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BY

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ON

BISCUITS FACTORY - ILORIN.
(A CONTRIBUTION TOWARDS THE ADVANCEMENT OF AGRO-BASED INDUSTRIES IN NIGERIA)

IN

JUNE, 1980

D E D I C A T I O N

This work is dedicated to:

The entire member of the family of

Mr. S. B. Awoniyi.

ABSTRACT.

AWONIYI, D. A. BISCUITS FACTORY - ILORIN
(A contribution towards the advancement of Agro-based industries in Nigeria)

Philosophy

The present day advance or industrialised countries have, and are still exploiting their farmlands to derive agricultural products which they process in their factories to produce sufficient food, both for local consumption and export. Since no nation can be considered advanced or industrialised unless it can feed her teeming population, Nigerians have undertaken the long march towards industrialization. I have decided to contribute my own quota towards this march, in its agro-based industrial sector, by designing a Biscuit factory to be located at Ilorin.

Aims and Objectives

The aims and objectives of my thesis therefore, is to use the knowledge I have aquired during my five years study of Architecture and during my research into the agro-based industries in general and Biscuits factories in particular, to design a Biscuit Factory at Ilorin, that will be architecturelly, structurally, economically and humanly suitable for the production of Biscuits.

Aspiration

I discovered during my research, and factory owners can testify to it, that beside the production hall and the auxiliary buildings, other buildings as well as the workers welfare are not given due consideration. The immediate

results of this neglet are the high rate of absentism, the low productivity of workers, work to rule actions and general strikes.

I hope with the thorough considerations I have given the design of the factory and the workers welfare my aspiration of high productivity and good labour relations will be realised.

A C K N O W L E D G E M E N T

In order to prepare this thesis; I sought and got assistance from many people, companies and organisations. Only very few of them will be mentioned here.

My sincere gratitude goes to the head of the department of Architecture, Professor E.A. Adeyemi my group mentor Mr. Olajide Solanke, my group coordinator Mr. Shim Adesina, Mr. C.S. John and the other lecturers in the department.

A number of Biscuits manufacturing companies gave me unhindered access to their factories and books on biscuits. Thanks are due to Chief Chris Ogunbanjo and the other directors and workers of Allied Biscuits (Nig.) Ltd. Lagos. I am very grateful to the Directors of Standard Biscuits (Nig) Ltd. Jos, including Mr. P.K. Haryani. I am appreciative of the cooperation of the workers of NASCO Biscuits Jos during my visit.

Thanks are due to the Food and Drugs administration section of the Federal Ministry of Health for their legal advice. And to the Immigration section of the Federal Ministry of Internal Affairs.

Other persons who have been of great help are Mr. Salako an Immigration Officer, Mr. Eric Babatunde Balogun of A.E.R.L.S. (Agricultural Extension and Research Liaison Services) Zaria and my typist Mrs. Margaret Akere of the Savanna Forestry Research Station, Zaria.

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INTRODUCTION

The feasibility study and market survey of Biscuits in Nigeria done in 1974 by Mr. V.H. Kisnadwala, an Indian national, with thirty years of experience in Biscuit Factories, resulted in the establishment of the standard Biscuits Nigeria Ltd. Jos Plateau State in 1977.

The study showed the need for more biscuits line. The present production capacity of the Biscuits ovens in the country is about 108,000 tons of biscuits per annum. The study show, by projection, that the present demand of biscuits is about 151,000 tons per annum.

There is therefore, a shortage of 43,000 tons of Biscuits per annum. The capacity of an oven per annum is 4,500 tons of biscuit. There is the urgent need for 10 more ovens to take care of the domestic needs only, without considering export.

The first phase of my Biscuit Factory has two ovens that will produce 9,000 tons of biscuits per annum. The ultimate capacity of the factory is 18,000 tons of Biscuits per annum from four ovens.

Adequate considerations has been given the Analysis of Ilorin Township, the site, the factory, the sources of raw materials, and labour requirements. I hope this book is going to be of tremendous help to future industrial architects and general readers.

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PART I ANALYSIS OF ILORIN TOWN

CHAPTER 1: The Town Ilorin

SECTION 1: The Master Plan

1. DEFINITION

An officially approved plan, drawn at scale 1:10,000 or 1:5,000 covering the master plan Area, determining its limits and those of the controlled development Area and indicating the main roads main open spaces and the various land use zones with the corresponding designation.

2. THE FRAMWORK

The Government of the Kwara State of Nigeria through the Ministry of Lands and Housing assigned Doxiadis Associates International, Consultant on development and Ekistics, to prepare a Master Plan and programme for the Development of Ilorin. The settlements of Oke Oyi, Gama Eiye Nkorin and Shao are included.

As a lot of urban problems have resulted because of the rapid growth of Ilorin and its environ, the study becomes very essential.

3. SCOPE OF THE REPORT

The report No. 3 (DOX-NIG-A93) comprises the final stage of the study namely, the preparation of the final Master Plan and the programme for Ilorin, up to the year 2000. It provides the proposed land use in the year 2000 integrating the new areas with the existing settlements. It defines the transportation network (rail, air, roads) It gives the illustrative plan of the utility network. It purposes a phasing of the areas to be developed with emphasis on the first 5 years plus proposals for the apportionment of population densities, and suggestions for bulk and height regulations.

The Master programme gives approximate cost of each phase of work gives suggestions and proposals for financing, management and administrative for successful implementation of the Master Plan. It concludes with suggestions for zoning regulations and for legislative and administrative measures to ensure the correct implementation of the plan and programme.

SECTION 2: THE PHYSICAL OUTLOOK BY 2000

1. AREA

The master plan of Ilorin for the year 2000 accommodates the projected population of 860,000. It covers a total area of about 159 sqkm or 15,900 hectares, thus providing for an overall density of approximately 54 person per hectares.

2. EXTERNAL BOUNDARIES

The external boundaries of the plan are: The Federal highway to the west linking Ilorin with Lagos and Kaduna the North and South peripheral roads that guide the growth of the city towards the east, and the artery that limits the city to the east. Further boundaries of Ilorin beyond those roads are the military estate towards the North, the college of technology a teaching hospital areas to the North-east, the catchment area of the new Asa River reservoir and the airport to the Southwest and the large area of the new University to the east.

3. LOCATION OF MAIN FUNCTION:

The major principles and constraints which were analysed and illustrated in sketch form shows the evolutionary process by which the eventual form of the city was determined. (See location of main function Map of appendice)

4. MAIN ELEMENTS:

The main elements which will have an immediate impact on the internal functioning of the city and strengthen its role as a major developing urban center in the country are:

(a) The external road and rail connection with the rest of the country.

(b) The zone for central functions

(c) The old city with its existing center.

5. MAJOR FEATURES:

The major features and determinants of the plan may thus be identified as follows:-

(a) The Federal highway is provided with 3 interchanges which represents the main entrances to the city and its links with the airpot, Ibadan and Lagos to the southwest, with Kiama to the west, and with Kaduna to the North.

(b) The zone of central functions extending east-wards from the Asa River incorporating the major commercial center and administrative area.

(c) The old city center will continue to play its traditional role in the life of the city. Thus will be possible by the preservation of the existing community structure.

(d) New residential areas which are provided for, around the existing city and particularly on the east bank of the Asa River following a hierarchical pattern.

(e) Light industry mainly located along the northern part of the Asa River and the railway line and a zone for heavy industry to the northeast, adjacent to Oke-Oyi village.

(f) Major recreational and green areas which are provided for along the Asa River, around the Sobe rock north of the present city, and along the northern perimeter of the restricted area of the new reservoir which itself may eventually become a major recreation zone.

SECTION 3: THE CLIMATE

1. LOCATION:

Ilorin is in the tropical region as it lies in lat. 8° 30' N. log. 4° 35' E. Therefore, all the climatic elements peculiar to the tropics are found here.

2. TEMPERATURE:

By averaging the mean daily maximum and mean minimum teperature values (°C/day) a mean monthly temperature value was derived. The difference between the highest (29.9°C) and the lowest (25.0 °C) (4.9°C). This is typical of the tropical region, where seasonal temperatures are always high but the range small.

3. WIND:

The wind speed is relatively high throughout the year. In the rainy season, it is 177.4 knots/day while it is 166.7 knots/day in the dry season. We have only a difference of 10.7 knots between the seasons.

In the rainy season, the prevailing wind is the S.W. trade wind, while during the dry season, the N.E. trade wind is stronger.

4. HUMIDITY:

The relative humidity ranges from 86.0% in the rainy season to 51.1% in the dry season. A range of 34.9%. Increase in temperature decreases relatively humidity as between October and March. Between March and October, Temperature decreases as relative humidity increases.

5. RAINFALL:

In the rainy season, the dominant wind is the south-west trade wind (between March and October). The highest rainfall is 243.8 mm/mo in September. In the dry season (between November and March) the wind comes predominantly from S.W. but the effect of N.E trade wind is stronger than it is in the wet season, so this wind brings little rain between November and March. (10.2mm/mo in Dec.)

Table of Climatilogical data for Ilorin (8° 30'N; 4° 35'E)

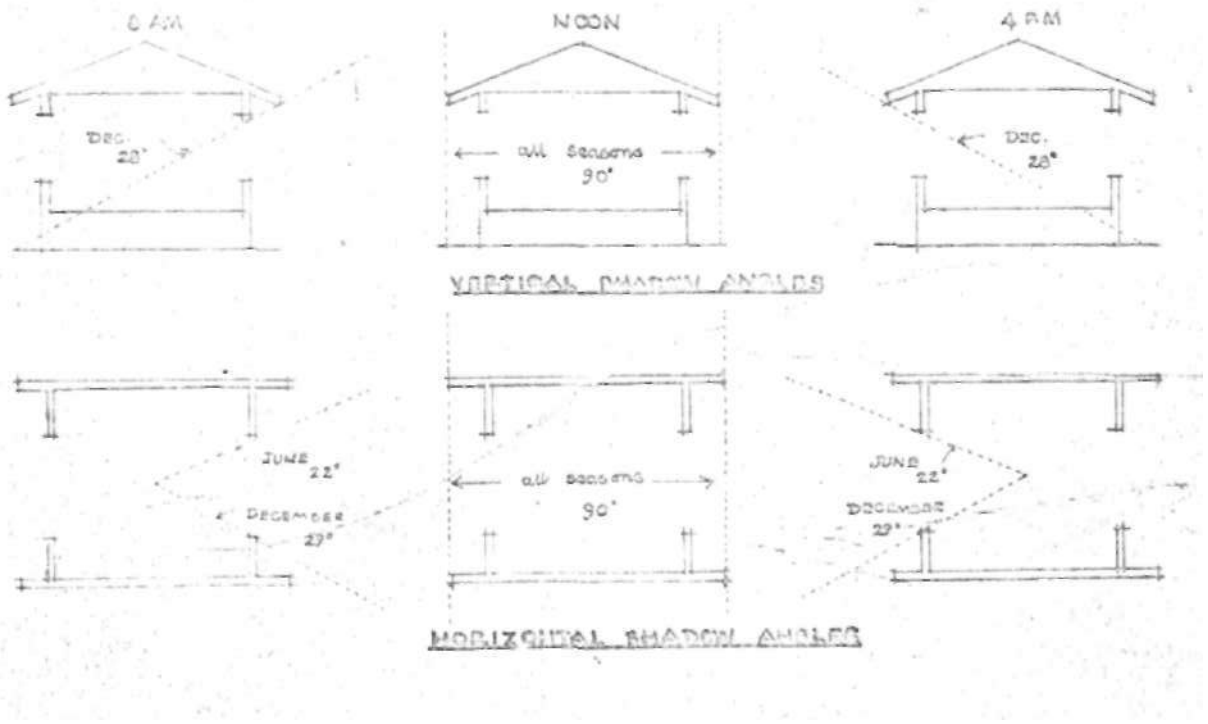
	Jan	Feb	Mar	Aprl	May	June	July	Aug	Sept	Oct	Nov	Dec
Air temp. (°C.)	26.0	2.8	29.9	28.9	27.5	26.3	25.2	25.0	25.4	26.1	26.6	26.0
Daily range of temp (°C)	15.9	13.5	12.9	11.7	10.4	9.5	7.8	7.7	8.5	9.7	13.6	15.5
Sunshine Hours	6.7	7.3	6.7	6.5	7.0	6.3	4.4	3.3	4.0	5.6	7.6	7.7
Rolative Humidity	51.1	58.5	62.5	74.1	80.5	83.7	84.6	85.0	86.0	83.9	70.8	58.0
Rainfall Total (mm/mu)	17.5	13.5	66.0	121.9	152.4	213.4	154.4	121.9	243.8	180.3	22.9	10.2
Rainy Days. 2.5 mm	-	2	4	9	12	13	12	8	16	14	2	-
Wind Speed (m/s)	0.46	0.62	0.80	0.80	0.51	0.40	0.5	0.43	0.26	0.77	0.78	0.76

All average values have been computed using 5-yrs (1974-78) data except rainfall for which 30 years. (1949-78) record have been used. - Source Dept. of Geography. University of Ilorin.

SUN ANGLES AND SHADING FOR ILORIN

ORIENTATION W°°E

Critical sun angles: vertical = 28°
horizontal = 28°



CHAPTER 2

THE TRANSPORTATION NETWORK

Section 1 - General

1. INTRODUCTION

Effective communication around and through the township is the goal. The main axis of the roads in the town are in a west to east direction following a grid-iron road system due to the inherent distribution advantages of such a pattern.

The town's main road network, comprising major & minor urban arteries, is traced as far as possible around the existing neighbourhood units simultaneously attempting to respect the existing community structure.

2. ROAD CLASSIFICATION AND STANDARDS:

Four categories of road are adopted in the hierarchical road classification of Ilorin, each designed to maximum usage. The design of special major intersections on the national routes will help prevent or reduce unnecessary through-traffic to the town.

3. THE 4 CATEGORIES OF ROADS AND THEIR CHARACTERISTICS

(i) Major Arterials

They connect either major urban areas serving corridor movements having a substantial trip length (major national arterials - freeways, expressways), or major centers within an urban area serving the highest traffic vol. curridors and satisfying the longest trip desire (major arterials in urban areas).

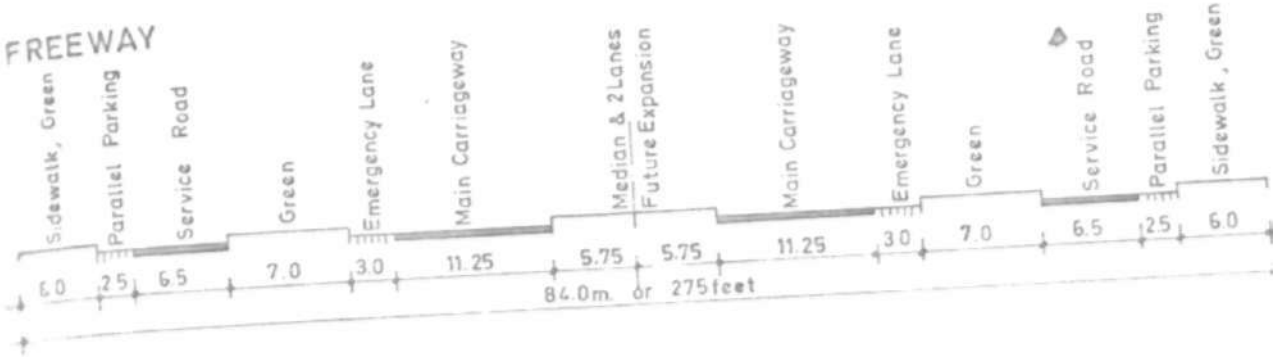
It usually carries the highest proportion of the total urban areas travel on a minimum of mileage and at a high speed, it is provided with partial control of access where possible.

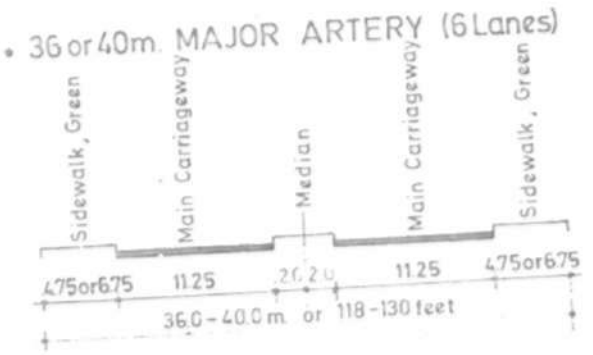
This will provide a fast direct connections between Ilorin and the conurbations to the South with the northern area and will help to consolidate Ilorin's role as a major urban center. The new alignment of the intra-state highway on the southern boundary of the city is linked with the freeway north of the airport. This road will by-pass the village of Gama including it in the master plan area and will be connected to it by a service link. The extension of this road into the south-east part of Kwara State will reinforce the influence of Ilorin as the major administrative and cultural center of the State.

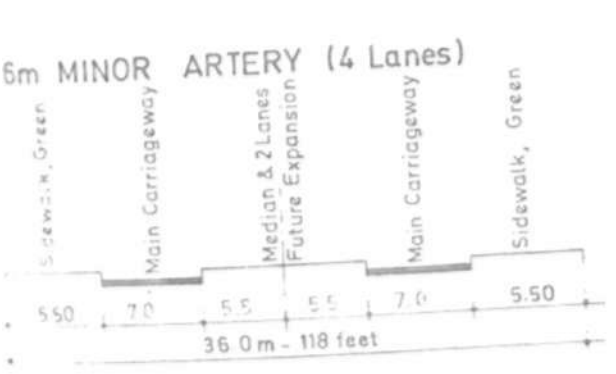
The road connecting Ilorin with Kiama is retained and improved in order to cope with the anticipated traffic volumes which it would generate. The road will be connected to the Federal freeway by means of a grade separated interchange. The existing highway to Kaduna skirting the college of technology teaching hospital areas, will remain substantially on the same alignment, with all needed improvements.

