KANO INDUSTRIAL ESTATE
(FOR SMALL-SCALE INDUSTRIES)

BY

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DECLARATION

I declare that this thesis is purely my personal undertaking and a record of my research work. It does not include materials previously submitted for a degree or diploma in any University or previously published materials without due acknowledgement.

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CERTIFICATION

This thesis entitled KANO INDUSTRIAL ESTATE (FOR SMALL-SCALE INDUSTRIES) by MU'AZU, ABDULLAHI JINDO 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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DEDICATION

This thesis is dedicated to the memory of my late cousin, Alhaji Shehu Adamu Dubantu, whose wisdom and foresightedness has helped in shapening my whole life and career; but has not lived to rejoice with me this day.

ACKNOWLEDGEMENTS

No thesis of this nature and magnitude can easily be accomplished without the help and moral support of ALLAH (God), and people in general. This help is gratefully acknowledged from ALLAH, the almighty and all those too numerous to mention by name, who assisted me in one way or the other, from the begining to the end of this work.

In particular, I would like to thank my mentors for their help and nice comments in making the subject a practical approach to design. I would also like to express my gratitude to some of my mates and friends who have contributed in making the thesis a remarkable success.

My sincere thanks goes to my loving brother, Alhaji Muhammed Babangida Muazu, without whose help sucess would have been really difficult. Lastly, my appreciation goes to my wife Tabawa, whose persistent patience at atime when she needed me most, allowed me to see this job through.

THSSIS ABSTRACT

TOPIC; INDUSTRIAL ESTATE FOR KANO.

Like most developing countries, Nigeria has realised the importance of diversifying its economic base in order to achieve a sound and stable economy. There is a consensus among development economists that "industrialisation is a potent factor in development process". Similarly, events in the last few years in this country have shown that industrial take-off is crucial to the whole process of economic take-off.

The Nigeriai Industrialists favour carrying out distributive trade in which they make quick gains, than engaging in manufacturing business which might on the long run turn-out to be more profitable. The government could minimise this problem by setting up the required industries which could later be sold or rented to the Nigerian businessmen who could then be willing to take them up. This can successfully be achieved through the establishment of government sponsored industrial estates.

Industrial estate is an industrial environment equip d with a road network; services and utilities for the various industries to be housed there;

communal facilities for the workers welfare and a completely built factory shed for the entrepreneur. The entrepreneur as a result will solenly invest his money in machinery andequipment rather than brick and motar. This idea is widely used to bring about rapid industrial growth in modern economies.

From the foregoing, it can be seen that the scope of this project is enormously large. As a result, I shall restrict myself to the small-scale industries, where emphasis will be laid on the Urban Planning problems associated with the estate general layout and the architecture of the factory sheds, so that a balanced and harmoneous environment is achieved for both the industrialists and the workers in general.

The obvious significance of such a venture will go along way to aid our ailing economy. Infact, "a virile small-scale industries sub-sector can contribute towards the realisation of wa wide range of development objectives, particularly in the creation of employment mobilisation of dcrestic savings and development of local entrepreneur". It's a well known fact that for any purposeful industrial activity to flourish, provision of basic infrastructure is a necessity. Therefore, this will be adequately catered for, and whatever shortcomings, others can improve.

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CHAPTER 1

INTRODUCTION

1.1 Technical Data About the Topic:

The term "INDUSTRIAL ESTATE" is generally confussed with industrial area or layout, therefore it has become quite necessary to clear the misconception. It is in this light that the following discussion is presented.

1.1.1 Classification of Industries

The parameters under which industries can be classified are broad, ranging from size, employment, function, performance, capital in-put, ownership and other variables[1]. Therefore, any of this can be used as a basis for classifying industries, depending on what one is set to achieve. Fundamentally, industries may be classified into two categories - "Basic and Service" industries. The basic industries are concerned with manufacturing of goods to be consumed outside the town and the service industries with the provision of goods for the towns consumption, repair and maintainance. The basic industries are further classified into:

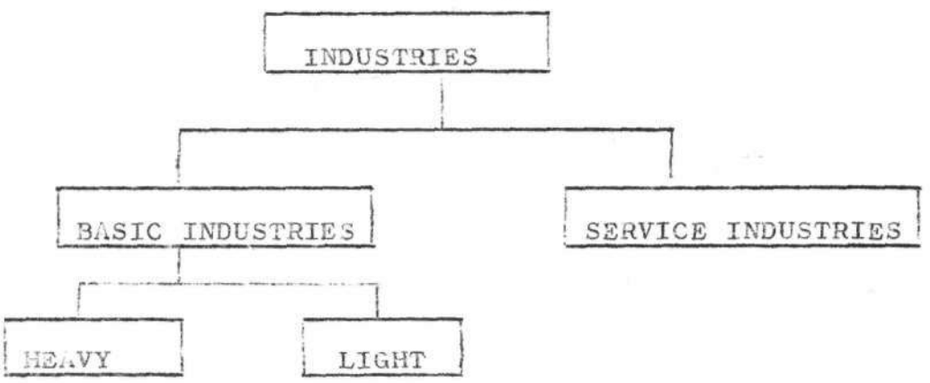
Extensive Industries: Which are industries assumed to have 20 or less number of employees per gross acre.

Intermediate Industries: These are industries employing about 30 industrial employees per gross acre.

Intensive Industries: Those industries employing about 50 or more industrial employees per gross acre.

As mentioned earlier, that the basis for classifying industries varies, here is yet another approach to that process; industry is sub-divided into two groups, namely "heavy and light" manufacturing[2]. The former (heavy) corresponding to the intermediate and capital goods industries, and the latter (light) to the consumer goods industries.

The light goods industries include food, beverages and tobacco products, textiles, clothing apparel and footwear, leather products, wood and furniture, rubber products, printing and publishing. The heavy goods industries cover paper, chemicals, non-metllic mineral products, basic metals, metal products and machinery and equipment, both electrical and on-electrical.



On performance basis, industries can be divided into three broad groups - Light industrial buildings, special industrial buildings and just industrial buildings,[3] with each housing different activities, thus -

Light Industrial Buildings: They are factories in which no solid fuel is used for processes and which only electric motors up to 10 Horse power (hp) single motors, are used for driving machinery. They can go almost anywhere, as they are not rooted to a particular source of power and do not cause any real nuisance. It is now generally accepted that light industrial buildings are best stied on "FACTORY ESTATE".

Special Industrial Buildings: These are all the industries which may have nuisance value. Noxious industries such as candle works, tanning, blood boilig, extractive industries such as brick works, lime kilns, coal and salt mines and heavy industries such as iron and steel works. Many of them have no place in town and those which must carefully be located.

Industrial Buildings: These are neither light nor special, but which set problems in their siting by reason of their size or the power they require. They include ofcourse all those large manufacturing like motor car, wool and cotton works, which are not by their nature absolutely fixed to particular places.

1.2 Definition and Scope:

"Industrial Estates or Industrial Parks" are planned areas that are sub-dividied into plots and developed systematically according to a developed and built-up factory sheds, ready to be given out on rentage to small-scale industrialists. It is a controlled environment for CONVERTABLE users. Restrictions are imposed inorder to maintain aesthetic values in the development and

general management of the estate. All necessary infrastructural facilities such as water pipe lines, electricity, roads and such others are provided in a planned and orderly manner.

What constitute a small-scale industry varies from country to country and from time to time. Infact marking off small from large industries is like marking off cold from hot water; much depends on the purpose, because water considered hot for washing one's hands is cold from the view point of running - steam turbine.[4]

A small plant in the steel industry may be many times larger than a plant considered sizeable in the garment industry. A machine shop that seems large in Nigeria would seem small in Detroit (USA); thus any boundary line must either be shadowy or arbitrary. In order to define a scope, the government use monetary measures as a yardstick of marking off small-scale industries from the rest.

1.2.1 Light Industrial Estate:

The dominant activity within the industrial scene in this country is distributive trade rather than manufacturing businesses, which are far more profitable in the long run than the former.

One of the causes for this trend is the lack of well planned business environements for the small-scale entrepreneurs. Therefore, the establishment of light industrial estate, will go along way to solve this problem.

Factory estate, industrial estate or trading estates are the various names refered to light industrial estates. They vary in size and character, from a few acres of small factories with no communal facilities to large developments of several hundreds, equiped with railway sidings, canteens, sosical clubs, banks and employment exchanges. They however, have the following characteristics:-

- The este is developed under one ownership.
- The layout is for a predetermined plan to which the industrialists conform, and
- The owners laydown estate roads and sewers, and they arrange for gases, water and electricity to be provided.

These estates can be aimed towards housing a group of similar industries, i.e "single industry estates" or for different industries i.e "mixed industry estates". For the purpose of this thesis, the latter type is being proposed.

This is for the fact that Kano is blessed with alot of raw materials and many business activities to support the various industries to be housed on the estate.

1.2.2 Factory Types:

Factory buildings are basically divided into two - "Singe-floor and multi-storey" industrial buildings. However, the type of factory most generally found on the estate is the single-floor light-framed structure with a one-or-two-storey office and welfare block infront. There are two types also:-

Special Factories:- Which are those designed for the industrialists own requirements.

Standard Factories:- Which are those actually designed and built for the industrialists to conform to, and are meant to be convertable, ranging from $930m^2$-$1860m^2$ in area.[5] In an estate of any size, some quite small single-floor factories for the "small man", known as nursery, sectional or incubator factories are found; they range from $93m^2$-$460m^2$

With these may be found a proportion of specially-designed factories with working space

on more than one floor. However, multi-floor sectional factories, known as "flatted-factories" are because of their cost, seldon built on factory estates.

1.3 Aim: The aim of the thesis is to provide an industrial environment that will go along way in solving both economic and social problems, being faced by the Nigerian small-scale industries sub-sector in generall and the provission of decent working conditions for the teaming workers.

Footnotes

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CHAPTER 2

INDUSTRIAL ENVIRONMENT OF THE CITY

2.1 Problem Definition:

In trying to arrive at the various problems facing the small-scale industrial sector in Kano, a general study of the existing industrial activities is carried out. It is not however meant to be an exhaustive report, but a representation of general industrial activities now in operation within the State Capital. The effort here is to try and portray theproblems that are inherent within the sector clearly. The following areas have been identified and treated accordingly.

2.1.1 Large Scale Sub-Sector:

Large industries, wholly or partly owned by expatriates are developing at the expense of the small-scale industries wholly owned and managed by indigenous businessmen who, however, lack adequate capital.[1] In an ideal situation, large manufacturing units spring up, growing relative to the small-scale industries, which later disappears to take modern forms. This has been the phenomenon in the industrialised countries of the world.

For instance, in highly industrialised United States in 1958, small-scale industries formed 91% of all manufacturing establishements, employing 27% of all manufacturing employees and producing 23% of all manufacturing out-put. In Japan, in 1959, the comparative figures are 98%, 56% and 34% respecitvely.[2] This has been the result of adequate attention accorded to the small-scale industries.

The reverse can rightly be said to be the case in this country and Kano in particular. One only need to visit the various industrial districts in this country to see the enormous position large industrial activities occupy, at the expense of the small-scale ones. This is sequel to the high regard accorded to them for years without any hitch, despite calls by industrialists and development economists of the dangers involved if the policy persist.

Industrial activities in this category, ranging from oil-mills, metal working and confectionary manufacturing are dominant (see Plates I and II). The problem is that large scale industrial activities over dominate the whole industrial business, which is in-appropriate.

Plate 1 **Kano State ginnery at Chalawa. Production capacity 25,000 tons of seed cotton per annum.**

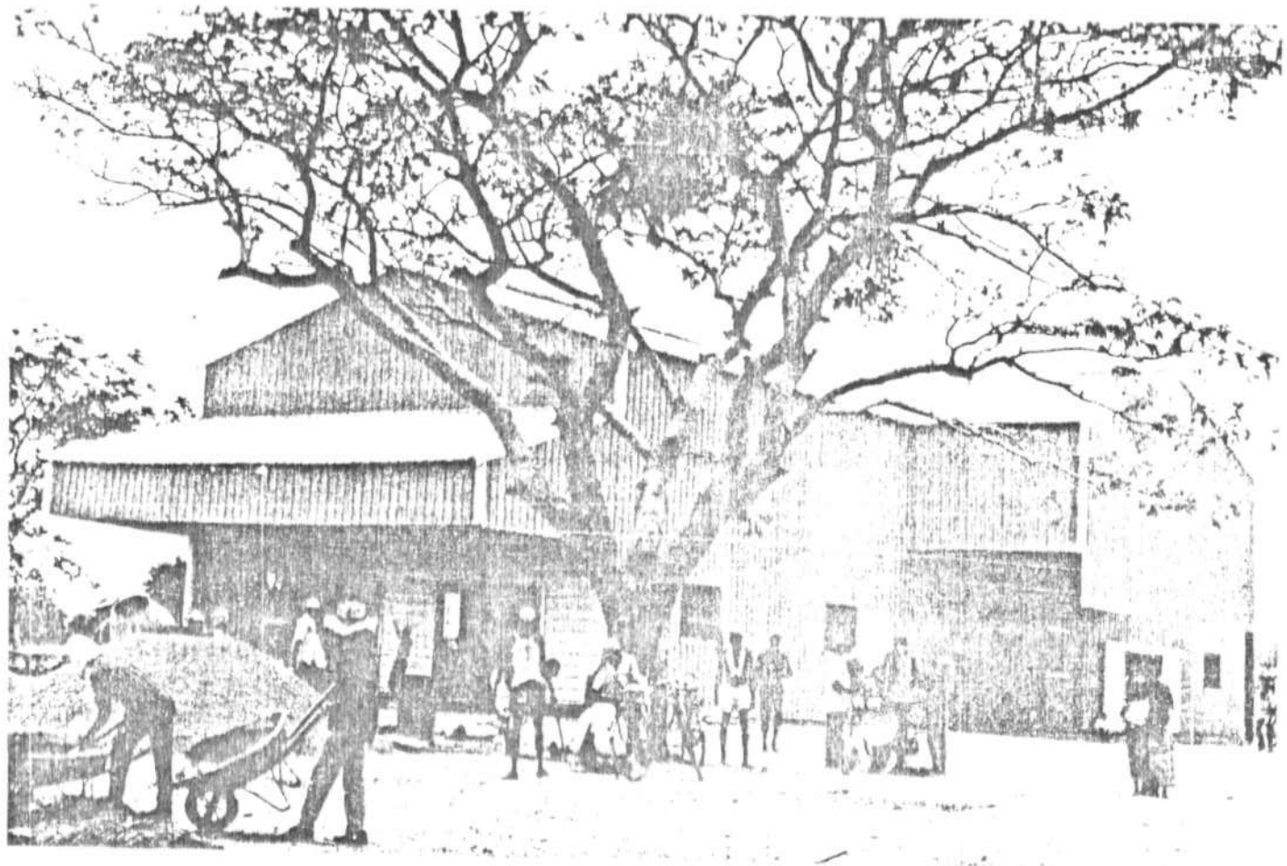
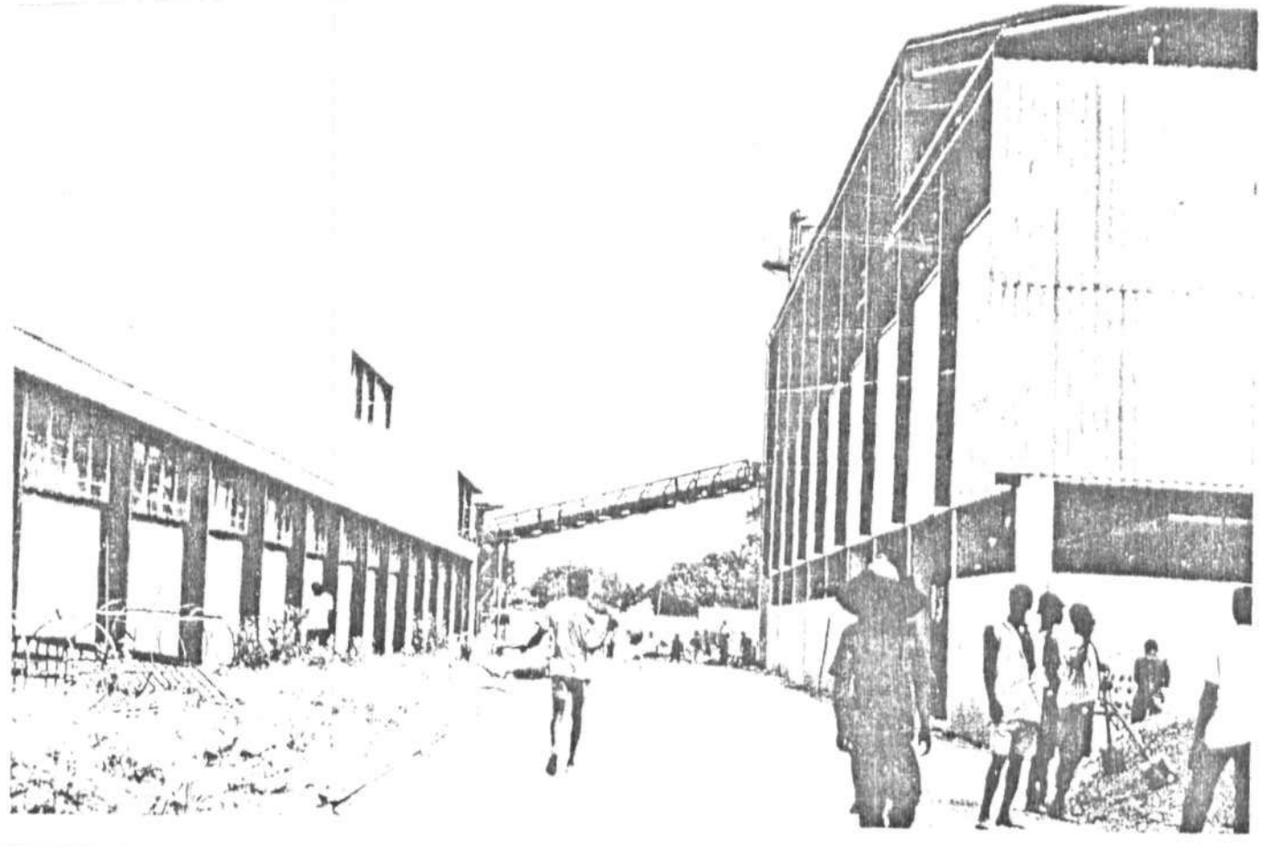


Plate II Kano State Oil Mills. Capacity 140,000 tons of oil per annum.



2.1.2 Small-Scale Sub-Sector:

This is yet another attempt to further enlighten the mind on the industrial picture of Kano. Like the previous case, it is also a general representation of the diverse small -scale businesses now in operation. It is common knowledge, that the small scale industries sube-sector in this country is suffering from utter neglect from both the government and the financial institutions.

While the government has not shown or rather chooses to remain passive over the sorry position small-scale entrepreneurs find themselves in the commercial banks and other financial organs are doing very little to remedy the situtiom. Incentives nursed by the entrepreneurs of borrowing from banks to maintain or establish a small-scale business are killed by the stringent loan conditionalities and very high interests.

It will be interesting to mention the Indian example at this juncture. In order to free the small-sclae entrepreneurs from the above problems and therefore set the pace towards industrialisation, the government took the radical

decision of nationalising all commercial banks. Government policies and loan procedures for small-scale industries were transformed to reflect national needs.

The result of these problems is the chaotic situation now faced in our urban centres. Virtually all available open-spaces, road sidings and in some cases residential buildings have been used to house small-scale businesses, ranging from hawking, carpentry, metal working, automobile repairs and artisans from different trades (see Plate III and IV). This problem is only inherent as a result of lack of proper environment to house these businesses, that required environment is a government sponsored Industrial Estate.

From another view, this utter neglect suffered by the small-scale industrial sub-sector, generate both economic and social problems. For instance, weaving is still the breadweaner of many residents especially in the rainy season, therefore, neglecting it will ofcourse set some friction within some families. Similarly, raffia mats and decorated guards for the tourists is still flourishing in Kano. These are very important economic activities whose survival should be protected at any length, for their obvious advantages.

Plate III *Making and Displaying Furniture on Road-Margins and Side-Walks*

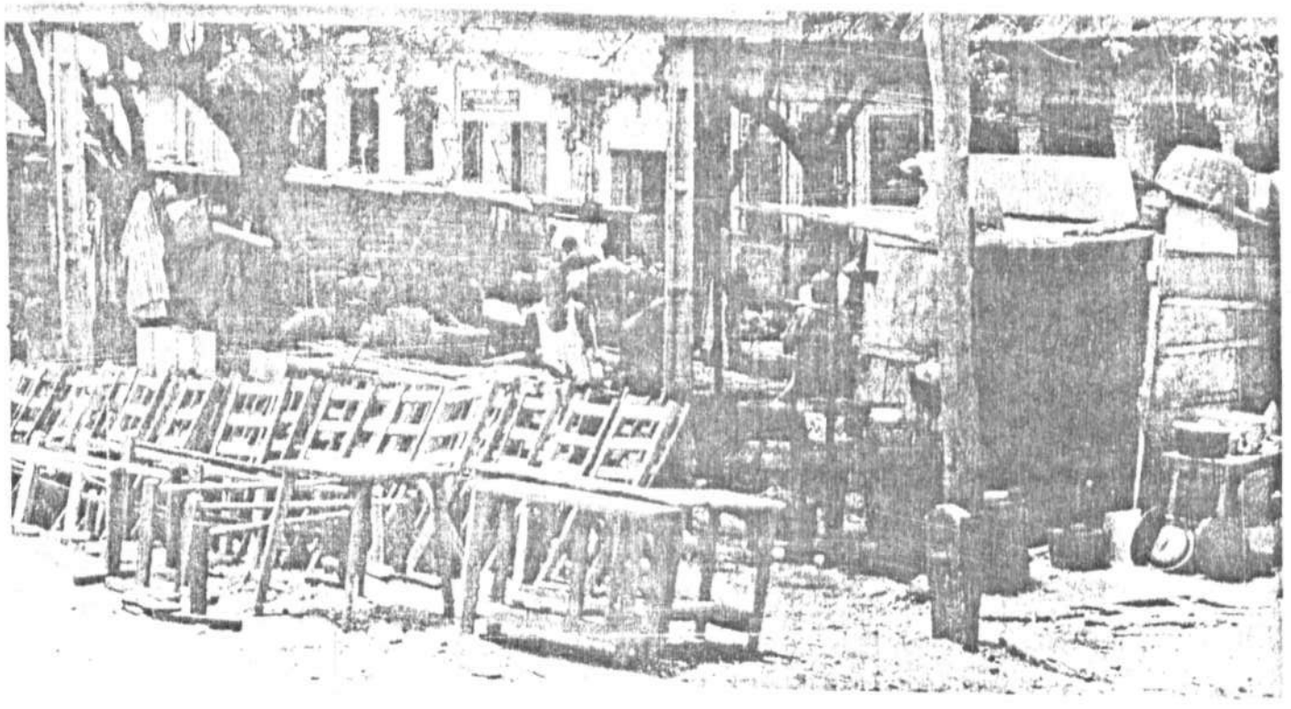
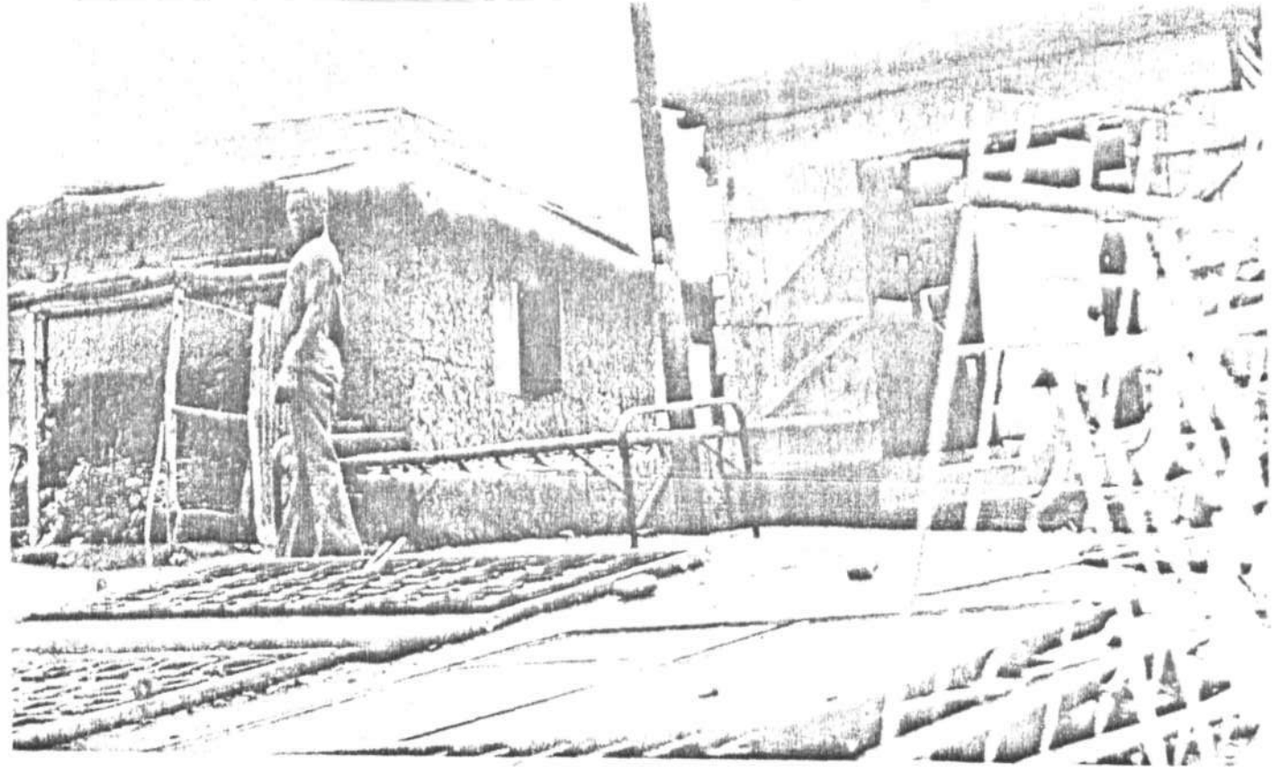


Plate IV *Encroachment by an Industry on the Sidewalk*



2.1.3 Other Sectors:

The whole economic structure today is yet another problem area. The economic strength of any nation is based on how much it is able to produce and sell to the outside world, while its local needs are satisfied with minimum outside help. Despite all the natural and human resources that Nigeria enjoys, it is still a consumer nation and an exporter of raw materials, whose earnings can very each year. This has generated serious balance of payments problems, which can be remedied by transforming the Nigerian economy into export oriented rather than import oriented one.

