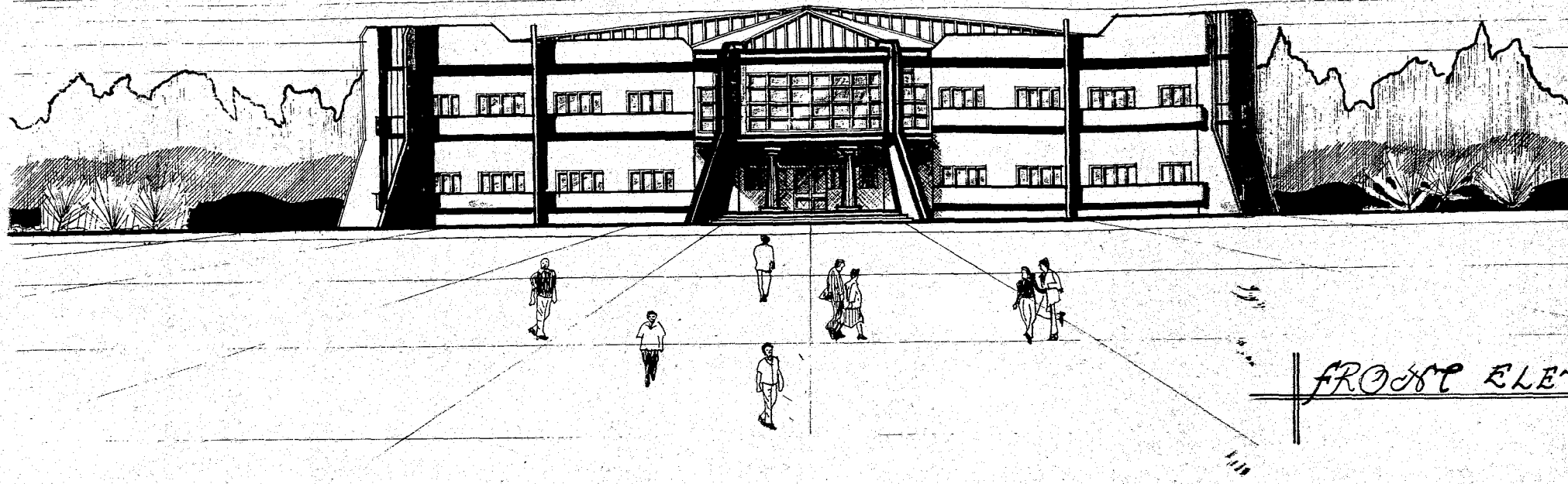


甲
甲

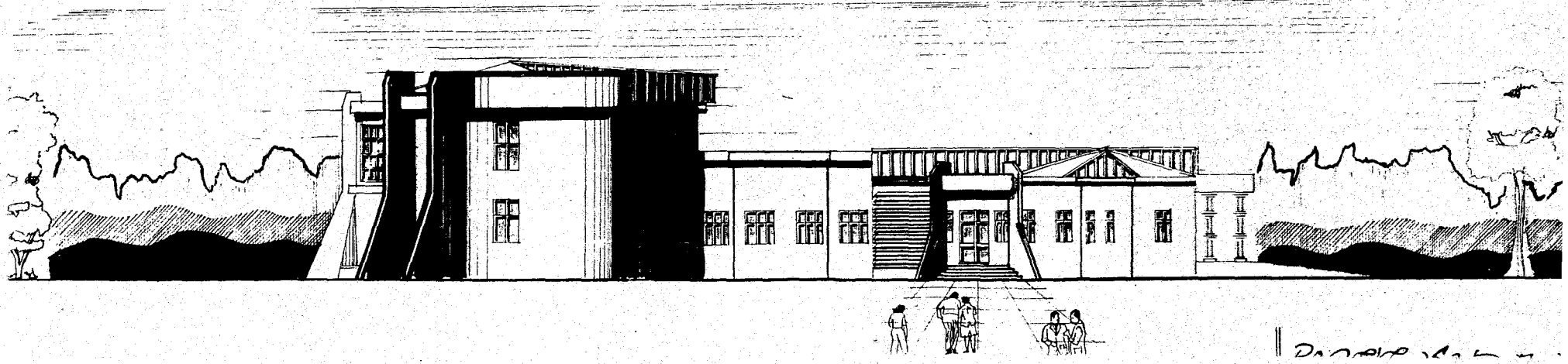

LOBBY
CONFERENCE Rm
LOBBY
LOBBY
LOBBY

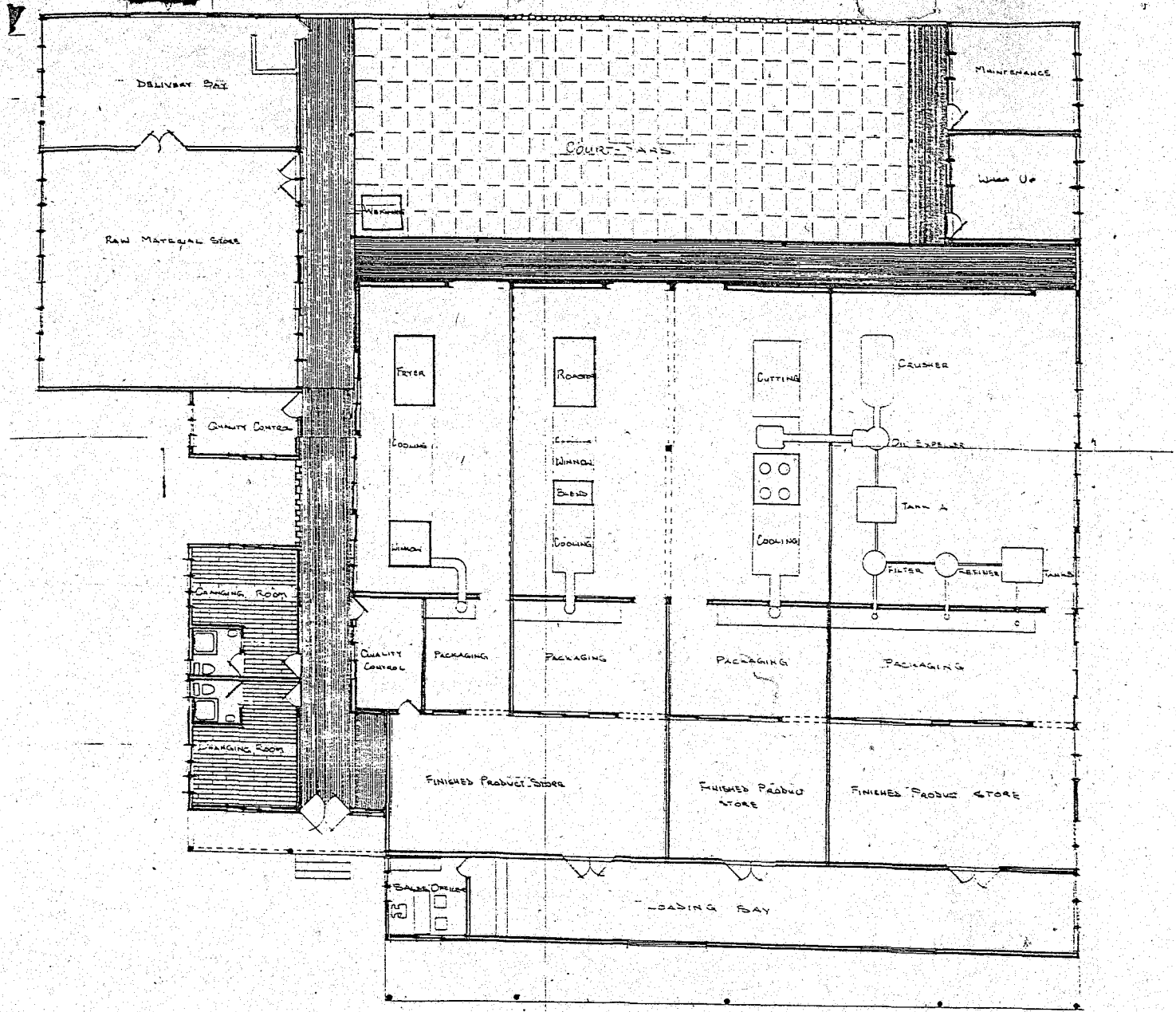
SECTION E-E


7
6
2
1