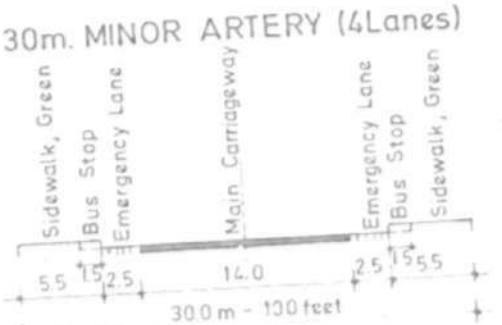
The new road extending north of the city to the east of the military area will provide an alternative to the freeway and good links with the northern towns. The confignation and alignment of the main road network are made to respect as much as possible the existing pattern in order to minimize expropriation costs. Thus the road pattern in the area of existing city continues to be irregular, although, proper hierarchical classification and connections were made to conform with the expected travel desire and to achieve a balance distribution of traffic. Outside of the existing city the network adopts a more regular form conforming topographical conditions and the objective of integrating the major land areas which have been committed for special uses.

TYPICAL CROSS SECTIONS OF ROADS







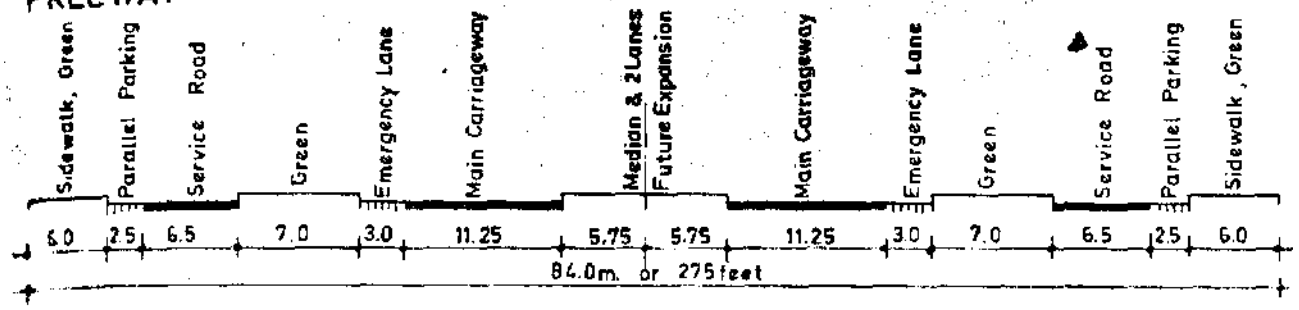




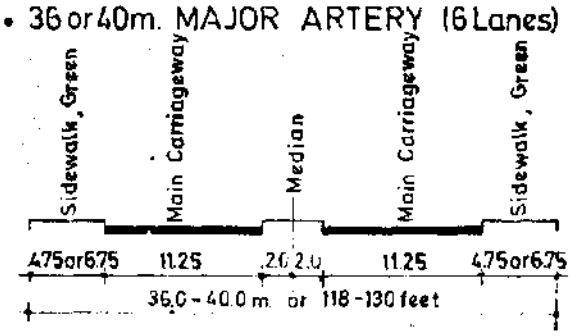
Fig

TYPICAL CROSS SECTIONS OF ROADS

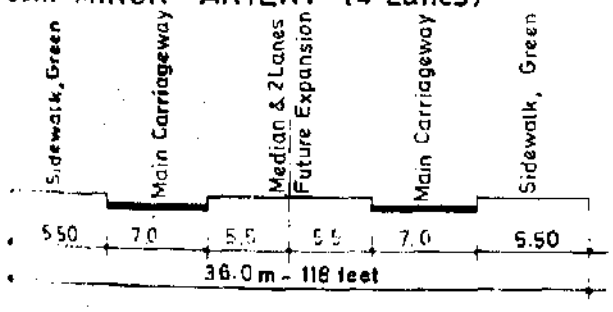
FREEWAY



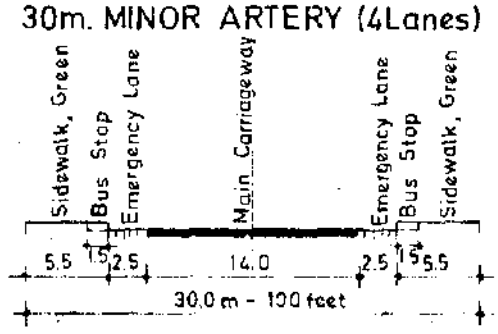
• 36 or 40m. MAJOR ARTERY (6 Lanes)



36m MINOR ARTERY (4 Lanes)



30m. MINOR ARTERY (4 Lanes)



COLLECTOR ROAD

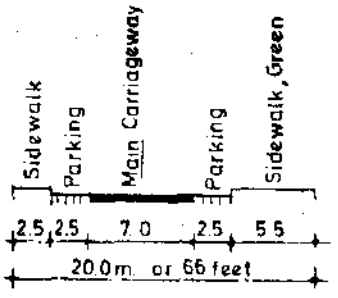


TABLE 4D

ROAD CLASSIFICATION AND STANDARDS

S/N	Road Characteristics and Standards	Road Classification		
		Freeways	Arterial	Collector Roads
1.	Traffic Function	Long distance National, Regional and Urban Trips	Long and Medium distance urban trips	Short trips and access to abutting properties
2.	Access Control	Full	Where needed	None
3.	Service Roads	Yes		None
4.	Medium	Included	Included where possible and necessary	No
5.	Design Speed in km/h m/h	120 75	70 44	60 38
6.	Operating Speed km/h m/h	80-100 50-63	40-60 25-38	30-50 19-31
7.	Practical Capacity in Passenger Cars per Hour and Lane	1,200-1,600	500-900	300-600
8.	Divided Flow	Always	Frequently	Not Usually
9.	Number of Lanes (Main roadway only. Parking lanes excluded)	4-8	4-8	2-4
10.	Right-of-way (m) (ft)	30-85 100-275	15-60 50-200	10-20 33-66
11.	Maximum Grade % a. Through Pavement b. Ramps Down c. Ramps Up	5 6 7	5 7 6	7 - -
12.	Minimum Horizontal Radius in Metre Radius in Feet	400 1,300	200 650	150 490
13.	Lane Width (m) (ft)	3.50 12	3.50 12	3.25 10
14.	Parking	Prohibited	Prohibited in general	Permitted
15.	Intersection Type	Always grade separated	Mostly high type signalized at grade	At grade signalized or stop sign controlled

2. RAILWAY

It is proposed that a section of the existing railway line adjacent to and south of the existing industrial area, be re-aligned eastward in order to facilitate the functioning of the southern communities, serving the light industry area as it is also provided with a re-located rail terminal forming part of the transportation terminal south of the city.

Further, the west-east road network should be grade separated from the railway line thus permitting greater mobility and increasing safety. In order to achieve this, especially at the central crossings, the railway line is purposed to be shifted about 100m westwards and rebuilt in a lower level allowing the arterial roads of this area to interconnect freely at ground level. The deviation and sinking approximate 1km of the railway line does not affect its normal functioning considering also that the railway station is to be relocated.

3. AIRPORT

The existing airport that will be extended to international standards, will be linked to the Federal Freeway to the southwest through the new artery which enters the city by the south and continues to the east as the main structing artery of the spinal chord of the city.

4. TRANSPORTATION TERMINALS

Two sites are proposed for the integrated transportation terminals of Ilorin, one to the south of the intra-state freeway, which will provide convenient connections of the city with the State highway the airport and railway line, and another at the crossing of the state and federal high-ways; west of the city, for higher level of inter-state movements as well as to serve more directly the western areas of the city.

CHAPTER 3

PUBLIC UTILITY NETWORK

SECTION 1: Water Supply System

INTRODUCTION:

In planning the future expansion of the city's water supply system, an analysis of the expected needs and the principles to be followed should be made. Among the influencing factors worth nothing are: The design period for the various parts of the system, the future average per capital daily water consumption and the population to be served during period of each part.

2. DESIGN PERIODS SUGGESTED ARE

(a) Water supply mains; design period to be considered is the one which will serve the population of this year 2,000 i.e. approx. for population expected in the next 24 years.

(b) Distribution network; design period to serve the population of the year 2,000.

(c) Water supply reservoirs: design period to serve the population expected by 1990.

(d) Pumping stations: Design period to serve the population expected by 1985.

3. DESIGN POPULATION

The population at the end of each of the above design periods. Namely, 1974-293,00; 1980 - 360,000; 1990 - 537,000; 2000 - 860.000.

4. POPULATION DENSITY:

The population densities in particular areas must be considered during the detailed design of the expansion of the water supply system.

5. ZONING:

The special character of the various districts of Ilorin and the corresponding uses for which they may be assigned, i.e. industrial, and commercial zones, green zones, etc. will affect the final design of the water supply network.

6. INDUSTRIAL WATER CONSUMPTION:

The focus will be on industrial water consumption although the other ones are: domestic, commercial. It is recommended that all the water supply installations, i.e. impounded reservoirs, purification plants reservours, be designed on the basis of daily peak consumptions, while the distribution network should be designed to meet the requirements of the hourly peak water demands. Industrial water requirements are based on an estimate of 6825 cu.m/day in 1975, as recommended by the Ministry of Trade and industry with an increase thereafter projected at a compound annual rate of 2.5%. This annual rate is about equal to one-half of the growth of the Gross National product (G.N.P.) in Nigeria during the past decade of 1960 to 1970.

The assumed industrial water requirements for the year 1975 - 2000 is shown below.

Daily Industrial Water Requirements

Target Year	Cu.m/day
1975	6,825.0
1980	7,735.0
1990	10,010.0
2000	12,740.0

See appendix for the of the daily Industrial water consumption for the city of Ilorin.

7. Total Average Daily water requirements and water demand loads.

The average daily aggregates of domestic, public and commercial and industrial water consumption, for the years 1975, 1980, 1990 and 2,000 are presented below and shown in the dig of sufficiency of the water sources of the city of Ilorin.

Fig 14

TOTAL DAILY INDUSTRIAL WATER CONSUMPTION IN THE CITY OF ILORIN

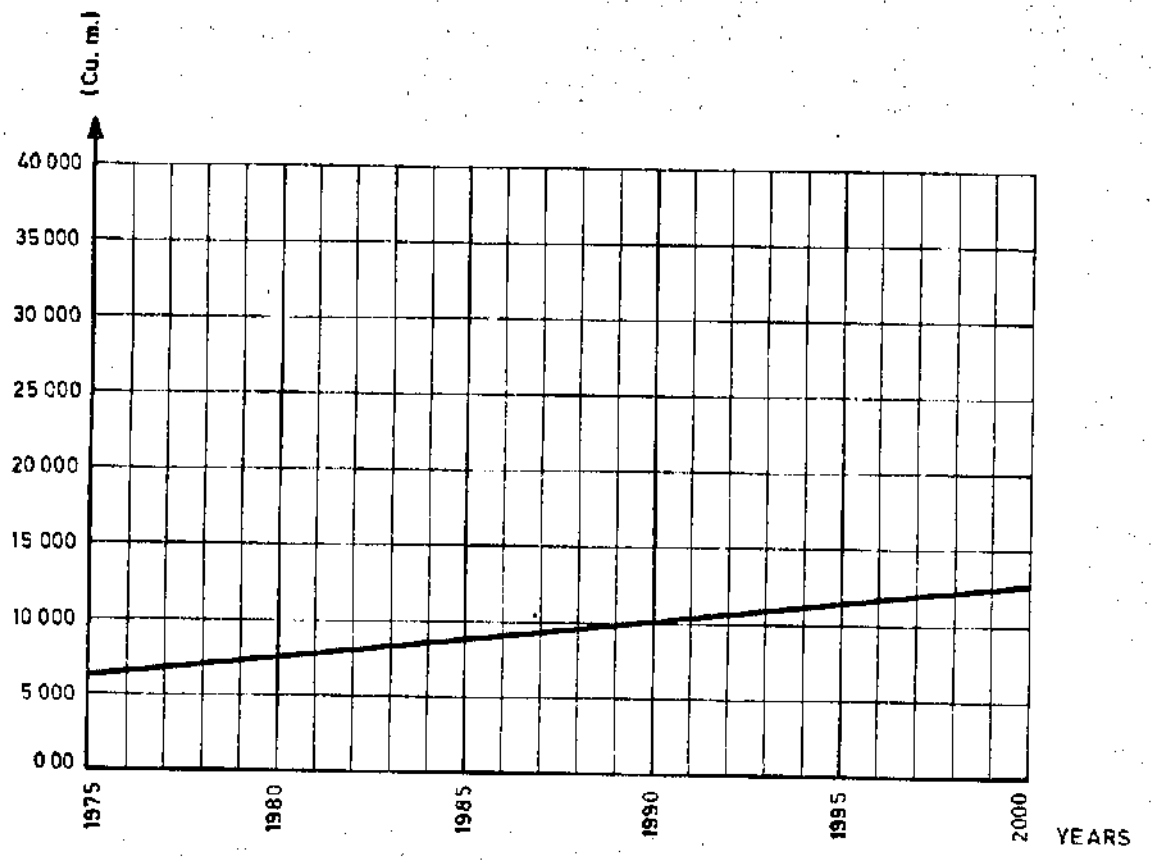
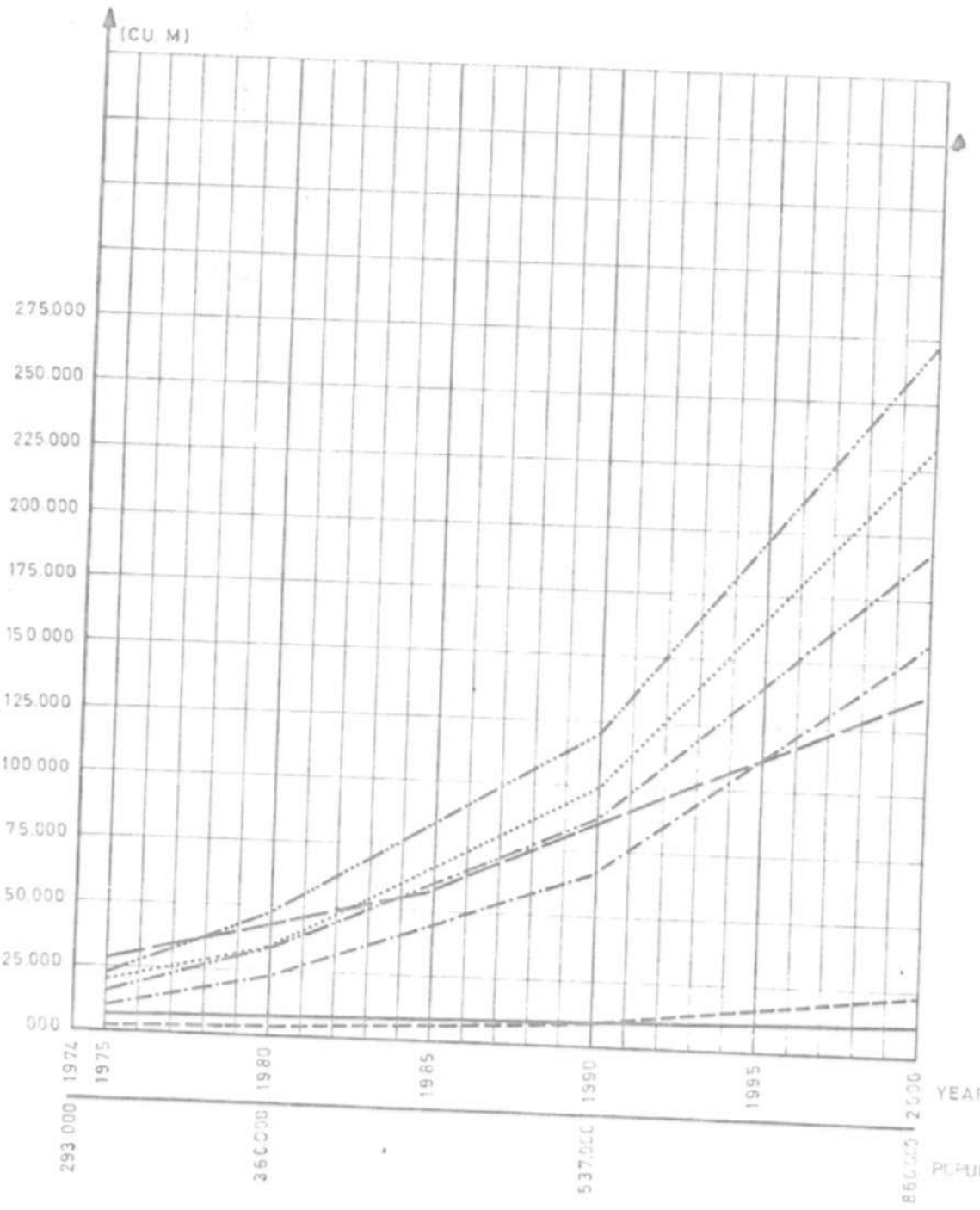


Fig. 15

SUFFICIENCY OF THE WATER SOURCES OF THE CITY OF ILORIN IN CONNECTION WITH DOMESTIC PUBLIC AND COMMERCIAL AND INDUSTRIAL WATER NEEDS OF THE CITY



——— DAILY INDUSTRIAL WATER CONSUMPTION

— — DAILY PEAK OF DOMESTIC AND INDUSTRIAL WATER CAPACITY OF ASA RIVER WATER SUPPLY SCHEME

– – – – DAILY PUBLIC AND COMMERCIAL WATER CONSUMPTION

—·— AVERAGE DAILY DOMESTIC, WATER CONSUMPTION

—··— AVERAGE DAILY DOMESTIC, PUBLIC AND COMMERCIAL, AND INDUSTRIAL WATER CONSUMPTION

—···— DAILY PEAK OF DOMMESTIC WATER CONSUMPTION INCLUDING PUBLIC AND COMMERCIAL, AND INDUSTRIAL WATER CONSUMPTION

..... DAILY PEAK OF DOMESTIC WATER CONSUMPTION

Population and Average daily domestic, public and commercial industrial and total water requirement

		Water Requirements			
			Public		
Target year	Population	Domestic	Commercial	Indust.	Total
1975	304,000	10,335	1,550	6,825	18,710
1980	360,000	23,040	3,450	7,735	34,225
1990	537,000	66,050	9,900	10,010	85,960
2000	860,000	156,520	23,500	12,740	192,760

8. SUFFICIENCY OF WATER SOURCES:

At present the total water yield for the city of Ilorin is almost 10,370 cu.m/day. The present water sources in Ilorin are the Agba-River impounded reservoir and the new reservoir under construction located at the Asa River south of Ilorin city. After the completion of the Asa River impounded reservouir, the total water yield will be increased to 105, 560 cu.m/day according to the planning report of the TAHAL CONSULTANTS NIG. LTD.