Another problem is that associated with the teaming population. It is clear that alot of the wealthy people in Kano, who are in a position to involve themselves in industrial activities do not really participate. The enormous wealth in these few hands if invested in such ventures will yeild encouraging results that will be beneficial to them and the generality of the people. Hence, the need to find a way of mobilising these individuals into small-scale businesses.

2.2 Justification for the Research:

Here, an attempt will be made to justify the viability of this topic as a research material. To do this, two main areas or rather elements of justice have been identified, viz - prospects of the research and its eventual benefits to the state and the country in general. For convenience, each will be treated separately as follows:-

2.2.1 Prospects for Developing Small-Scale Industries in Kano:

There are good prospects for development of small-scale industries in Kano on account of its geographical location. Kano State is not only rich in its agro allied and animal husbandry resources which provide adequate raw material support (Fig. 1), but also has abundant human resources, with an estimated population of over 10 million. About a third of this figure resides within a radius of 80km of the state capital (project site), thereby providing adequate supply of man-power.

Coupled with the above, is the provission of developed infrastructure to cater for the teaming industries to be proposed. For instance, the availability of water for both industrial and

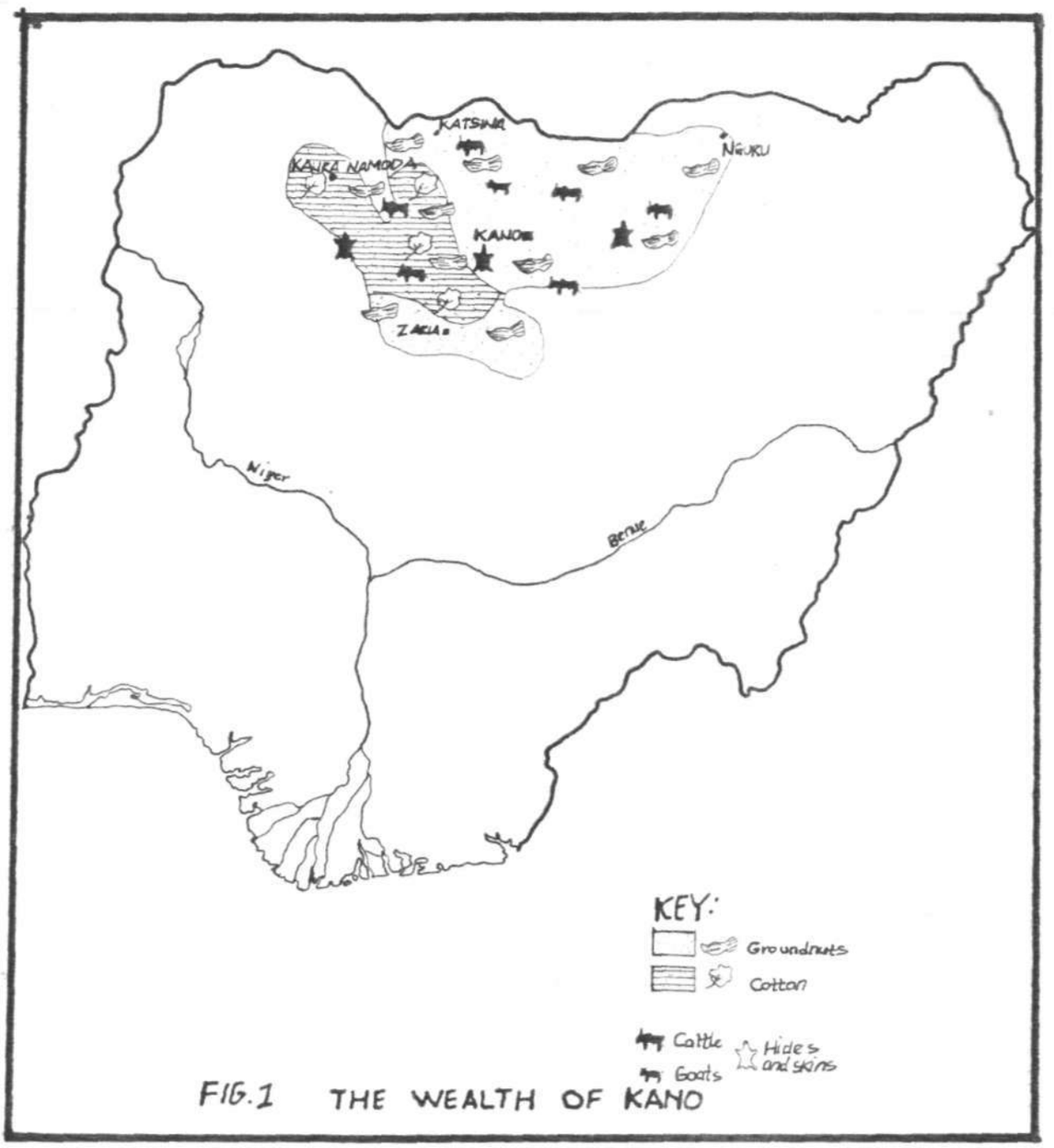


FIG. 1 THE WEALTH OF KANO

non-industrial purposes is quite adequate. There are at present two water works at Chalawa and Tamburawa, to supply all needed water. All power requirements are supplied to Kano by the National Electric Power Authority (NEPA) from the national grid. Transport and communication facilities are just adequate, which include good roads, railway services and an international airport. To crown all, there is abundancy of industrial plots.

Kano is the largest industrial centre outside Lagos in this country. It houses quite a number of both large and medium scale industries, which manufacture or assemble capital goods. As a result, these industries can patronise the small-scale ones through sub-contracting the supply of ancilliary parts and components for their use to them.

Finally, there is an encouraging gesture from the government in this direction. For instance the traditional sector of small and cottage industries is receiving government attention for adaption of more efficient factory methods and power operated machinery and equipments.

2.2.2 Benefits for Developing Small-Scale Industries in Kano:

It has been accepted by the developed and developing nations that small-scale cottage industries are a vital instrument for generating economic growth, as they tend to promote not only a stable industrial sector, but also a balanced spatial distribution of industrial development. The importance of small-scale industries, especially in all developing countries, has been realised or account of the mirculous progress made by Asian countries notably South Korea, Hong-Kong, Taiwan, India, Singapore, Malysia, Pakistan etc. Infact the accepted co cept in all develop ng countries i "progress through small-scale industries".

The development of small-sclae industries in Kano will go along way to solve the problem of teaming masses. For instance, there will be a progressive rise in their standard of living. In addition to this, it will bring changes in the social structure, learning of technical and industrial skills and growth of a managerial and industrial working classes, and in rural areas, rapid urbanisation will result.

Furthermore, a viable small-scale industries sub-sector will obviously generate alot of capital which will help towards business sustainance. Utilisation of local materials that are quite abundant is another significant benefit and this will definitely solve problems associated with under useage of our materials. More importantly, a planned small-scale industrial estate in Kano will present yet another method aimed towards solving problems associated with urban planning.

2.3 Motivation:

Industrialisation is found out to be very crucial to the whole process of economic take-off the world over, and the small-scale industries have been identified as the necessary catalyst in the process of industrialisation as well. Therefore, the small-scale industries can rightly be said to be the key, to that economic take-off, and as a result, any effort to improve their operations and growth will surely not be in vain. This situation principally served as the motivation towards the commencement of the research.

At the moment, most of the small-scale entrepreneurs are concentrating on traditional items such as bread bakeries, cement block making,

tailoring; metal and wooden furniture on the assumption that these projects have a prospect without knowing that they if not already saturated will soon be, as new comers may also follow the same path, instead of breaking through new grounds. At present, emphasis is for setting up non-traiditional industries of mechanised and semi-mechanised nature because of increasing demand for sophisticated products. This also provided me with an impetus to pursue the research.

From a wider perspective, there is a limit to the employment prospects that can be provided by agriculture, which is dominant in the state and the country in general. The result of this dominanc is leading to a chronic and interactable of under-employment of large number of people. For this reason, enterprising youths from both the rural and urban areas are critically searching for alternative businesses or jobs. The situation can only be remedied by diversifying the agricultural economy, through both rural and urban industrialisation.

2.4 Goals and Objectives:

While it is desirable to identify the problems, it is more important to provide their solutions. The urge to find meaningful solutions is becoming increasingly strong with the continued expansion of the economy and the ever-increasing demands for infrastructural services, foreign exchange, domesstically produced consumer goods, and the need to break Nigeria's dependence on foreign industry. Infact, unless this is done, real development will be extremely difficult. The goals and objectives proposed here are possible approaches aimed to remedy the situation (IF-GOD-WISHES), and are presented as follows -

- To break the monopoly of large and medium scale industries which are only an integral part of the whole industrial sector.
- To provide a decent and improved working environment for the teaming small-scale industries now expanding.
- To mobilise the local tycoons towards venturing into small-scale industrial businesses that are more profitable in the long run.
- To try and make Nigeria integrate properly into the world economic structure, which

is threatening the very existence of many a nation.

- To find a way of exploiting the numerous development potentials of Kano, so that their existence will be justified.
- To identify the possible way of realising the range of development benefits that goes with the research work.
- To find a possible way of realising the dreams I have in the motivating factors, that gave me the strength to pursue the research.

The key to the realisation of these goals and objectives is the development of government sponsored industrial estate, which should be located at a suitable site in Kano Metropolis.

Footnotes

1. Anonymous (1974), Kano State Commercial and Industrial Handbook.

2. Anonymous (1974), Kano State Commercial and Industrial Handbook.

3. Anonymous (1980) Procedures and Prospects of Establishing Small-Scale Industries in Kano State.

CHAPTER 3

HISTORICAL EVOLUTION

The development of industrial estates the world over is of interest here. This survey will provide us with an idea of how the various developments were executed, their shortcomings and ofcourse their successes and failures. In other words, we will look to history for the lessons of time, for as Santana has concluded, "Those who refuse to learn the lessons of history are condemned to repeat it".

The information presented here are based on the answers to a questionnaire prepared and submitted to member countries by the United Nations[1] in 1964. The questionnaire sort to find out the extent of industrial estate development in each country. For the purpose of clarity, the world is viewed on a regional context, from where a representative nation or so is/are selected for discussion on their submission.

3.1 The African Setting:

To relieve the excessive concentration of people and employment coupled with the desire to attract foreign investors or enterprises,

ra ical changes in thi ıking about ind:strial development in Africa have been taken within recent years. These changes are manifested in the establishment of industrial estates ₦ll over the continent as shown below.

3.1.1 West Africa

Nigeria: The first small-scale industrial estate was established in Lagos in 1958 at Yaba. This was followed by another in 1964 at Uwani, in Enugu. Realising the importance of such a venture, the Lagos State Government established a new one in 1980 at Matori. The earlier two were aimed towards attracting from overseas enterprises into the Nigerian industrial activities while the la t one was to encour ge local entre reneurs into small-scale businesses.

All three industrial estates - Yaba, Matori and Uwani were commonly developed by the governments of this country. It is on record that of Yaba was built by the Federal Government and later transferred to Lagos when states were created. The one at Uwani was owned by the Eastern Region Government, and later taken over by the Anambra State Government.

Cameroun: Under the various technical aids of the United Nations, the government was able to undertake the development of industrial estates, in 1963. These estates were apart from housing small-scale businesses, catering for the training of workers and firemen.

Chad: Some potentials that are very vital to the development of industries were considered in the location of the estates in this country. For instance, zones were located near sources of electric power and water supplies. The welfare of the workers was given little consideration because facilities were not provided.

Gambia: The main issue for establishment was economic diversification, because as at 1964, there was no manufacturing industries. Akinifing Serekunda (a suburub of Bathrust) was zoned for estate development, the basic consideration for siting being communication factors, namely roads. The area was laid with services and utilities.

Senegal: The motive for the establishment of the industrial estates here, was simply for the obvious advantages that go with such ventures.

Guinea: The industrial estates in Guinea were aimed towards catering for the small-scale entrepreneurs and the training of workers as well. As a result 1,000 acres were earmarked in 1963 for their establishment. The idea was for the promotion of small-scale businesses.

Ghana: The Ghana Estate Investment Company was the pioneer in the development of industrial estates in Ghana. The Nyaniba industrial estate at the outskirts of Accra was developed by the company. The buildings on the estate contain 82 bays, which were given out in multiples to the entrepreneurs. Another was built at Kubuashie, accommodating 800 repair shops and other smaller operations like artisans.

3.1.2 East Africa:

Kenya: In order to increase participation of local entrepreneurship in the divers national economic activities especially small-scale industries, the government began to build industrial estates. Services and utilities were provided to the standard factory buildings. However, there is lack of employee facilities and the site is choked up making expansion impossible.

Uganda: The concept of integrating the small-scale industries with medium and large scale industries was used here. For instance, in 1964 an industrial estate was developed near Kampala, where part of the land was to be developed as an industrial area for medium and large scale industries. It was aimed towards mobilisation of indigenous entrepreneurs into small-scale businesses.

Tanzania: The government's effort to establish such estates was not successful, despite its inclusion in the 1961-1964 development plan. The aim was towards encouraging indigenous entrepreneurs into small-scale businesses.

Somalia: The estates were proposed at Mogadishu, Chisimie, Hargeisa and Berbera in the government's development plan (1963-67). These estates will apart from offering manufacturing opportunities also provide service centre to train workers in tools handling.

3.1.3 Central Africa:

Zaire: A wide range of location factors were considered in the siting of the estates in this country, such as raw materials, energy and water supply, communication and land for industrial use. The estates were to be located at Stanleville,

and Elizabethville-Kolwezi to stimulate the growth of small and medium sized industries near large ones. This was achieved, but the aim of having the large industries patronising the small and medium ones was not realised.

Equatorial Guinea:

Econominic and transportation factors were considered as locational factors. The estate was proposed to be built at Santa Isabel, on the Fernando Poo Island, which was not possible because at that time, the Rio Muri Habour was being constructed, and government could not afford the two projects.

3.1.4 South Africa:

Angola: Transport facilities, services, water and electricity supplies were available. Coupled with this, land can be acquired at reasonable prices at the sites selected for the development of the estates, namely - Luanda, Lobito and Sada Bandeira. New businesses were preferred to older ones as tenants on the estate.

Zimbabwe: Harare (Salisbury) and Bulawayo were the locations of industrid areas, mainly aimed towards attracting foreign investors. Plots were available for lease with an option to purchase as soon as development reaches half stage.

South Africa: Land was completely developed with roads, railway sidings and water by the development companies, using loans from financial institutions. There were no standard factory buildings for rent, only the developed plotswere sold.

3.2 Eurpean Setting:

Coordinated programmes of nation building during pre-and-post-war Europe, saw the development of industrial estates, a review of which is presented below:

3.2.1 Western Europe

United Kingdom: The United Kingdom, along with the United States of America, was the first country to establish industrial estates about 80 years ago. The pioneer ones were - Trafford Park, Manchester, and Slough, in Western London. Over this period, alot of policy changes were effected with regards to estates development; from private profit-motivated real estate ventures in the begining of this century, to aiding the rehabilitation of depressed areas in the 1930s, to regulatory distribution of industry over wider areas of the country in the 1950s and finally in the 1960s to maintaining reasonable employment throughout the country.

General facilities such as power, water, gas, sewerage, surfaced streets, transport and communication, others like postal, banking and railroad trucking facilities in or near the estates were provided by the agency concerned. The obvious success was the reduction of unemployment.

Sweden: The development of industrial estates in Sweden were financed by municiapalities, cooperative societies or joint stock companies. Such buildings have been constructed in Stockholm, Norrkoping, Orebro, Uppsala, Karlstad, Ostersund, Vasteras and Gavle. No special services were provided.

Italy: The policies for the development of industrial estates were formulated in 1957 and 1959, following the government's desire to industrialise the underdeveloped southern part of the country, where an area was already opened for that at Catania, in Sicily in 1953.

The fund for Southern Italy (Cassa per Il Mezzogiorno) makes grants to public law associations (consortium) which is a union of local authorities, chambers of commerce and industry and other interested bodies. These grants were for the

development of industrial estates, and for carrying out the necessary infrastructure investment.

Malta: The government of Malta has established three industrial estates at Marsa, Msierah and Mriehel between 1957-1966. All three were located within the vicinity of an airport and a habour. Tenancy was opened to new and expanding undertakings both local and overseas under government's aid scheme for industries.

The industrial estates provide facilities of power, water, gas, sewerage, access roads, fire protection and quality control laboratory. Government incentives range from capital grants, income tax holidays of ten years and exemption or reduction on customs duties.

Ireland: Ireland has five industrial estates in operation and a sixt one under construction. Three of these estates at Shanno, Galway and Waterford are government sponsored. The other two at Dublin are private estates. The government sponsored ones were aimed to provide inducement to industrial development and attraction of new industries particularly from abroad. The government incentives are same with that of Malta.

Greece: The industrial development corporation in 1962 proposed the location of industrial estates at Salonika, Volos, Patras, Kavalla and Heraklion (Crete). The major objective being providing additional employment. The common facilities to be established in the industrial estates might include security, fire protection, medical service, mess room (canteen) and possibly industrial training centres. There are more proposals at Preveza, Canea and the Athens districts.

3.2.2 Eastern Europe:

Bulgaris: A major objective in the development of industrial estates was to narrow down the differences in the levels of economic development among all regions and districts. Also, substantial differences between the standard of living in rural and urban communities should be reduced and eliminated.

3.3. The Asian Setting:

It has already been mentioned that miraculous achievement were made in the development of small-scale industries through the establishment of industrial estates, especially in India, Malysia, Singapore, South-Korea, Pakistan, etc.

The successes in India supercedes that in any of these countries and the developing world in general, and is therefore choosen for review.

3.3.1 South-East Asia:

India: Among the industrialising countries, India has the largest industrial estate programmes, both as regards number and geographical spread. The objectives of these programmes were:-

- To create immediate and permanent employment on a large scale at relatively small captial cost.
- To meet a substantial part of the increased demand for consumer goods and simple producer goods.
- To facilitate the mobilisation of resources of capital and skill, which might otherwise remain under-utilised.
- Integration of industries with the rural economy on one hand and large scale industries on the other.

Dominantly sponsored by the government, industrial estate growth over the years in India has been remarkable as shown in the table below.

Table 3.1: INDUSTRIAL ESTATE GROWTH OVER THE YEARS IN INDIA.

	Number of Estates	Amount Allocated (million Repees) Rs
First five year plan (1951-1956)	10	5.8
Second five year plan (1956-61)	110	112.2
Third five year plan (1961-1966)	300	302.0

Rs 4.76 = $ US 1 before June, 1966.

Rs 7.50 = $ US 1 from 6th June, 1966.

The Fourth Development Plan proposes the establishment of industrial estates at 149 urban centres and 700 growth points (small-towns) spread over the country at a cost of Rs 630 million.

3.4 The American Setting:

The term Industrial Park is commonly used to refer to industrial estate. It is infact being used as a promotional and advertising gimmick rather than as an accurate description of a specific type of industrial development.[2] The United States of America (USA) together with the

United Kingdom (UK) set the pace in industrial estate development.

Between 1950-1960, a number of specialised types of developments began to appear; namely - the balanced or self contained community, with its industrial area designed to fit harmoniously into the overall plan; the research or research-oriented park; and the industrial urban renewal projects.

Typical examples are - Fair Lawn Industrial Park, in New Jersey, Annacis Industrial Estate, Vancouver, British Columbia, Pointe Claire Industrial Park, Montreal Quebec; Tampa Industrial Park, Tampa, Florida; Joe's Creek Industrial Park, St. Petersburg, Florida, etc.

3.5 Successes and Failures:

While some of the developments were successful in terms of both operation and development some were not. Some of these shortcomings and ofcourse the successes are:

3.5.1 Successes:

- Expansion of individual enterprises,
- Facilitated the mobilisation of both under utilised materials and human resources,

- In the developed nations integration of the industrial sector was achieved, while in the developing countries the process is still on.
- Narrowed down the differences in the levels of economic development among regions.

3.5.2 Failures:

- In most of the developing countries, impact is yet to be felt.
- Some enterprises were found to have been ejected from the estates before their businesses actually expand, because of rent default, thus defeating the whole aim of the project.
- Inability to curb monopoly by certain tenants, who take more sheds than otherwise prescribed, thus preventing more people to come to the estates.

Footnotes

1. UNITED NATIONS, Industrial Development Organisation. Industrial Estates in Europe and the Middle East, New York, UN; 1968.

2. No. TB 44 Urban Land Institute. Industrial Districtis: Principles in Practice.

CHAPTER 4

GOVERNMENT POLICY

4.1 Development of Small-Scale Industries:

Since Nigeria operates under Federal System of Government, it is only logical to expect that broad policy guidelines will be set for the country at Federal level and narrower ones designed at State level to compliment the efforts of Federal Government in realising the overall national objectives. In designing such policies at State level, however, the realities and problems of the State have to be taken into consideration.

Condition in Kano State as far as they concern trade, industry and commerce are very conducive to development of industries. Therefore, having regards to the policy of the present administration, which is geared to serving the masses of the people, the following fundamental guidelines have been adapted as the policy on the development of small-scale industries.[1]

1. In the small-scale industries sector, the government will continue to provide financial,

managerial and technical assistance to small-scale industrialists in all parts of the state.

2. The Small-Scale Industries Credit Scheme of the Ministry of Trade, Industries and Co-operatives will undertake the identification of viable small-scale industries through feasibility studies for the benefit of those wishing to establish small-scale industries.

3. The government will continue to patronise small-scale industries wherever possible and to assist in finding markets for their products elsewhere.

4. Industrial estates for small-scale industries in both the Metropolitan and other suitable rural areas of the state will be fully developed with all necessary infrastructures for the development of small-scale industries.

4.1.1 Policy Objectives:

The objectives of the above policy guidelines are :-

(a) To eliminate the obstacles and pave the way for smooth development in the industrial and commercial sectors of the economy.

(b) To ensure even development in all areas of the state and to provide for effective participation by both the government and local businessmen towards achieving these goals.

(c) To provide the necessary infrastracture and incentives and to creat the right atmosphere for healthy and rapid development of this sector.

4.1.2 Reasons for Development Programme:

The basic objects of small-scale industries development programme are:

(a) To provide loan assistance to artisans and small-scale industry for purchasing and installation of machinery and equipment.

(b) Working capital for raw materials and other items necessary for the production of goods and services.

(c) To provide necessary technical assistance to raise the level of productivity.

4.2 Approach:

In order to achieve the above objectives, the Federal Government has adapted a definition for Small-Scale Industries according to which

small-scale operation in the country. The list is reproduced for the information of interested entrepreneurs.[2]

Agro-Based Industries:-

1. Fruit Juices
2. Baking
3. Biscuit
4. Rice Milling
5. Toilet Soap
6. Craft Bag
7. Yellow Board
8. Automobile Tyre-Tube
9. Toilet Paper
10. Working Clothes
11. Oil Milling
12. Coconut Processing
13. Candy
14. Simplest Re-Worked Fibre
15. Medical Use Textile
16. Blanket and Non-Fabric System
17. Starch
18. Rice Oil
19. Farm Implements
20. Cotton Towel
21. Bicycle Tyres and Tubes
22. Coir Fibre Processing

23. Mosquito Net

24. Sisal Twine Cord

25. Absorbent Cotten

26. Alcchol From Molasses

27. Bakers' Yeast

28. Brushes (Fibre and Bristles)

29. Carbohydrate and Proteins-Extracts from Groundnut-cake

30. Cashew Shell Oil

31. Cattle and Poultry Feed

32. Coconut Shell Powder

33. Condiments and Spice Powers

34. Cotton-seed Oil

35 Dehydrated Ginger

36. Dessicated Coconut

37. Dried Molasses-Cattle Feed

38. Fibre from Banana Stalks

39 Ginger Oil

40. Glucose from Tapioca

41. Orange Oil

43. Oxalic Acid from Pineapple

43. Preservation of whole Fruits

44 rocessed Food

45. Refined Oils

46. Rice Bran Oil

47. Roasted Cashew

48. Ropes and Twines
49. Starch from Banana Stems
50. Starch from Maize
51. Tobacco Seed Oil
52. Brushes (Tooth)
53. Brushes (Industrial)
54. Banana Power
55. Cards (Playing)
56. Electircal Assessories (Wooden)
57. Food (Dehydrated)
58. Gloves (Surgical)
59. Oil (Lemon Grass)
60. Picking Sticks
61. Paper Cups and Saucers
62. Paper Products used in Packaging Industry
63. Rubber Moulded goods
64. Tyres (Scooter)

Other Manufacturing Industries

1. Batteries (Automobile)
2. Buttons (pressed typed)
3. Bicycle Accessories
4. Amplifier
5. Buckles (garments)
6. Crown Corks
7. Dusters
8. Distributors

9. Detergent Formulations
10. Flouerescent Tubes
11. Grease Mipples
12. Garments (leather foam)
13. Gas Burner and Cooking Ranges
14. Hoses (brakes)
15. Hose Pipes
16. Plastic Coated Paper and Cloth
17. Perfumery Compounds
18. Pens and Refills (ball-point)
19. Pencil Sharpeners
20. Pumps (cycles)
21. Rectifiers, Battery Chargers, Voltage Stablisers and Boosters
22. Sprayers (Insecticides)
23. Tapes (measuring)
24. Tubes (callapsible)
25. Tacks (shoes)
26. Tools (hand-operated)
27. Universal Joints
28. Wipers (wind screen)
29. Grinding Wheel
30. Match
31. Powder, Granular BHC
32. Pump Assembling
33. Wire and Wire Product

34. PVC Insulated Wire
35. Electroplating
36. Ice Making and Refrigeration
37. Shoe
38. Mcsquito Coil
39. Men's Dress Shirt
40. Umbrella
41. Arc Welding Electrode
42. Printing
43. Fishing Net Making
44. Air Separation
45. Bond
46. Concrete Admixture
47. Crown Cap
48. Electric Steel
49. Procelain Insulator
50. Rotary Kiln with Preheating Grate
51. Rubber Beach Sandal
52. Wire Net
53. Book Binding
54. Caffeine
55. Calcium Carbide
56. Card Board Boxes
57. Cottone Tapes
58. Disinfectant

59. Hosiery Items

60. Insulating Adhesive Tapes

61. Jute Twine and Rope Making

62. Manure Mixing

63. Paints and Varnishes

64. Pesticide Formulations

65. Pharmaceuticals

66. Safety Matches

67. Spectacle Lens Grinding

68. Ready-made Garments

69. Photo Frames

70. Radio Cabinets

71. Sports Goods

72. Straw Matting for Packing

73. Tanning Material out of different Barks

74. Tooth Picks

75. Wooden Joinery Products

76. Wood Toys

77. Wodean Blackboards

78. Wooden P acking Cases

79. Woodent Electrical Accessories

80. Wooden Furniture

81. Wooden Stationery Articles.

Marine-Based Industries:

1. Fish Meal and Fish Manure
2. Fish Sausage
3. Canning and Freezing of Fish
4. Essom Salt
5. Fish Curing
6. Fish Oil
7. Freezing of Prawns
8. Salts
9. Potassium Chloride
10. Potassium Permanganate

Mineral-Based Industries:

1. Tiles
2. Ceramic Tableware
3. Concrete Blocks
4. Polythlene Bags
5. Cellophane Tape
6. Pencils and Slates
7. Sign Pen
8. Foundry
9. Bolts, Nuts
10. Agricultural-use PVC Film
11. Rigid PVC Pine
12. Plastic Container
13. Polyester Button

14. Corrugated Board Box.
15. Canning
16. Can
17. Aluminium Household Goods
18. Stretched Tape Woven Sack
19. Sanitary Ware
20. Asbestos Cement
21. Red Bricks
22. Press Moulded Glassware
23. Pipe Fitting
24. Sewing Needle
25. Concrete Pole and Pile
26. Glass Bottle
2 . Aggregate making
28. Automatic Water Treatment
29. Chalk
30. Irradiated P.E. Foam
31. PVC-Asbestos Tile
32. Benefication of China Clay
33. Bleaching Powder
34. Cement Asbestos
35. Cement Colours
36. Coal Briquettes
37. Crockery
38. Distempers

39. Decorated Mirror and Glasswares

40. Dolomite Refractories

41. Dry-Ground Mica

42. Fire Bricks and other Refractories

43. Grinding of various Minerals

44. Gypsum Plaster Boards

45. Lime Burning

46. Marble Cutting, Chips Making andPolishing

47. Mica Bricks

48. Precipitated Chalk, Calcium Carbonate (Activated)

49. Stoneware Polishing

It was mentioned earlier that the state governments augment the efforts of the Federal Government on all policy issues by providing more to suit their local conditions. As a result, the Kano State Small-Scale Industries Division of the Ministry of Commerce, Industry and Co-operatives has produced a list of prospective small-scale industries.[3]

List of Prospective Small Scale Industries in the State is shown below:-

1. Animal Feed.
2. Poultry feed
3. Cotton Hosiery
4. Leather Footwear
5. Leather goods
6. Cardboard boxes and cartons
7. Exercise books, registers, diaries, etc
8. Laundry soap
9. Steel trunks and suitaces
10. Metal fixtures
11. Locks and padlocks
12. Roofing nails
13. Agricultural implements
14. Hand tools
15. Cutlery
16. Bicycle parts
17. Condiments
18. Mechnised bakery
19. Candles
10. Surgical bandages
21. Bone meal
22. Metal oors and window frames
23. Household Electrical Accessories (Swithces, lampholders, plugs, etc.)