WAITING AREA
CONFERENCE HALL
LOBBY
RECEPTION
ENTRANCE
PORCH



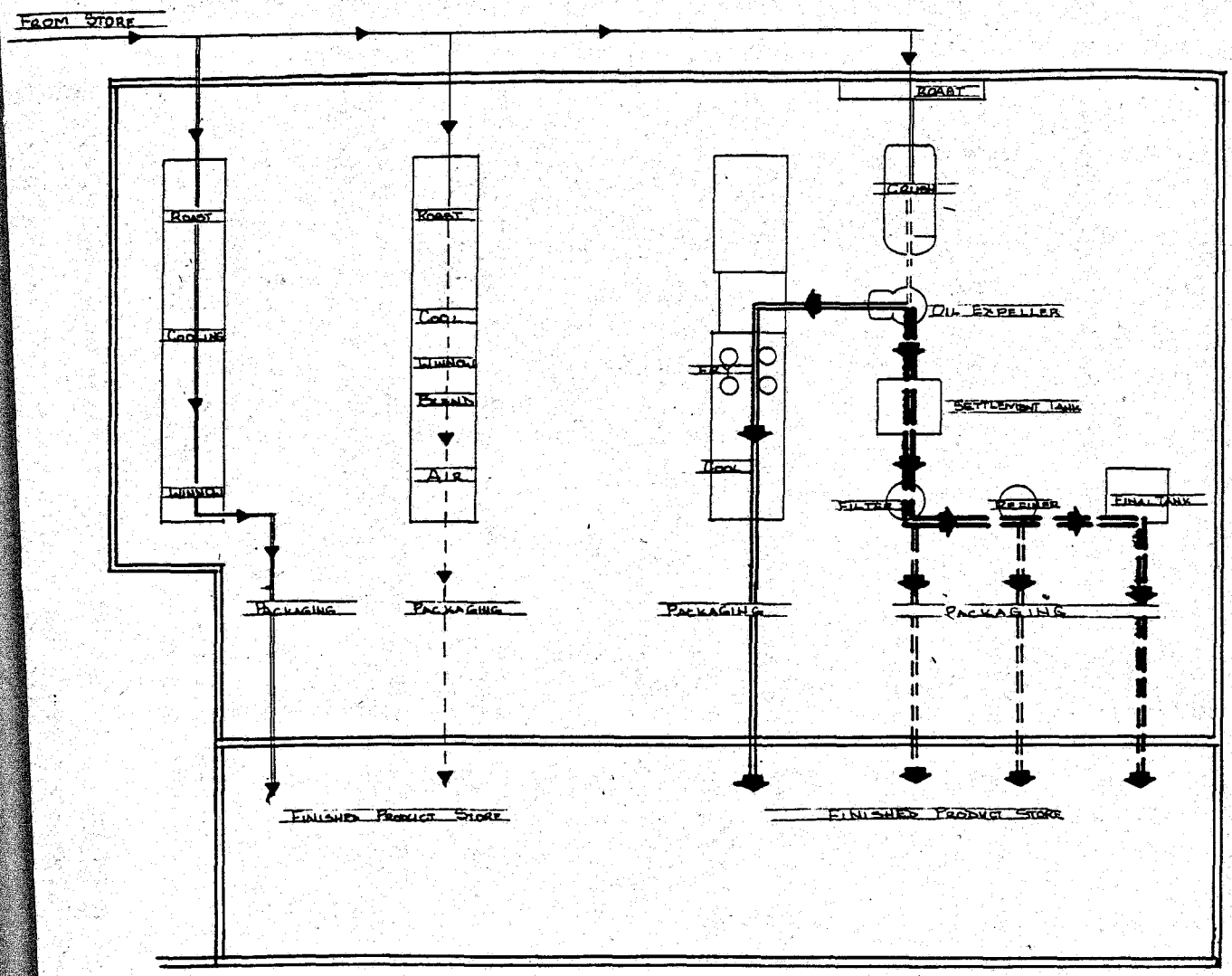
FRONT ELE





DESIGN PROPOSAL FOR A GROUNDNUT PROCESSING IND

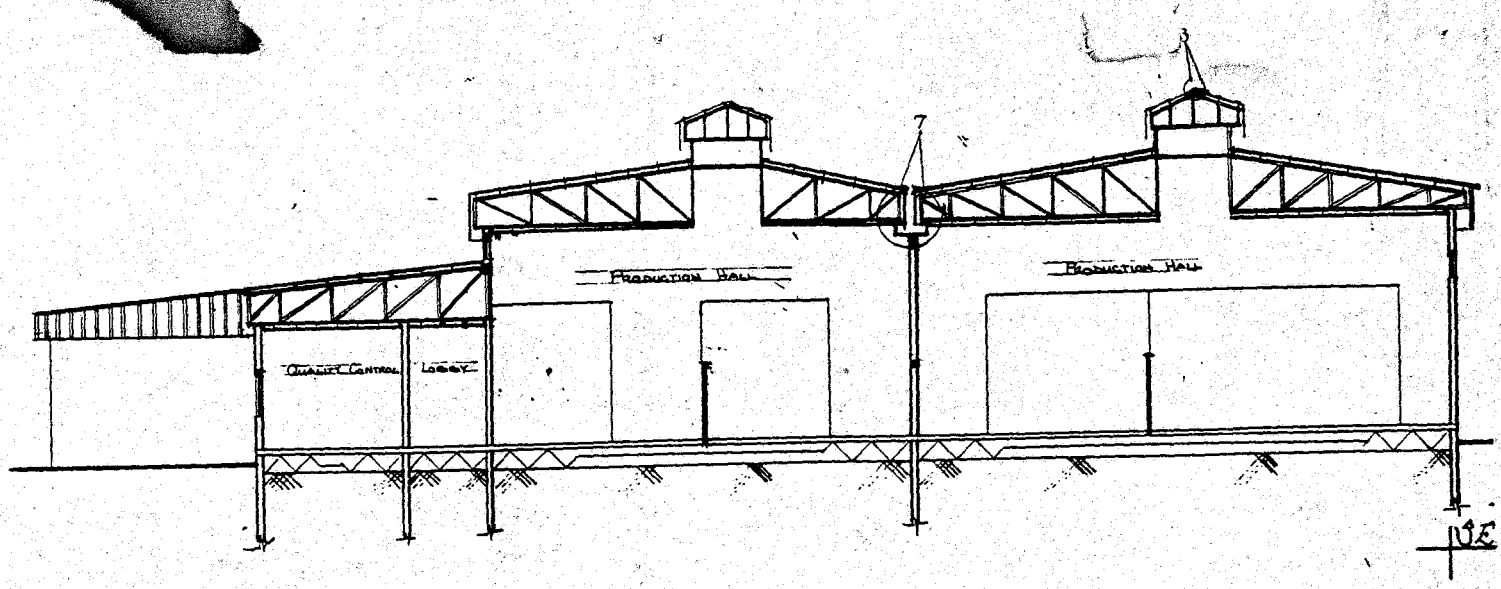