The water yield from the new water works at the Asa River is enough for the area's water needs until 1980. Steps for reinforcing these water works or for construction of new ones must be undertaken by the next few years at the latest. The Asa River at present will form the main water source for meeting the citys' requirements until 1990.

9. THE PROPOSED WATER SUPPLY SYSTEM:

On the assumption that Asa River Dam will form the city's main water source in the years to come, the treated water will be delivered through raising mains to the ground level reservoirs and to elevated water tanks.

Also a raw water raising main will deliver supplemental water to the existing Agba river treatment plant. A distribution network will receive water from the ground level reservoirs and elevated water tanks and convey the supply throughout the city of Ilorin.

SECTION 2

SANITARY SEWERAGE SYSTEM:

The lack of a complete water borne sanitation system for the whole city, creates extremely unpleasant conditions of living, is a source of odor, and a breeding place for flies and involves a great danger for the health of the people.

The new Sanitary Sewer System:

The general outline for the probable future development of the city's sanitary sewer system is presented in the sanitary system in the appendix. As it is shown on this drawing there are two main trunk sewers which are ending into the treatment plant at the North perimeter of the Master Plan where a sewage treatment will be built in the final stage of development. The implementation of the sanitary sewer system will proceed by stages following the expansion of the city.

3. STORM WATER DRAINAGE:

Construction of a storm water sewer system

The construction of an integrated storm sewer system does not present any serious difficulty as the whole areas of the city presents mild slopes toward natural water courses. Two systems of storm sewers may be applied in Ilorin namely; the underground closed sewer and the open channels. Considering the general ground configuration of the city, both system may be used. The underground in certain areas,like the city's center and the open channels in the remaining areas (see appendice for the storm sewer system flow diagram)

4. ELECTRICITY:

At present, electrical energy in Ilorin city is supplied from the hydro-electrical power plants from Kainji Dam by the National Electric Power Authority (NEPA) The existing grid has been installed by N.E.P.A. and consists mainly of overhead lines. However, this grid is inadequate to meet the near future demands.

Forecasted Average Annual Electrical Energy Consumption and required Capacity for the Years 1980, 1990, 2000.

	1980	1990	2000
Population	360,000	537,000	860,000
Electricity consumption (MWH)	118,800	300,720	1,118,000
Required installed capacity (MWH's)	29.7	66.83	223.6

Source - Master Plan Ilorin (Dox - Nig - A93

According to the above table, the percentage increase of the required capacity is 153% for the period 1980-1990 and 272% for the period 1990 - 2000. In order to meet the future demand. The following projects must be carried out.

- The estension of the existing network
- The addition of new network as needed
- The establishment of a broad and flexible programme for the erection of new sub-stations. To meet these needs, the extension of the 33 kv line up to the heavy industry areca is proposed together with the construction of a new main transformer station 33/11 Kv in the same area, for economy and flexibility. All the new network must be underground except the 33 Kv line that could be overhead. The existing overhead lines should gradually be substituted for underground ones.

5. TELECOMMUNICATIONS:

The existing telephone connections in Ilorin are inadequate. A projected population of more than 5,000 in habitants should be progressively equipped with automatic urban telephone exchanges of corresponding capacity. The telephone network includes telephone house connections and all the exchanges and intrastructure required to achieve the necessary and efficient functioning of telecomminications in the city (domestic, commercial institutions, and industrial)

Total Telephone Connections in Ilorin up to the year 2000.

Population			Total Telephone Connections		
1980	1990	2000	1980	1990	2000
360,000	537,000	860,000	9,180	23,896	64,070

Source; Ilorin Master Plan DOX-NIG-A93.

6. GARBAGE COLLECTION AND DISPOSAL

1. Collection

Garbage collection is usually the most expensive phase of the entire refuse disposal operation. It can cost between 50 - 80%. Economics may be achieved here if thorough analysis of the people's habit, location is done so as to know the best collection activities e.g. pick up hawl off route time and improving refuse collection efficiencies.

2. Disposal Method:

(a) The three main methods of garbage composting and garbage incineration.

The Sanitary Landfill Method:

Landfill method is the most economical if enough land is available within a reasonable hawling distance from

the center of the city. This method may be employed for the first years of development. The chosen sites must be mildly sloping ground consisting of easily dug soil. The area should be estimated on the basis of 8 acres per 100,000 population, assuming a compacted fill with a final depth of 6-8 ft.

(ii) Garbage Composting Method:

In the garbage composting method, the material is ground, stored in open places and controlled in such a way that air can reach and ferment every part of it. Temperature of up to 150 ^{o}F are generated due to the natural heat renders seeds pathogenic micro-organism etc. innocuous. Fermented material can be used as fertilizer. About 2 acres per 100,000 population are needed for the functioning of a composting plant/

(iii) Garbage Incineration:

A temperature of about 2,200 ^{o}F is required for burning garbage. Domestic rubbish has little value as fuel its calorific valve being 1,800 BTU per lb as compared with 13,000 BTU per lb for coal. simple garbage burning is not therefore profitable.

CHAPTER 4

POPULATION AND ECONOMIC PROJECTION

AND GENERAL NEED

SECTION1: Population and Economic Projections:

1. Population projections: The future population of the city of Ilorin.

Future population projections for the city of Ilorin based upon past trends would lead to a figure for the year 2000 which appears to be acceptable if we take into account the economic structure of the city, the rate of emigration and immigration, the relatively high natural rate of growth and the overall rate of growth of the country's population.

Projected Population in Thousands

Year	Population at end of period	Annual rate of change
1963-74	293	3.1
1974-80	360	3.5
1980-85	436	3.9
1985-90	537	4.3
1990-95	675	4.7
1995-2000	860	5.0

The average rate of population growth of Ilorin for this period is = 4.2%

Source - Report No 3 (DOX - NIG - A93)

2. The Active Population of Ilorin

According to the survey done by the consultants in late 1974. The active population in Ilorin was found to be 123,775 persons. The labour participation ratio was roughly 45% of the total population.

This figure is considerably higher than the estimated national average of 39.1% for 1974 because female employment is common and becuase Ilorin has grown dramatically from 4o-6o,000 in 1952/53 to about 300,000 today, mainly as a result of immigration. As a result , the non-working, older age groups form a very small percentage of the population.

3. THE FACTORS WHICH WOULD INCREASE THE LABOUR PARTICIPATION RATIO ARE:

   (a) The fall in the natural rate of growth from 3.1% in 1974 to 2.8% in 2000. This will increase the relative share of the 15-64 years of age groups.

   (b) Increase in immigration.

   (c) Decrease in emigration

4. FACTORS RESPONSIBLE FOR DECREASE:

   (a) The increasing pace of educational opportunities and the associated tendency for persons to stay at school longer and enter the active labour force later.

   (b) The increase in per capita income and the improvement in lying standard (This temps people to stay at home or retire early e.g. woman.

   (c) Married immigrants with good job will soon bring their families. This will increase the non-working population of Ilorin and counter balance the effect if the fall in the natural rate of growth.

   (d) International experience shows that the labor participation ratio rarely rise above 44-45%. The high ratio of Ilorin is due to the low income levels which will change with economic development.

SECTION 2: THE GENERAL DEVELOPMENT NEEDS

1. Housing

Housing needs arise as a result of both the increasing population and the necessity to improve the existing housing situation, which involves the reduction of overcroweding and replacement of dwelling units.

Number of Households in the period 1974-2000 and additional dwelling units needed

Year	Existing or projected, population	Population in private household	Average size of households	No. of Households	Additional dwelling needed
1974	293,000	280,000	5.7	49,000	-
1980	360,000	345,000	5.5	63,000	14,000
1990	537,000	512,000	5.3	97,000	34,000
2000	860,000	822,000	5.0	164,000	67,000

Source - Master Plan Ilorin (No 3 (DOX - NIG -A93)

It can be seen that cumulatively, the population increase will create a need for a total of 115,000 dwelling units up to the year 2000.

2. EDUCATIONAL FACILITIES

The additional educational facilities was based on the assumption of an expected increase in attendance over the future years in all the educational divisions. Other higher education establishments such as a university are not related to the populated of the city alone and therefore are not estimated here.

NEED IN SCHOOLS

Population	Year 1974	1880	1990	2000
	293 x 10^3	360 x 10^3	537 x 10^3	560 x 10^3
c/o of school-age groups and desirable attendance.				
(a) Primary (6 grades)	19.6%x65%	18%x80%	16%x100%	14%x100%
(b) Secondary Commercial, vocational school. etc.	12%x10%	12%x20%	11.5x40%	11.5x60%
No. of pupils or students				
(a) Primary	37,325	52,000	86,000	120,500
(b) Secondary, Commercial, Voc. Sch.	3,525	8,600	24,700	59,340
Required no. of schools				
(a) Primary (12-classroom sch. 360 students)	103	144	238	335
Comulative needs Minus: existing (of accpt.	31	24	17	10
standard Additional needs in primary schs.	72	120	221	325
(b) Secondary Commercial Voc. (12 Classroom Sch. 300 student): Cummulative need	10	24	69	165
Minus Existing (of accptable standard)	9	9	9	9
Additional needs in secondary schools	1	15	60	156

3. Health Services:

The present and future needs was made on the basis of the follwoing 3 categories and corresponding standards

(a) Dispensaries, one for every 10,000 inhabitants

(b) Health centers " " " 100,00 "

(c) Hospital with a progressively improving standard of no of beds, rising from the present 1.9 to 6 beds per 1,000.

The table below was aimed at after deducting existing units of health facilities of acceptable standard.

NEEDS IN HEALTH BUILDINGS

Population	Year			
	1974	1980	1990	2000
	293×10^3	360×10^3	537×10^3	860×10^3

2. Standard Accepted

(a) Dispensaries $1/1 \times 10^4$ inhabitant

(b) Health Center $1/1 \times 10^5$ inhabitant

(c) Hospital (beds per 1000 people) 2 3 4 6

3. Dispensaries (in units)

(a)	Total requirement	30	36	54	86
(b)	Minus existing of acceptable standard	1	1	1	1
(c)	Needs in dispensa-	29	35	53	85

4. Health centers (in Unit)

(a)	Total requirement	3	4	5	9
(b)	Minus exist. of acceptable standard	0	0	0	0
(c)	Needs in Health Centres	3	4	5	9

5. Hospitals (No. of beds)

(a)	Total req.	586	1,080	2,148	5,160
(b)	" Exist. of st	541	541	541	541
(c)	" Need	45	539	1,607	4,619

4. Religious Services:

There are many religious buildings in Ilorin. Most of them are small chambers known as Mosallasi with no specific arrangements and used for everyday prayers. They are mainly located within a compand of houses and serve either a group of families or the personnel of an institution of office.

Other more important but less numerous religious are the Friday mosques (11 in all) the Eid mosque (a large open space for annual religious feasts. The total no. of churches are 18. The Masterplan deals only with only the Friday mosques Eid mosques and churches as the mosallah is merely a domestic place.

The following standards have been adopted for providing the needed religious

1 Eid mosque for every 300,000 inhabitants

1 Main " " " " "

1 Friday mosque for every 20,000

1 Church for every 3,000 parishioners (approx. 20% of the population of Ilorin are christians thus 1/15,000

Requirements in Religious Buildings

	Year			
	1974	1980	1990	200
1. Population	293,000	360,000	537,000	860,000
2. Standard Adopted				
a. Mosque		1/20,000 inhabitants		
b. Churches		1/15,000 inhabitants		
3. No. of Mosques				
a. Total req.	14	17	26	39
b. Minus est.of accept. stn.	11	11	11	11
c. Need in Mosq.	3	6	15	28
4. No. of Churches				
a. Total Req.	20	24	36	58
b. Minus exis. of accepted standard	18	18	18	18
c. Needs in Churches	2	6	18	39

* Comprising Friday Eid and Main Mosques

5. COMMERCE:

The commercial areas of Ilorin are characterized by groups and combinations of informal shops selling a great variety of goods, plus a small no. of larger and well built shops, located in specific areas along i important avenues.

The needs of shops for Ilorin were calculated for two categories: average size and large size shops. These have been calculated as a derivation of the employment force. It is estimated that 123,000 person will be employed in shops in the year 2000 the no. of shops needed was determined by adopting a standard of 2 employees per average size shop and 3 employees per large shop.

NEEDS IN SHOPS

Source (DOX-NIG-A93)

	Year			
	1974	1980	1990	2000
a. Population	293,000	360,000	537,000	860,000
b. Total employment (per employed)	121,050	157800	239,000	384,000
c. Employent in commerce to total employment	48.6%	46.0%	43%	40%
d. " " " (per employed)	58,925	72,500	103,000	154,000
e. " " commercial establishment to Total employment in commerce	25%	35%	50%	60%
f. Employed in commercial estab.	14,700	25,400	51,500	123,200
(i) " " local centers (15%)	2,200	3,800	7,700	18,400
(ii) " " central location (85%)	12,500	21,600	43,800	104,800
g. Employment in commercial estab. to total employment	12.2%	16.1%	21.5%	31.2%
Needs in shops by category				
a. Neighborhood shop (average size)	1,100	1,900	3,650	9,200
b. Shops in principal center	5,200	8,640	18,250	43,700
(i) Average size shops[x]	3,125	5,400	10,950	26,200
(ii) Larger shop[xx]	2,075	3,240	7,300	17,500
Total needs in no of shops	6,300	10,540	22,100	52,900

6. Industry:

The needs for light medium and heavy industries are based on the employment force involved in these activities in the various years of the study.

Distribution of Employment in the Manufacturing Sector.

Employment Distribution %	Year 1974	1980	1990	2000	
Light industry	26,850	4,000	12,450	38,500,	61%
	93.3%	49%	55%		
Medium industry	1,925	4,100	9,700	23,000,	37%
	6.7%	51%	43%		
Heavy industry	-	-	450	1,300	2%
	0.0%	0%	2%		
Total employment in industry	28,775	8,100	22,600	62,800	100%
	100%	100%	100%		

The figures shown for light industry in 1974 appear exaggerated due to the fact that it comprises mainly a great number of domestic (household) manufacturing and not people really employed in light industry establishment.

Industrial Areas

The area requirements for industry as shown in the table below are estimated on the basis of

(a) The industrial employment as the table above shows.

(b) The accepted standards of 200 employed/ha, 50 employed/ha and 20 empl./ha. for light, medium and heavy industry respectively.

Area requirements for industry

Standard Adopted	Year 1974	1980	1990	2000
Persons employed				
Light industry	26,850	4,000	12,450	38,500
Medium industry	1,925	4,100	9,700	23,000
Heavy "	0	0	450	1,300
Area required				
Light industry 200p/ha	134	20	62	193
Medium industry 50p/ha	38.5	8.2	19.4	46.0
Heavy " 20p/ha	0	0	22.5	65.0
Round figure (in ha)	172	28	104	304

Source. Marter plan Ilorin - DOX-NIG- A93. X

CHAPTER 5

LAND USE BREAKDOWN AND INDUSTRIAL ZONING REGULATION.

The following tables gives the breakdown of the total area covered by the Master Plan into the main land uses.

SECTION 1:

Breakdown of Land Use

Land Uses	Areas Sq.Km	%
Residential (communities class v)	106.99	66.9
Central Functions Areas*	9.42	5.9
Industry**	10.62	6.6
Green Areas & Open spaces	16.38	4.2
Other special uses within the city	6.72	4.2
Major road system & Railway (excluding transportation terminals.)	9.87	6.2
	160.00	100%

x Mixed with a percentage residential uses

xx Including 6.25 Sq.Km. Outside and northeast of the City for heavy industry.

xxx Cementary, Psychiatric Hospital, Athletic Center and Colleges.