24. Cement blocks

25. Automobile repairing workshop

26. Ice cream and iced candies

27. Lime Kilns (Lime burning)

28. Builder's hardware (steel and aluminium)

29. Automobile parts

30. Coil springs and upholstery springs

31. Barbed wire

32. Moulded plastic products

33. Pharmaceutical and chemical items

34. Assembly of Radios and Transistors

35. Printing presses

36. Dry cleaning

37. Readymade garments

38. Stone quarrying

39. Cassava grating

40. Pepper grinding

41. Sugar cane crushing

42. Small tanneries

4.3 Finance:

There is a liberal government lending programme in the State to give loans to small industrialists for setting up viable manufacturing, processing or servicing industries in the small-scale sector. Finance is such a key factor in realising the development potential of small-scale industries. For that, the government of the State has allocated substantial sums of money for on-lending to small industrialists under the small industries credit schemes, through Loan Management Committees (LMC).

4.3.1 Credit Schemes:

The origin of the small-scale industries credit scheme can be traced to the Ford Foundation Grant of ₦380,000.00 to the Northern Region Government in 1965, which was to be used in starting the scheme.[4] Realising its importance, the regional government established its own in 1966, with the aim of providing financial and technical assistance to indigenous industrial entrepreneurs of the region.

However, with the breaking of the regional government into six autonomous states, the working

of small industries credit scheme was temporarily transfered to the Interim Common Services Commission (ICSA), Kaduna. Later in May 1968, a decision was taken to establish the scheme in each state of the North. As a result, the scheme has been functioning in Kano State since first April 1969.

Background: The main issues that warranted the establishment of the small-scale industries credit scheme can be summarised as follows:-

1. The lack of adequate capital and credit schemes is a general problem faced by small-scale industries the world over, credit is especially crucial because they have weak captial base.
2. Adequate institutional credit is not available to small-scale enterprises as they are considered high credit risk by commercial banks, due to their ownership structure, and this makes them turn to other unfavourable sources that impede their growth.

In light of the above problem the Second National Development Plan (1970-1975) incorporated the Small-Scale Industries Credit (SSIC) Scheme as an industrial policy for the whole country, which

gives loans on liberal terms. This was further strengthened in the Third National Development Plan (1975-1980) as mentioned earlier.

Functions of the Scheme: It was menant discharge the following services:

1. To mobilise the indigenous people into participating in the industrial development of their country.
2. To provide a means of livelihood to the families of artisans who operate the local industries.
3. To assist in bringing about the necessary transformation in techniques and organization.
4. To break the monopoly of large industries wholly or partly owned by expatriates, because they are developing at the expense of local industries wholly owned and managed by indigenous businessmen.

Projects that do not qualify under the Scheme:

The following types of businesses are not eligible for small-scale industries credit scheme loans:-

1. Purely trading businesses including cold store.

2. Places of entertainment, such as hotels, bars, restaurants, night-clubs, and cinemas.
3. Institutions of learning and training.
4. Barbers and Beutitians.
5. Portriate Photographers.
6. Transport services, including lorries, buses, taxis, etc.
7. Hiring services for things as bicycles, typewriters, and other equipment.
8. Repair services for such tings as bicycles, clocks and watches.
9. Building contracting and painting.

Who qualify for a loan:

To qualify for credit under the scheme, the entrepreneur should be creidt worthy, honest and capable of managing a project which could:

1. Produce needed goods and services.
2. Manufacture or process of local raw materials for the home market or export.
3. Train workers to acquire industrial skills.
4. Contribute to the economic development of Kano State.
5. The entrepreneur should be an indigene of Kano State, or living in Kano for more than five years with strong economic ties.

4.3.2 Management

The maximum limit of loan which can be given to any single applicant is ₦80,000.00, including fixed and working capital. The loan could be granted within the aforesaid limt to cover up to 75% of the total cost of the machinery and equipment to be purchased and upto 50% of the working capital needs, subject to maximum of ₦10,000.00.

However, no loan is granted for the construction or expansion of the workshed, except in very special cases where the present work-place is considered unsuitable for the process to be carried on or where the applicant has to shift from a non-conforming to a conforming area under Town Planning Regulations.

The SSIC Scheme is liberalised to further enhance the operations of the indigenous entrepreneurs. For instance, the rate of interest is lower than the market rate, as it is 5% on reducing balance. The loan is repayable in convenient installments over a period of five years with an appropriate grace period of three to six months, depending on the nature of the project. Applications for loans are submitted to

the LMC through the Secretary of the committee.

As a measure of protecting the loan, payments are to be made to suppliers direct and, ordinarily, no part of the approved loan is to be paid in cash to the borrower prior to the delivery of the machinery, ordered for the enterprise.

4.4 Others:

4.4.1 Land Acquisition:

The land in Kano State and the country in general is sole prerogative of the governments. Following the indiscriminate usurping of lands just outside the State Capital, the government declared a wide range of radius surrounding the city as part of it, and thus requires planning permission for any physical construction from the Urban Development Board (the planning authority).

All land requirements are channelled through lands and survey department of the Governor's Office. This can be inter-ministerial, categorised under the 'GKN' clause of land acquisition or between local and State Governments.

4.4.2 Incentives:

The Small-Scale Industries section in conjunction with the Industrial Development Centres

organises training programme for black smiths on tinkering production of small agricultural equipment, for carpenters on furniture making and wood-work; for motor mechanics and electricians on machine operations and maintainance; and general managerial training for various businesses.

Furthermore, the highly essential idea of good book keeping of business transactions has been taken up by many small-scale businessmen on the initiative of the section. Also, this section has encouraged and achieved the formation of partnerships or moderate limited liability companies with the cooperation of thesmall-scale ind strialists.

Footnotes

1. Anonymous, Industrial and Commercial Policy of Kano State Government.

2. Anonymous, (1985), What Small-Scale Industry to Start, Compiled by the Promotion and Modernisation Unit, Small-scale Industries Division, Ministry of Commerce, Industries and Cooperatives, Kano 1-Nov.

3. Anonymous, (1980) Procedures and Prospects of Establishing Small-Scale Industries in Kano State.

4. Anonymous (1974) Kano State. Commercial and Industrial Handbook.

5. Anonymous (1974) Kano State Commercial and Industrial Handbook.

CHAPTER 5

DATA COLLECTION

5.1 Processes:

For the successful completion of this aspect of the whole research, three basic ways were followed, viz - a review of literature, already presented in the first three chapters; analysis of sight stimulating examples to be treated under case studies and lastly the survey of people who have had practical experience with the operation of estate setting or management. It is this last aspect that will be presented under this section.

5.1.1 Survey of People:

Here, about four people that have had practical experience with industrial estates in one-way or the other, were met and interviewed. They were an industrial officer of the Ministry of Commerce and Industries; the Credit Controller for Small-Scale Industries and the Industrial Estate Manager at one of the existing estates around; and lastly a Town Planning Officer. A wide range of issues were discussed, in order to familiarise the mind about estate setting and management.

Industrial Estate for Kano: In 1977, a trial to establish one was made, when a piece of land was reserved within the Sharada Industrial Area. Proposals were prepared and submitted to the authorities, but the project could not take-off, because funds were not available. This proposal includes roads, electricity, water, telephone, erected factory buildings, estate administration block, facilities (machines for spare parts) and worker's welfare.

The government also had the intention of establishing such estates at Kazaure and Hadejia. The basic concept to be adapted is having the industrial estate as the nucleus for medium and large-scale industries, in line with the Indian example. However, all theproposals could not take-off for lack of fund, this led the industrial officer to suggest both public and private sectors participation in this direction.

Credit Schemes: The small-scale industries credit schemes set-up by the federal government and extended to states is found to be bewitched with more problems than successes. It is reliably learnt that one of the major obstacles is having people who lacked knowledge on finance like

bankers in connection with loan recovery at the helm of affairs. In most cases, beneficiaries of these loans have to be chased around before debts are settled.

Another problem is that most of the loans collected on the pretext of setting up or maintaining a small-scale business were diverted to other non-priority areas. However, there are cases of people who make prompt payment and have made tremendous successes in their various fields.

Management: The relationship between the industrialist and the estate management was found to be a sour one through the interview. The major area of contention is rent collection. Many tenants fail to pay their dues for many months in some cases years. According to a manager, this is due to a lack of adequate clauses to cover agreements entered into between the management and the industrialists or tenants.

One of the measures designed to curb this problem is one of the industrial estates studied (Uwani), is the setting up of a tribunal to try all defaulters. It was also found out that the total rent for each month of Uwani Industrial Estate hardly pays staff salaries, not to talk of maintainance and other related issues.

5.2 Site Analysis:

It is common to find many completed projects functioning partly, or actually preluding the very uses for which they were planned. This problem may arise as a result of the project being forced on an unusual site or poor design. Therefore it has become necessary to thoroughly investigate the site at the same time the programme requirements are studied. It is important to note that the site here includes its immediate environs to the horizon and beyond. The following areas have been identified and discussed.

5.2.1 Selection Criteria

The most important elements which ensured the successful selection of a site, that will be suitable for the development of industrial estates are being referred to here. They are numerous, but the important ones are:[1]

Accessibility: The one essential line of communication is a main road system linking the region with other parts of the town. Availability of railway facilities provides a measure of flexibility, while water-ways and airports adds considerably to the attraction of the site.

Water Supply: Water for industry is a controlling element in all estates. The availability of public water supply determines the location of the estate as well as the type of industrial activities that can be conducted on it.

Topography: The physical characteristics of the site exert a strong influence on industrial estate location, especially as they relate to grading, drainage, building foundation, extension of rail and utilities, visibility to and from adjacent major highways, and site layouts. Gently rolling land with compatable uses is preferable to perfectly flat but hard-to-drain tracts.

Types of Industries: The type of industrial activities to be housed on the estate quite influence the location. Noisy industries and those that produce noxious wastes are sited far away from the main area of the town.

Vast Land: The availability of land and its cost is very important. Infact a substantial area of moderately flat and in-expensive land is required.

Other Utilities: The availability of gas, electric power, sanitary sewer services and drainage (both surface and sub-surface) are very vital to the estate.

Environment: Character of surrounding use is vital, as this will have direct effect on marketability of the estate. Adverse conditions like pollution, reduce the site's appeal.

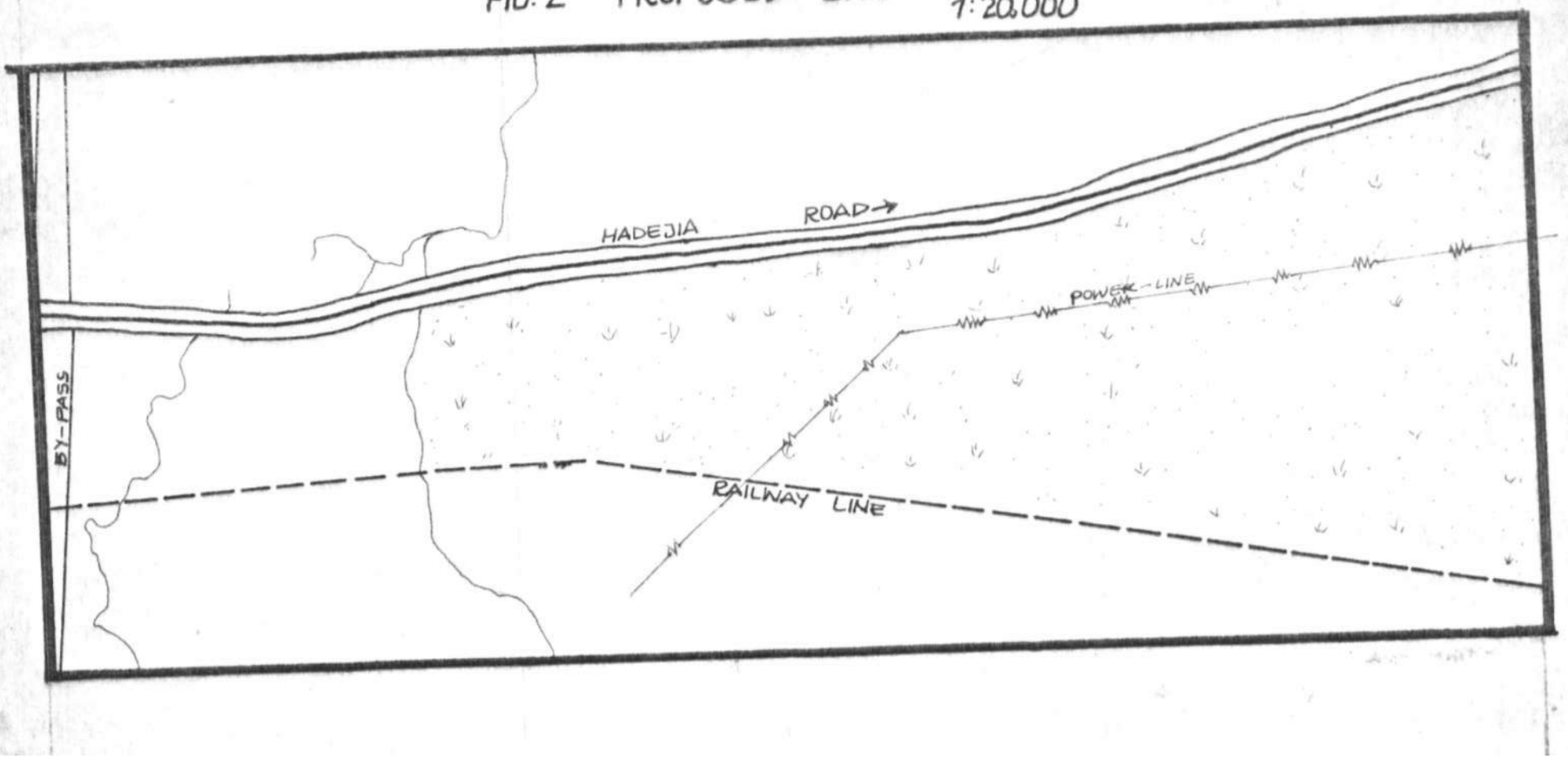
Finance: The cost of providing infrastructures and social overheads is crucial. Therefore new developments are sited where such things are already present.

5.2.2 Choice of Site:

Armed with the selection criteria of a site, a choice within Kano is to be made here. At present, there are three possible sites for consideration, viz - Sharada, Chalawa and the proposed Hadejia road industrial areas. Out of these sites, the proposed Hadejia road industrial layout site is the one that satisfies those criteria most satisfactorily, it is blessed with the following potentials (Fig. 2).

- Good communication and transportation routes. The site is bounded by the arterial road linking Kano and Hadejia at the front

FIG. 2 PROPOSED SITE 1:20,000



and the Kano to Nguru rail-line at the rear.

- The site is over 156ha of vast open agricultural land, with few physical development of industries at the front. This particularly makes possible the evolvement of a concept for the overall site development, a quality lacked by the other sites.
- Services and utilities supply is adequate, comprising of water and electricity.
- The site is gently sloping, without any rugged out-crops, this enable good sewage and drainage layout.
- Both residential and industrial activities already exist on and around the site, and this will encourage marketability of the estate.
- Proximity of the site to the Kano International Airport is close, this in addition to the stream on the western side of the site are added advantages.

5.2.3 Study Area:

Now that a site has been selected, the next concern is the detailed analysis of the site.

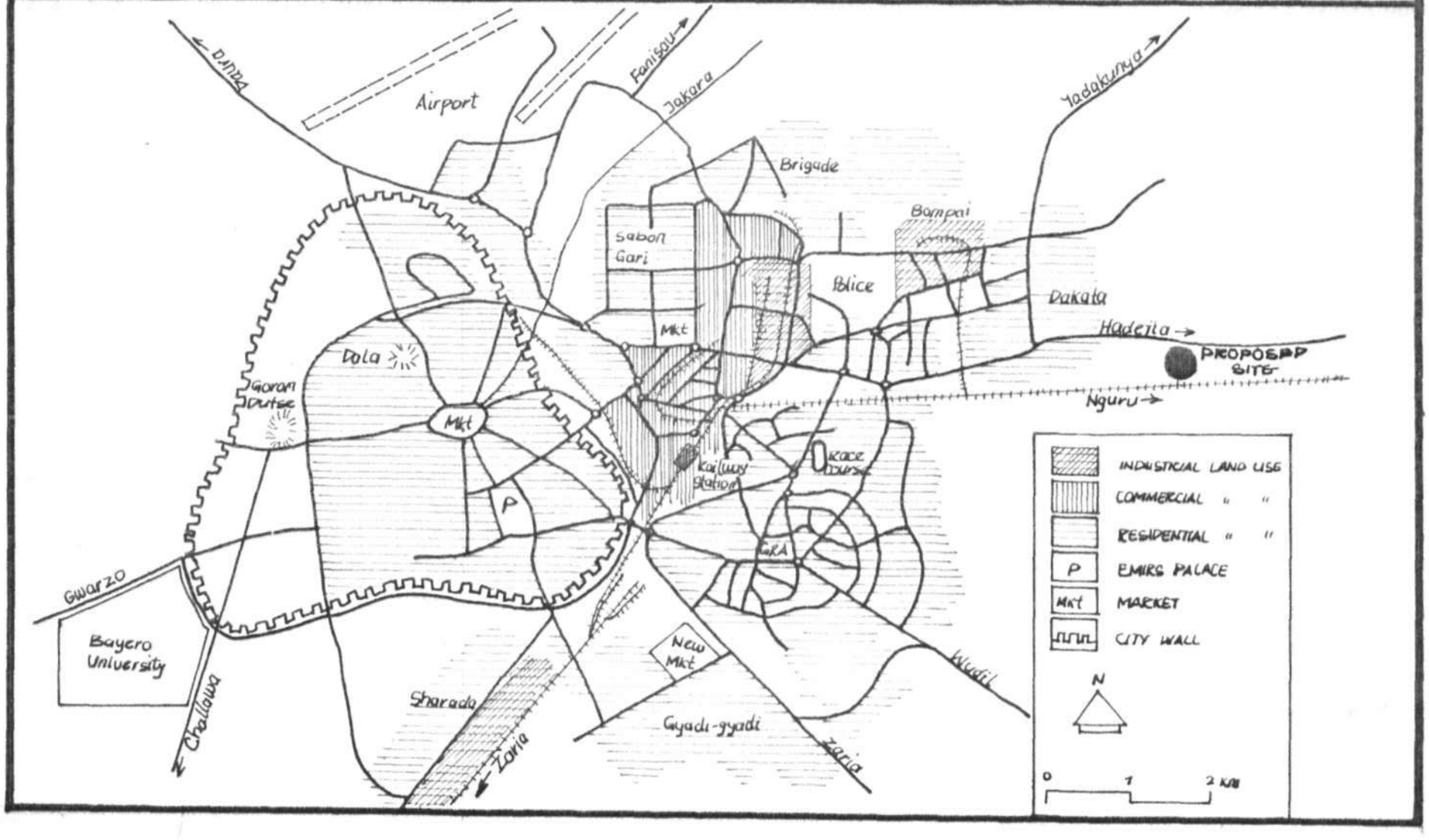
Therefore, variables ranging from geographical location to climatic and physical factors will be dealt with.

Geographical Location: Kano, the largest city in the Sudan region and the fourth largest city in Nigeria, is the administrative commercial and industrial centre of the State.[2] Metropolitan Kano covers an area of 67,843ha, including Urban Kano, with a population of approximately 650,000 residents as well as surrounding villages and scattered hamlets (1963) (Fig. 3).

Relief and Drainage: Metropolitan Kan is situated on an altitude of 450m-500m above sea level and is bordered by rivers Taskama (to the north) and Watari (to the west), non of which has a permanent water flow. The area consist of gently undulating plains with a Savannah type of vegetation, giving a part-like appearance.

The plains are broken by a number of wet season drains leading to borders of the study area. The only prominences in the area are Dala hill (518m) and Goron Dutse (534m) within the walled city, which rise above 30m and 40m respectively over the surrounding area.

FIG. 3, KANO: LOCATIONAL RELATIONSHIP BETWEEN INDUSTRIAL AND OTHER LAND USES



Geology: Kano area is of pre-cambrian origin and comprise in general granites and megematites, covered by laterite and their top soil. The upper parts of the laterite are mostly dried out and often concretioned laterite zones are encountered. There are frequent rock-out-crops in the southern and eastern areas of Kano.

Climate: Kano's climate is influenced by two major factors and a few others. Extreme values in TEMPERATURES occur during the dry season, which can range from a low 13°C in January to a high 40°C in April. However, there are more moderate temperatures with less extr ment values but coupled with high humidity during the wet season (Fig. 4).

The WIND currents which causes the climatic seasons are:-

- The dry season (October - April) is characterised by the tropical dry continental Sahara winds (Harmatan) from North-East.
- The wet season (May-September) is characterised by South-westernly maritine winds which carry warm and humid air.

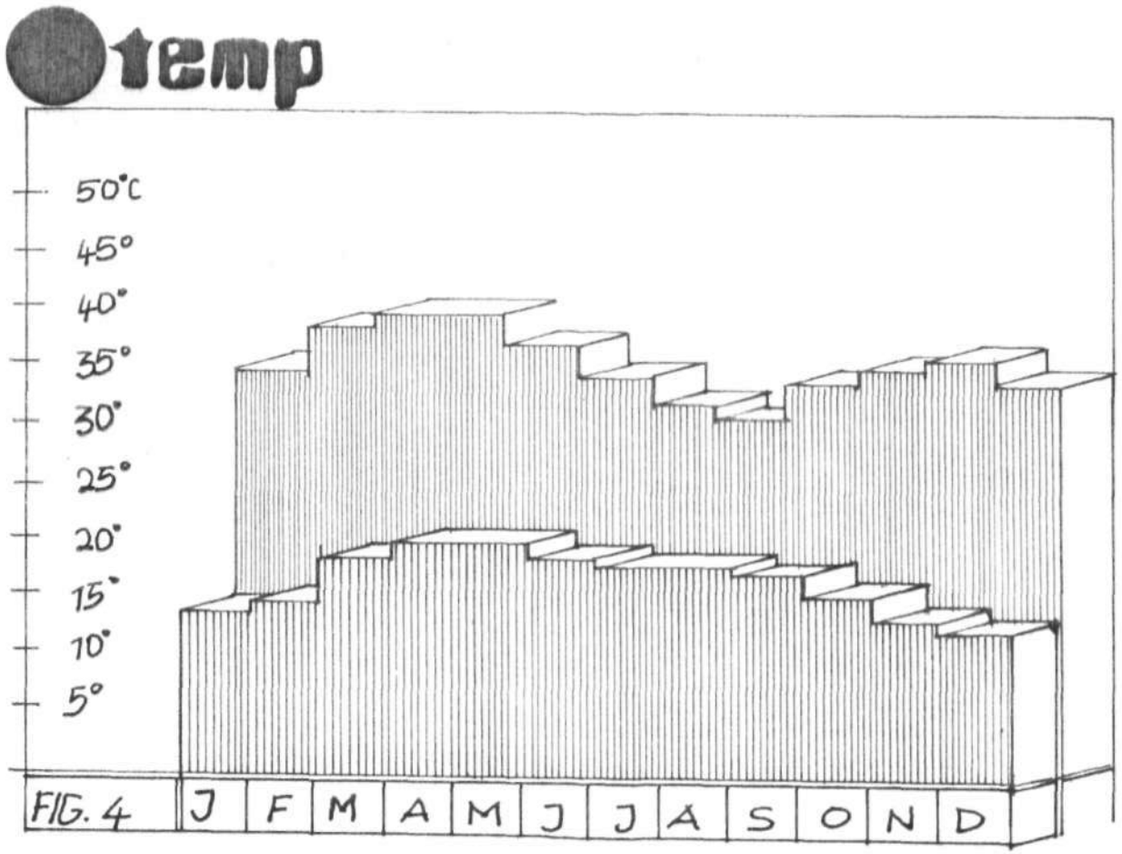


FIG. 4

The mean annual RAINFALL amounts to 862mm and occurs mainly between May and September with a peak in August (Fig. 5). Similarly, HUMIDITY is fairly high during the wet season (60-80%) and remains around 30% during the dry season, leaving its daily maximum at 70% in the morning and its minimum at 30% in the afternoon (Fig. 6).