Floor P

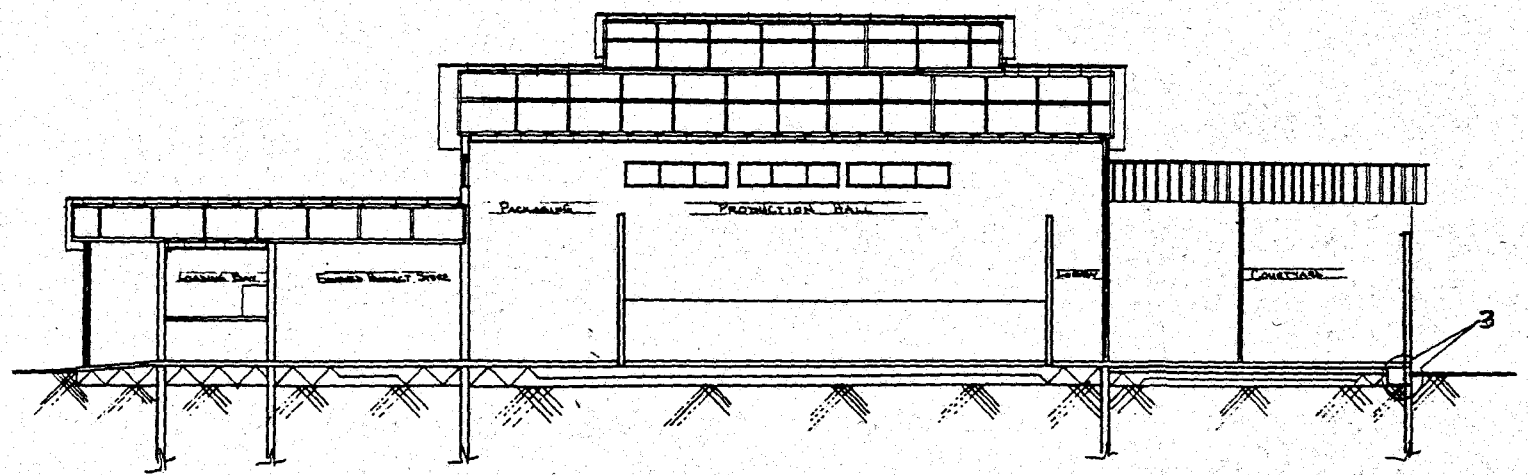


LEGEND	
	RAW GROUNDNUT
	ROASTED & BOTTLED GNUT
	GROUNDNUT FLOOR
	GROUNDNUT BISCUIT
	SLUSH
	GROUNDNUT OIL
	GROUNDNUT PASTE