SECTION 2:

INDUSTRIAL ZONES AND ZOINING REGULATION:

Two main industrial zones for light industry (11) and heavy industry (12) are provided. See Zoning plan Map at appendice.

Zone (11)

This comprises the medium and light industries which need a limited railway connection and that can be established within the city in as much as they do not produce nuisance incompatible with residential areas and other zones of the city.

Zone (12)

This comprises the heavy and large scale industry with direct railway access and is separated from the residential areas. Industries that produces nuisance of any kind will be located here.

SECTION 3:

ZONING REGULATION

Within industrial zones, no buildings or any tract of land shall be devoted to any other use, besides the following uses which are permitted.

(a) Any production process, cleaning, servicing, testing, repair, storage or sales of goods materials and products, which comply with the requirements, and which shall not be injurious or offensive to the occupants of the adjacent premises.

(b) Automobile service and filling stations including autolaundries and lubrications.

(c) Public and private garage and parking sites

(d) Building material warehouses and the like

(e) Contractos or builders offices shops, sale stores and yards.

(f) Fuel and ice sales.

(g) Junk yards

(h) Public utility installations, services and network including headworks i.e. electric lines and power sub-stations, fire stations, water filtration plants, water pumping stations water reservoirs, Telephone exchange, sewage pumping stations and in general all public utilities required for the proper functioning of the industrial establishments, of the same public utilities, and of the whole town. Their establishment is feasible provided they are not injurious to the property and health of all citizen.

(i) Restauramts within the factories.

(j) The type of the trade schools which are suitable to be established in an industrial zone.

(k) Dwelling units for watchmen and caretakers and their families and in general for the families of those employees who have to be located with the premises of industrial establishments where they are employed in this capacity. In that case, the residence is considered as a Secondary use.

(l) Any type of accessory use required for the functioning of the establishment.

(m) Public parks, and playgrounds, or also parks and playgrounds within the premises.

(n) Banks currency exchanges pharmacies restaurants, coffee houses, tobacco shops and the like which should be located in special properly grounds preferably within green areas and separated from the industrial plots as possible.

(o) Vehicle roads as planned, designed and approved and also public transport facilities, i.e. bus terminals and garages, railroad rights-of-way and railway stations for passengers and goods.

(p) Administrative services such as police stations, labour exchange offices, trade unions etc.

PART II: THE BISCUIT FACTORY

CHAPTER 1: THE SITE ANALYSIS

SECTION1:

1. LOCATION:

The town Ilorin lies between latitude 8^{o} 30' N; and longitude 4^{o} 35^{o} E. In Ilorin, there are four industrial zones namely, the industrial/commercial area, the light indusrial area, the motor assembly plant area and the heavy industrial area. The Biscuit factory will be located in the industrial commercial area.

The first three indusrial zones are demarcated for non-toxic producing factory, in fact they are close to commercial and residential area. The site is approximately 3.9 hectares.

2. CLIMATE:

There is no micro-climatic element affecting the site so generally, the climatic conditions of the site is as that of Ilorin, stated as follows:

(i) Temperature

On the average the highest temperature is 2.99 ^{o}C while the lowest is 25^{o}C.

(ii) Wind

The prevailing winds are S.W trade wind during the rainy season, and the wind speed can be as high as 177.4 knots/day. In the dry season, the N.E trade wind is dominant, and the wind speed can be as high as 166.7 knot/day. The wind is particulaly useful in the cooling of biscuits, the east-west orientation of the factory will afford maximum use of this advantage.

(iii) Humidity

The relative humidity ranges between 51.1% to 86.0%. It is suitable for biscuit.

(iv) Rainfall

In the rainy season, March to November, the highest rainfall can be as high as 243.8 mm/mo. While in the dry season, the rainfall can be as low as 10.2mm/mo.

(v) Sun-rays

The critical sun angles for Ilorin are;- vertical shadow angle is 28° while the horizontal shadow angle is 22°. The factory layout follows West-East orientation with the majority of openings (Doors and windows facing North-South directions).

3. ROAD NETWORK

(i) Expressway

The site is bounded by three roads. The express-way, now under-construction, bounds the northern part of the site. The longest side of the factory is parallel to the express-way and the production hall with its folded plate roof can be admired from the express-way. The express-way links the North & South of the country.

(ii) Minor Road

The site is bounded on the western side by a minor road that links the present Lagos-Ibadan road to the express-way. The exit of biscuit is primarily through this minor road either to Ilorin township or other parts of the state or to the express-way en-route to the northern or southern part of the country.

(iii) Internal road

This road bounds the eastern part of the site. It originates within commercial industrial zone and joins at the express-way. It will be used for bringing the raw-materials and also for bringing in factory workers and visitors.

4. UTILITIES:

(i) Water Supply

The Agba and Asa dams provides water to the Ilorin Township. Within the industrial/commercial zone where the site is located a big water reservoir is also located there, therefore there will be constant water supply at high pressure.

(ii) Storm Water Drainage

The site slopes gently towards its western boundary, therefore open channel will be used to drain storm water to the gutters along the minor road. The water from the express-way will be prevented from flooding the site by the gutter that bounds the express-way.

(iii) Electricity

Electrical energy will continue to be supplied by the National Electric Power Authority (NEPA) from the hydro-electric power plant at Kainji dam.

(iv) Telephone

The post and Telecommunication autority will continue to give telephone lines. With their expansion programme more lines will be available for both domestic industrial and commercial uses.

5. TOPOGRAPHY

The site slopes gently towards the western side. Apart from using this slope for storm drainage, it is used in the despatch section of the factory. The loading platform is about 1.2m from the natural ground level, this affords the tailgate of the loading vehicles to coincide with the platform.

6. FACILITIES NEAR THE SITE

Residential: Since the factories that will be located in the industrial/commercial zone are the non-toxic producing type, the zone is very close to two big

residential areas. The Adewole housing Estate on its northern part and another residential area on its eastern side near the existing light industrial zone.

Besides, the township itself provides ample residential opportunity. With the Bus facility that the factory will provide, communication to and from the factory will be ensured.

(ii) Transportation Termianl

The two proposed integrated transportation terminals by the Master Plan will be sited close to the industrial/commercial zone. The one on it's South will ensure connection between the city and the expressway. The one to the east of the zone will ensure connection between Ilorin township and the other areas of the State.

The newly completed international airport is about 20min by car from the site. This will encourage the drift of high skilled labour to the site and Ilorin in general.

(iii) Educational Facility

A primary school is located within this industria commercial zone as it is also close to two large residential areas.

(iV) Marketing Facility

A big market is located within this industrial/ commercial zone, it will be a quick selling sport for the Biscuits. It is about 5 min by bus to the site. The site for machines and the NITECO Company is very close-by for the sale and service of vehicles that will be used for the raw material, Biscuits etc.

(v) Availability of Labour

There is ample opportunity for the large number of unskilled labour force that are unemployed now. Unskilled labour will be needed in areas such as transportation, of packing and parkaging of Biscuits, Catering Service and low administrative jobs. This opportunity will increase the active population of the area.

(vi) Health Facility

The general hospital is about 30 min. by amblance. This will take care of complex health need beyond the scope of that of the factory.

PART II

CHAPTER 1:

SECTION 2: THE LAYOUT OF THE FACTORY

1. Producing capacity

The factory will produce many varieties of biscuits such as: Cabin Gem, Marie, Coaster, Shortcake, Nice and Lincoln. 9000 tons of biscuit per year is the capacity during the first phase and 18,000 tons of biscuit per year after expansion.

2. Orientation

The North-South orientation of the factory is as a result of three factors.

1. The straight-line production flow
2. The site configuration
3. The desire to design with climate. The north-south orientation of the majority of the buildings namely, the production hall the rest-room, the female washing building and the administrative will afford them the best daylighting without trouble from in coming sun-rays.

The production hall is built parallel to the express-way from where the beauty of its folded roof structure will be best appreciated.

The other buildings on the site are the catering building, the washing building for the male workers and the clinic. Sunshading sevice has been provided to prevent them from the east-west sun-rays.

3. RELATIONSHIP OF THE BUILDINGS:

Production hall, administrative building and the workers facilities buildings are arranged close to one another, yet in separate building massess. The separating element is open courtyards which are useful for cross-ventilltion, visual communication, resting place and provides the users with the difference of purpose which each building stands for.

4. CONSTRUCTION

The design of the buildings is based on separate building mess. This permit the use of approriate construction method needed by each one.

The production hall is covered by reinforce concrete folded plates that are monolithically connected to the ring beam by the stiffener. The supporting structural element is reinforced concrete columns. The Administrative building uses reinforced concrete columns as supporting structures while the workers facilities uses hollow-block load-bearing walls. All the buildings uses reinforced concrete slabs for floors. The outer skins are hollow block wall and for the side of the production hall towards the expansion sole, wall cladding of profiled aluminium panels is used.

5. FUTURE EXPANSION

The Administrative and the workers facilities have been design for future expansion only the production hall

CHAPTER 2

THE MAIN FACTORY

The factory is made up of storage space for reception of raw materials, storage space for despatch of Biscuit and the space for manufacturing Biscuit (production hall). Also included here are the loading and the unloading areas.

SECTION 1: STORAGE SPACES FOR RECEPTION AND DESPTCH OF GOODS

1. Location

The raw material storage is located at the eastern end of the production hall. It is located near the preparation space which is the beginning of the manufacturing process. The production flow run in east-west direction and the storage for all varieties of Biscuit is located at the extreme western end of the production hall.

2. Types of good

The raw materials, commonly called ingredients are the following: Wheat Flour, Corn flour, Sugar, Fat Glucose, Skim milk powder, Ammonia - Bi-carbonate, Soda Bi-carbonate, Sodium Chloride, Lecithin, Sodium - Meta-Bi-Sulphate, Flavours/colors and coconut. The finished products are the various types of Biscuits.

With the exception of fat that requires cold storage all the other goods are dry.

3. Loading and unloading areas

The loading and unloading areas are covered by folded plate roofing. They are provided with platform, 2.0m wide, so that mass loading into and unloading from vehicles can take place at a time. The unloading area is provided with weighing facility space for repacking goods damaged in transit and inspection area.

The platform at the storage for Biscuit is raised by 1.2m above the natural ground level so that the tailgate of loading vehicles can coincide with the platform.

4. Handling Machine

Forklift will be used to move goods from platforms to the stores and vice-versa.

SECTION 2: THE PRODUCTION HALL

1. Location

The production hall (1490m^2) is sandwitched between the raw material and the finished goods storage.

2. Areas in the production hall

Preparation of raw material (45m^2) workshop (15m^2) foremen and supervisory offices (15m^2), Quality control and inspection (10m^2), packing and packaging material storage (50m^2), Gem packing (215m^2), Packaging (25m^2), Manufacturing space 1320m^2.

3. Technical specification for the one meter wide steel band Biscuit plant in the production hall.

Item 1: 550 vs Vertical Dough Mixer

Application:

A multi-purpose batch mixer for all types of biscuit doughs especially where a gentle mixing action is an advantage. A detachable tub is advantageous for manual ingredient feeding and for dough fermentation.

Process Control:

The mixing time can be controlled directly by the operator using push buttons or can be controlled automatically by a pre-set time.

Output

The output of the mixer depend on the dough formulation. Batch quantities will normally range from 475.0 kg of very

hard dough up to 550.0 kg of softer dough. Mixing cycle times including loading and unloading the tubs from the machine can range from 15 minutes for soft doughs to 45 minutes for very hard doughs.

Beat Speed

30 R.PM. (Revolution per minute).

Extra to Item 1: 550 vs Dough Tub

Application

A heavy duty tub designed for use with the 550 vertical dough mixer.

Capacity

The tub volume of 0.95 m^2 (33.5 ft^3) will accommodate sufficient ingredients to produce 550 kg of dough.

ITEM 2:

1000mm. wide dough forming machine with synchronised D.C. drive system comprising:

(a) Rotary Moulder

Application

The rotary produces biscuit shapes of soft dough products from hard fed dough.

Mode of Operation

The forcing roll pulls dough from the hopper and presses it against the moulding roll to fill a series of biscuit impressions engraved on the roll periphery. Different type of engraved impressions will produce the type of shape and size of soft biscuit required. The engraved impressions are done on a 205mm diameter gunmetal roll.

Moulding roll speed

The speed can be varied from 0 to 10 meters per minute periphery speed..

(b) Cutting web drive and panner

Application

This assembly of units performs several functions in

Compressed Air Requirement

A compressed air supply of 80-100 p.s.i is needed. Consumption is negligible. An air compressor is not included.

(b) 1000mm indirect fired biscuit oven with turbulence

Indirect fired baking chamber 39725mm long with 3 heating zones each with hot duct thermocouples and indicators including turbulence in the last 2 zones, and built in control panels for burners. It has steel band.

This is a multi-zone, indirect fired oven suitable for general pupose biscuit baking. The oven is divided into a number of independent zones, each comprising a combustion chamber with burner, circulating fan, turbulence fan, and the associated duct-work feeding the banks of radiator tubes. It can operate on both gas and oil with change over made in minutes.

Construction:

The baking chamber are manufactured in mild steel and are continuously welded, steam tight units of strong but light construction for reduced thermal storage capacity, giving quicker response and a saving in fuel and labour costs by reducing the heating up period at the start of production.

Sliding expansion joints are fitted between sections at the end of each zone to relieve the stresses due to expansion and contraction. The inner casing is mounted on a framwork of plate formed frames and enclosed by "lift off" outer covers giving quick access to the electrical conduct and piping runs and presenting a clean external appearance.

Insulation:

Mineral wool insulation of 230mm (9") thickness on the control side and 300mm (12") on the non-control side is provided. An air space is provided between the insulation

and the outer covers, 50mm (2") on the non-burner side and 127 (5") on the burner side. The crown requires 340mm. thickness of spun mineral wool with removable mild steel roof sheets. The base requires 150mm (6") thickness of mineral wool matress insulation.

Heating

The oven is divided into zones of a convenient length each provided with a combustion chamber comprising a stainless steel cylinder lined with high grade refractory brickwork, a circulating fan and banks of radiator tubes.

Radiant Heating System

The products combustion are re-circulate through 4" (102mm) diameter tubes above and below the band. The gases in the radiator pressure to ensure that the goods in the event of leakage.

This system gives maximum economy and temperature stability as only a proportion of the gases are exhausted to atmosphere the reminder are returned to the combustion chamber for re-heating. An adequate area of relief doors is provided on the non-burner side of the combustion chamber and servers as an access to the heat ratio damper.

A double-glazed, hinged inspection door with an external, automobile type spot light is fitted at the end of each zone of the oven on the control side. For additional engineer access, bolted panels are fitted on the non-burner side of the baking chamber at intervals along the oven and in staggered relationship to the inspection dovers.

Controls

Each zone is operated by controls mounted in a panel situated at the centre of the zone, and baking characteristics in each zone are quickly adjustable to suit the product. Controls are provided for heat input, steam extraction, top and bottom turbulence and top to bottom

heat ratio. Each burner is controlled by a modulating thermostatic device which responds to the average of two thermostats in each zone.

C. Oven delivery and drum, stripping gear and drive (1000mm)

Band height is 1219mm, drum diameter is 1168mm standard extension is 2000mm.

(i) Delivery end drum:

To provide the oven band turning point after delivery end extension, and to provide friction drive for same.

(ii) Stripping Gear

To provide a take off point for baked goods, and transfer them to the cooling conveyor.

(iii) Drive

To provide the necessary power for the baking band, and to keep its speed synchronous with the associated plant.

Item 4

Transfer unit stacking, cooling and packing arrangement to provide the equivalent of 130% cooling length (of biscuits on the flat in still air to baking length comprising the following:-

(i) The Biscuit Transfer Unit

Application

The transfer unit takes biscuits from an oven stripper and delivers them to a biscuit stocker or cracker splitter unit.

Mode of Operation:

The transfer unit when supplied with a stacker will deliver the biscuits to the stacking spindle for on - edge stacking. The transfer unit incorporates a bypass web which can be extended over the stacking spindle to deliver the biscuit direct to a cooling/ stacking band where they are penny stacked at the transfer point[illegible]

Table lengths:

The standard length of a cooling section from the centres of the support legs at each joint is 3140mm. The maximum number of sections using the standard dvive arrangement is 5. The number of cooling sections required will depend on the backing time and ambient temperature. Generally one cooling section per 15 meter of oven length is adviced.

(iv) The Packing Table:

Application:

The packing tanle provides a reservoir goods to creaming machines, wrapping machines, tins or trays.

Width:

Two standard widths are available 900mm web width for 800mm wide plants and 1100mm web width for 1000mm web plants.

Table Height:

The standard height to the web is 838mm.

Table Lengths:

The standard length of a packing table from the center of the support legs is 2440mm. The maximum length of table using the standard drive is 12200mm.

CHAPTER 3:

ADMINISTRATIVE AND WELFARE BUILDINGS

SECTION1: The Administrative Building

1. General

The Biscuit factory is an independent one that has its own administration. To accommodate the office staff strenght of 36 person, an administrative building with total floor area of 1100m^2 on two floors (Ground and first floor) has been designed.

The entrance to the office building is emphasised by a 5.0m^2 wide entrance with protruding canopy covered by folded plate.

2. The Ground Floor:

The elaborate entrance leads directly into an area of about 150m^2 mode up of the lobby, the reception area, the waiting area, the display area, the staircase and the suitch (electrical service ...) area.