5.3 Case Studies:

The sight stimulative aspect of the research is treated here. An intensive study of selected examples of industrial estates within and outside the country is conducted, with a view to identifying their general and unique features. All the cases available locally have been studied, while for the external cases, the quota or representative sampling system is used to aid the selection.

5.3.1 Yaba Industrial Estate, Lagos:

Location: Established in 1958 by the colonial administration at Yaba in Lagos, and later transferred to Lagos State when states were created. The estate is accessible only by roads. It is located behind Sabo Market off Herbert Macauley

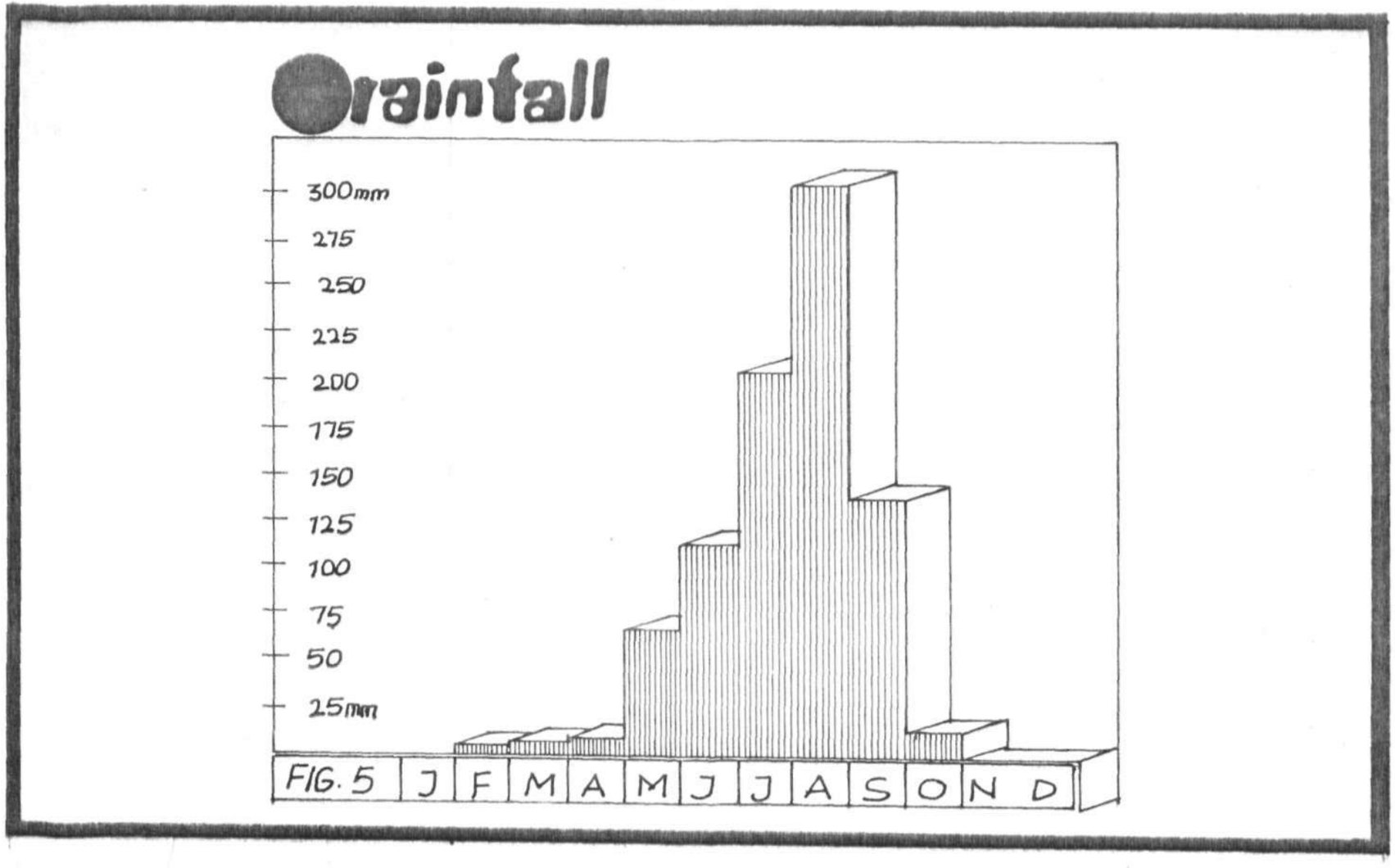

Rainfall
300mm
275
250
225
200
175
150
125
100
75
50
25mm
J
F
M
A
M
J
J
A
S
O
N
D

FIG. 5

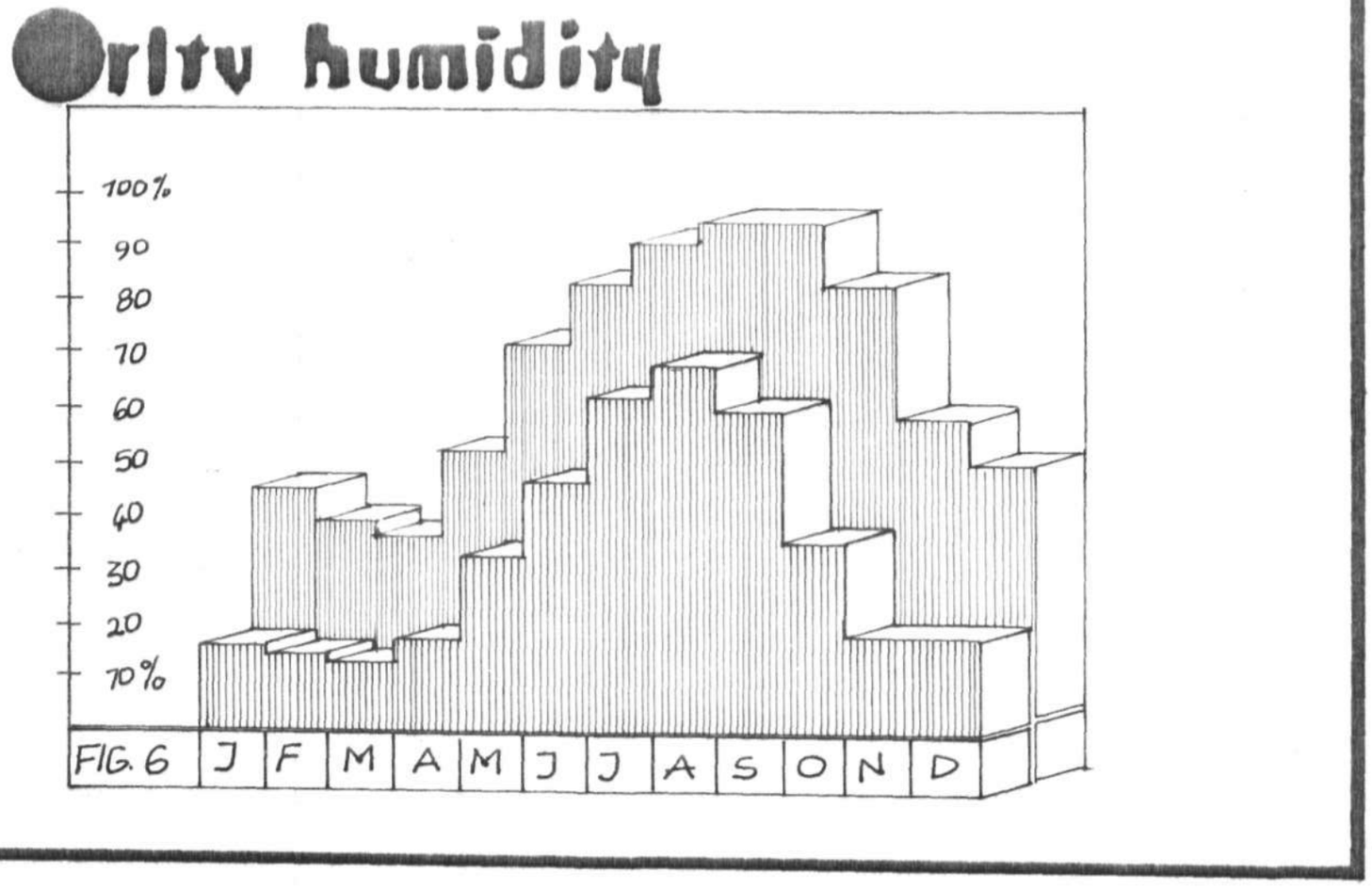


FIG. 6

road and along Onike road via commercial avenue, on a site of about one hectare. It is also surrounded by land of mixed uses - commercial, residential, institutional and ofcourse industrial.

Planning: The development of the site gives a measure of flexibility through the provision of three different industrial buildings. The large buildings were arranged round the small and medium ones. Facilities provided for include maintainance workshop, workers canteen, water, electricity and road.

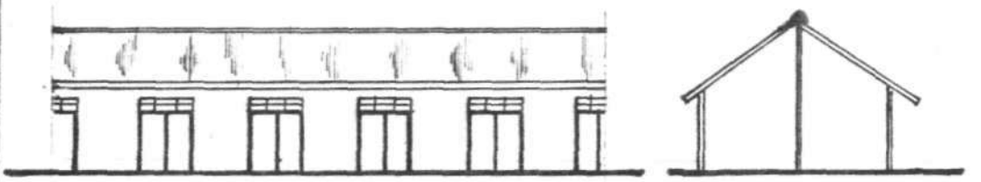
Architecture: The three categories of sheds provided are all in multiples of $24m^2$, $48m^2$ and $72m^2$, so that multiple occupancy is allowed by taking adjacent unit, steel frames are the main structural elements. The spaces so provided can only house the small-man-businesses, otherwise known as the incubator factories (Figs. 7, 8 and 9).

Appraisal:

- The idea of using environment to decide siting was adequately exploited.
- A measure of flexibility introduced by the provision of three categories of factory sheds.
- Workers welfare properly considered.

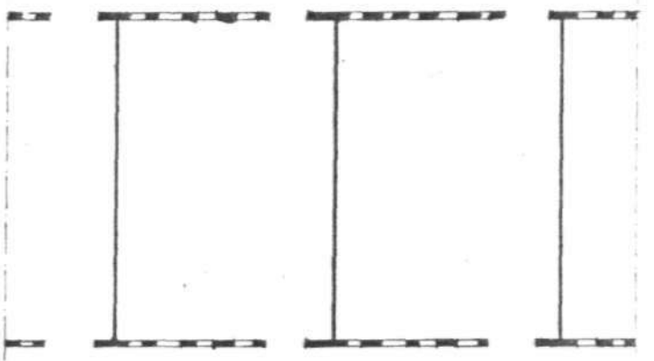


PLAN: SPACE DIVIDED BY DEMOUNTABLE PARTITIONS.

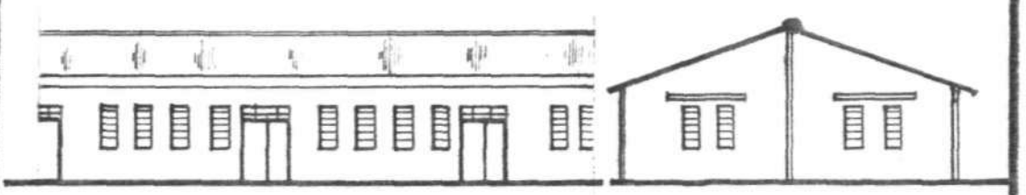


ELEVATIONS: FRONT, REAR AND SIDE.

FIG. 7 SMALL SHED (24 m²) TYPE.

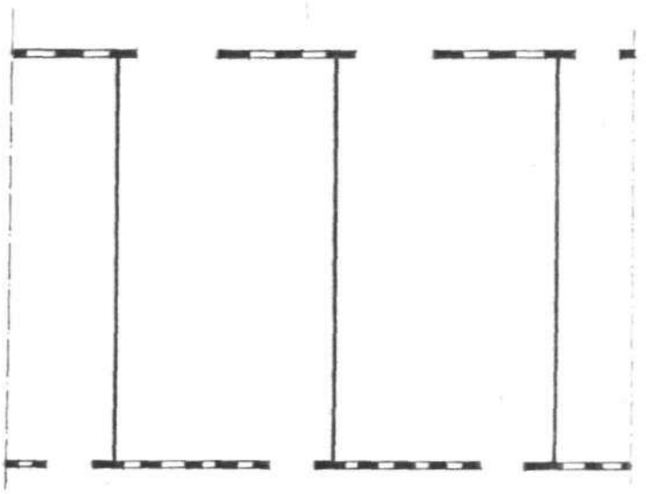


PLAN: SPACE DIVIDED BY DEMOUNTABLE PARTITIONS



ELEVATIONS: FRONT, REAR AND SIDE

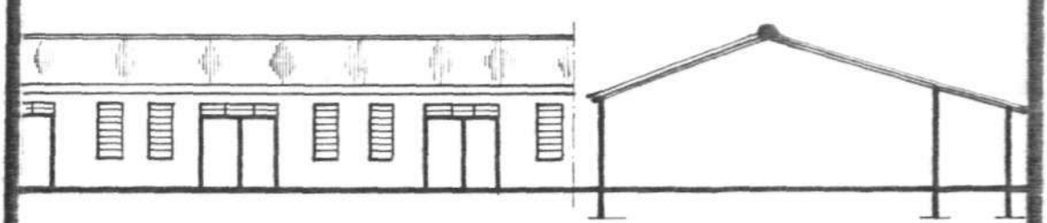
FIG. 8 MEDIUM SHED (48 m²) TYPE.



PLAN: SPACE DIVIDED WITH DEMOUNTABLE PARTITIONS.



ELEVATIONS: REAR AND SIDE



FRONT ELEVATION CROSS-SECTION

FIG. 9 LARGE SHED (72m²) TYPE.

5.3.2 Matori Industrial Estate, Lagos:

Location: The site was choosen at Matori, within the already existing industrial layout there. The project was initiated in the early 1970s, and was completed sometime in 1980. The 6,000m^2 site is located at Mushin area of Lagos Mainland. Principally, the estate is accessed by the road leading to Matori from Isolo.

Planning: The Matori Industrial Estate was planned using the concept of lots platting, that is to say the site was divided into plots. Three main categories of plots were provided, namely - small (20m x 10m = 200m^2), medium (25m x 10m = 250m^2) and the large ones (35m x 15m = 525m^2). Facilities such as workers canteen and co-operative consumer shop; water and electricity; and an office block for the management were provided.

Architecture: There are three categories of factory sheds designed and constructed for the industrialists - The small shed (10mx 15m = 150m^2), the medium shed (10m x 20m = 200m^2) and the large shed (15m x 30m = 450m^2). Each of these sheds was designed along with its toilet and washing units. A staircase at the entrance, along with

a suspended floor makes provision of offices possible if required. Structural steel frames carrying ventilation and lighting grid was used for the roofing (Figs 10, 11 and 12).

Appraisal:

- Site location is very strategical
- Lineal layout of site provides easy access to sheds and smooth traffic flow.
- The architecture is truely industrial.

5.3.3 Uwani Industrial Estate, Enugu:

Location: The estate is situated at Uwani, a suburban area of Enugu metropolis. Principally, it is connected to other parts of the town by Zik Avenue, which is the only means of transportation to the site.

Planning: Generally, the overall layout is symmetrically, with the factory sheds at the sides and the administrative block together with a canteen for the workers at the centre. The blocks are roughly about 50m x 10m = 500m^2 in area. The workers canteen is turned into a shed, and it has not been replaced. Utilities and services provided are not adequate.

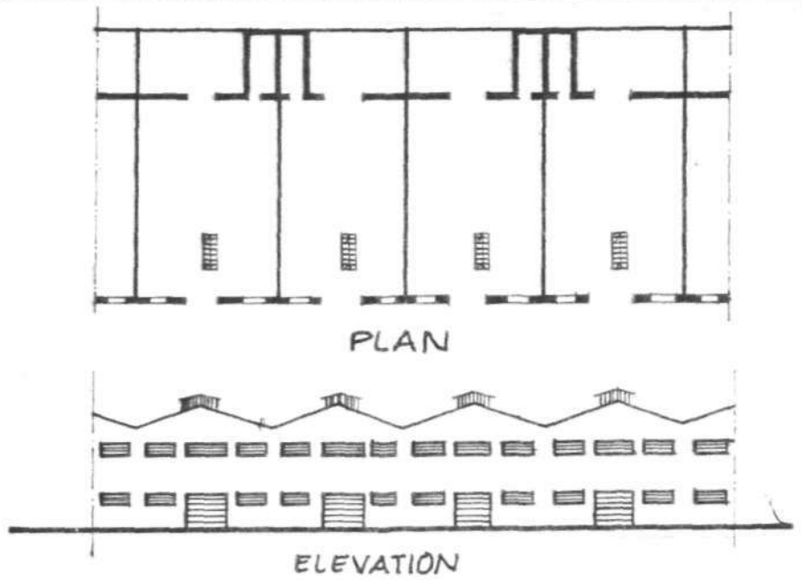


FIG. 10 SMALL SHED (10m x 15m)

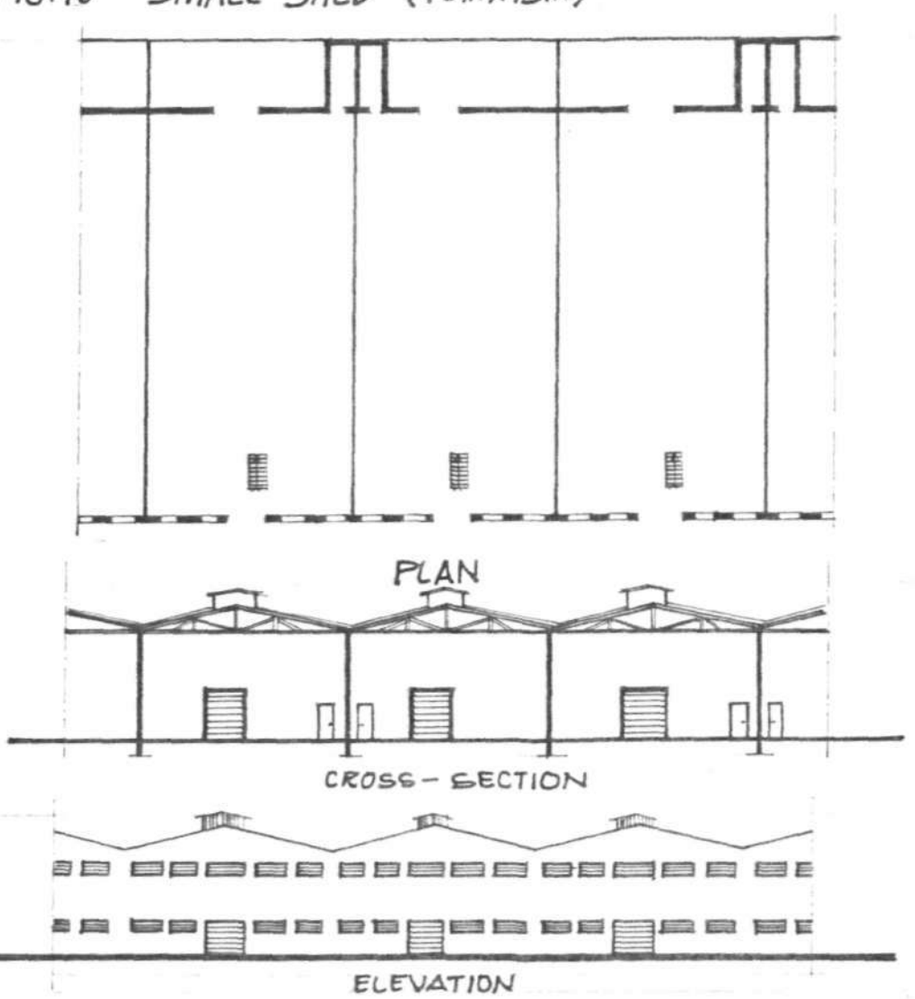
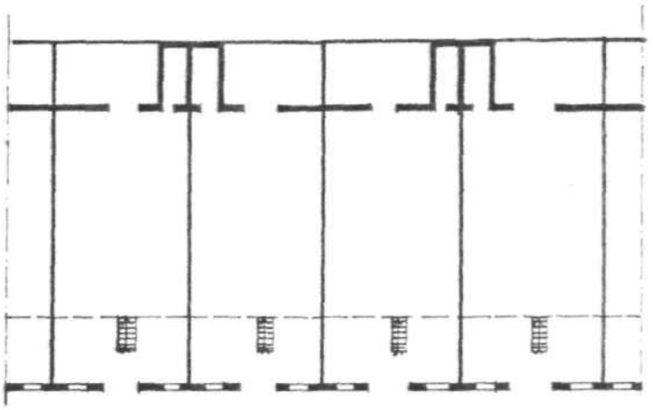
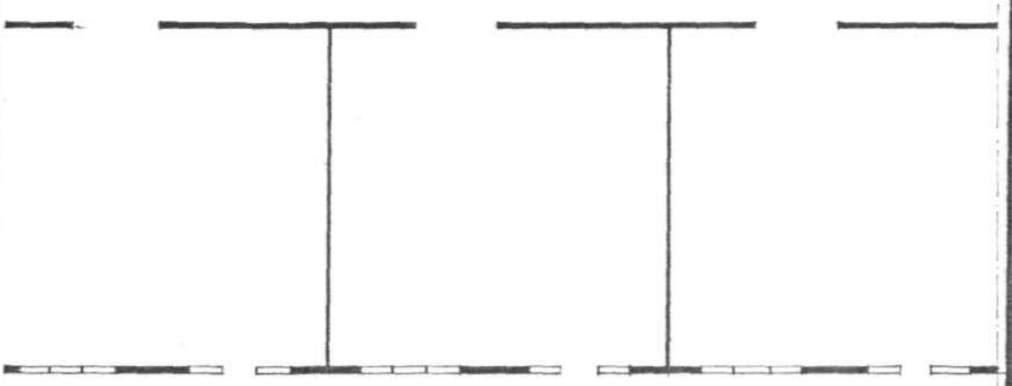


FIG. 11 LARGE SHED (15 x 35) m^2 TYPE.

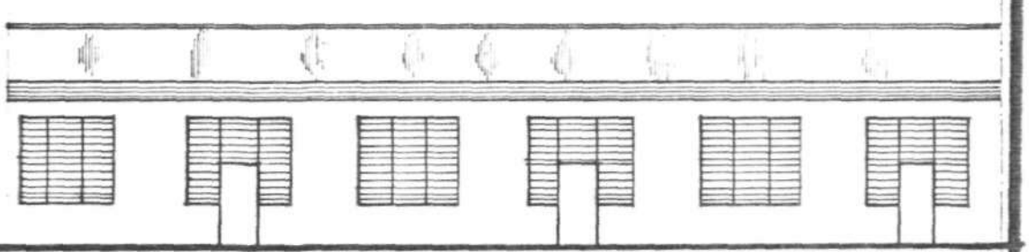


PLAN (N.B. ELEVATION SAME AS FOR FIG10.)

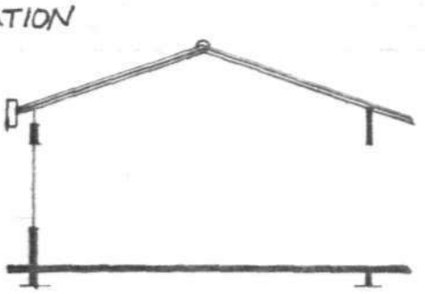
FIG.12 MEDIUM SHED (10m X 20m) TYPE.



PLAN OF SHED



ELEVATION



CROSS-SECTION

FIG.13 10m x 10m SHED.

Architecture: Actually, there is only one shed type of $100m^2$ (10m x 10m) in area. Therefore in each block five of such sheds are provided, separated by a demountable partition. The first two units are given out as double in each block, giving a total of four-double sheds and 12-single ones. Both lighting and ventilation are provided by means of side windows. The structure is basically of steel and concrete walls (Fig. 13).

Appraisal:

- Layout is harmoneous, giving the idea of logical planning.
- The architecture is generally simple and well expressed.
- An adequate environment for the small-man and new businesses.

5.3.4 Joe's Creek Industrial Park, USA:

Location: Located in the rapidly growing St. Petersburg area, Joe's Creek Industrial Park is situated just outside the city of St. Petersburge and fronts directly on U.S. highway 19. The new atlantic costline rail-road terminals are adjacent to the development; the St. Petersburg - Clearwater International Airport is only a few

minutes away; and Tampa and its Seaport are about a half hour drive from the estate. Proximity to the plants of major firms is a factor which makes the estate's location attractive to certain sub-contractors and [illegible] suppliers.

Planning: Choice of layout design possibilities was somewhat limited by the rectangular shape of the originally acquired 80-acre tract. No attempt was made to sub-divide the land into individual lots, instead, it was plotted in small tracts from which land percels of varying sizes could be selected on the specific requirements of the prospects.

The sizes vary from $972m^2$ to $18,956.16m^2$, with the $1980m^2$ site more popular. Rail service; city water and natural gas; electric power; storm sewers, sub-surface drainage and sanitary sewers; together with streets were provided.