SING INDUSTRY BIDA

Circulation

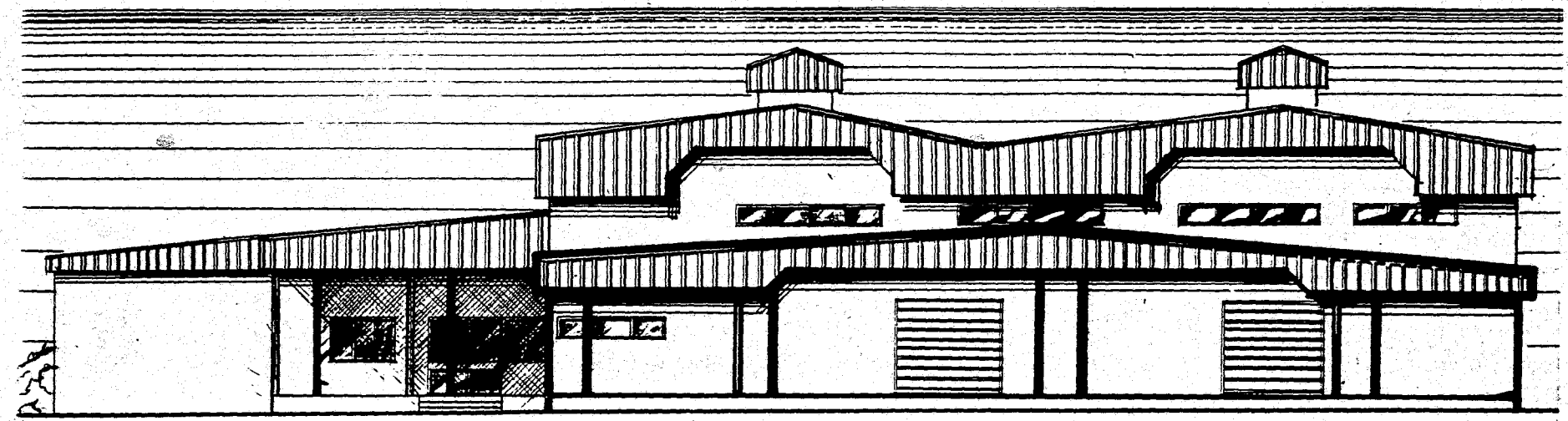


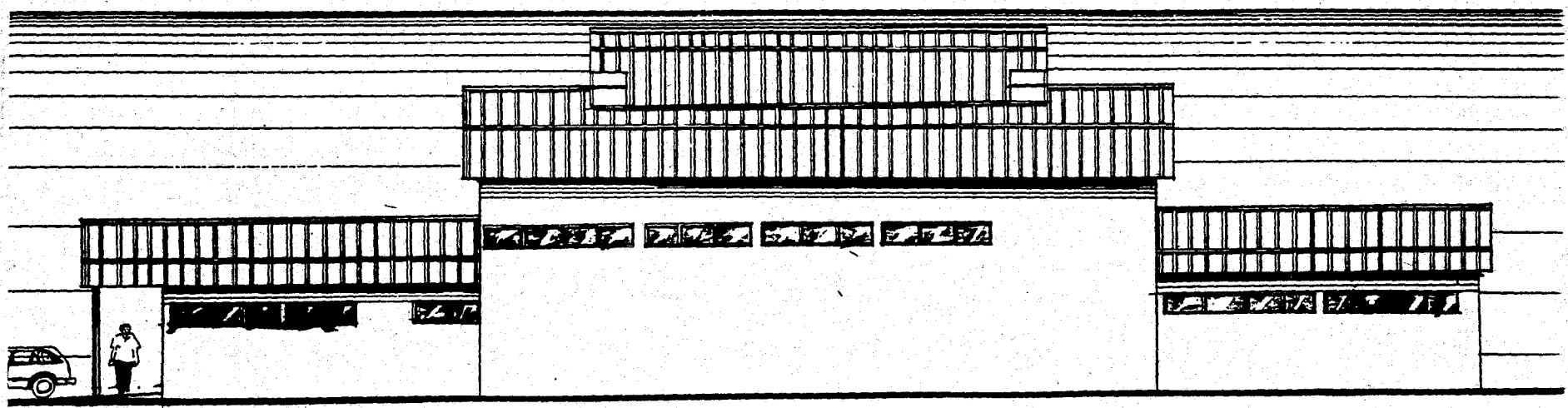


SECTION

DESIGN PROPOSAL FOR A GROUNDNUT PROCESSING IN