Also located on the ground floor are the Accounts Section, stationary section, the catering office, stores and toilets. The personnel office with waiting area for job seekers is also here.

3. The First Floor:

The offices of the General Manager and his assistant with their secretaries are located close to the conference room. The Accountant, production manager, purchase manager, Technical manager and the welfare officer with their secretaries are all on the first floor. Clerk office, record store, cleaning equipment store and toilets are also here.

4. Schedule of Accommodation:

Ground Floor:

	Space for:-	No. of person	Area
1.	Catering Officers	2	40m^2
2.	Personnel Officer	1	10m^2
3.	" Officer's Sec. and waiting area.	8	18m^2
4.	Lobby reception, display waiting and staircase	-	145m^2
5.	Electrical service	-	5m^2
6.	General Officers (Clerks)	4	40m^2
7.	Record store	-	20m^2
8.	Cleaning equipment store		10m^2
9.	Escape staircase		10m^2
10.	Male Toilet	4	20m^2
11.	Female Toilet	4	20m^2
12.	Sales Manager	1	20m^2
13.	Sales Clerks	2	20m^2
14.	Cashier	1	20m^2
15.	Telephone Operator	1	20m^2
16.	Stenographer- Typists	2	20m^2
17.	Messengers,	3	20m^2
18.	Drivers	3	20m^2
19.	Cleaners	2	20m^2

	Space for	No. of person	Area
7.	Accountant's Secretary	1	$10m^2$
8.	Stairing and lobby.	-	$75m^2$
9.	Electrical service	-	$5m^2$
10.	Production Manager	1	$20m^2$
11.	Production Manager's Sec.	1	$10m^2$
12.	Purchase Manager	1	$20m^2$
13.	" " Sec.	1	$10m^2$
14.	Record store	-	$20m^2$
15.	Cleaning equipment store	-	$10m^2$
16.	Office clerks	4	$20m^2$
17.	Welfare Officer	1	$20m^2$
18.	" " Sec.	1	$10m^2$
19.	Technical Manager	1	$20m^2$
20.	" Manager's Secretary	1	$10m^2$
21.	Male Toilet	4	$20m^2$
22.	Female "	4	$20m^2$

SECTION 2: THE WORKERS' WELFARE BUILDINGS

1. Introduction:

It is observed that in factories or industries where the workers' welfare is given serious consideration in form of provision of facilities and ammenities, there is high productivity, good relationship between workers, low absentism, and reduce number of strikes or work to rule actions.

Catering service, washing facilities, restroom, health service, transport service and recreation facilities have been provided for the benefit of the workers. The welfare buildings are sandwitched between the factory and the administrative building. Communication between the welfare buildings and the other ones is short and convenient under

4. Rest-Room:

The restroom is 120m^2. It accommodates 30 workers seated. All sort of indoor games can take place there. A T.V. Set and sound set are provided, as well as a kiosk. Payment of salaries can be done there and workers with take-away food can eat there.

5. The Clinic:

The clinic is 100m^2. It contains the nurse's station, laboratory, treament room, pharmacy, record and waiting area. Minor health problems of workers will be attended to here and application of first aid.

6. Wash - up facilities and Locker Rooms (Male & Female)

1. General

For the functional use of the wash-up facilities, the flow is as hereby described. Both male and female workers will clock at the entrance lobby street clothes, boots, raincoats and umbrella are kept at each workers locker in the first locker room.

Workers will then proceed to the wash-up area and then to the second locker room where he/she will put on the work clothes and glooves, and then either go to the Dinning hall or to the factory.

After the working hours. The workers will go to the second locker room to put off the work clothes and then proceed to the wash-up area. From here the workers will go to the first locker room to put on his/her street dress, pack his/her belonggings, clock and then go home.

(ii) Male Wash-up Area:

The design is made considering the future needs. There will be 72 male workers per shift the facilities are provided as follows.

216 lockers in each locker room.

10 wash hand basins (W.H.B)

5 Urinals

5 Showers

5 Water closets (W.C.)

1 Drinking fountain

(iii) Female Wash-up Area:

The design is made for maximum expansion. There will be 90 female workers per shift then facilities are provided as follows.

100 lockers in each locker room.

5 wash hand basin (W.H.B)

2 Showers.

2 Water closet (W.C)

1 Drinking fountain.

CHAPTER 4

THE RAW MATERIALS

SECTION 1: WHEAT

1. World Situation

About one-half of the 2,600,000,000 acres (1,052,000,000 hectares) of the cultivated land in the world is used in the production of cereals which provides 80% of food calories produced. About 2/5 of the cereal acreage 500,000,00 acres or 202,350,000 hectares is used for wheat production. Wheat is produced more than rice. It is consumed as food in form of leavened bread, cakes and pastries and macaroni, spaghetti and other semolina products.

2. The Wheat Grain (Kernel)

Wheat is a grass, of the Gramineae family and of the genus Triticum. The grain is a single seed or nutlike fruit called a caryopsis. A grain of wheat is covered by a thin shell, the pericarp and several other cell layers often referred to as the bran.

Inside the bran coat is the endosperm, the storage organ for food for the embryo. The endosperm consists of thin - walled cells filled with starch which is embedded in a protein called gluten, an elastic protein substance present only in wheat. Gluten is essential for making light or leaven breads.

The embryo or germ is located at the base of the grain, the other end of the grain has hairs. The germ is a miniature plant with rudimentary roots and leaves.

3. Uses of Wheat:

The composition of kernel varies considerably because of climate and soil variation but on the average, the kernel contains about:

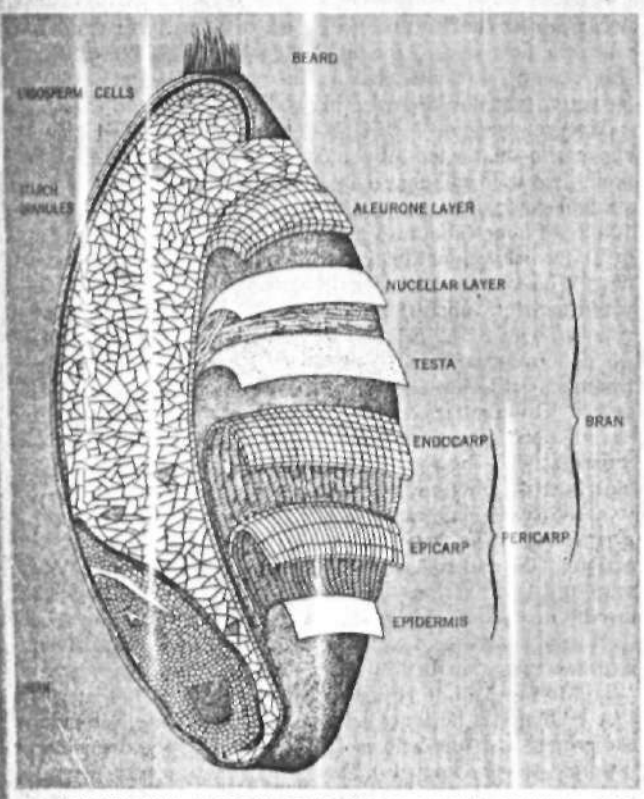


FIG. 1.—LONGITUDINAL SECTION OF A WHEAT KERNEL SHOWING BRAN LAYERS

botanically, the outer layer of the endosperm); (2) the scutellum or the germ, which is the embryo of the future plant; (3) the endosperm, which is composed chiefly of starch, protein and cellulose cell walls, with small amounts of sugars, lipids, gums and other matter. Since the wheat kernel consists of approximately 85% endosperm, it would appear that an 85% extraction of flour consisting entirely of endosperm could be obtained; this is never achieved, however, because separation of endosperm from bran and germ is imperfect and is complicated by the existence of a deep furrow or crease that extends into the middle of the kernel on the ventral side. Admixture of bran particles with the flour during milling darkens its colour and affects baking qualities adversely. Inclusion of germ in the flour lowers baking performance and reduces storage life because of the presence of oil in the germ.

Figure 2 shows a simplified diagram of the flow of stock in a small modern flour mill. The process shown can be carried out continuously since the equipment in most mills is driven by electricity and is automatic. The equipment for milling flour consists essentially of roller mills, sifters and purifiers connected together into a continuous system by inclined spouts (tubes), horizontal conveyors and vertical bucket elevators or pneumatic lifts. Flour, bran and shorts (U.K., wheatfeed) are taken off at different points in the break roller-sifter-purifier line, while germ and additional flour and shorts are taken off the set of reduction roller mills and sifters shown across the bottom of the diagram. A flow sheet for a large mill would be much more elaborate with several machines operating in each step instead of only one as shown in fig. 2.

Flour mills usually occupy buildings with three to six floors. All the machines of one type are grouped on one floor as far as possible. One or two floors may be occupied solely by roller mills; other floors may be occupied completely by sifters or purifiers. The machines are grouped in this way so that stocks can flow from machine to machine by gravity wherever possible.

The Break System.—In the break rollers the wheat kernels are cut open and the endosperm is scraped off the bran coats. The endosperm is released gradually by passing the kernels through a series of four to six breaks, the clearance between the rolls being progressively decreased from first to last breaks. A small additional amount of endosperm may be separated after the last break by impacting, beating or brushing the bran in specially designed machines.

A break roller consists of two parallel-mounted corrugated iron rolls that work as a pair but at different speeds; at their point of contact the rolls move in the same direction; the speed differential is 2½ to 1: that is, the speed of the fast roll is 2½ times that of the slow roll. Sawtooth-like grooves spiral around the surface of each roll; the corrugations become progressively finer (from 10 per in. to 24 per in.) from first to last breaks. The fineness of grinding can be adjusted by increasing or decreasing the gap or clearance, between a pair of rolls.

After the stock leaves the first break rolls, it is sifted on the first break sifter and is divided into several portions according to particle size. The coarsest stock (bran coats) goes to the second break rolls, and the next two coarsest stocks are graded for purifiers; the finest stock is taken off the first break sifter as flour. The clean stock passing through the first (least coarse) cover of the first purifier is middlings; the throughs of the next coarser cover are sizings (U.K., semolina); throughs of the last (coarsest) cover are chunks (U.K., scratch stock). The chunks are ground on the chunks rolls (U.K., scratch rolls). The break work on the coarsest stock is repeated on the other break rolls, sifters and purifiers. The flours from the sifters are grouped according to their purity.

Sifting (Bolting).—Sifters basically are sieves that separate according to particle size or shape. The sifters (U.K., plansifter) move in a gyrating fashion and are equipped with one or more flat horizontal sieves arranged in a vertical nest. Most sieves are rectangular; they are kept clean by various devices such as rubber balls and web belt cleaners that roll or ride under the cloth.

After each break the released endosperm is first sifted on cloths made of wire, silk or man-made fibres (*e.g.*, nylon); some of the cloths have meshes as fine as 12,000 per square inch.

The stocks, after being separated in the sifters, are divided into several grades, which in a large mill are named as follows: (1) coarse, medium and fine sizings (the coarsest particles; U.K., semolina); (2) coarse, medium and fine middlings (medium-sized particles); (3) break flour (finest particles).

Purifying.—The purifiers make it possible to remove free bran particles from the break chunks, sizings (semolina) and middlings. These machines employ an oscillating sieve in conjunction with air currents that rise vertically through the sieve. For the most efficient purifier operation the sizings and middlings must be graded on sifters into several size classifications, each of which contains a relatively narrow range of particle sizes, and each grade must be purified separately.

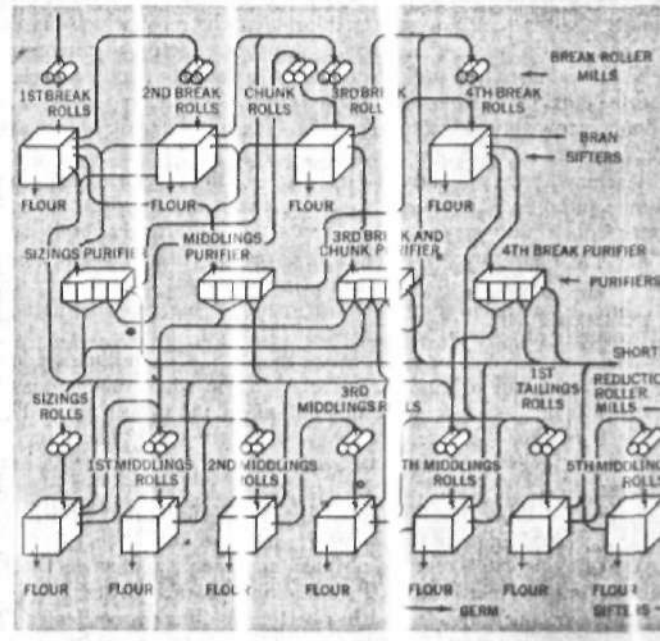


FIG. 2.—FLOW SHEET OF A SIMPLE FLOUR MILL OF SMALL CAPACITY

a. Water - 12%
b. Carbohydrate - 70%
c. Protein - 12%
d. Fat - 2%
e. Minerals - 1.8%
f. Crude fibre - 2.8%

A pound of wheat contains about 1,500 cal. (100g contains 30 cal). Thiamine, riboflavin niacin and small amount of vitamin A are present, but as the milling proocss removes the bran and germ where these vitamins are formed in large quantity they must be added later.

Wheat is not a homogeneous commodity but may be divided into various market classes on the basis of use. These classes can be recognised morphologically on examination of the grain. In United States. The percentage of marketed grain are:-

a. Hard red winter - 60%
b. Hard red spring - 20%
c. Soft red winter - 10%
d. While wheat 6%
e. Durum - 4%

Most wheat is grown for human food but about 10% is needed for seed, and small quantities are used for starch production, paste malt dextose, gluten, alcohol etc. Surplus or inferior wheat are grinded for animal feed.

Baked Products

The chief food use is flour in the form of a backed product. The Hard red winter and spring wheats are used for bread flours. Soft wheats are used for cake, crackers, cookies, pastry and family flours. Durum wheat sernolina is used mostly for making spaghetti and macaroni and other pasta products.

4. Areas of Wheat Production in Nigeria:

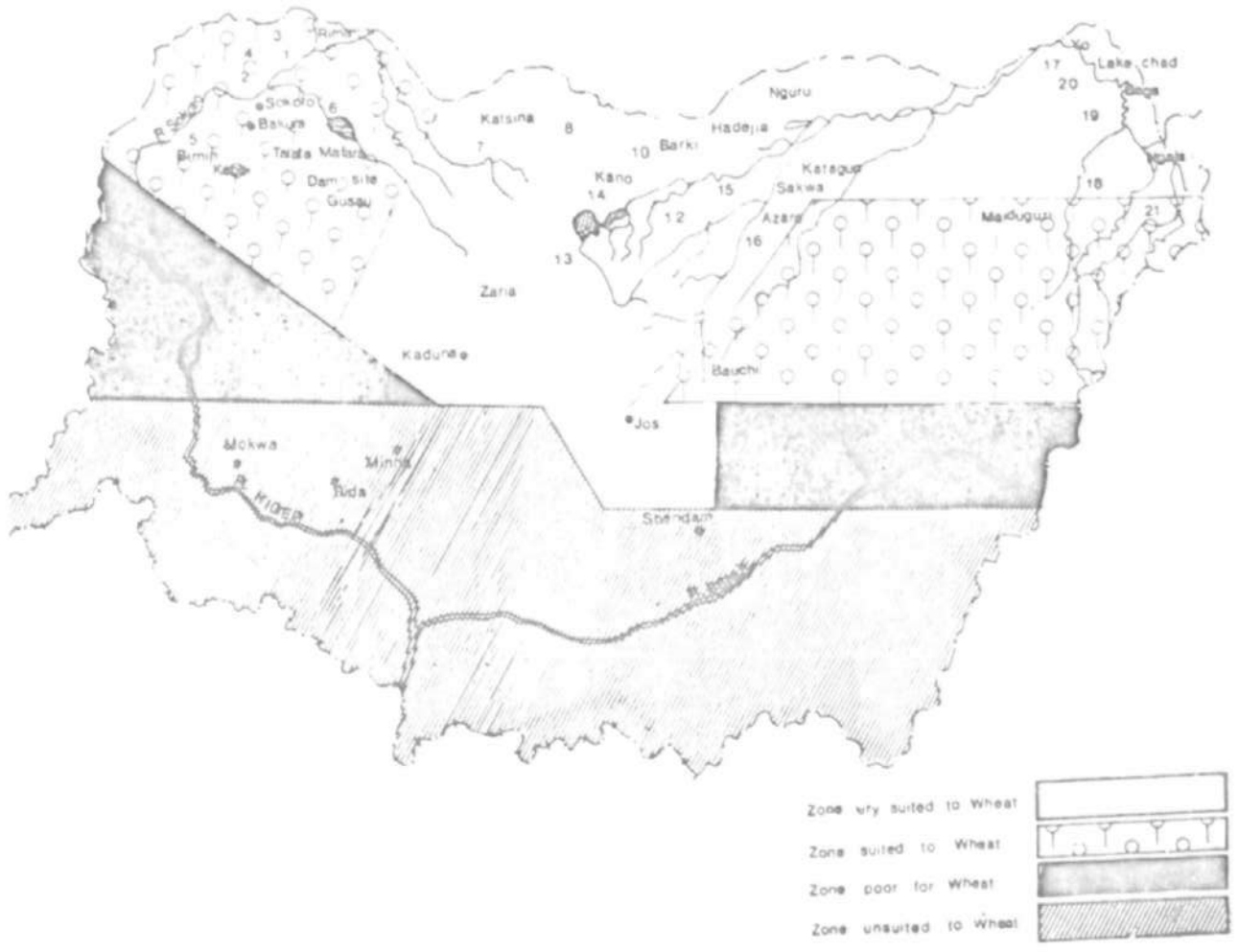
(i) Unirrigated Wheat Production:

Non-irrigated or fadama wheat production is mainly found in the Hadejia River and Rima River valleys. Before the Tiga Dam was operational peak seasonal flooding in the Kano-Hadejia river used to cover large tracts of land near Ringim and beyond Hadejia, which enabled 400-800 ha. of wheat to be grown on residual moisture after the waters receeded.