Architecture: Building sizes range from $270m^2$ -$9630m^2$ of retail, wholesale and warehouse space occupied by the furniture trade. It caters primarily to small, growing firms whose intial space requirements are modest as reflected by the

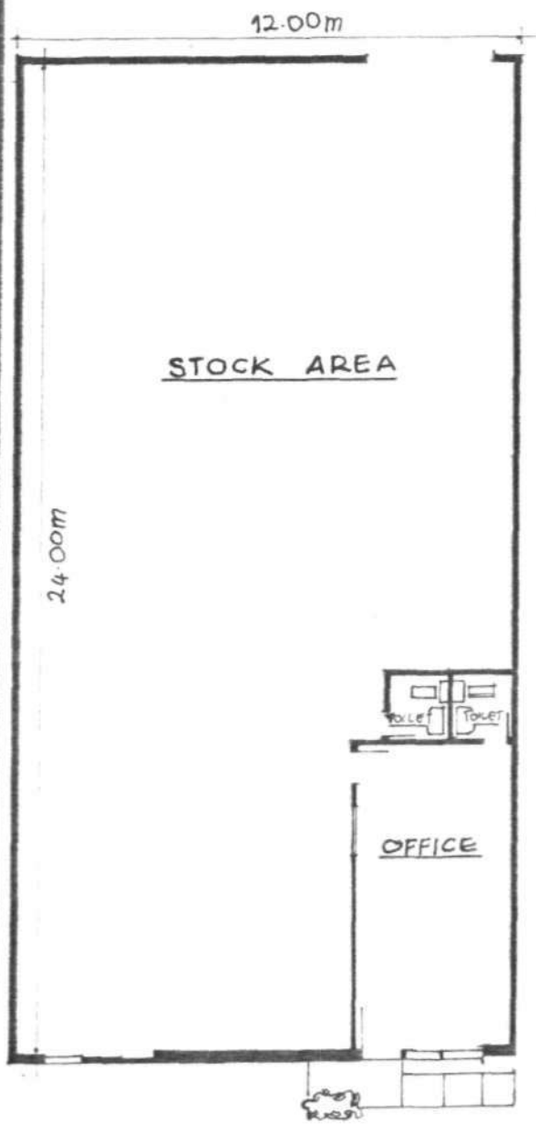
small site and building sizes in the development. The $288m^2$ (12m x 24m) was designed to cater for small businesses. It consist of four small offices and 18 multiples (each 4.5m x 9.0m), permitting a tenant to rent multiples of $40.5m^2$ (Fig. 14).

Appraisal:

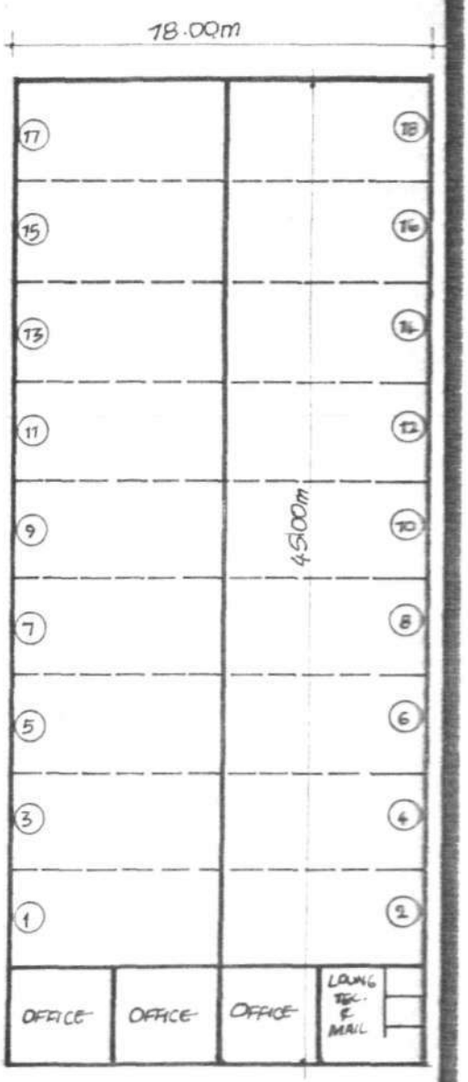
- Joe's Creek Industrial Park is fairly representative of many of the smaller, intensively developed industrial districts in the United States by virtue of its design.
- Also of interest is the success the developer has had in marketing incubator space to small users in multiple-occupancy buildings.
- The industrial park is very well located, having almost all the vital requiremonts needed for such a development.

5.3.5 Annacis Industrial Park, Canada:

Location: Annacis Industrial Estate is located on Annacis Island in the greater Vancouver Metropolitan area. The island is strategically located near the port of New Westminster. Despite its island location, the estate's accessibility



STANDARD 288m² BUILDING WHICH IS ADAPTABLE TO FUTURE EXPANSION BY INCREASING THE LENGTH OF THE BUILDING.



MULTIPLE OCCUPANCY BUILDING SHOWING EXPANDABLE 4·5m x 9·0m UNITS AND FRONT OFFICE SPACE.

FIG. 14 TYPICAL FACTORY ACCOMMODATION.

to transportation facilities makes the site unusually convenient. The Vancouver airport is twenty minutes away, a highway to provide access, rail facilities, fresh water and seadocks frontsites, are available on the Fraser river.

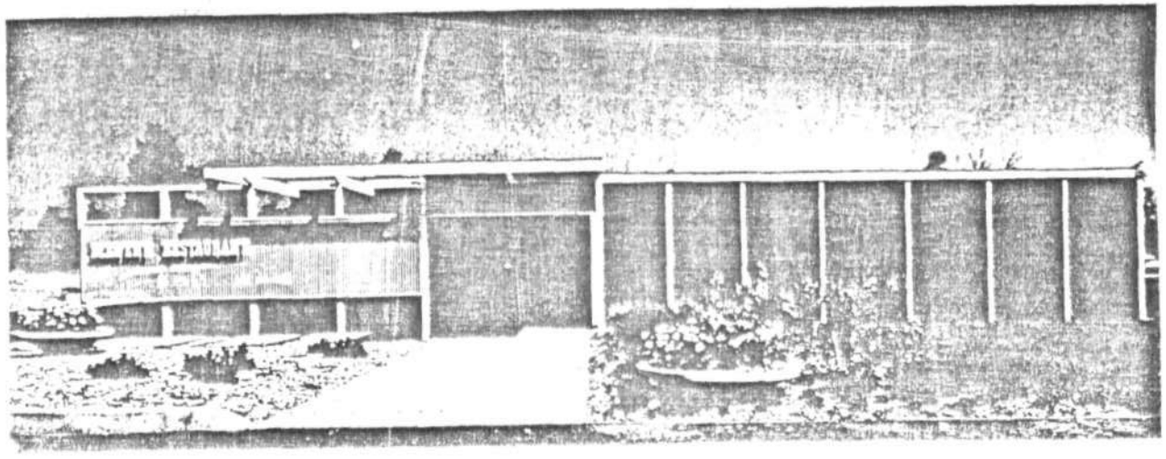
Planning: The Annacis development is designed to provide a variety of industrial sites, large and small. Leasing policies are very flexible and allow both for companies wishing to build their own facilities and those preferring to rent land and building. For the former, the site is completely improved with services, utilities and graded ready for building construction while for the latter the buildings are constructed.

Industries were grouped to achieve mutual cooperation. Abundant power, water, natural gas, concrete roads with no rails or switching bottle necks, and a modern drainage and sewage disposal systems were provided to the industrial occupants.

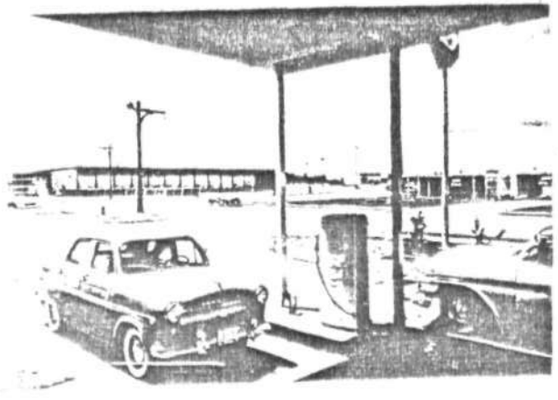
Architecture: For those industries requiring a completed factory or warehouse, the developer provides a variety of designs. The four principal categories are:-

- Buildings designed and built to custom requirements,

Plates V and VI Typical occupants of Annacis Industrial Estate.







- A selection of standard one-storey designs ranging from 900m^2 upwards, featuring clear space, natural light, low maintainance costs and adaptable to meet special needs of individual occupants.
- Small factory units within a composite structure providing for expansion, based on the incubator factory concept, and suitable for young and growing organisations, pilot plants, small branch plants etc; these units are available on short-term leases.
- Warehouses, bulk breaking or assembly plants, trans-shipment depots etc.

Plant sizes vary tremendously and factory buildings have been provided up to 18,630m^2. The incubator factory provides space varying in size from a minimum of 270m^2 of production area upto 540m^2.

Appraisal:

- The estate introduced a new type of tenure and development to Canada.
- Experiment in providing incubator space for young and growing concerns was very successful.
- The Annacis industrial estate was choosen as one of the ten outstanding contributions to Canadian architecture in the post-war period (see Plate V and VI).

Footnotes

1. No. TB.44 Urban Land Institute Industrial Districts: Principles and Practice.

2. Travallion, B.A.W. (1983) Metropolitan Kano. Published by Newman Neame Limited, Glasgow, Great Britain.

CHAPTER 6

DESIGN CONSIDERATIONS

Here a wide range of issues that have direct influence on the overall design decisions to be made, will be dwelt on. For instance, the various planning standards and architectural variables will be looked into. Of great importance is the conceptual analysis, as it is the major factor that ensures a harmoneous operation of the basic industrial unit or factory. As a result, the foll wing discussion is presented. ..

6.1 Planning Standards:

Standards are generally required in order to control the overall development of the estates. This is done towards achieving maximum interaction between all the coponents of the estate and the workers. Problems of in-adequacieis in connection with services and utilities that are fundamental to the performance of the industries, further stresses the need for standards in estate planning. The following are as have been identified and treated accordingly.

6.1.1 General Layout:

Overal Size: The basic consideration here are the amount of industrial employment to be provided for and the scale of development in relation to surrounding areas adjacent to the estate. In all, three main sizes have been proposed by planners and industrialists as well.

The small estates covering a site of between four to eight hectares, housing only factory buildings, while facilities are those of the neighbourhood. The second are the medium ones which have a site coverage of 12-40 hectares (ha). It has the advantage of easy integration into the neighbourhood. The last are the large estates with an overall site area of 20-60 hecatares (ha). In comparison, it is very difficult to integrate into the neighbcurhod. The last two are completely built with workers facilities and administration buildings.

Land Use Structure: Proper integration between all the landuses within the urban setting is an essential requirement. For instance, industrial, commercial and residential land uses, should relate properly with one another. The percentage

allocation of land in an industrial estate may be suggested as follows, depending upon the type of industries and extent of the estate.[1]

Table 6.1: SUGGESTED LAND ALLOCATION FOR INDUSTRIAL DEVELOPMENT IN NIGERIA.

	LAND USE	% OF DEV. AREA
1.	Work sheds	45-50
2.	Services, Utilities and Facilities	10-15
3.	Roads and Parking	20-25
4.	Organised Open Spaces	15-20
5.	Others	5-10

Industrial Density: To avoid congestion and overcrowding in any planned estate development, a measure of the intensity of land usuage for industrial purposes has to be introduced - this is the "Industrial Density". It may be expressed in terms of the number of industrial employees per unit area (acre or hectare) of land committed to industries and their ancilliary uses. This depends on types and sizes of industries and land values.

In order to realise the above variable, siting conditions should allow a reasonably compact layout, a sufficient amount of floor area per industrial worker and a high factor of design efficiency. As a guide, a density of 25-60 industrial employees per gross acre is desirable.

6.1.2 Factory Sheds:

In the design of the industrial work sheds, provision for offices and workers facilities such as lavatories and changing rooms has to be made. As a result, out of the overall shed area, about 15-20% is taken for the offices and facilities, while the remaining 80% is allocated to the workshop.

6.1.3 Services, Utilities and Facilities:

In order to respect comfort, efficiency and economy standard rates have been set for the various industrial estate requirements.

Water: Which is the most essential infrastructure in any industrial development is supplied based on extent of industrial development, types of industries and the number of employees. As a result, the supply is divided into two.

- That for use by industrial employees at 68-91 litres (l) per capita per day for

industries employing less than 100 persons.

- And that for industrial purposes at 6,825-9,100 litres (l) per gross acre of industrial area.

There is also need to provide outside hydrants, to deliver 2,275 litres of water per minute at 5.12kg/cm^2. Also, pressure tanks for supplying sprinklers should have available at least, 13,650 litres of water for fire fightings, in addition to buckets of sand.

Electricity: Industries are divided into power oriented and non-power oriented ones. For those that are power oriented, their power needs should be calculated separately, while for the others, as a general guideline, it may be syggested that the installation may be between 20-30KW per gross acre of industrial development.

Facilities: These are provided in order to aid the general operations on the estate, and towards achieving cheerfulness and comfort of the working force. With a view to minimising the costs of social overheads, community facilities are provided on a cooperative and sharing basis.

6.1.4 Roads and Parking Lots:

Roads: These are elements that help the achievement of efficient circulation in-and-around

the industrial estate. Circulation, is a patterned and systematic movement of an object within or outside a structure.[3]

It is necessary to set back industrial buildings and structures sufficiently away from the centre line of an abutting road. One of the reasons for this, is towards giving adequate room for future expansion of the roads "metal portion". Similarly, the roads should be sufficiently wide to provide for easy movement of people and heavy vehicles, storm water drainage, conveyance of industrial effluents, laying out sub-systems like water mains, electrical cables, gas mains, etc. The following are recommended:-

Table 6.2: RECOMMENDED CARRIAGEWAY WIDTHS.

TYPES OF ROAD	SETBACK IN METRES (M)	
	Minimum	Maximum
Highway	50.00	60.00
Major Road	40.00	45.00
Collector Road	25.00	30.00
Access Road	15.00	20.00

Table 6.3: RECOMMENDED SET BACKS.

TYPE OF ROAD	WIDTH OF CARRIAGE WAY IN METRES (M)	
	Minimum	Desirable
Highway	13.20	15.60
Major Road	10.80	13.20
Collector Road	9.00	10.80
Access Road	6.60	7.80

Parking Lots: On-street parking (curb-parking) or off-street parking can both be provided on estates that are devoted to light manufacturing and service industries, like the one being proposed here. Curb parking is however not allowed in automobile service garages and repair workshops. Essentially, 10%-15% of the developed area of an industrial plot may be devoted to off-street parking of trucks, cars, and other vehicles.

6.1.5 Open Spaces:

Some spaces are needed for recreation, but in comparison with the other areas, it is of very minor importance. It is only where the industrial estate is very isolated, or when there is no proper town sprorts ground, that large recreation spaces are required. Parks or recreation ground must be planned to resist the inevitable pressure for subsequent industrial expansion.[2]

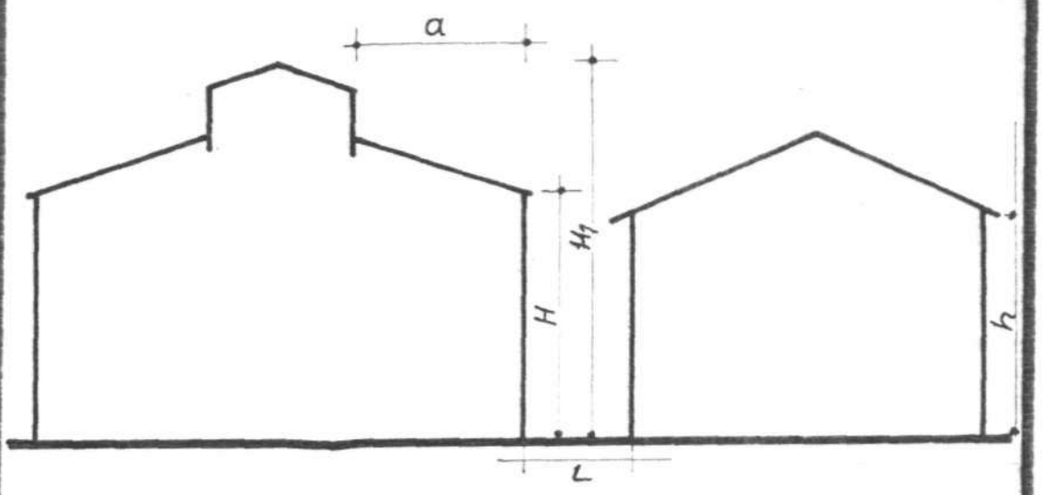
6.2 Industrial Architecture:

Generally, industrial buildings are designed in two ways - either the design is done prior to the laying of the technological courses or afterwards. However, whichever method is adapted, the basic design problems (that of producing a functional building) remain the same. The crucial areas are treated below.

6.2.1 Fire Protection:

In order to curb incidences of fire outbreaks, some design measures are followed, these are:-

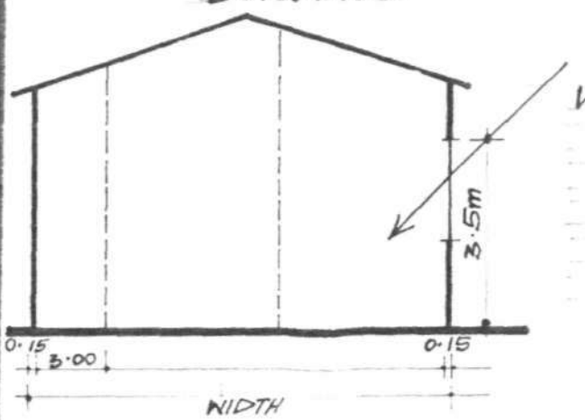
- For sites smaller than 20ha, percentage of built-up area is between 30% and 35%.
- For sites bigger than 30ha, percentage of built-up area is between 25% and 33%.
- Locating fire hydrants along the roads at 100m apart and not more than 25m from the walls of the buildings.
- Emergency pools and tanks to be installed at 250m with a capacity of 200m^3 (covered) or 500m^3 (opened).
- Distance between buildings have to be adequate and calculated as shown in (Fig. 15). For ventilation the same calculation is applicable.



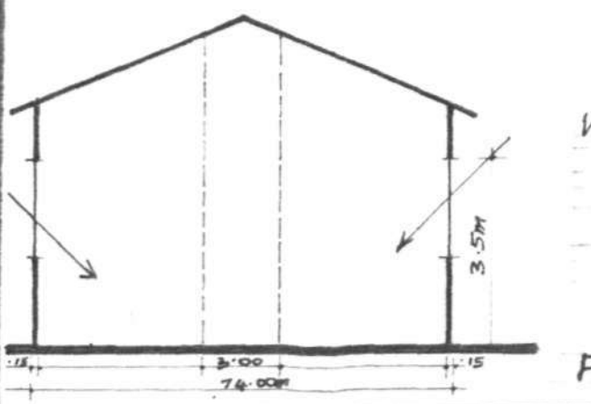
$L \geq \frac{1}{2} H + h$; $L \geq \frac{1}{2} H_1 + h$

$L_{min} = 20m$, if $a < 3.00m$.

FIG. 15 CALCULATION OF DISTANCE BETWEEN BUILDINGS.



WIDTH = 3.5 (height) x 2 (width) x
2 (no of Production bays) +
3.0 (movement bay) +
0.30 (internal walls)
= 17.30m



WIDTH = 3.5 (height) x
2 (width) x
2 (no of Production bays)
+ 0 (movement bay) + 03
= 14.30m

FIG. 16 SIDE LIGHTING

6.2.2 Lighting:

Side Lighting: Because natural lighting has to be adequately provided within the whole of the production area as appropriate to the technological scheme of production, the depth of each bay should not exceed a distance double the height of the building measured from the floor to the bottom of the window lintel thus:

Width = height x 2 x number of production bays + external walls.

If side lighting is from one side, the width of the movement bay is added, but not included if lighting is from two sides (Fig. 16).

Sky-lighting: Another method of lighting the interiors of production halls is by means of sky lighting as shown in Fig. 17).

6.2.3 Characteristics:

Industrial buildings are divided mainly in accordance with the productionproces viz -

- Technological process performed on one level,
- Technological process performed on many levels.

One-storey buildings: These industrial buildings usually have light structures, mobility of internal arrangements, good and elastic traffic movement,

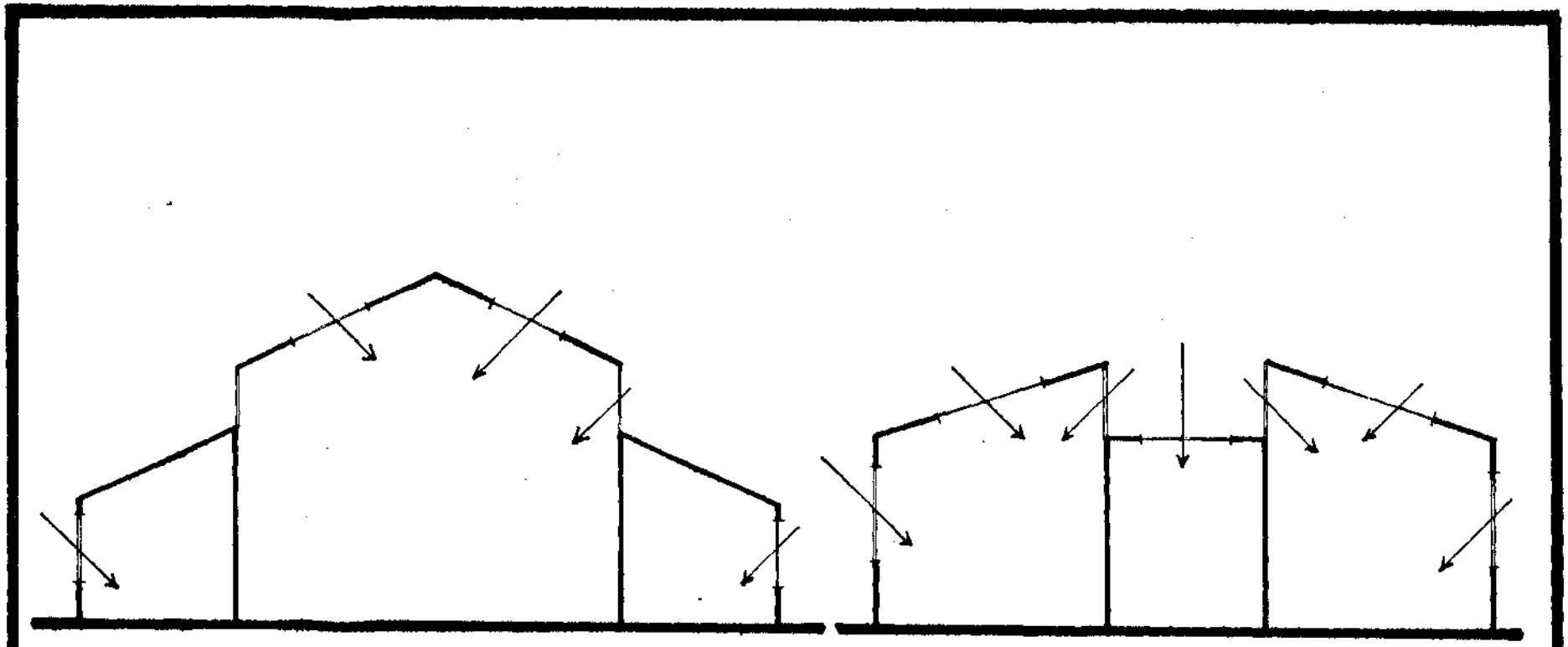
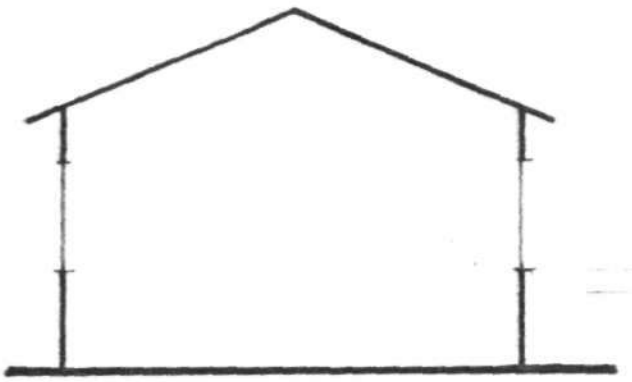
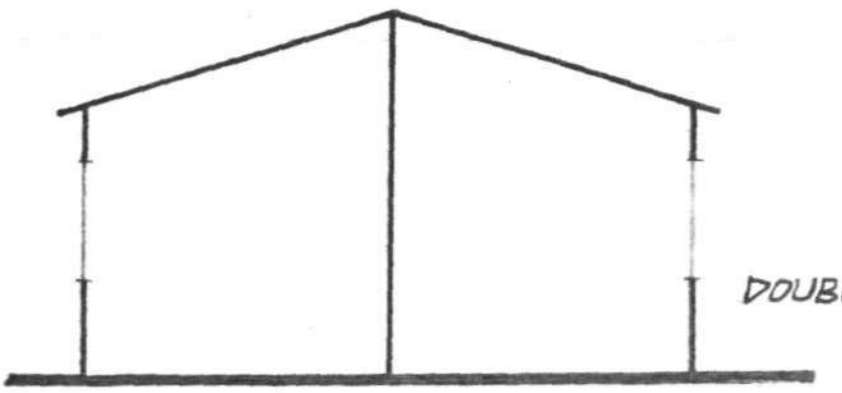


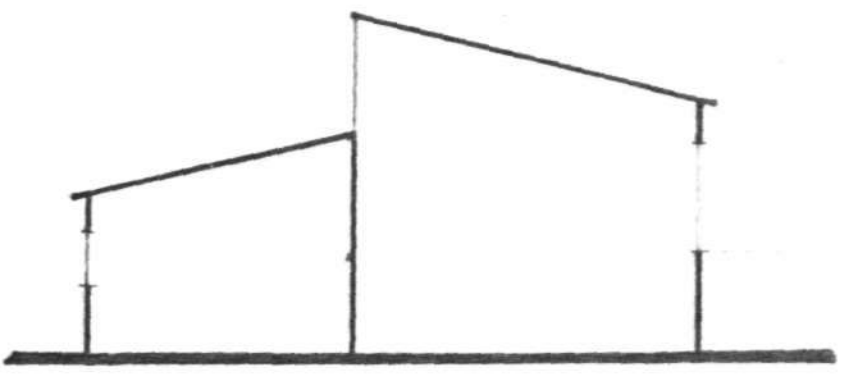
FIG 17 SKY- LIGHTING

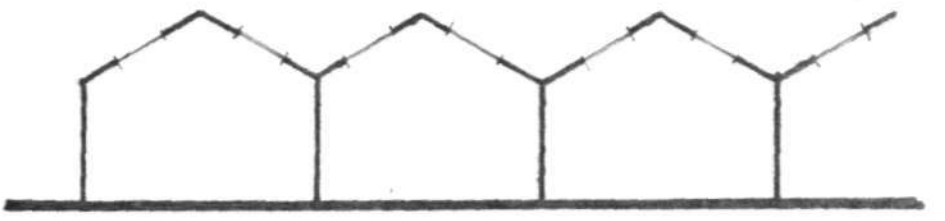


ONE AISLE HALL



DOUBLE AISLE HALL





MULTI-AISLE HALL

FIG. 18 ONE STOREY BUILDINGS.