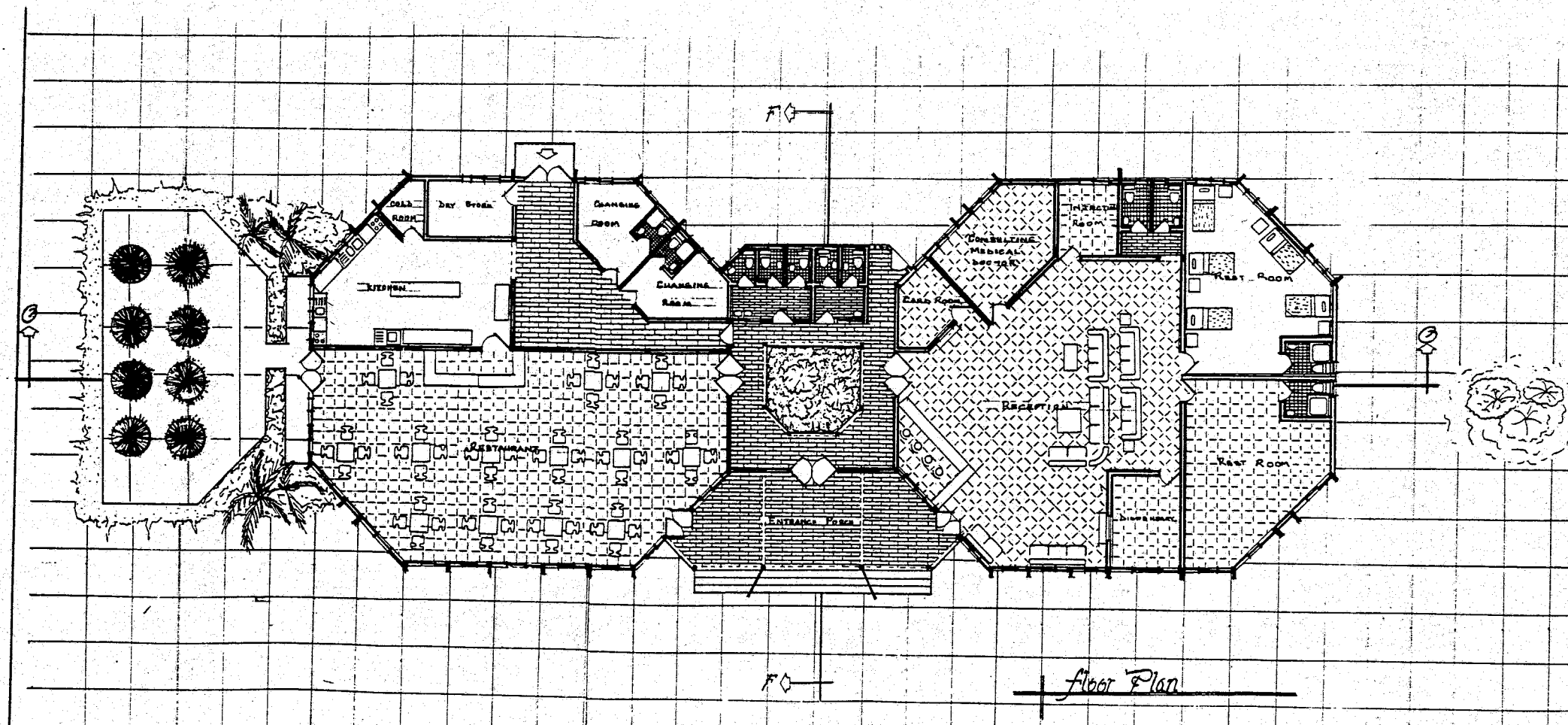
With emphasis on effective circulati



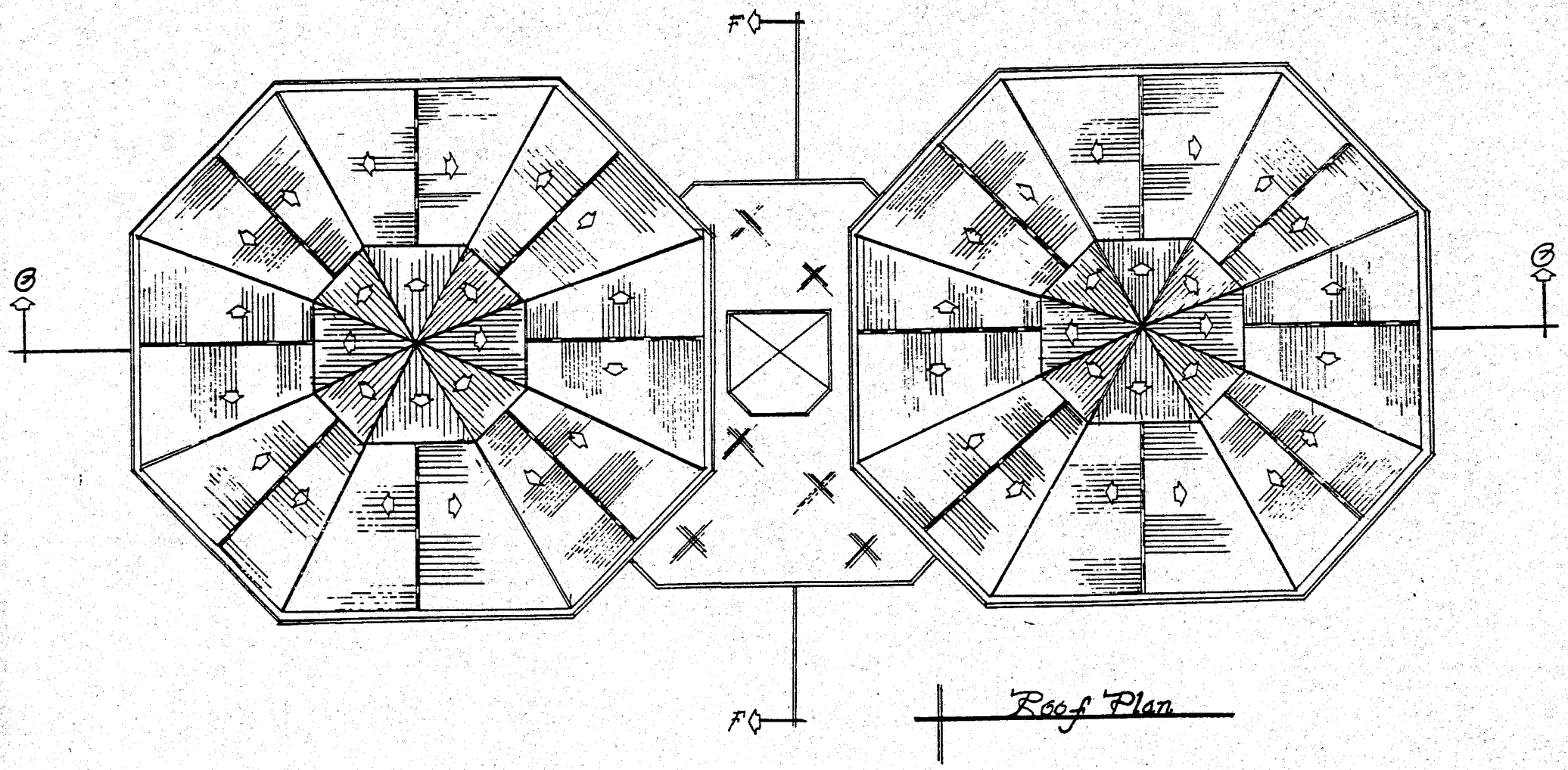


RIGHT SIDE EL.