(ii) Planned irrigated Areas within the Wheat Zone:

The zones designated as suitable for wheat - Sokoto and Maiduguri - Bauchi zones generally have an average 20-60 days with maximum temperatures belows 32.5 ^{o}C and 40-100 days with minimums below 15 ^{o}C in the November-February wheat season. The zone designated as very suitable for wheat consistantly has the major part of the November-February period with maximum temperatures below 32.5 ^{o}C. (70 - 115 days) and minimus below 15 ^{o}C (80-95 days) and wheat grown within this period can be expected to yield well given a good standard of irrigation management.

The table below lists the schemes according to the key on the map and indicates their planned development schedule. THE HJRBDA and the CBDA together will be providing 86% of the area devoted to irrigated wheat upon completion of the irrigation, scheme in 1990. Thus 85-90% of the national wheat production can be expected from the two irrigation authorities.


Sokoto
Birnin
Katsina
Nguru
Hadejia
Barki
Kano
Katagum
Sakwa
Azare
Maiduguri
Lake chad
Zaria
Kaduna
Bauchi
Jos
Mokwa
Minna
Ilida
NIGER
Shendam
Zone wly suited to Wheat
Zone suited to Wheat
Zone poor for Wheat
Zone unsuited to Wheat

Provisional List and Size of Irrigation scheme Located in Potential Wheat

No		Administration Authority.	State	First year of production	Year of projected completion	Area (ha).	Percentage of area of wheat
1.	Gorgnyo +	MNR	Sokoto	1960	1986	11,200 (ha)	25%
2.	Wurno	"	"	1962	1965	600 (ha)	"
3.	Kailmalo	"	"	1965	1981	800 "	"
4.	Tungun Tudu.	"	"	1962	1963	100 "	"
5.	Kardi	"	"	1980	1983	800 "	"
6.	Bakalori	SRBDA.	"	1978	1982	30,000 "	"
7.	Kawaduwa	"	Kaduna	1982	1986	6,000 "	"
8.	Gari River	MANR	Kano	1978	1982	6,400 "	50%
9.	Tomas River	"	"	1977	1980	2,600 "	"
10.	Jakara River	"	"	1979	1983	2,000 "	"
11.	Watari River	"	"	1983	1987	4,500 "	"
12.	Various Minor Scheme 1.	"	"	1981	1985	250 "	"
13.	Kano River phase 1.	HJRBDA.	Kano	1972	1982	22,000 (ha)	60%
14.	Kano River phase 2.	"	"	1979	1986	24,000 "	"
15.	Hadejia Basin	"	"	1959+	1982	12,000 "	"
16.	Ja'amare Basin	"	Bauchi	1981	1990	60,000 "	"
17.	Ya MNR Borno	"	Borno	1959	1965	1,000 "	50%
18.	Scip	CBDA.	Borno	1979	1984	66,800 "	60%
19.	Kironowa Polder	"	"	1981	1982	20,443 "	"
20.	Baga Polder	"	"	1981	1982	20,243 "	"
21.	Tedsiram	"	"	1985	1989	53,800 "	30%

Total area (ha) + 345, 336
Net (ha) wheat = 163,854
+ To be takes arer by SRBDA. within 3 yrs.
+ Initially were small state ministry schemes.
1. These include 20 (ha) at Dabiram, and up to 80 (ha) at Galma in Kaduna State
2. This area is still under surrey; as much as 35,000 (ha) with (40 - 75%) area for wheat.

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2. This area is still under survey, as much as 35,000 (ha) with (40-75%) area for wheat.

Source:- From the report on wheat production and marketing in Nigeria compiled by NAFPP for the Federal Department of Agriculture.

5. Current levels of Productivity:

Wheat yields with irrigation at present has been about 19 ton/ha over the last 15 years. Factors that reduces farmers incentives are:

(i) Low price of flour mill
(ii) Alternative crops are more productive
(iii) Shortage of water
(iv) Tractor hiring operations is not well organised
(v) Inadequate skill of the farmers
(vi) Untimely supply of crop inputs.

Provisional estimates of current wheat productivity levels in metric tons per hectares

Source	Location	yield or mean Range	Year
M.N.R. Borno	Yao	1.1	1962/3°
"	"	1.6	1975/6°
	"	2.0	1977/7°
	Gamboru	3.1	1967/8°
	"	1.73	1970/1+
	"	2.0	1971/2+

Source	Location	Yield Mean or Range	Year
	Gamboru	2.75	1974/5[O]
	"	1.22	1976/7[O]
Ad hoc committee	"	1.5-20	1976/7[X]
S C I P P	Govt. farm Ngala	1.8	1975/6[H]
"	"	2.6	1976/7[H]
Schultz	Same Bauchi	1.3	1974/5[+]
"	Hadejia Kano	2.3	1975/6[X]
M.A.N.R. Kano	"	1.25-20	1974/5[O]
"	"	1.25-2.2	1975/6[O]
"	"	1.0-1.5	1970/7[O]
N.A.F.P.P. Benchmark	"	2.6	1974/5[X]
Survey	Jekarade	2.56	1974/5[X]
"	Kadawa	2.2	1974/5[X]
"	Ring. Fadama	1.7	1974/5[X]
I.R Kano	Kadawa farmer	1.5	1975/6[H]
"	"	3.0	1976/7[H]
HJRBDA	" Govt. F.	2.0	1976/7[H]
MNR Kaduna	Dabiram	1.25	1960/61[O]
"	"	10-20	1975/6[O]
MNR Sokoto	Wurno	2.5	1965/6[O]
	Goronyo seed	0.75	1975/6[O]
	Multiplication	1.25-1.5	1976/7[H]
Ad hoc committee	Goronyo Sokoto	0.75-2.5	1976/7[H]
"	Taloka "	2.0-25	1975/6[X]
"	Tungan Tudu	1.8	1975/6[X]
	" "	1.0-2.7	1976/7[X]

Unweighted Mean - 1.85 ton/ha

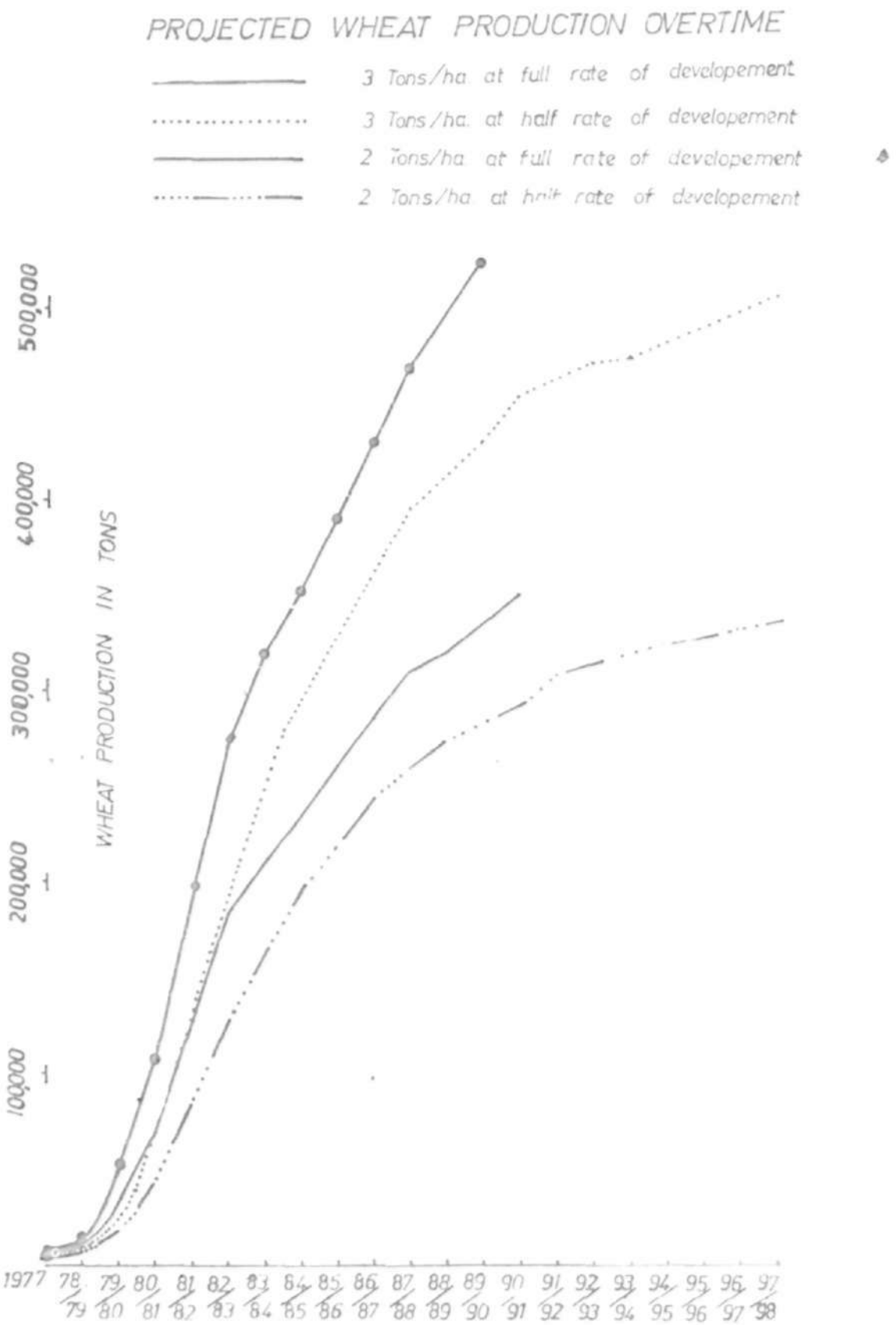
Yield are for small farmers unless otherwise stated

O - estimate of local Agricultural Officer

+ = " from random samples of farmers fields.

H = " from a measured harvest recorded from a measured are.

X = estimate based on farmers interviews by the committee.


PROJECTED WHEAT PRODUCTION OVERTIME
3 Tons/ha at full rate of developement
3 Tons/ha. at half rate of developement
2 Tons/ha at full rate of developement
2 Tons/ha at half rate of developement
WHEAT PRODUCTION IN TONS
500,000
400,000
300,000
200,000
100,000
1977 78/79 79/80 80/81 81/82 82/83 83/84 84/85 85/86 86/87 87/88 88/89 89/90 90/91 91/92 92/93 93/94 94/95 95/96 96/97 97/98

It is the whitest flour and contains the least bran germ and has ash contact of about 0.4%. The ash content is much lower in flour made from soft wheat than from hard wheat.

(ii) First Clear:

It is used in the production of dark bread, such as rye bread it is darker in color than patent flour and its ash content varies from 0.7% to 0.8%.

(iii) Low Grade Flour:

Ash content between 1.0% to 1.3%, it may be used to make dark cookies.

3. Properties and Uses of Flour:

1. General

The three main varieties of wheat as distinquished by their properties are:-

1. Soft wheat
2. Hard spring wheat
3. Hard winter wheat

They differ chiefly in the amount of protein and mineral content.

Soft wheats are lower in protein and ash content than are the hard spring and winter wheats. Winter varieties of Hard wheat are planted in the Autums and harvested the following Summer, while varieties sown in the spring are usually grown in regions where the winter are too severe for the winter type.

When flour is mixed with water to make dough, the protein in the flour is hydrated to form what is called gluten which forms a continous network throughout the dough.

High glutes means high glutem network that has stronger retaining ability for carbondioxide generated in the dough during fermentation. When the dough contains sufficient gluten, so that the gas retention is good the dough bakes into large loaves with soft smooth - texture crumbs.

(ii) Soft Wheat Flours

These flours are used in making cakes, cookies (U.K. Biscuits) pie crusts, crackers, doughnuts, ice box cookies and other pastries. The protein content ranges from 7.5% to 10% and the ash content from 0.32 - 0.48%.

(iii) Hard wheat Flours:

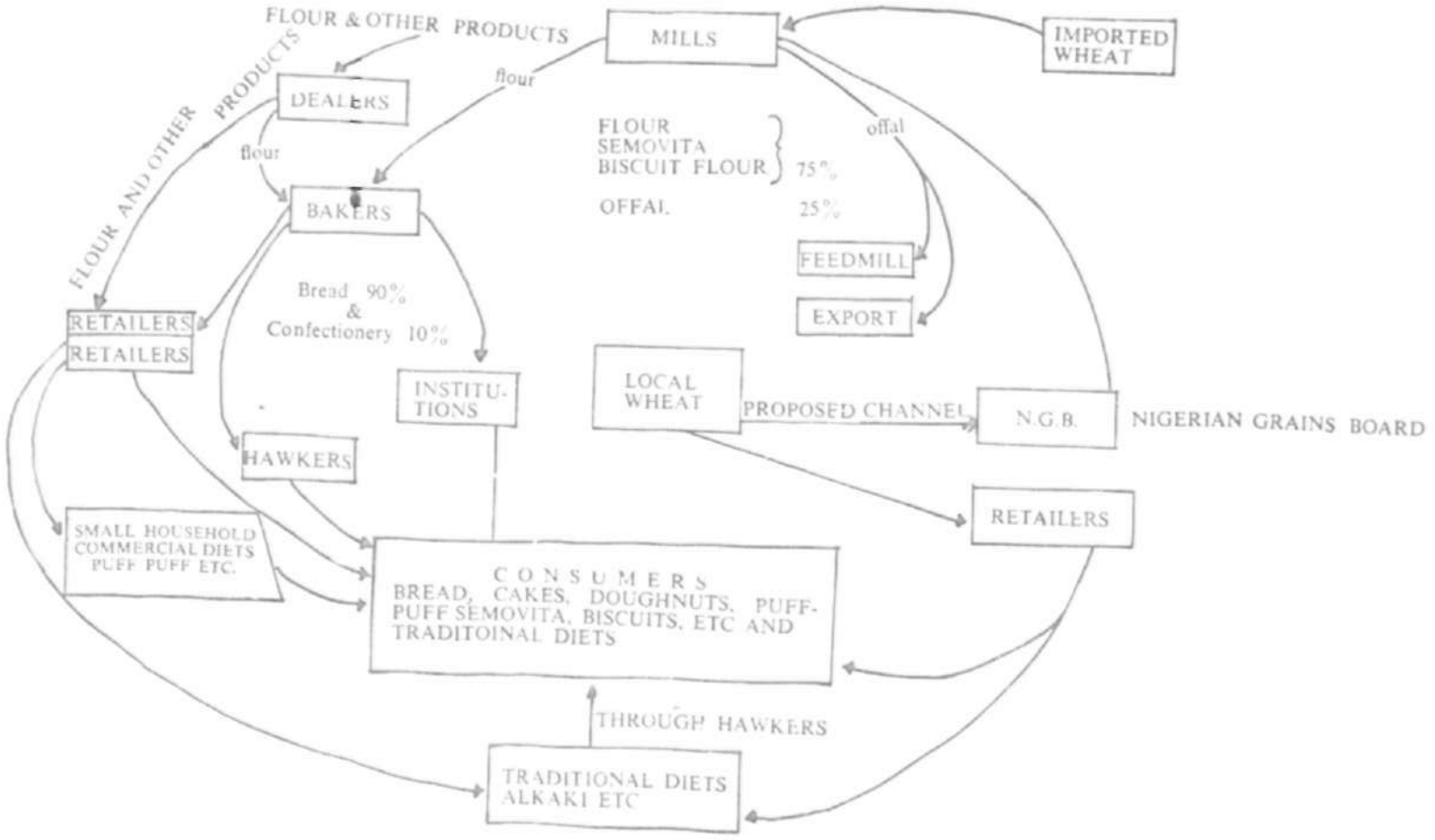
Flour made from hard red spring and hard red winter wheats are used in making white pan (U.K. tinned), bread (both sponge and straight dough), speciality and variety breads, hamburger and similar buns, yeast - raised doughnuts, hard rolls and hearth bread. The protein content ranges from 12.5% to 15.5% and the ash contents from 0.42% to 0.74%.

(iv) Dark Flours:

These flours include rye and whole wheat rye, customarily is produced by blending rye flours with a good, first clear, white flour from wheat to obtain the color and flavour of bread desi red.

In Britain, home grown wheat is mostly soft wheat of low protein and ash content suitable for cakes and Biscuits, but not for breadmaking. Consequently, the British millers generally import strong wheat, such as Canadian Manitoba wheat and with "filler" wheat, such as from U.S. and Australian.