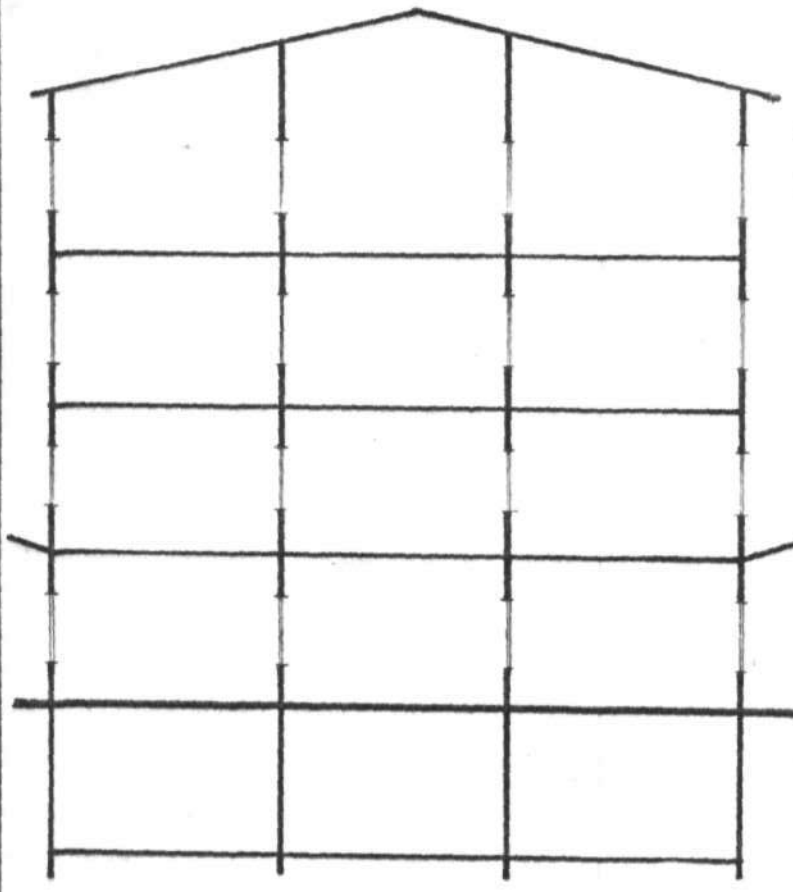
Multi-storey auxilliary buildings, such as laboratories, offices, social facilities, commonrooms etc. are used without any limitations (Fig. 19).

The obvious advanges of these structures are the reduction in the built-up area; diminishing of foundation and installations and the possibility of blocking the technological process. These cannot stand major set-backs like its costliness, and limitations in the use of machinery.

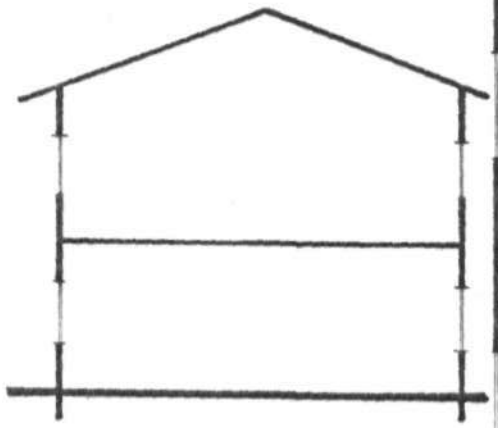
6.2.4 Elasticity, Extension and Modular Grids:

Elasticity: Destruction of existing buildings should only be undertaken under extreme conditions. Attention should be paid more to rebuilding or adaptation for other ses. For inst nce offices into canteens, engine halls into assembling plants, assembling plants into stores, etc.

Extension: Progress after five to ten years may require modernisation and often exchange of machines and equipment, thus necessitating re-arrangement and extension of the buildings. For this reason, each industrial site requires reservation of space for future expansion in one or even better two directions, with the main core of the objects remaining rather untouched.



THREE CONSTRUCTION BAYS OF EQUAL LEVELS



TWO CONSTRUCTION BAYS OF EQUAL SPAN AND LEVELS.

TWO CONSTRUCTION OF EQUAL SPAN & DIFF. LEVELS.

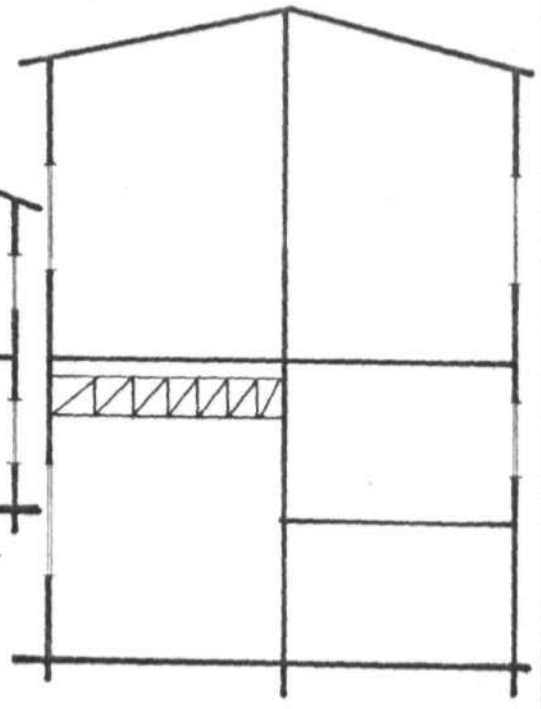


FIG. 19 MULTI-STOREY BUILDINGS.

Modular Grids: Each industrial object designed or built without full modular co-ordination, even including social buildings, is an amaturist and ignorant work. In each industrial project, foremost consideration is decided, then the technological scheme of production, then optimal required grid and at the end buildings, roads, etc.

The constant use of modular grids is absolutely inevitable in industrial buildings designed in order to allow the extension of selected divisions and buildings, either cross-or-length-wise (Fig. 20).

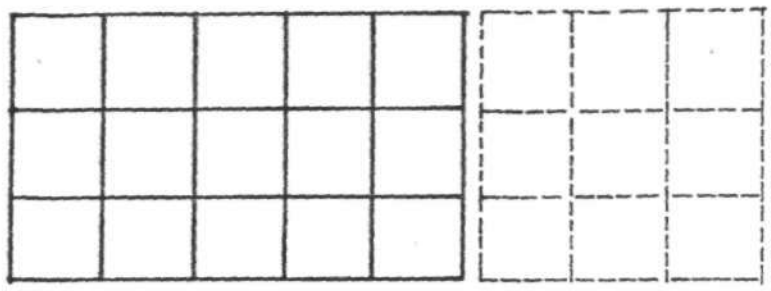
6.2.5 Main Services and Auxilliary Rooms:

Adequate attention given to the production halls should also be given to rooms for administration and staff welfare. Social rooms including kiosks, common rooms and sanitary facilities. Administration blocks are divided into general administration for the whole complex and divisional administration and supervision.

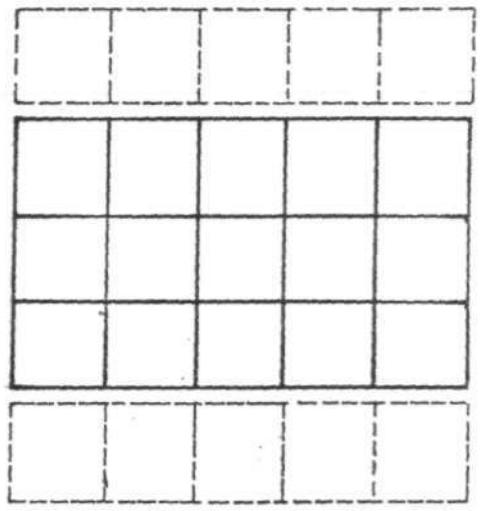
All rooms and facilities mentioned in this chapter may be located as a detached part of the production halls or located within them (Fig. 21).

6.3 Design Concept:

For the successful evolvement of a concept in any industrial design, a detailed study of how the various parts of the industry related to one



LENGTH-WISE



CROSS-WISE

MIXED

FIG. 20 EXAMPLE OF EXTENSIONS BASED ON MODULAR GRIDS.

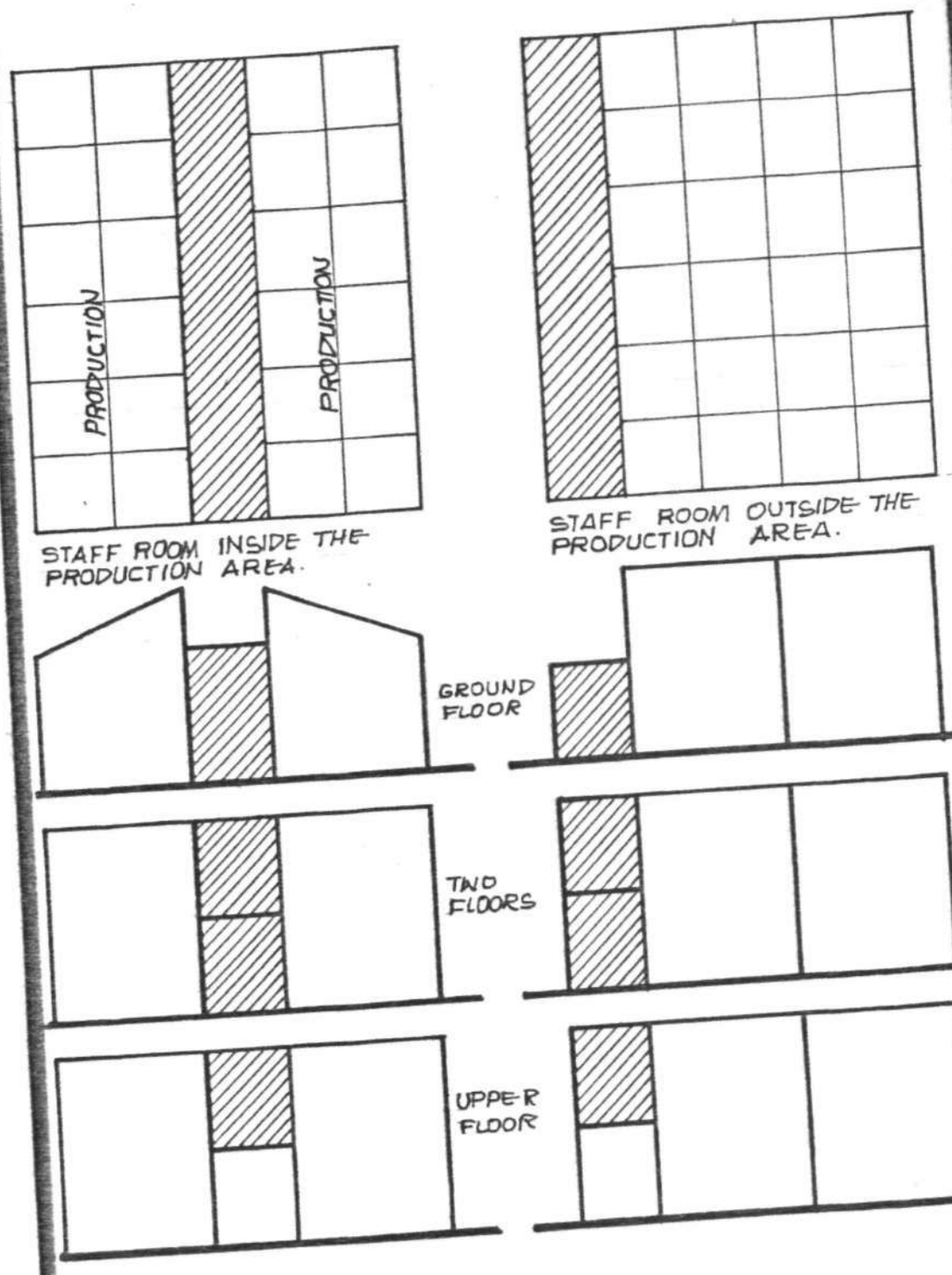


FIG. 21 LOCATION OF FACILITIES.

another; the process of production; and ofcourse the technological courses, is very important.

6.3.1 Internal Zoning:

In any industrial compound, zoning is normally introduced for the minimisation of construction expenses, optimisation of production factors and maximisation of profits.[4]

Functional Analysis: Industrial process vary from one industry to the other. This ranges from complex operational procedures to the very simple ones. However, whatever disparity between these industries, they should follow a logical natural flow. DELIVER→STORAGE→PROCESSING→PACKING→FINISHED GOOD→DISPATCH.

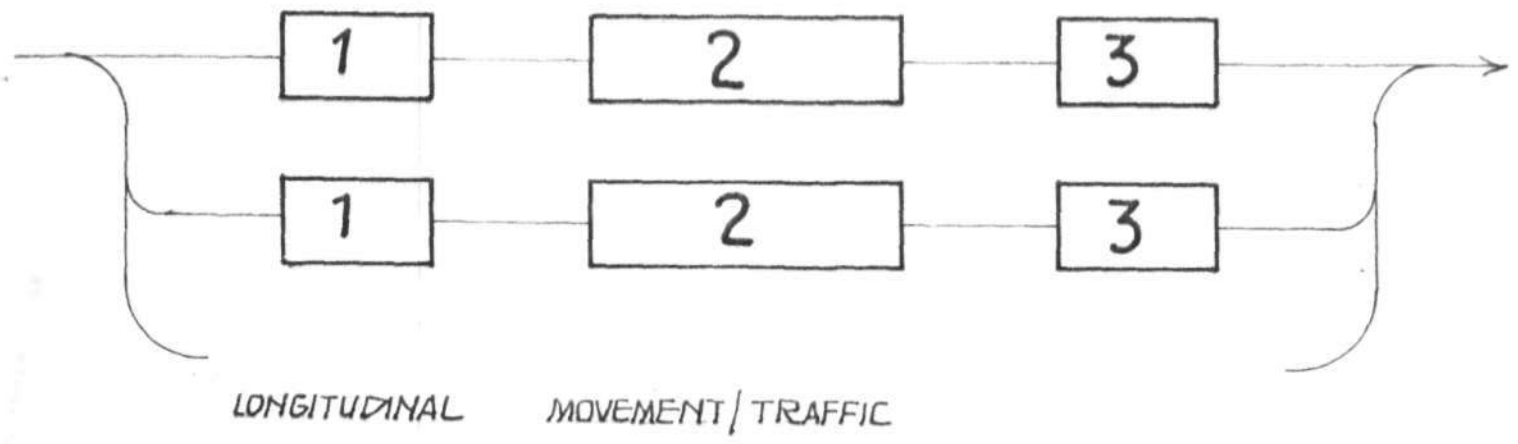
6.3.2 Production Schemes:

In any industrial process, there are generally four basic schemes of production as shown below:

Longitudinal Movement/Traffic: The production is in one or more parallel technological process. Buildings are located along the axis of technological movement with transportation in one or more raws (Fig. 22.1).

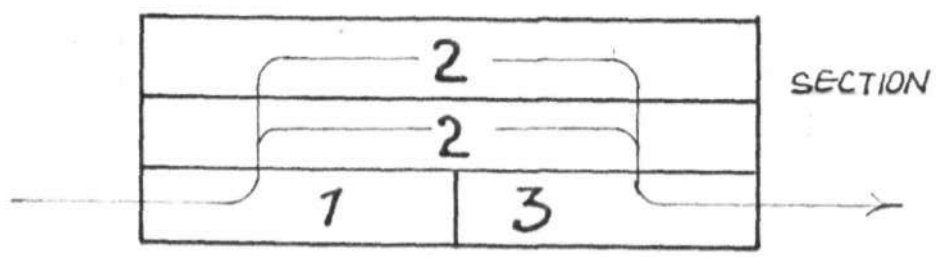
Perpendicular Movement/Traffic: The technological process here is perpendicular to the traffic. Transportation lines are placed usually on two opposite sides of the compound (Fig. 22.2).

FIG. 22.1 PRODUCTION SCHEMES



LONGITUDINAL MOVEMENT / TRAFFIC

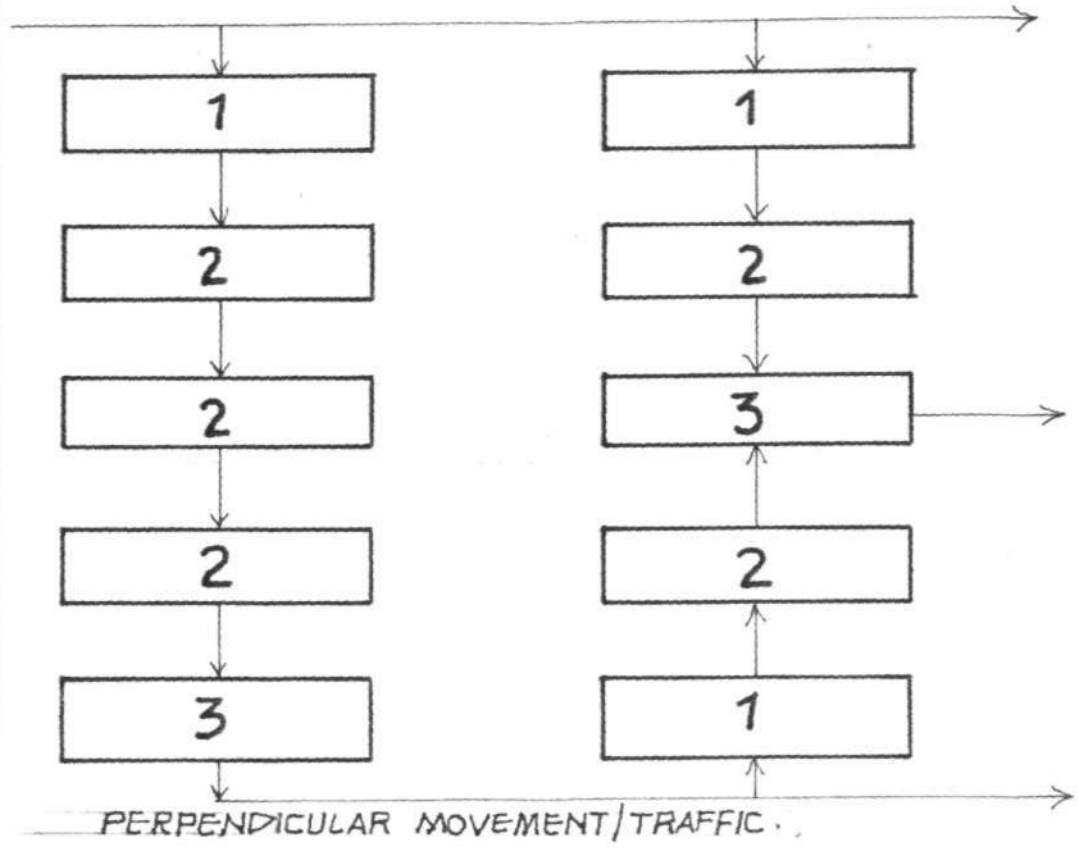
1- RAW MATERIAL
2- PRODUCTION
3- EXPEDITION



SECTION

VERTICAL MOVEMENT/TRAFFIC

FIG. 22·2 PRODUCTION SCHEMES.



Vertical Movement/Traffic: The technological courses are upwardly and downwardly, and if possible with the use of gravitation (Fig. 22.1).

Combined Movement/Traffic: In this case, the technological courses are partly parallel and partly perpendicualr in one or more lines. This is the most elastic and convenient, but only used for complex processes (Fig. 22.2).

6.3.3 Functional Schemes of the Space and Traffic:

The development of organizational patterns for a design programme begins with theobservation of the characteristic activity patterns of users. The physical design is generally the result of a combination of three concepts, used by the architect.[5]

1. The characteristics of the construction site (its shape, the surrounding environment, views, etc) will lead to a specific form of design.
2. The physical form is a direct result of the optimal organization of activities in space.
3. The architect attempts to accommodate the programme in a predetermined spatial form.

Although it seems obvious that the best organizational solution will be a product of all of these concepts, most architects employ their own

distinct alphabet of archetypal forms within which they have developed their special skill of visualisation and design. Some of these models are the grid, the linear axis, the constellation, the star, and the ring. Each of these basic forms favours a special form of organization that is flexible or rigid, open ended, or finite, centralised on decentralised, etc.

The final form selected, however, will reflect considerations of economic feasibility and the aesthetic preferences of the client as well as the concepts above.

Organizational Values: The efficiency of an organizational pattern is evaluated in terms of five major aspects:

1. Circulation; which is facilitated by a harmonious flow of space without abrupt changes.
2. Behaviour characteristics; the structure should support the behavior of its occupants.
3. Health; the stress caused by adverse spatial and organizational conditions is not always detectable, since people adjust quickly and often are not consciously aware of the negative effects.
4. Adaptability; growth and reorgnisation should be possible without interrupting the project

major functions.

5. Cost; the economy of space and construction often suggests forms that are the opposite of those developed in accordance with the other organising principles.

Organisation and Design: The creation of an original design involves the definition of a project's basic functions and the visualisation of a spatial form that best serves the functions. In practice, however the architect very rarely has the opportunity to follow this approach. Both the conceptual design and the production phase are often greatly facilitated if the architect uses a stereotype solution developed in the past that has good record of performance in similar situations.

Stereotypes are valid also because they ensure a smooth and cost saving process of construction. The architect needs to be familiar with them to be able to evaluate the possibility of adapting a particular stereotype to fit a specific design problem, though this may not be possible in certain unique sites characteristics and climatic conditions.

Organizational Factors: These are factors that are determined by construction site and its relation to the surrounding community rather than

the internal function. All factors relating to site, such as topography, soil, boundaries and climate, may eliminate many alternatives of spatial organization and will influence selection of a feasible site. Similarly, weather conditions will for instance determine how much space is to be useable outside, and this will influence concept of growth and flexibility.

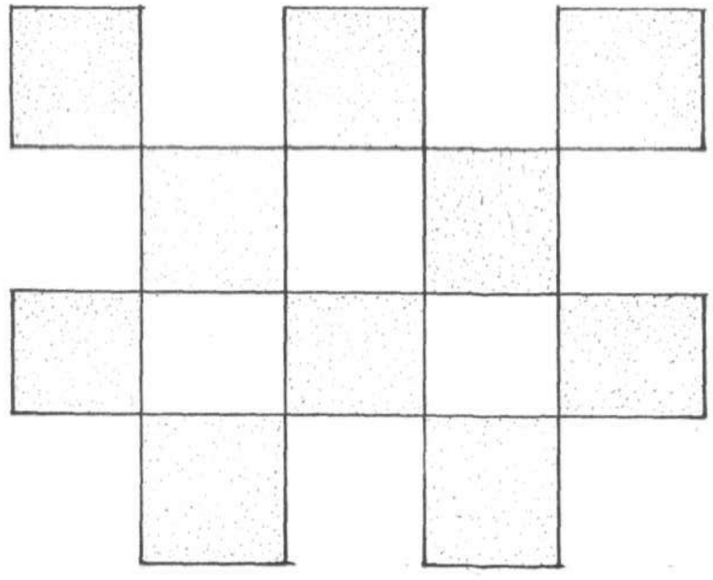
The way in which the project is to be linked to the movement patterns of the surrounding communities is another important organization factor. Another link to the communities consists of public utilities and services. All these factors call for a scheme of great flexibility.

Organizational Patterns: The archetypal forms of design mentioned previously, are related to the conventional types of organization illustrated in (Figure 23.1 and 23.2), and discussed below:-

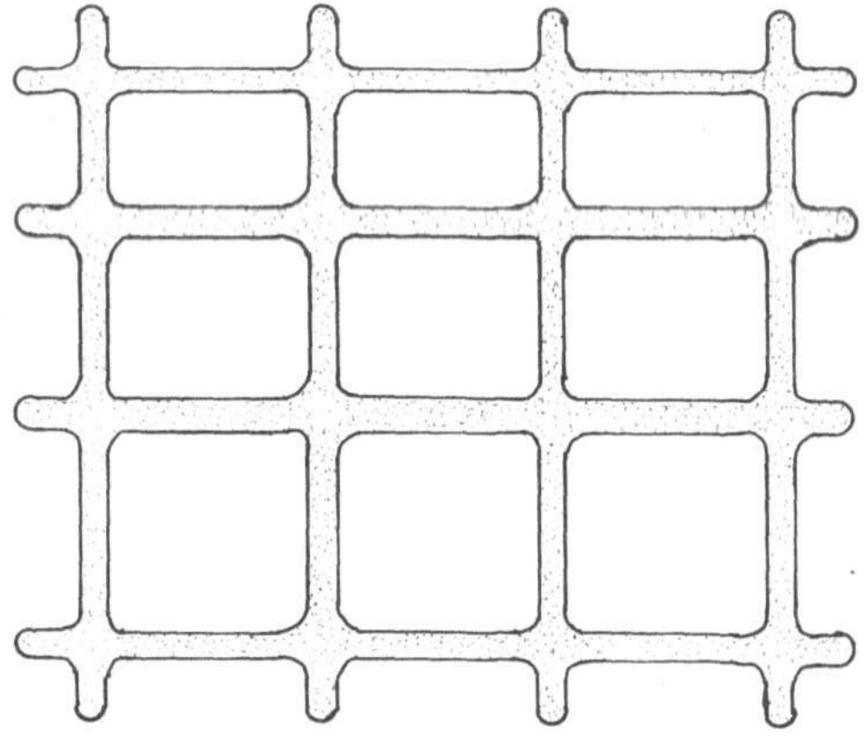
1. The grid or checker or net pattern; offers the greatest flexibility. This is because Its modular structure can be extended and changed without interrupting the whole organization, this also makes it easy to solve. Coupled with this, a very complex organization responds well to this pattern.

FIG. 23.1 ORGANISATIONAL PATTERNS.

GRID PATTERNS.