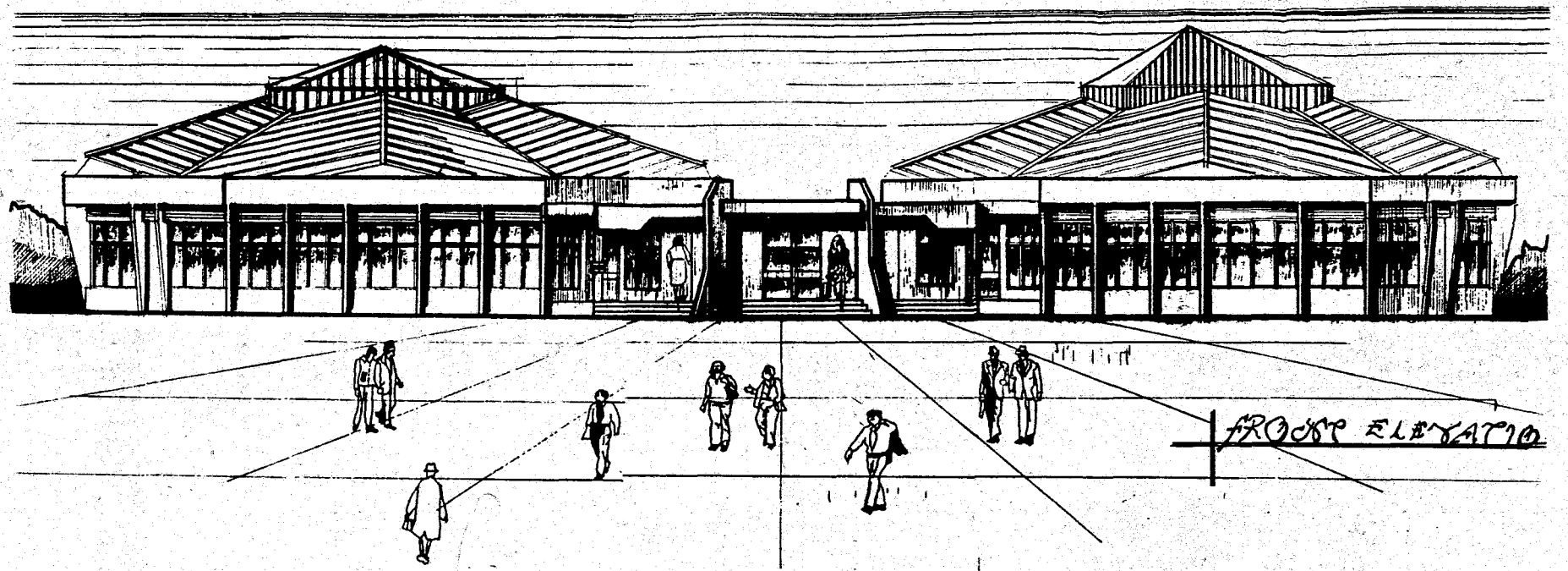
DESIGN PROPOSAL FOR A GROUNDNUT PROCESSI


F
F
Cold Room
Dry Store
Changing Room
Changing Room
Kitchen
Restaurant
Entrance Porch
Consulting Medical Doctor
Card Room
Reception
Insecticide Room
Rest Room
Rest Room
Dispensary