WHEAT AND WHEAT PRODUCTS DISTRIBUTION CHAINS



4. Flour Mills in Nigeris

The first and now the largest flour mill, flour mills of Nigeria Ltd., Apapa (F.M.N.) was established in 1962. Beside flour for bread (85 - 90%) production, F.M.N. which dominates the milling industry, also produces semolina 10%, Biscuit flour (4%) paste below (1%) whole wheat flour below (2.5%) and less than 300 tons of self reising flour. The flour mills in the country are shown below

Flour Mills in Nigeria

Mill Name and Location	Present Staff Strenght	Present Production	Expected Production
1. Flour Mills of Nigeria Ltd., Apapa	1,400	350,000 ton/year	750,000 ton/year
2. Port Harcourt Flour Mill Ltd.	180	50,000 ton/year	100,000 ton/year
3. Life Flour Mill Sapele	250	50,000 ton/year	100,000 ton/year
4. Northern Nigeria Flour Mill, Kano	-	-	80,000 ton/year
5. Maiduguri Flour Mill Maiduguri	-	-	40,000 ton/year
6. Niger Flour Mill, Calabar	-	30 ton/year	120,000 ton/year
7. Crown Flour Mill, Apapa-Lagos	-	-	90,000 ton/year

Source - Federal Ministry of Industries.

The above mills will produce a total of about 1,280,000 tons/year in full production. We need 3,665,000 ton/year of flour to add to the productions. This need can be met either by building more mills or importation of wheat flour or both. Figure of wheat and flour imports to Nigeria between 1962 - 1975 is given below.

Wheat and Flour Imports to Nigeria 1962-1975

Year	Wheat	Flour	Total tones
1962	2,00	96,000	98,000
1963	39,000	34,000	73,000
1964	53,000	4,000	57,000
1965	72,000	2,000	74,000
1966	136,000	3,000	139,000
1967	165,000	5,000	170,000
1968	125,000	5,000	130,000
1969	143,000	1,000	144,000
1970	214,000	-	214,000
1971	376,000	9,000	385,000
1972	279,000	71,000	350,000
1973	300,000	4,000	304,000
1974	310,000	1,000	311,00
1975	294,000	8,000	302,000

Source - Report on wheat production and marketing in Nigeria compiled by NAFPP for the Department of Agriculture.

the center of the city. This method may be employed for the first years of development. The chosen sites must be mildly sloping ground consisting of easily dug soil. The area should be estimated on the basis of 8 acres per 100,000 population, assuming a compacted fill with a final depth of 6-8 ft.

(ii) Garbage Composting Method:

In the garbage composting method, the material is ground, stored in open places and controlled in such a way that air can reach and ferment every part of it. Temperature of up to 150 ^{o}F are generated due to the natural heat renders seeds pathogenic micro-organism etc. innocuous. Fermented material can be used as fertilizer. About 2 acres per 100,000 population are needed for the functioning of a composting plant/

(iii) Garbage Incineration:

A temperature of about 2,200 ^{o}F is required for burning garbage. Domestic rubbish has little value as fuel its calorific valve being 1,800 BTU per lb as compared with 13,000 BTU per lb for coal. simple garbage burning is not therefore profitable.

5. Other Ingredients for Making Biscuits

Other ingredients apart from wheat flour needed for the manufacture of Biscuits are: Sugar, Fat Glucose/Syrup. Chemicals such as Ammonia - Bi-carbonate, Soda-Bi-carbonate, Lecithin, sodium - Metat - Bi - Suphite Butter Flavour skim milk powder and table salt.

Sugar can be bought locally from sugar factory Bacita, while the chemical are to be imported.

CHAPTER 5

BISCUITS

1. General

Biscuit literally means twice cooked. It is a thin, crisp dry cake made from flour, water, sugar, fat etc. but without rising agents so that it may be preserved without deterioration for a long time.

Scientific advances have brought many improvements in the quality and purity of Biscuits. Tests are conducted on new raw materials, as well as those already in use. Health department constantly inspect factories and equipment to ensure purity of the product.

The improvement of packaging methods has contributed to the Biscuits industries. Bulk sales of loose crakers and cookies were once the only means of distribution. The Biscuit barrels of the general store was replaced first, by tins, eventually cardboard cartons were introduced and were themselves later replace by small boxes and bags.

The basic aim in packaging is to provide the consumer with the freshest product possible. One method of achieving this goal is to combine several (usually two or four) individually wrapped packages of biscuits within a single box. On opening the box. the content continues to be protected until each of the separate packages is ready to be consumed. Improved packaging has also encouraged export.

2. Market Survey of Biscuit in Nigeria

Chief H.B. Chanrai of H.A. and Sons/J.T. Chenrai and Co. (PH) Ltd. invited Mr. V.H. Kisnadwala, who has worked for over 30 years in Biscuit factories in India to survey the Biscuit market in Nigeria and prepare a feasibility study. His findings of 1974 resulted in the

establishment of the standard Biscuits Nigeria Limited in Jos. The trial production of this factory began in January, 1977 and the commercial production in February, 1977.

Marketing:

In attempting to establish the size of the biscuits market in Nigeria, the following factors were considered.

(i) Total population in the year 1977 approximately 70,000,000.

(ii) Population growth: 2½% per annum.

(iii) Consumption of Biscuit: 2 kilos per capital.

(iv) An average production capacity of 4,500 tons per annum.

Demand of Biscuits:

It is estimated that the demand of biscuits in the year 1977 was in the region of 140,000 tons. The demand is expected to increase to 171,000 tons by 1985 as shown here.

Year	Population	Biscuit Demand
1977	70,000,000	140,000 tons
1978	71,750,000	144,000 tons
1979	73,550,000	147,000 tons
1980	75,400,000	151,000 tons
1981	77,300,000	155,000 tons
1982	79,050,000	159,000 tons
1983	81,250,000	163,000 tons
1984	83,300,000	167,000 tons
1985	85,400,000	171,000 tons

Source: Feasibility study on Biscuit market done by Mr. V. H. Kisnadwala.

Present Biscuits Making Capacity:

Name of Company	No. of Ovens
Bisco	5
Niger	3
Pioneer	3
Nasco	3
Standard	2
Kaura	2
Niki	2
Riv	2
Jabre	1
Albrix	1

The production capacity of these company is 108,000 tons of biscuits per annum. The present demand of biscuits is 151,000 tons per annum which leaves a shortage of 43,000 tons of Biscuits per annum. To meet the shortage of Biscuits in Nigerian market alone without export, about 10 more biscuits making lines are needed now.

BISCUITS

NO 3

REQUIREMENT OF INGREDIENTS (PER 1,000 KGS. OF BISCUITS)

INGREDIENT	CABIN BISCUITS	GEM BISCUITS	MARIE BISCUITS	COASTER BISCUITS	SHORT-CAKE BISCUITS	NICE BISCUITS	LINCOLN BISCUITS
	KGS.	KGS.	KGS.	KGS.	KGS.	KGS.	KGS.
WHEAT FLOUR	1,010	827	782	907	650	630	720
SUGAR	67	182	166	145	254	280	250
FAT	77	107	154	72.5	188	133	180
GLUSOSE	13.5	25	28	45	25	30	26
SKIM MILK POWDER	-	4.13	13.85	-	25	20	31
AMMONIA-BI-CARB	11.8	9.9	3.45	7.25	4	8	40
SODA-BI-CARB	6.1	4.13	2.10	7.25	2	3	30
SALT	6.1	5.0	5.54	11.0	6	2	60
LECITHIN	1.5	1.65	1.40	-	1	1	70
SODIUM-META-BI-SULPHITE	0.84	1.65	0.30	0.5	-	-	-
BUTTER FLAVOUR	0.34	0.42	0.86	-	6	5	30

BISCUITS

No 4

COST OF INGREDIENTS (FOR 6,300 TONS OF BISCUITS)

INGREDIENTS	QUANTITY REQUIRED TONS	PRICE PER KG. ₦ K	VALUE ₦
WHEAT FLOUR	5,839	0.29	1,693,310
SUGAR	746	0.50	373,000
FAT	604	0.90	543,600
GLUCOSE	136	0.42	57,120
SKIM MILK POWDER	19.5	0.48	9,360
AMMONIA-BI-CARB	60.5	0.47	28,435
SODA-BI-CARB	32.1	0.25	8,025
SALT	39.25	0.28	10,990
LECITHIN	8.6	0.70	6,020
SODIUM-META-BI-SULPHITE	6.0	1.29	7,740
BUTTER FLAVOUR	8.7	2.60	22,620
			2,760,220
		Say ..... ₦	2,760,000

5. Production Process:

(i) The required ingredients:

These are wheat flour (protein content 7.5-10%, ash content 0.32-048%), corn flour, sugar, Fat Glucose, skim milk powder, Ammonia - Bi-carbonate, soda - Bi-carbonate, salt, Lecithin, sodium-meta - Bi - sulphite Butter flavour and coconut.

(ii) Preparation:

Wheat flour is sieved while the sugar, either granulated or in cubes is finely ground. The required ingredients for the desired type of biscuits are then measured by weight into the dough tubs which are equiped with wheels. The dough tubs are then wheeled to the vertical mixing machines.

(iii) Kneading and Mixing:

This is carried out by the vertical dough mixer. It works the ingredients into throughly mixed dough. Batch quantities ranges from 475.0kg of very hard dough up to 550 kg of softer dough Mixing cycle time including loaching and loaching and unloading the tube from the machine can range from 15 minutes for soft doughs to 45 minutes for very hard doughs.

(iv) Moulding of Soft Biscuit:

This is done by the rotary moulder which produces biscuit shapes of soft dough products from hard fed dough. The forcing roll of the rotary moulder pulls the hard fed dough from the hopper and presses it against the moulding roll to fill a series of biscuit impressions engraved on the roll periphery.

Many biscuit impressions can be engraved on the moulding roll to produce varietie of soft biscuits.

(v) Cutting of Hard Biscuits:

The cutting machine which is an assembly of many units that performs several functions is used in cutting or embossing the dough. The dough sheeter which is the first unit in the cutting machine unless preceeded by a laminator reduces the bulky dough into thick sheet.

The dough roll further redress the thickness of this sheet as required. The rotary cutter then cut or emboss the dough sheet to the shape of the required biscuit. The cutting machine is equiped with conveyor that returns scrap dough from the cutting section to the Distributor.

The cutting machine also has fixed discharge panner which overhangs the end of the oven and transfers the dough pieces at the oven band. The powder sprinkler sprinkles flour, powder, sugar, salt etc. over the product on the conveyor.

(vi) Developing and Baking:

This is done in the indirect fired oven suitable for general purpose biscuit baking. The oven is divided into a number of independent zones, each comprising a combustion chamber with burner, circulating fan, turbulence fan, and the associated duct work feeding the banks of radiator tubes. The burners can operate on both gas and oil with changover made in minutes. Products of combustion are circulated in a sealed system and do not contact the food being backed.

The first and second zones are for developing the biscuits while the third and the fourth (if the fouth zone is present) are for coloring or baking.

The biscuits leave the oven at temperature between 150°C to 200°C.

(vii) Stacking and Cooling:

The stacking machine takes aligned biscuits from a transfer conveyor and stacks them on edge. Cooling of biscuit is done on the colling table. Stacked biscuits are carried on an open mesh band over a plenum chamber supplied with low pressure air from a centrifugal fan. The open mesh of the band allows air to percolate through the stacked biscuits to effect cooling.

(viii) Packing and Wrapping:

The packing table provides a reservoir of biscuits when manually transferring cooled good to wrapping machine, tins or tray e.g. for gems. Alternatively the machine arrangement where high speed stacking and handling for feeding directly into the wrapping machines can be used as in the cases of nice or tea time biscuits.

(ix) Packaging and Storage:

Wrapped Biscuits are again packed in larger containers such as cartons and corrugated boxes. On opening the carton or boxes, the contents continues to be protected by the wrapping materials. Packaging is particularly useful for protecting the biscuits from crushing and for easy handling during transportation. Biscuits are stored and distributed in parkaged form.

Vertical mixers

Pétrins verticaux

Senkrechtmischer

450 VS

2 spindle 450 Kilos capacity

2-Spindelmischer
Teigfassung: 450 kg

650 VS

3 spindle 650 Kilos capacity

3-Spindelmischer
Teigfassung: 650 kg

- Spindle mixers can be used for soft and hard doughs.
- The mixing blades lift and cut the dough with a gentle action especially useful on some cracker doughs and where minimum increase of dough temperature is desirable.
- The bowl is removed from the machine for filling and also to discharge the dough.
- By using several bowls to each mixer, cracker sponges can remain in the bowl during fermentation and be returned to the mixer for final dough making.
- The bowls can be supplied with adaptors to fit tub tilting machines when mechanical discharge into forming machines is required.

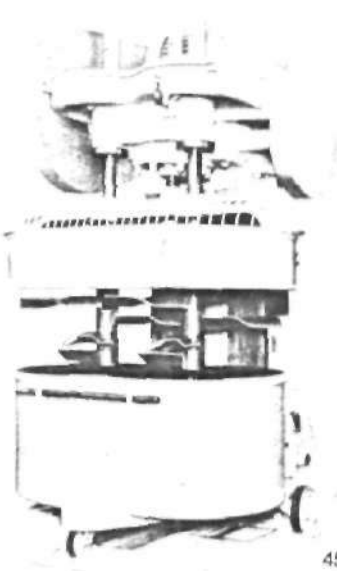
Die Spindelmischer können für weiche und harte Teige verwendet werden.

Die Mischwerkzeuge heben und schneiden den Teig sehr schonend, was bei der Verarbeitung von einigen Kracherteigarten vorteilhaft ist, ganz besonders in Fällen, in denen nur ein geringer Teigtemperaturanstieg erwünscht ist.

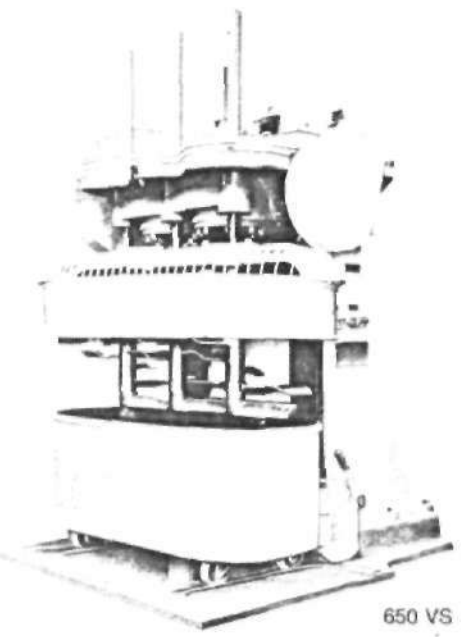
Die Mischschale wird zum Füllen und Entleeren aus der Maschine herausgenommen.

Bei Anwendung mehrerer Mischschalen pro Mischer kann der Kracherteig während der Gare in der Schale gelassen und zur endgültigen Bearbeitung wieder in den Mischer zurückgegeben werden.

Für eine mechanische Entleerung des Teiges in die Gußeisenformmaschinen mittels Hebe- und Kippvorrichtungen sind die Mischschalen mit Zusatzteilen lieferbar.



450 VS



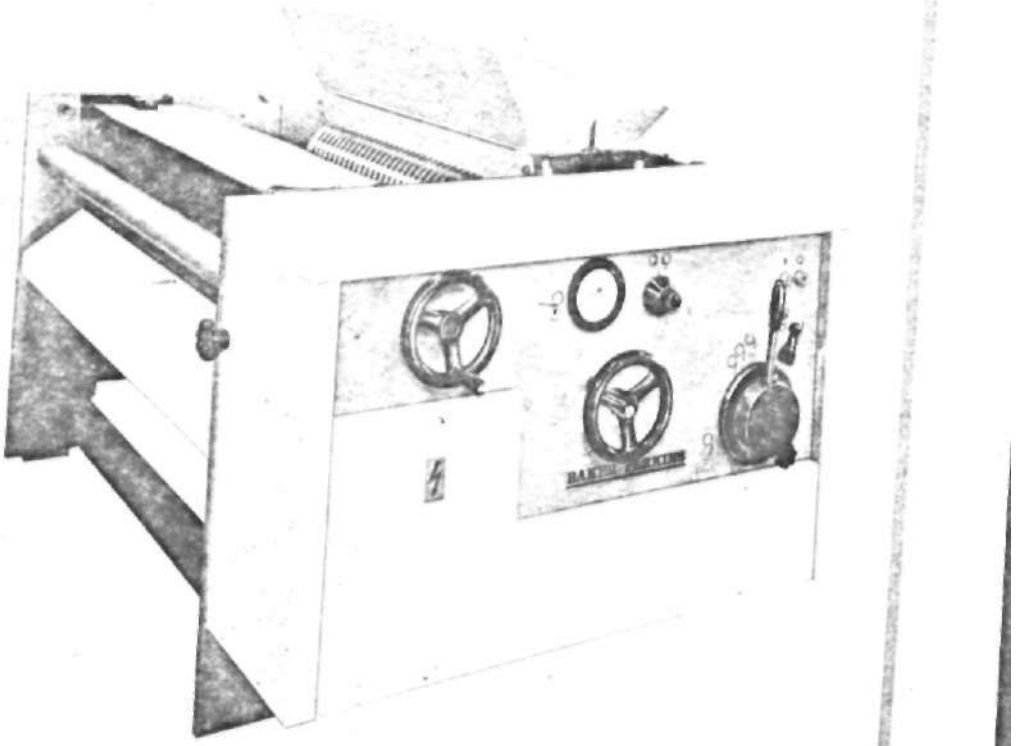
650 VS

BAKER PERKINS LIMITED

Data sheet **073**

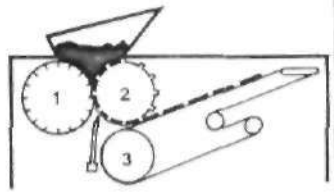
62BA rotary moulder

Application The rotary moulder produces biscuit shapes of soft dough products from hand fed dough.