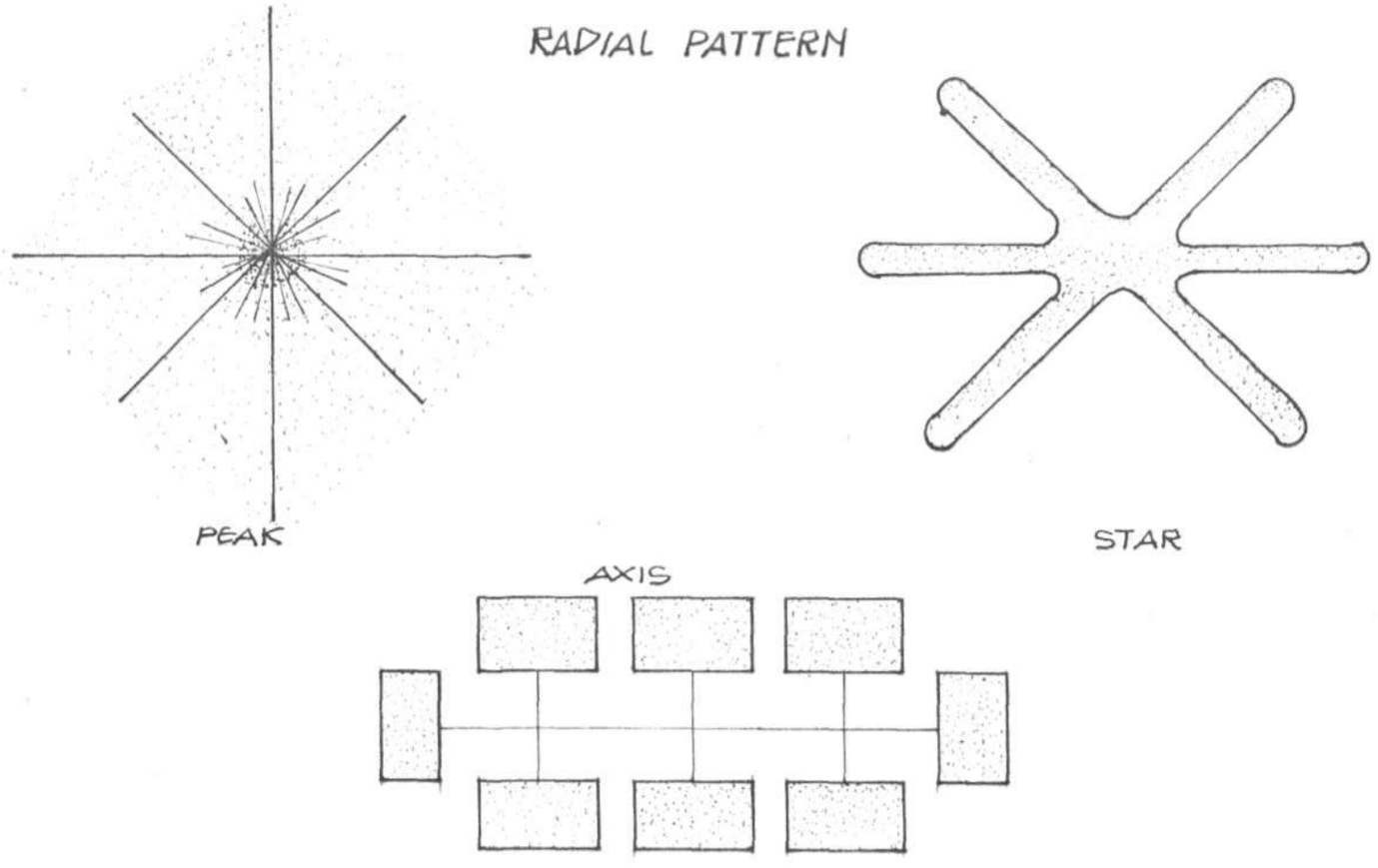


CHECKER



NET

FIG. 23.2 ORGANISATIONAL PATTERNS.



The obvious disadvantage of this organizational pattern is that it may lead to monotomy and lack of identity in the project.

2. The linear pattern has a single spine along which all elements are organised and which determines the direction of growth. If land is available, new segments can be added easily, but eventually the spine may become overloaded. If a secondary spine is added at right angle to the linear type, the pattern is called axial. This gives more of a focus than the linear pattern, and it can be developed in phases. Most Urban Planning projects follow the axial pattern.

3. The radial or star or peak is an opposite of the grid. This organizational pattern offers simplicity in organization and interactions of all kinds. The pattern is found to be appropriate for all functions and activities that have their origin or destination in the central core.

6.4 Design Principles:

In preparing the layout for an industrial estate on a selected site, one should apart from taking into consideration the wide variety and range of manufacturing concerns to be accommodated,

also look into the following design principles and practice.

1. Flexibility in the layout.
2. Grouping the industrial establishments on the basis of performance standard.
3. Phasing the development.
4. Block planning instead of plot planning.
5. Reducing the overall development costs by sharing common utilities.
6. Attention should adequately be given to landscaping and street sign design.

Footnotes

1. VAGALE, L.R. and ADEKOYA, O.C. (1974) Industrial Environment of a Nigerian City. Caxton Press (West Africa) Limited, Ibadan.

2. DE CHIARA, J. and KOPPLEMAN, L. Planning Design Criteria, Published by Nostraud Reinhold Company, New York.

3. KIRKPATRICK, E.M. (1982) Chambers Mini Dictionary, T and A Constable Ltd. Edinburgh, Great Britain.

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5. Kemper, A.M. (1979) Architectural Handbook, A Whiley Interscience Publication, Canada.

CHAPTER 7

DESIGN PROPOSALS

Research is normally a means to an end, therefore, all the gathered information can be termed as accessories of the means, which are geared towards the realisation of the end; usually solution to the problems identified. The design proposals are therefore thought to be the possible solution of these inherent problems.

7.1 Proposed Brief:

Towards realising the enormous benefits associated with industrial estates, and warding-off the problems; the establishment of an industrial estate in Kano is therefore proposed. The said estate will have the following components.

Worksheds: The following factory buildings will be provided on the estate, viz:

1. Standard factories; which are factories designed for letting to the industrialists.
2. Sectional, nursery or incubator factories; which are factories designed for the "Small-Man" who can easily expand.

Utilities, Services and Facilities: The infrastructural elements to be provided include: filtered and pipe borne water, drainage and sewerage, supply of industrial gases, electricty to both normal and high voltages, telephone services, fire station, Bus stands, truck parks and passenger car park; warehouses.

The community facilities to be provided for include:- canteens, welfare centres, cooperative department stores, reading rooms, and library, recreation clubs, petrol filling stations, police station, customs and excise duties, office, kiosks, accommodation for transit drivers, and health centre.

Roads, Streets and Parking: Good access is the primary requirement for industry; therefore the following roads will be provided for:

- Collector or spine roads
- Access roads

Marginal access road

These are in addition to the already existing highway along which the site is located. In addition, adequate parking for both employees and visitors will be provided.

Open Spaces: In addition to its aesthetic value, landscaping serves various utilitarian purposes, such as regulating wind, mitigating the dust and

offering shades, preventing glare, screening storage yards and parking lots from view, reducing run-off and preventing erosion. Therefore it will be adequately used.

7.2 Space Requirements:

The standards earlier discussed are being applied here to arrive at the various figures proposed, having comfort and operational efficiency as the basis for any proposal.

7.2.1 General Layout:

Overall Size: The medium sized industrial estate (12ha - 40ha) is the one to be established for its obvious advantages mentioned earlier. To arrive at a particular figure, the average of the minimum and the maximum figures is taken, and the result will be the size of this estate. Thus

$$12 + 40 = 56$$

$$56 \div 2 = 26\text{ha} \approx 25\text{ha}$$

Land Use Structure: The overall area above is to be distributed based on the following percentage allocation to the various components of the estate.

Table 7.1: PROPOSED LAND ALLOCATION FOR THE INDUSTRIAL ESTATE.

	LAND USE	% OF DEV. AREA
1.	Worksheds	55
2.	Organised Open Spaces	10
3.	Utilities, Services and Facilities	20
4.	Roads and Parking Lots	15
5.	Others	5

Industrial Density: A density of 25 industrial employees per gross acre is desirable based on:

- $27m^2$ of floor area per industrial worker
- 75% design efficiency and
- 33% land coverage.

Therefore, the total number of industrial employees,

$$= \frac{25}{0.405} \text{ acres} \times 25 \text{ persons/gross acre}$$

$$= 1,500 \text{ employees}$$

7.2.2 Worksheds:

Plot sizes and Coverage: Four categories of plot sizes are being proposed all within the range of $93m^2$ to $1,860m^2$ of built up factory shed. Thus:

Table 7.2: PLOT SIZES AND COVERAGE

	PLOT SIZE (m^2)	PLOT COVERAGE (m^2)	NO. OF EMPLOYEES
A	300	100	4
B	2700	900	32
C	4000	1300	47
D	5000	1688	60

Area Distribution: Out of the overall shed built-up area, 20% is taken for the managerial staff offices and vital workers facilities, while the remaining 80% is to be used for the workshop.

Table 7.3: RELATIONSHIP OF WORKSHOPS AND OFFICES SIZES.

	PLOT COVERAGE m^2	WORKSHOP SIZE m^2	OFFICES/ FACILITIES m^2
A	100.00	80.00	20.00
B	900.00	820.00	180.00
C	1,300.00	1,040.00	260.00
D	1,688.00	1,350.00	337.80

7.2.3 Services and Utilities:

The guiding principles here are comfort, efficiency and economy. The Table below gives an estimate of the requirements.

Table 7.4: SERVICES REQUIREMENTS

REQUIREMENTS	UNIT RATE	TOTAL NEED
1. Water Supply		
a. Employee Use	90 litre/ capita	135,000 litres
b. Industrial Use	9,000 litres/ gross acre	540,000 litres
Total		675,000 litres
2. Electricity	30KW/gross acre	1,800 KW
3. Industrial gases	*	

* The industrial gas requirements should be calculated on the basis of those industries that need it, because not all industrial works use gases.

With respect to water requirements, 30% of the overall need should be provided, to take care of expansion thus:

Total water need = 675,000 + 202,500 = 877,500 l

7.2.4 Roads and Parking:

Table 7.5: ROADS SET-BACK LINES.

		SET-BACK IN (m)	
	HEIRARCHY	MINIMUM	DESIRABLE
1,	Highway	45.00	60.00
2.	Major road	35=00	45.00
3.	Collector road	2500	30.00
4.	Access road	1500	20.00

Table 7,6: ROADS WIDTH.

		WIDTH OF CARRIAGEWAY (m)	
	HEIRARCHY	MINIMUM	DESIRABLE
1.	Highway	13.0	15.60
2.	Major road	10.80	13.20
3.	Collector road	9.00	10.80
4.	Access road	6.60	7.80

Parking Lots: One parking space for $93m^2$-$180m^2$ of gross floor area used for manufacturing, plus one space for each $70m^2$-$93m^2$ of office area.

7.3 Layout Organisation:

Since the essential plan form of the building types to be considered is rectangular, a rectangular layout is the one most appropriate. Similarly, as the site will be relatively flat, and as rectangular layout is the most desirable, the planform is invariably the GRID-IRON. From the foregone argument, it is logical and reasonable enough for one to choose the grid concept as the basic form of the overall estate layout.

This concept, apart from the already mentioned advantages, also posses the quality of providing easier accessibility to individual units of the estate. Coupled with this, the concept makes the laying of services and other engineering works economical in addition to reducing the chances of wasted spaces.

7.3.1 Site Concept:

The overall site is to be planned for all categories of industries - small, medium and large scale. This requires the adaption of a concept that will ensure proper interaction between these

divisions. As a result, the site is to be planned with the small-scale industries located as a focus of the overall development. It is to be surrounded by the medium-scale industries, while the large scale industries surrounds them all.

Apart from the fact that the client of the project (Kano State Government) proposes this concept, it also has a good record of performance the world-over. As mentioned previously, the concept was extensively used in Indian, and the results were good. The main idea of such an arrangement is to provide a ready market for the small-scale industries products, since the large and medium ones will patronise them.

CHAPTER 8

DESIGN REPORT

8.1 Concept Development:

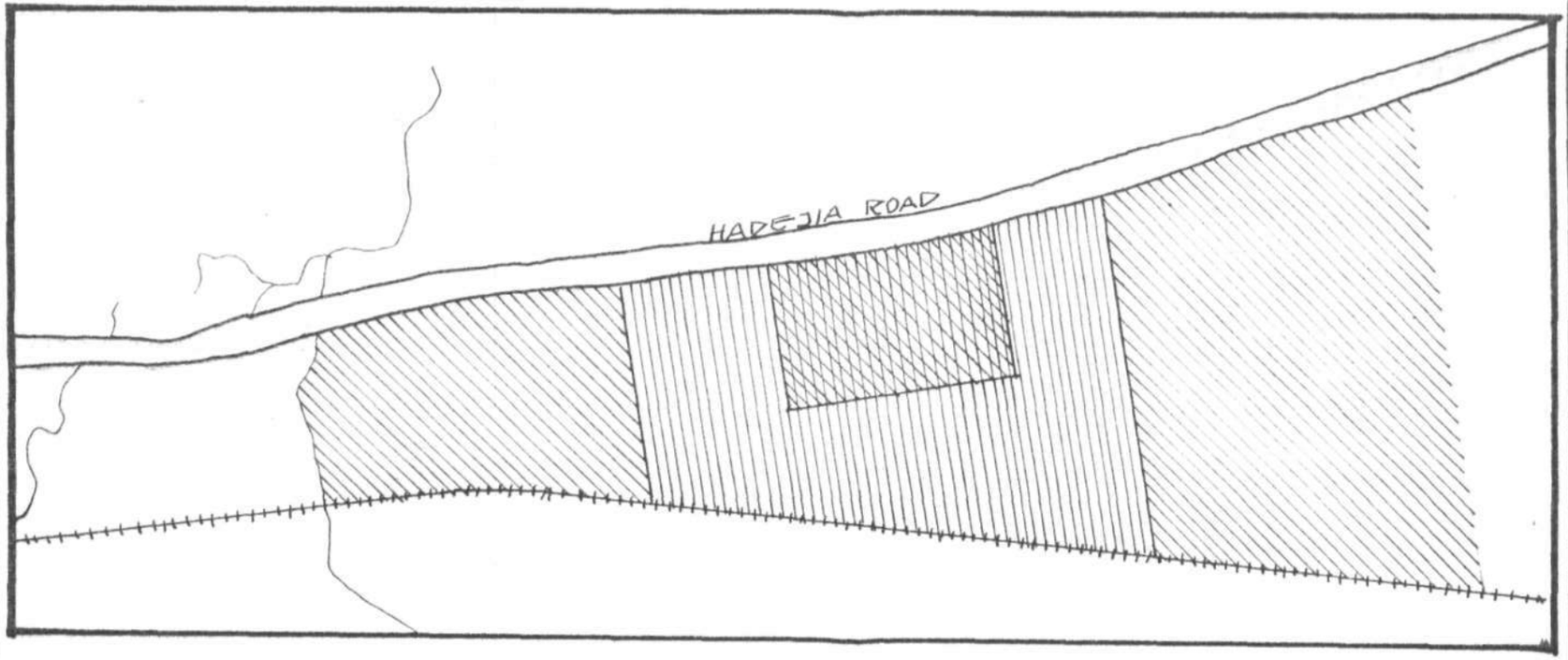
In trying to adapt the proposed concept on the site, one major problem encountered was the geometry of the site. The site is wide on the eastern side and tapers to the west, thereby restricting a direct application of the concept. The process of modification is what I called "concept development".

Since the site is principally served by an arterial road at the front and a railway line at the rear, the road has been used as a focus to the site. As a result all the three industrial sub-divisions (large, medium and small-scale industries), were arranged relative to it.

8.1.1 First Alternative:

Towards realising the concept, the site was divided into three parts. The middle portion was allocated to the middle-scale industries, while the other two parts at the wings were left for large-scale industries. Since the medium scale industries are more related to the small-scale ones, an area is cut-off within the middle portion to house the small-scale industries (Fig. 24.1).

FIG. 24.1 CONCEPT DEVELOPMENT.



FIRST ALTERNATIVE.

SMALL-SCALE INDUSTRIES
MEDIUM-SCALE "
LARGE-SCALE "

The same procedure was extended to the development of the portion reserved for small scale industries, with little modification. The four plots proposed were divided into categories A, B, and C inorder of their sizes. Category 'A' is bigger than 'B', and 'B' bigger than 'C'. Therefore when the portion was divided into three, the two wings at the sides were left for categories 'A' and 'B'. The central part was further sub-divided into two, to house category 'C' and the communal facilities (Fig. 24.2).

This particular alternative was found to have satisfied most of the important design principles, namely - adaptability to site, flexibility, economy and expansion, which can be effected without interrupting other parts of the project or layout.

8.1.2 Second Alternative:

In this case, the large, medium and small -scale industries were arranged radially in a semi-circle on the site, because of its elongated nature, with the small scale industries as the core (Fig. 24.4). Like in the previous case, the same arrangement was extended to the small-scale industries part. Here the three categories of plots were arranged radially also, but here, the communal facilities occupy the core (Fig. 24.3).

CONCEPT DEVEVELOPMENT

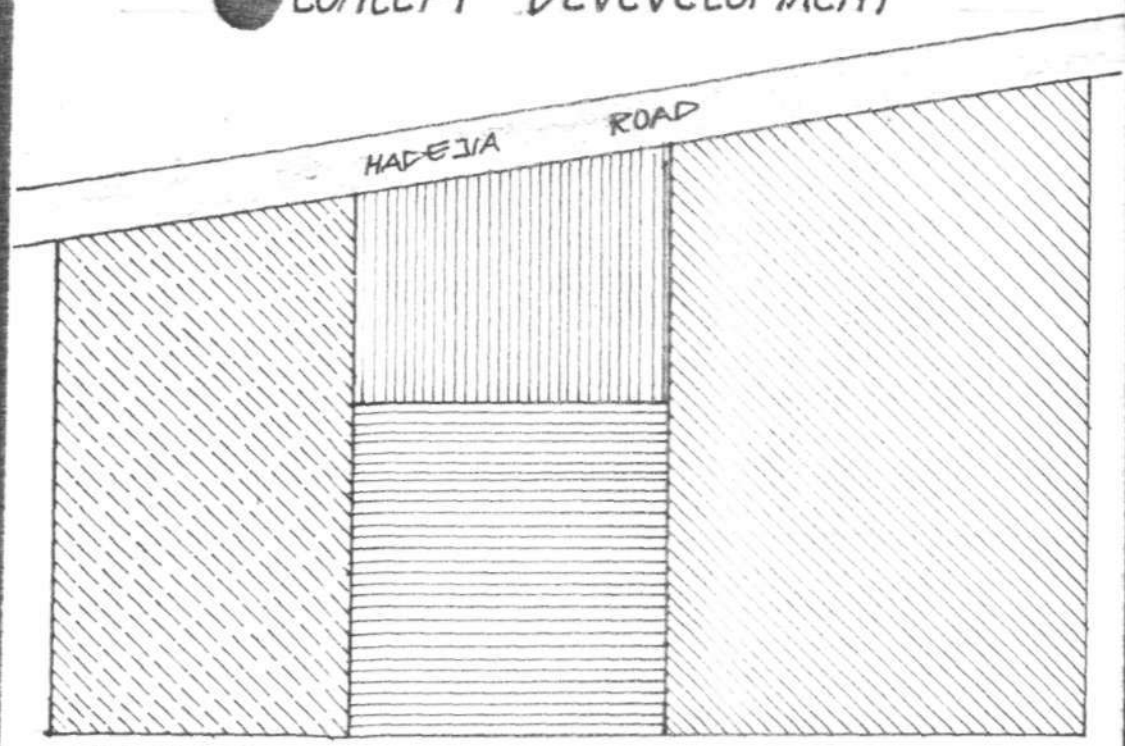


FIG. 24.2

CATEGORY A' FACTORY BUILDINGS
CATEGORY B' FACTORY BUILDINGS
CATEGORY C' FACTORY BUILDINGS
COMMUNAL FACILITIES

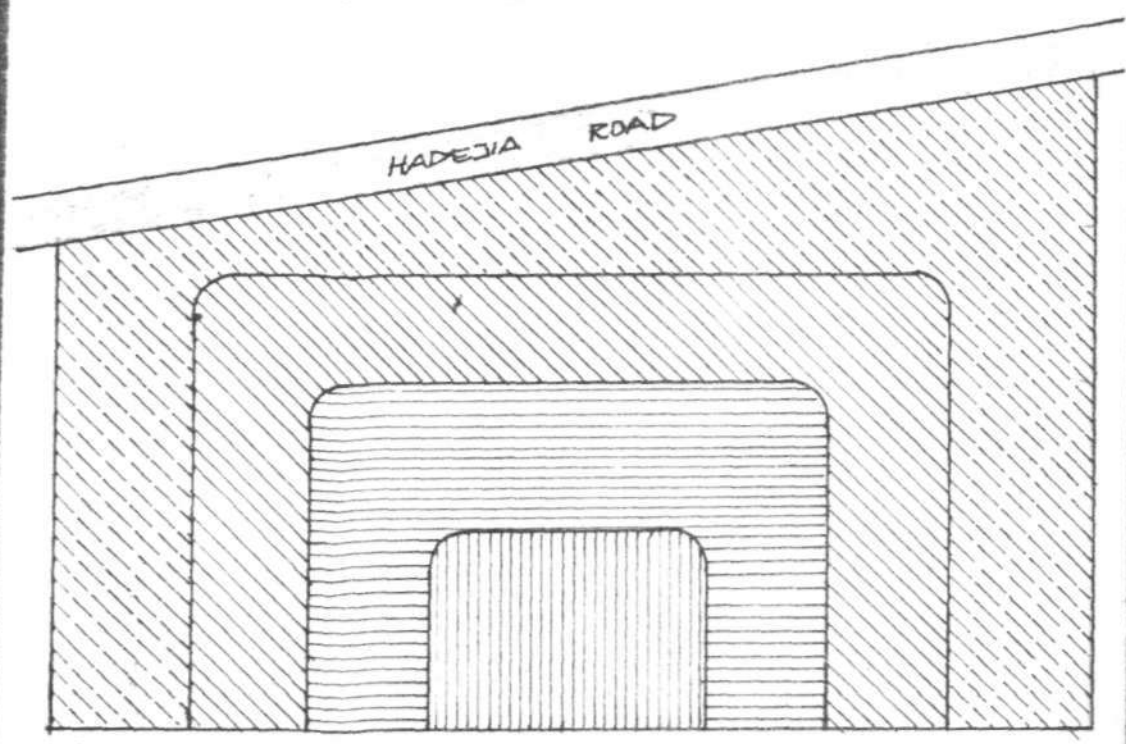
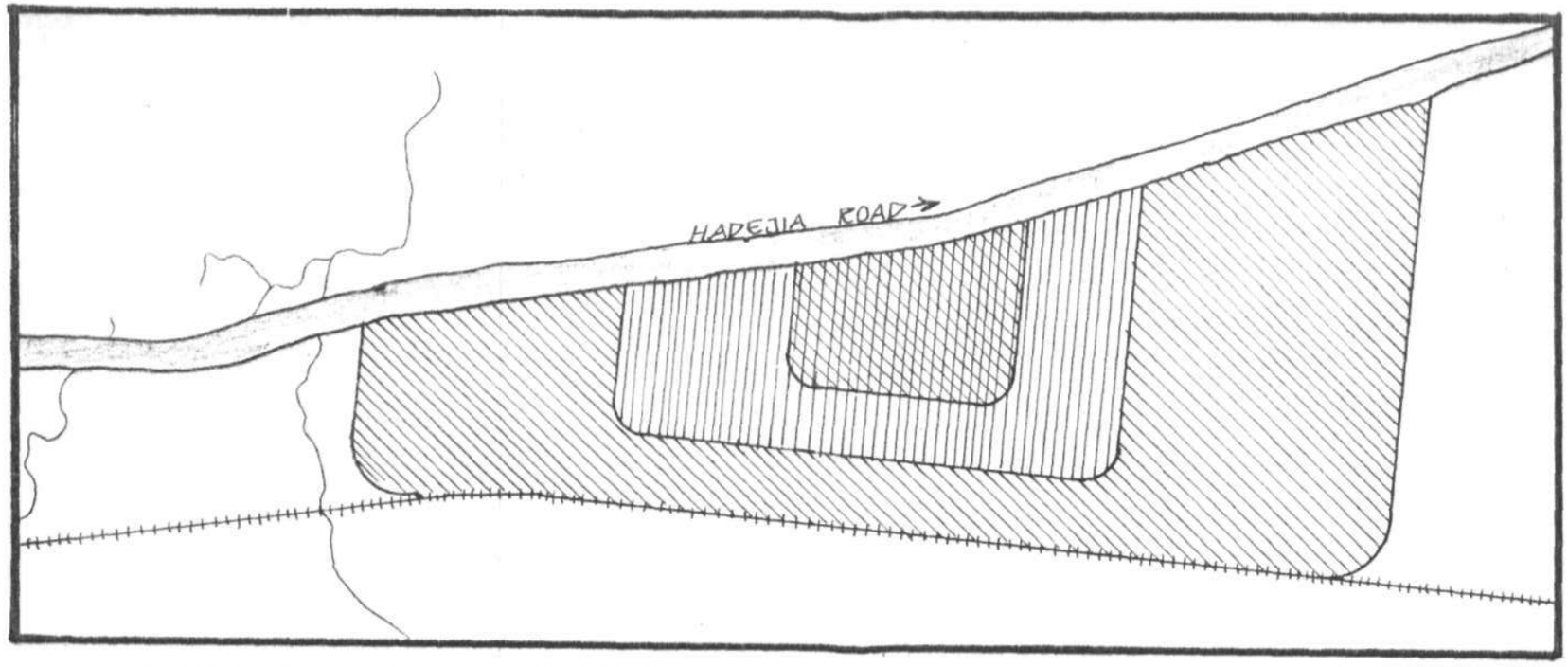


FIG. 24.3

FIG. 24.4 CONCEPT DEVEVELOPMENT



SECOND ALTERNATIVE

SMALL-SCALE INDUSTRIES
MEDIUM-SCALE "
LARGE-SCALE "

The major setpbacks suffered by this alternative are lack of expansion possibilities without interrupting other major functions of the project, because there is no direction of growth; and it has poor adaptability to the site.

In light of the above, the first alternative was adapted as a basis for the whole planning of the site and later also applied in the area allocated to the small-scale industries, the subject of this thesis. The decision to develop the whole site stemmed from the fact that the small-scale industries are part and parcel of the other two.

8.2 Estate Layout:

In order to provide maximum flexibility on the estate layout, both block and plot planning have been adapted. This flexibility is mainly viewed in relation to space requirements of the various industries to be housed on the estate. The block planning has been restricted to the overall site layout, in other words, only plot planning has been used when the small-scale industries area was designed.

The reason behind such a decision lie in the fact that the whole site has been laid to work as a homogenous unit. Any small-scale industry whose space requirements exceed the ones provided

is to be shifted into the medium-scale industries sector. Similarly, those medium-scale industries that need more space are to move into the large -scale industries sector. The area that has been blocked planned is to accommodate exceptionally large industries.