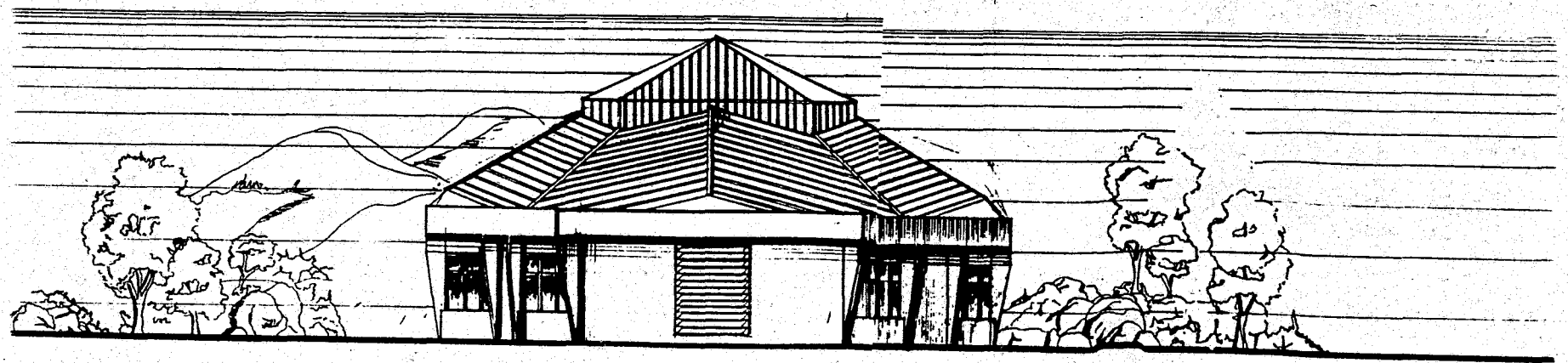
Floor Plan



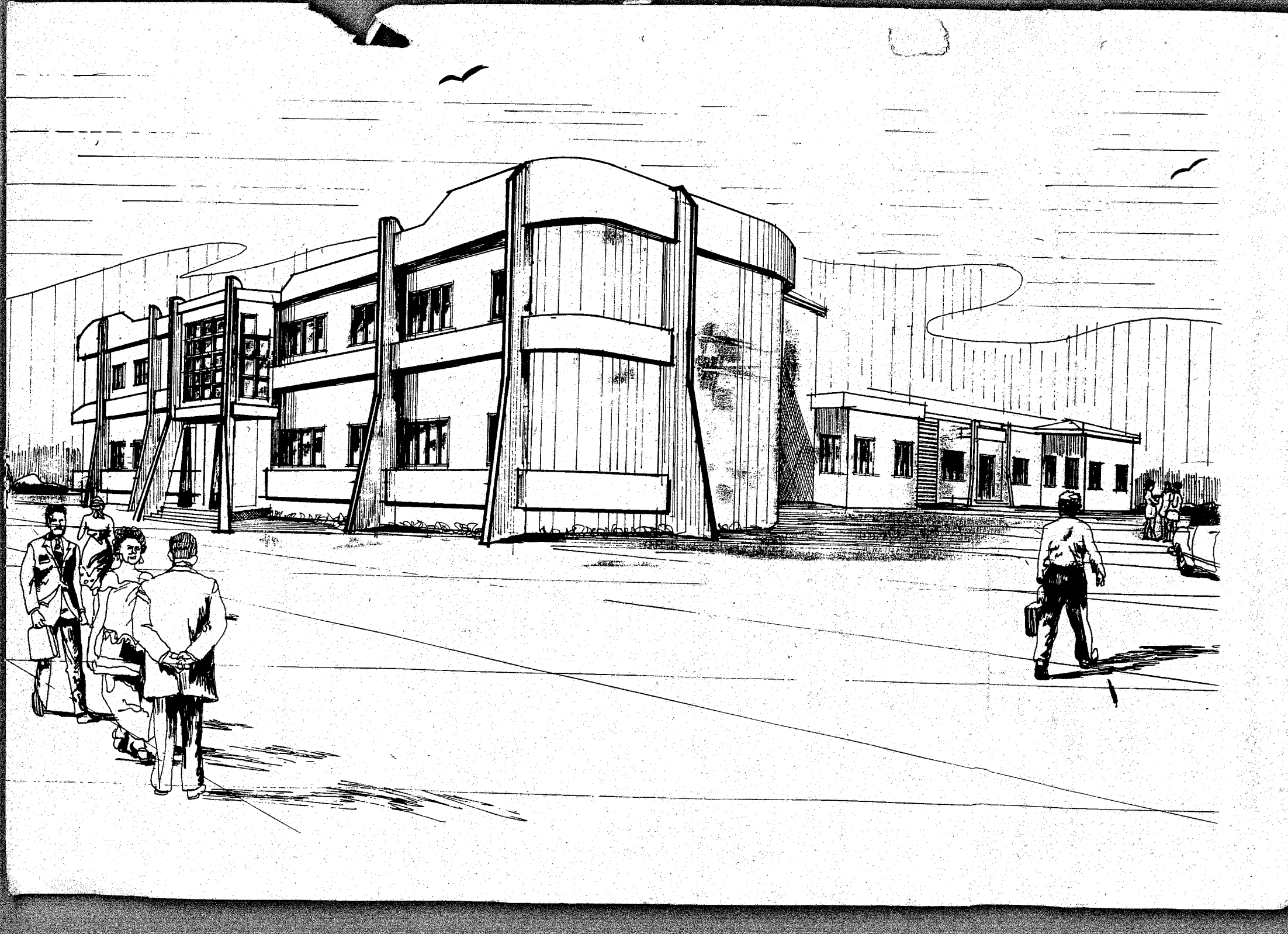
Roof Plan

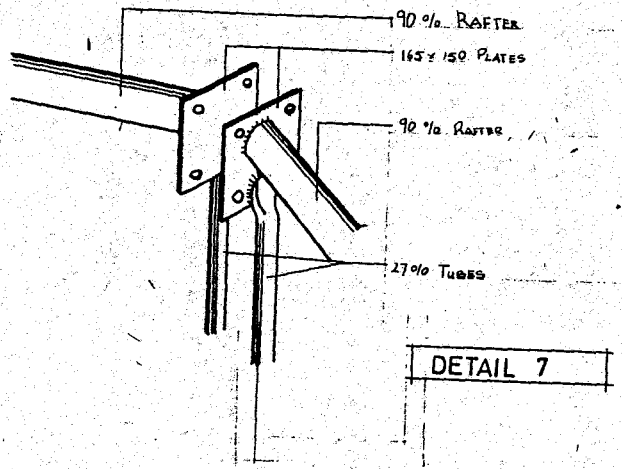


FRONT ELEVATION

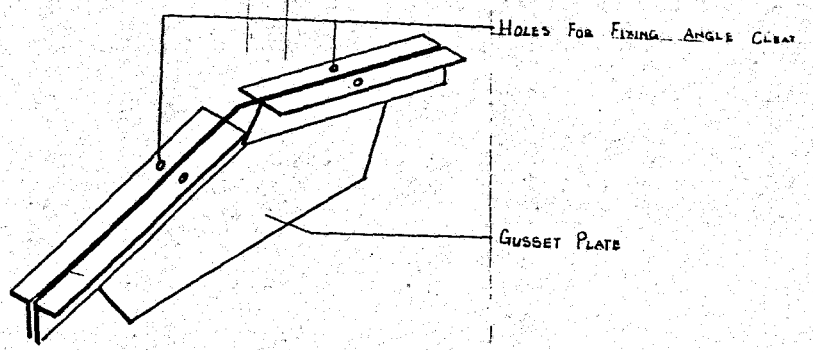


RIGHT SIDE ELEVATION