For the purpose of clarity, and as a matter of convenience, the whole estate is divided into four major components, viz - transportation systems; services, utilities and facilities; factory plots; and open spaces. These will be the parameters to be used in the discussion.

8.2.1 Transportation Systems:

RoadS System: Four types of roads have been proposed for the site. In reality, not all of them are going to be actually designed. At present, the main road serving the site is in the class of major roads, therefore the design will only consider collector or spine road, access and marginal access roads.

The spine road was used to collect the incoming traffic from the major road, at two points, in order to keep down chances of accidents and also to ensure proper checking of all in-coming and out-going traffic from the district. Within

the planned area, the spine road was located at the periphery of major sub-divisions, so that the heavy traffic normally associated with them is isolated from the busy factory areas. Because of their magnificense, they were used to define the concept on the site.

The access roads were arranged in such a way that they join the spine road at convenient points to prevent unhealthy traffic movement. In order to give accessibility to the plots facing the major road, a marginal access road, running parallel to the major one is provided, this also prevent accidents.

Towards ensuring smooth traffic flow (both vehicular and pedestrian), separate tracks have been provided beside the main carriageway to serve cyclists and pedestrians.

Railway Facilities: Because not all the industries actually need railway sidings, and as a result of the enormous cost involved if all industries are to be provided with these sidings, a central marshalling yard has been provided along the main railway line. This yard, is where all industrial cargoes are handled. Trucks are to be used to transfer the cargoes from the train's couches to the various industries and vice-versa.

The exceptionally large industries, located on the area block planned, are by virtue of their sizes and material handling provided with railway siding. This has been taken care of on the layout.

8.2.2 Services, Utilities and Facilities:

Sewage, drainage lines (both surface and sub-surface), water mains, electricty lines, telephone lines, have been designed to go underground within the roads right-of-way. For ease of repair and maintainance, no structure has been built on such lines.

For fire fighting, fire hydrants (FH) have been located along all roads at 100m. In addition to that, the fire station is placed centrally to provide easy accessibility to all factories. Both electric transformers and water towers have been provided at major sub-divisions to provide for specific needs. Because the facilities are to be shared on co-operative basis, they have been placed centrally, in order to give easy access from all parts of the estate.

8.2.3 Factory Plots:

The major problem encountered in the design of the various plots, is their integration with the already exsiting industries on the site.

In order to incorporate these old industries into the new layout, plots have been sub-divided. Such that each of them fits into a plot or so on the new layout.

The allocation of plots for the different industrial processes was based on the number of firms, size of firms and the nature of the industries. As much as possible, the longer sides of the plots have been oriented towards the north and outh directions in order to keep down the amount of sun-rays absorbed into the buildings.

All the plots provided are perfectly rectangular (sides ratio 2:1), in order to ensure proper development with adequate space left at the rear for expansion. Theidea here is for the eventual obscuring of the workshop areas by an administrative building at the front.

8.2.4 Open Spaces:

These are fairly distributed strategically over thewhole site. They have been designed to accommodate recreation areas, parking and location of services such as water towers and electricity transformers.

The high tension electricity line that crossed the site posed a major problem, because no structure is to be provided within its right-of-way. Since this right-of-way is to be lightly

planted, the open spaces were incorporated within it to neutralise the ambiguity of the space.

8.3 Factory Buildings:

The building set-back on the front street or the lot frontages on inside properties, is a minimum of 12m. This is envisaged to provide adequate parking for both employees and visitors alike. It is also to provide uncongested freight and traffic movement within the area. The review here will be taken in two parts.

8.3.1 Building Design:

With the current revolution in manufacturing techniques using cheap, micro-processor-based automation, the design of the workplace will polarise into two areas, that principally for personal use and that principally for machines. Since in this situation we do not have a detailed breakdown of technical and managerial staff, offices and workers facilities are provided with in the 20% area allocated for that purpose.

Since the macro-climatic conditions in Kano are a bit oppressive, for instance the heating of the building envelop by the scorching sun, the following steps were taken.

1. The number of openings on all walls, has been minimised, while on the east and western sides, they have been avoided where possible. Similarly, courses and sun breakers have been used to shade the windows, where necessary.
2. The long axis of the buildings have been oriented along the path of the sun (east-west), thereby exposing the longer sides to the North and South directions.
3. - Roofing materials have been selected to be those that reflect rather than absorb heat from its surface.
4. Ventilation in all cases have been trated to be cross, while lighting problems have been adequately taken care of through the provision of wall glazing and sky-lighting.

8.3.2 Construction :

Materials to be used for the construction of this estate are strictly restricted to the immediate locality for two reasons - the exploitation of local skills and the introduction of new techniques to the area as a whole. The various building elements have been broken down as follows:

Foundations: The soil conditions on the site are good, coupled with the fact that very light machinery are to be used. For these reasons, ordinary strip foundations have been designed for all the factory buildings.

Floors: Since the material to be used has to be both durable and possess the ability to carry loads (dead and live loads), concrete has been used in the construction of all the floors.

Walls: The main structural system used in the factory design are steel framed structures in order to allow flexibility in the use of space; while for the offices, the traditional column and beam structures were used. As a result, all external walls are non-loadbearing, constructed with 15cm concrete hollow blocks, which allow for large openings. The interior walls are demountable partitions.

Windows: Since the external walls are non-loadbearing, openings for windows could be of any size. Therefore, in order to respect both environmental and aesthetic factors, they have been placed strategically along all facades. For all east and west facing windows, sun-breakers have been provided for shading purposes.

Doors: At the main entrances, where the administration and workers facilities are located, very nice looking doors have been provided, while on the other hand, heavy and somewhat rugged doors that not only prevent illegal entry, but also prevent the spread of fire, have been used in the workshop areas. For the following reasons, sliding doors are placed at all main entrances, while flush doors are placed in offices. As for the workshops, rolling shutter doors are provided.

Roofs: In two of the factory sheds, concrete roof was used over the administration block and corrugated iron sheets used to cover the workshops. But in the remaining t o sheds, the hole structure was roofed with corrugated iron sheets.

8.3.3. Services and Finishes:

Both water and elctricity are being fed to the factory sheds from the main supplies. The floors within the offices are tiled and rugged, while in the production halls epory toppings (a king of terrazzo) is used to finish the concrete floor.[1] This finishing material has a degree of resistance to chemical attack from acids, alkaclies and solvents.

The choice of colour apart from enhancing the appearnace of the buildings also improve the workers moral to their jobs. For this reasons, neutral and resful colours are to be used in the painting of the buildings.

8.3.4 Landscaping :

A wide range of elements have been used to enhance the beauty of the whole environment. For instance, trees have been planted along all the roads at 12m-13m apart. In all open spaces, shrups and flowers have been distributed to creat a pleasant view. Similarly hedges have been used to screen the sides and rears of all factory buildings so as to cover the ugly and usually unsightly appearance of the backyards.

Foot-paths and pedestrian tracts are paved. in a manner to attract the attention of the passerby. Street furniture are located mainly in the recreational areas to harmonise with the planting. Street sign posts are placed strategically to appear very inviting and self explanatory to all people coming to the estate. Punctuation elements such as water towers have been provided at appropriate locations to give a certain character to the estate.

Footnotes

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CONCLUSION AND RECOMMENDATIONS:

CONCLUSION

No work of this magnitude can be accomplished without some problems here and there. For instance, the absence of any comprehensive industrial estate in this country, posed a particular problem in connection to assessing their adaptability and ofcourse operations with respect to our peculiar local situation. As a result, international standards have to be employed in addition to the available information locally, hoping that the desired results will be achieved.

The proper co-ordination of the various components of an industrial estate is a very difficult design aspect, especially if one consider their individual needs. In the design process, this has been adequately taken care of as much as possible and practicable. The buildings have been laid in such a way that zoning of industries can easily be achieved, while sufficient space for future expansion has been incorporated into the programme.

This thesis is principally geared towards the provision of a solid foundation for the eventual industrialisation and therefore proper economic

take-off for Kano State; while to the nation, it will serve as a model being more comprehensive than the already existing ones, having comprise both mechanised and semi-mechanised industrial buildings, in addition to those for small businesses.

The effort of the Federal Government to bring down unemployment figures, gave birth to the National Directorate of Employment, charged with the responsibility of combatting mass unemployment. In this direction, the industrial estate will surely help remedy the situation. In other words, using architecture to solve social problems.

RECOMMENDATIONS

The overall process of building a virile small-scale industrial sector in this country is faced with alot of problems and shortcomings. The governments have formulated so many policies, whose effects are yet to be felt. In light of the above, the following recommendations are made.

1. The whole operation of the Small-Scale Industries Credit (SSIC) Scheme has so far failed and need to be overhauled, if the objectives for setting it are to be realised. This is so because the money allocated to the schemes is only meant for granting of loans.

On many occasions, the loans had to be written off as bad debts, and in some cases utilised for other purposes than those intended. Therefore, if the scheme is to be maintained, it should go further by involving itself in the physical development of industrial estates, in addition to the capital grants it provide to the industrialists.

2. The operations of the Nigeria Industrial Development Bank (NIDB) should be widened to cater not only for large businesses, but for small ones as well. Infact, if the SSIC schemes are to continue as sources of capital grants only to the industrialists, the physical development of the estates should be a responsibility of the NIDB.

3. If the government cannot go directly into the physical development of the estates, it should encourage the formation of co-operative societies, through which it can execute the projects. For instance, a law can be made to allow local authorities; Chambers of Commerce and Industry; and other interested bodies form associations for the establishment of industrial estates, and of carrying out the necessary infrastructural investment.

The sources of fund for these associations can either be the NIDBor SSIC Schemes.

4. The Government should undertake a review of incentives for small-scale industries, so that their survival will be adequately guaranteed. For instance, the custom duty (dumped and substitution) decree and the custom drawback regulations should be made stronger and strictly adhered to. Also tax holidays should be increased from five to ten years.

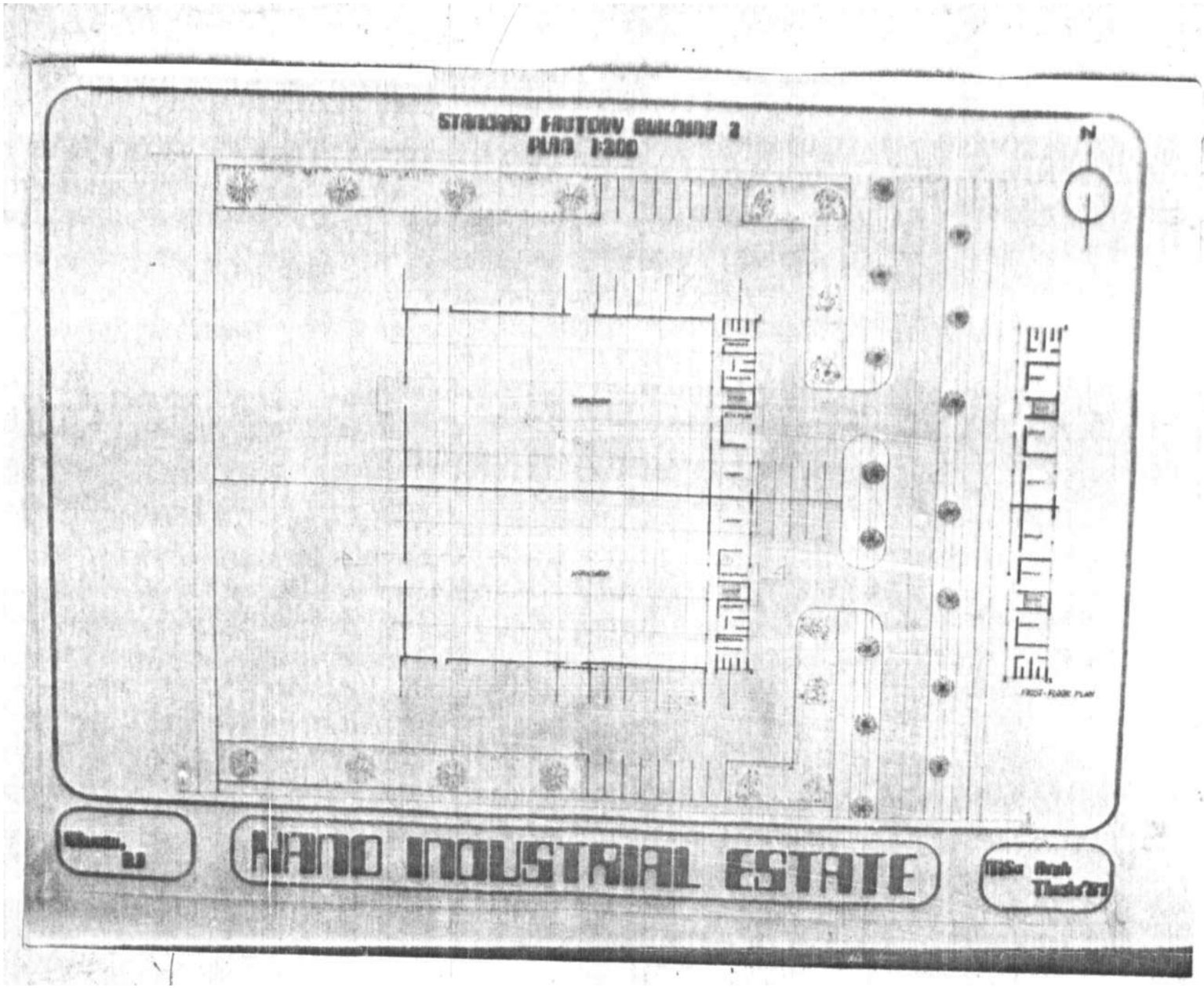
5. Finally, the present economic situation now faced in the country should not be used as an excuse of not going into the development of industrial estates, because of their enormous advantages. Infact all the countries that have made giant strides in this direction have faced the same problem we are now facing at the initial stage of their development.

ALTAIR INDUSTRIAL ESTATE

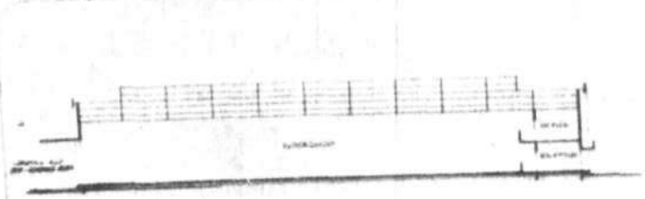
MAIN INDUSTRIAL QUARY

SITE LAYOUT 1
1:5000

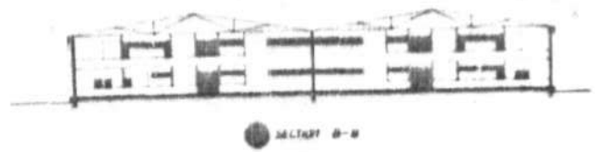
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STANDARD FACTORY BUILDING 2
PLAN 1:200
N
NANO INDUSTRIAL ESTATE

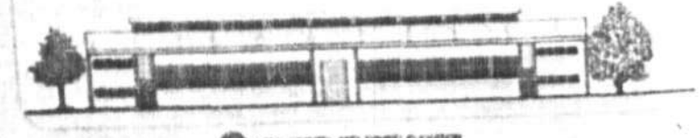
STANDARD FACTORY BUILDING 3
Sections, and Elevations 1:200



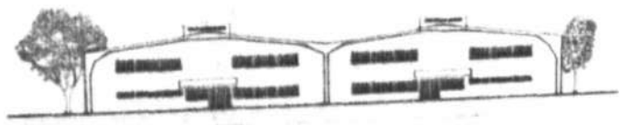
SECTION A-A



SECTION B-B



SIDE ELEVATION

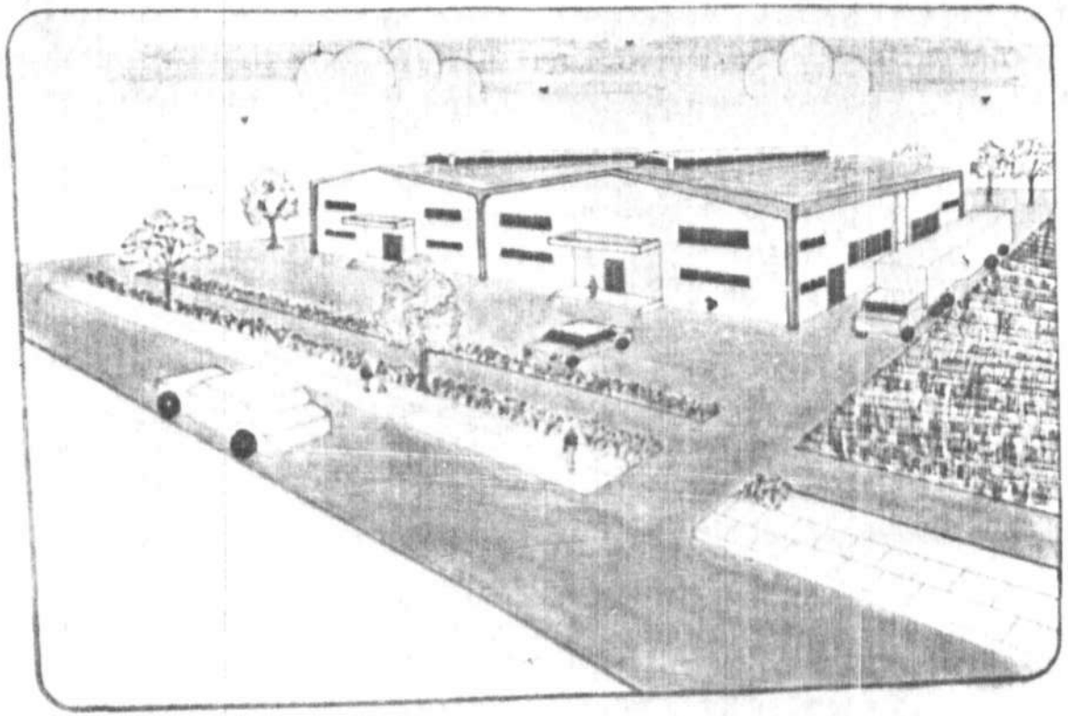


FRONT (EAST) ELEVATION

NANO INDUSTRIAL ESTATE

MSc Arch Thesis '20

STANDARD FACTORY BUILDING 3
PERSPECTIVE



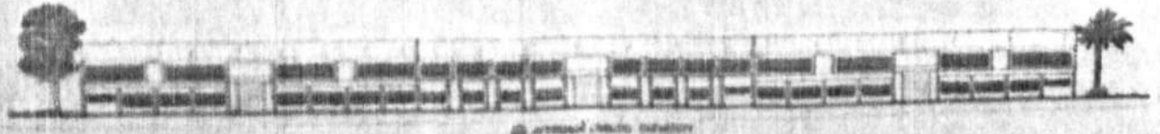
NAND INDUSTRIAL ESTATE

AMO INDUSTRIAL ESTATE
STANDARD FACTORY BUILDING 3M
PLAN 1:200
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STANDARD FACTORY BUILDING 38
Section, and Elevations 1200

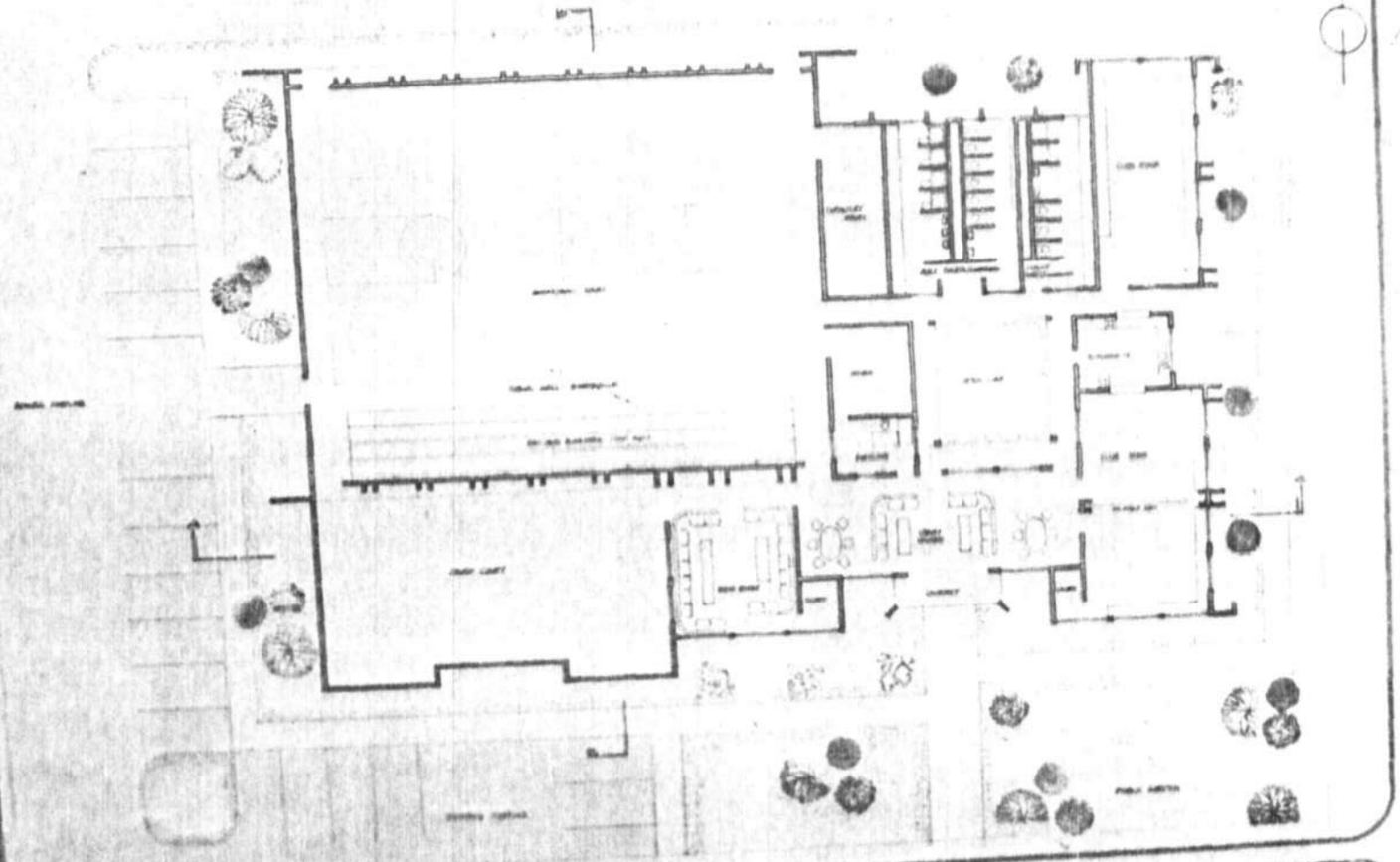






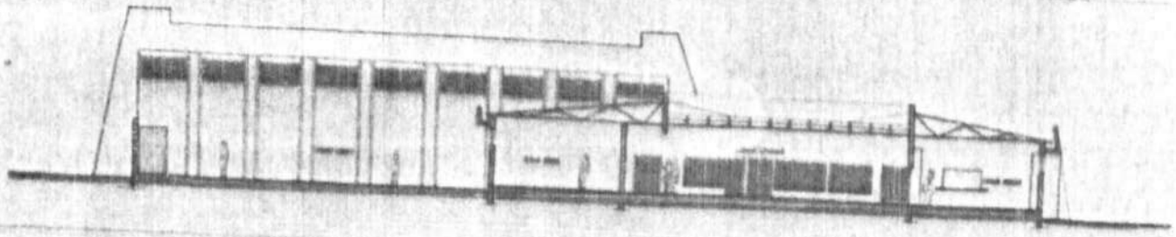
HAND INDUSTRIAL ESTATE

THE RECREATION CENTRE
PLAN, 1:100

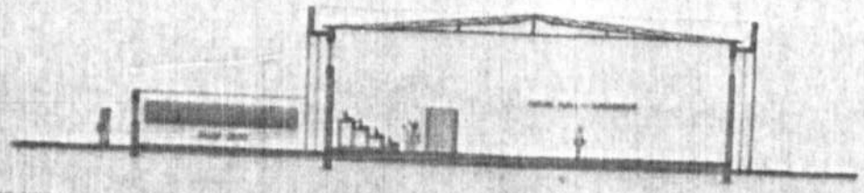


NAND INDUSTRIAL ESTATE

THE RECREATION CENTRE
SECTIONS 1:100



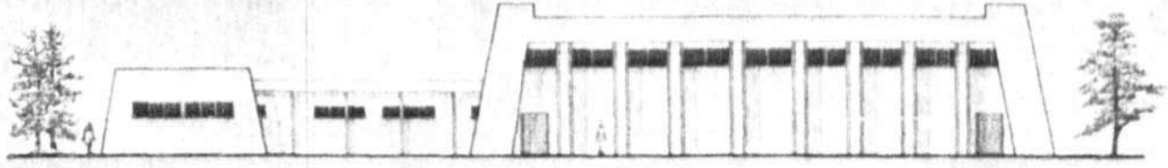
SECTION A-A



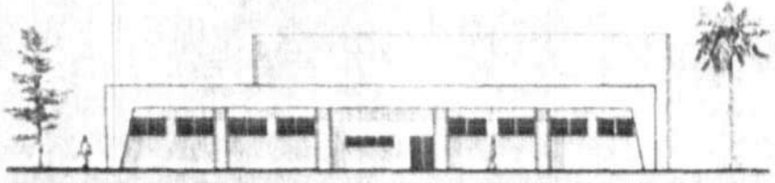
SECTION B-B

NAMO INDUSTRIAL ESTATE

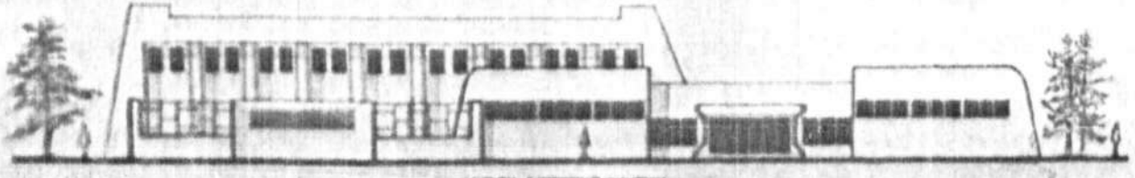
THE RECREATION CENTRE
ELEVATIONS 1:100



NORTH (CLUB) ELEVATION



SIDE (LAKE) ELEVATION



SOUTH (ENTRANCE) ELEVATION

KANO INDUSTRIAL ESTATE

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