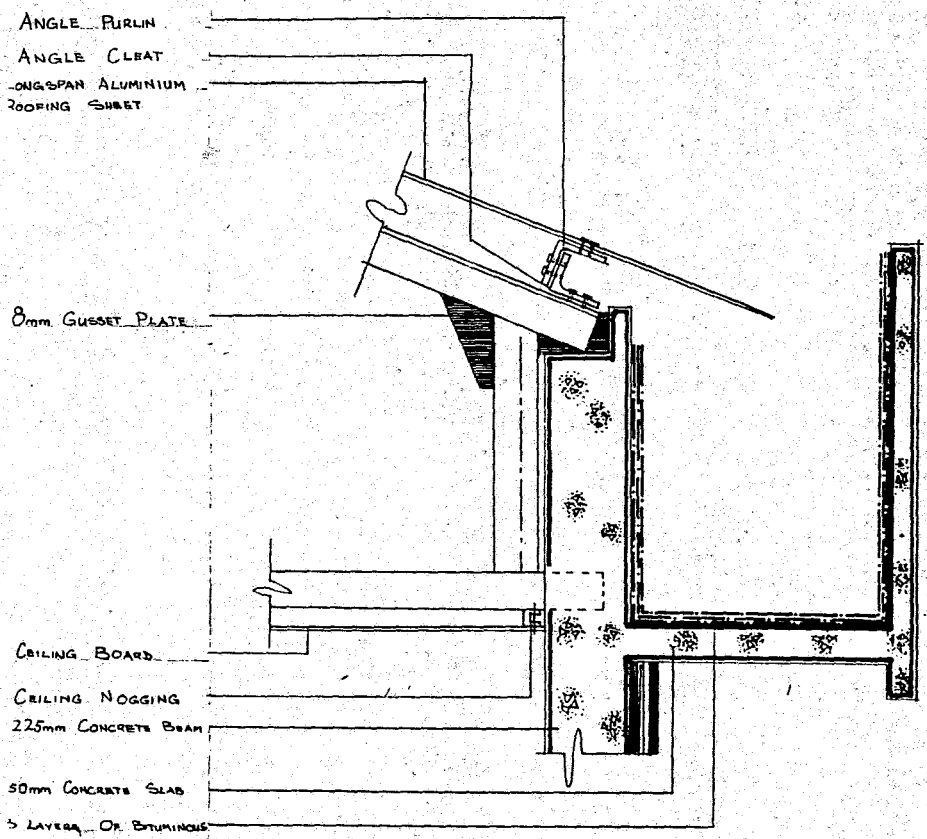




DETAIL 7



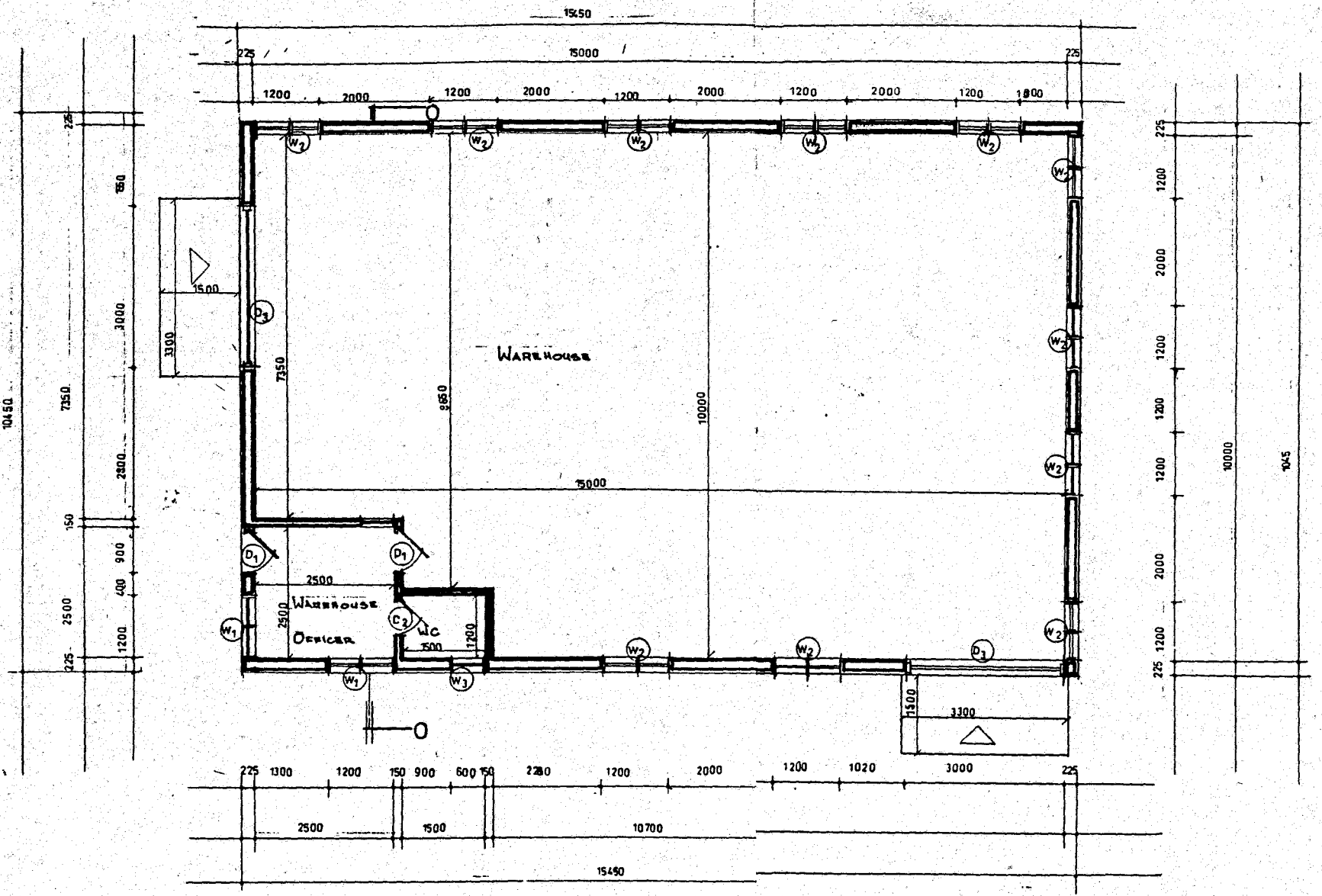
DETAIL 8



DETAIL 6

NAME	DANA C.S	NUMBER	ARC 621

DESIGN PROJ



FLOOR PLA

Course	Arc 621
Name	Arc. A. Mou'd
Scale	1:50
Date	JAN. 2003

DESIGN PROPOSAL FOR A

Wish