62BA rotary moulder

Mode of operation



The forcing roll (1) pulls dough from the hopper and presses it against the moulding roll (2) to fill a series of biscuit impressions engraved on the roll periphery. Excess dough is removed by a scraper on the moulding roll surface and is returned to the hopper by adhesion to the forcing roll.

The extraction web is pressed against the moulding roll by a rubber covered pressure roll (3) and the dough pieces adhere to the web and are extracted from the impressions in the moulding roll.

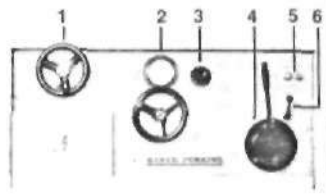
The extraction web terminates in a nosepiece enabling the dough pieces to be transferred to another web.

Machine widths

The rotary moulder is manufactured in two widths. The nominal operating widths are 800 mm and 1000 mm.

Controls

The operator controls are mounted on a facia panel on the side of the machine. Machines can be supplied with controls on the right hand or left hand side.



1. Extraction web tension.
2. Pressure control for extraction web, with pressure gauge.
3. Roll speed control.
4. Moulding roll scraper adjustment.
5. Start/stop push buttons.
6. Electrical isolator switch.

The thyristor control equipment for the variable speed drives is attached to the main frame under the guard.

Roll changing procedure

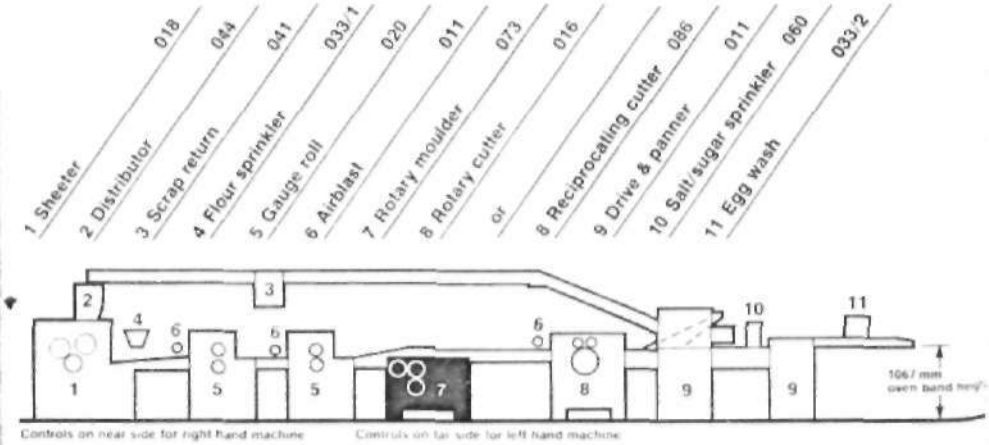
Each moulding roll is fitted with its own gearwheel and bearings.

To remove a roll:

1. Swing hinged hopper away from rolls.
2. Move scraper to 'park' position.
3. Remove bolts and lift off bearing keep plates.
4. Lift out existing roll using a hoist.

Replacement is a reversal of this procedure.





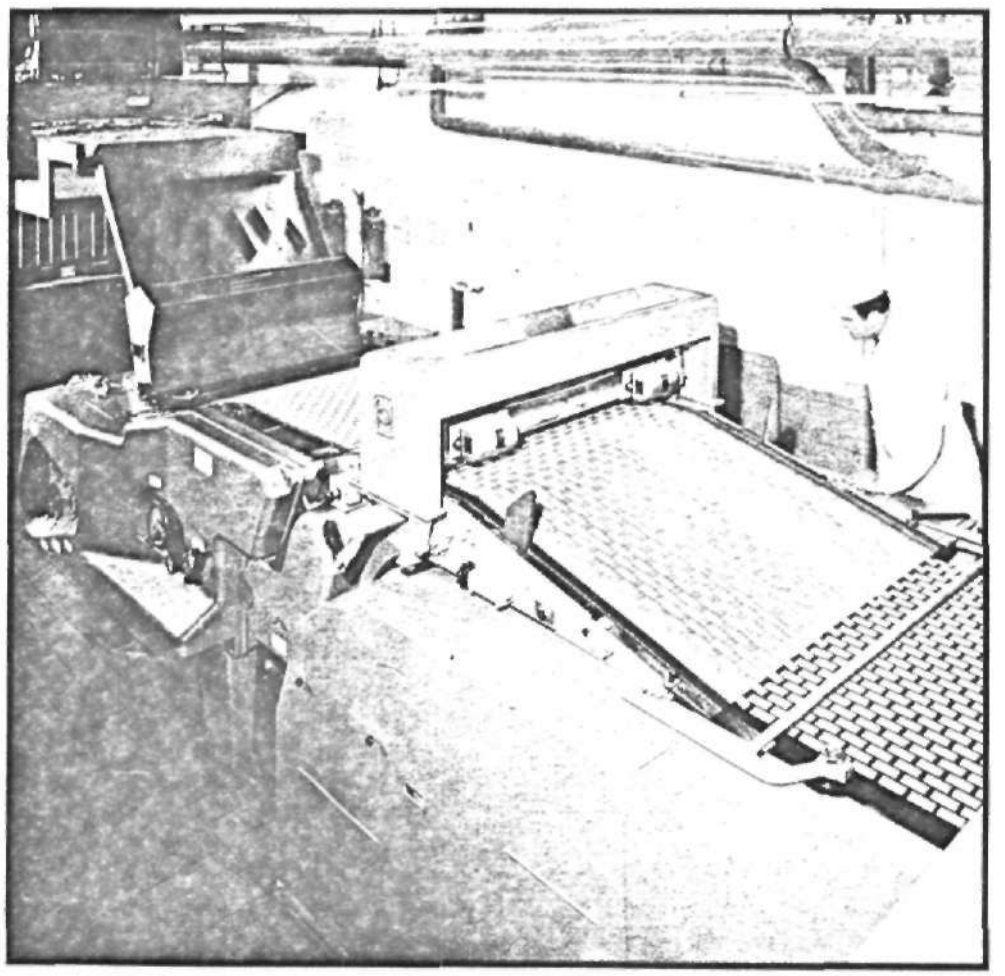
A cutting machine will comprise some or all of the above units and the appropriate data sheets should be read in conjunction with each other.

Moulding and depositing machines

Mouleuses et Déposeurs

Gebäckformer und Dressiermaschinen

Baker Perkins



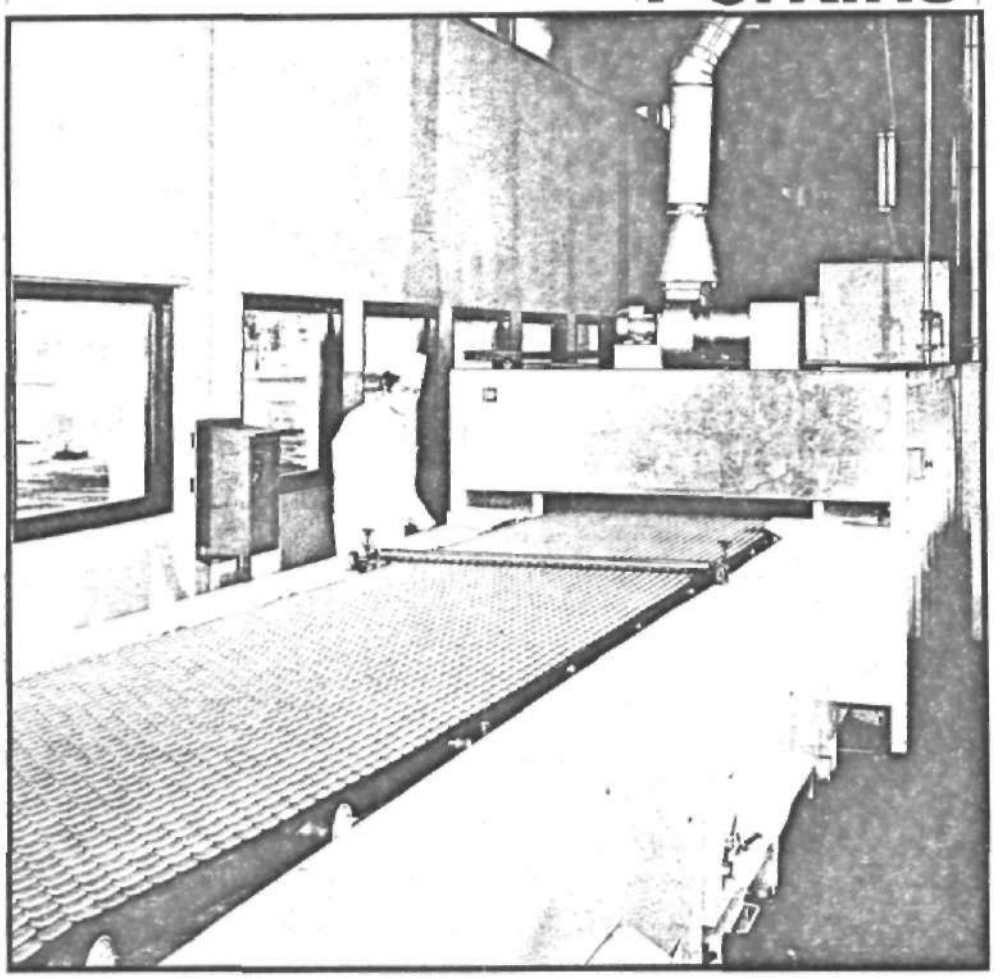
88 BT

Biscuit baking ovens

Fours pour la production des biscuits

Backöfen für Kekse

Baker Perkins



Indirect: oil or gas

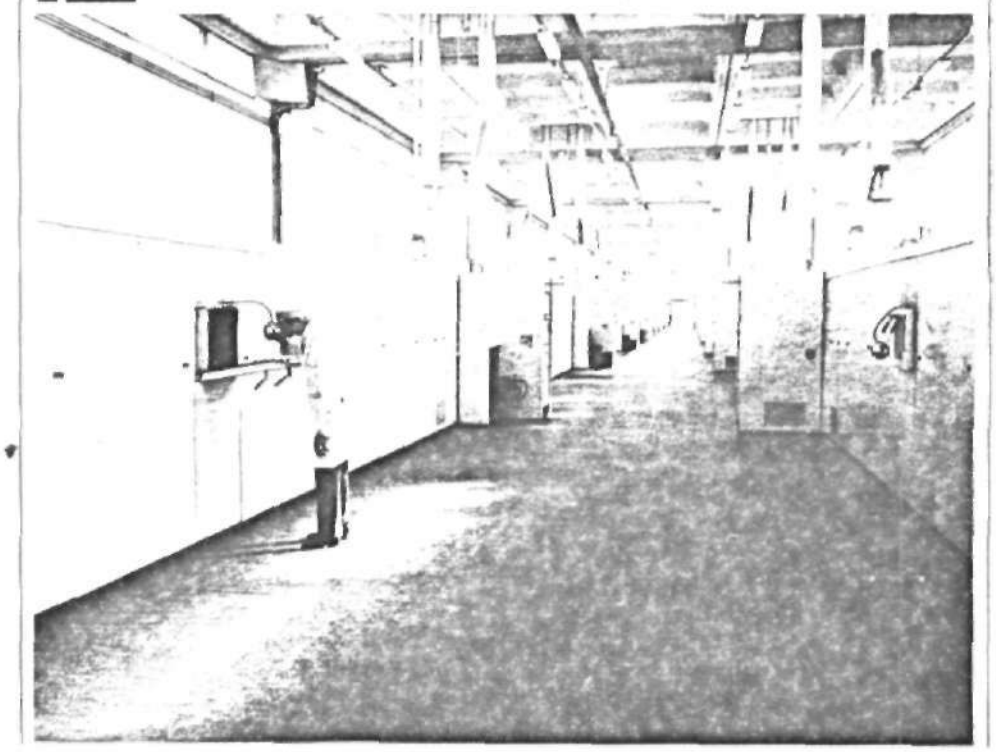
Chauffage indirect: mazout ou gaz

Indirektes Heizsystem: Öl bzw. Gas

- Products of combustion are circulated in a sealed system and do not contact the food being baked.
- Each zone has its own Baker Perkins fully modulating draught tube burner and control panel.
- Top to bottom heat ratio can be pre-set and is independent of total heat input.
- Operates with diesel oil, light fuel oil or the usual gases.
- Burners can be supplied to operate on both gas and oil with changeover made in minutes.
- Baking chamber and heating ducts are continuously welded and steamtight.

- Les produits combustibles circulent dans un circuit fermé et n'entrent pas en contact avec les produits en train de cuire.
- Chaque zone comprend un brûleur à tirage par tube Baker Perkins, entièrement modulant, avec tableau de commande.
- Le rapport de chauffage sole/voûte peut être préréglé et est indépendant de l'apport total de chaleur.
- Fonctionne au gasoil, au fuel léger ou aux gaz usuels.
- Les brûleurs peuvent être alimentés pour fonctionner au gaz ou au fuel, le changement de combustible ne prend que quelques minutes.
- La chambre de cuisson et les conduits de chauffage sont soudés en continu et étanches à la vapeur.

- Die Verbrennungsgase werden in einem geschlossenen Kreislauf umgewälzt und kommen nicht mit dem Backgut in Berührung.
- Jede Ofenzone ist mit ihrem eigenen modulierenden Brenner von Baker Perkins sowie mit einer Steuertafel ausgerüstet.
- Das voreinstellbare Ober/Unterhitzeverhältnis ist von der Gesamtwärmezufuhr unabhängig.
- Der Ofen kann mit Dieselöl und Leichtöl bzw. mit allen herkömmlichen Gasarten beheizt werden.
- Es können Brenner, die für beide Brennstoffe d.h. Öl und Gas ausgelegt sind, geliefert werden, dabei nimmt die Umstellung von einem Brennstoff auf den anderen nur eine kurze Zeit in Anspruch.
- Sowohl die Backkammer als auch die Heizkanäle sind schwadendicht geschweißt.



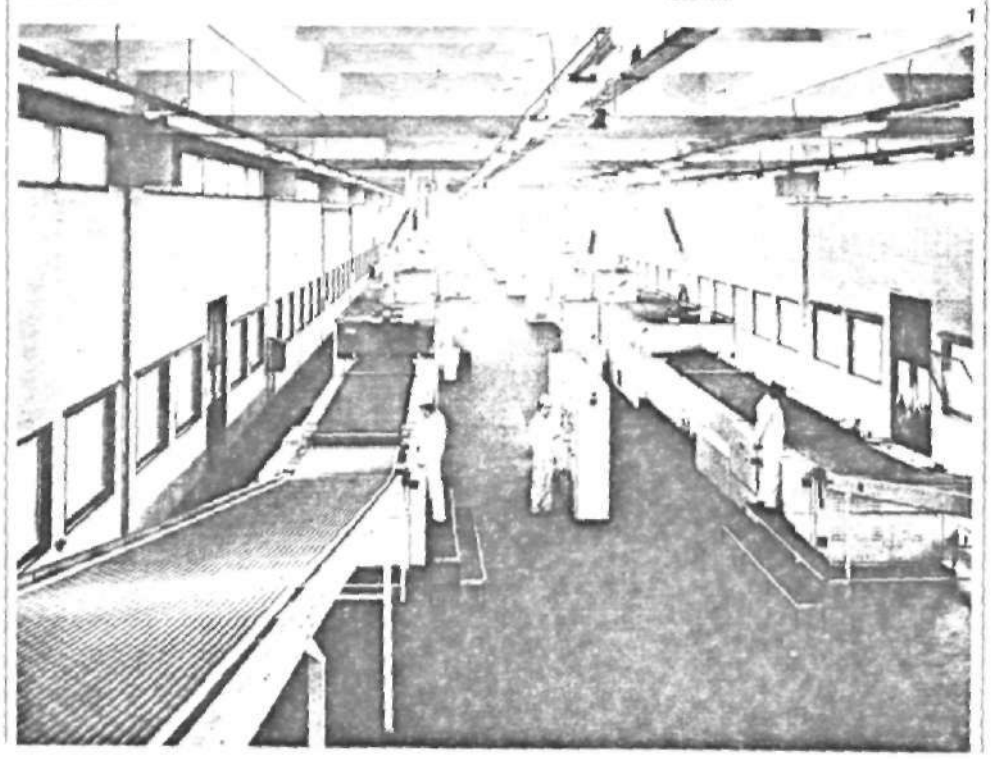
Biscuit cooling systems

Systèmes de refroidissement des biscuits

Kühlsysteme für Kekse

When biscuits leave the oven at temperatures between 150° to 200° centigrade, they are soft and need to be cooled under controlled conditions to retain their perfection.
Baker Perkins experience ensures the choice of system and temperature cooling gradients are suitable for the type of biscuits you wish to bake.
The basic systems are shown on the opposite page, many variations are possible to suit single or multi floor installations. Wire belt radial turns as photograph (3) can be used to change direction. Turnover drums as photograph (4) and diagram (5) elevate or deliver between the conveyors.
It may be necessary to cool the biscuits before they leave the oven band as shown in diagram (6).
Standard plant widths 800, 1000, or 1200 mm.

Die Temperatur der Kekse beim Verlassen des Ofens beträgt zwischen 150° und 200°C, die Kekse sind weich und müssen unter geregelten Bedingungen abgekühlt werden, damit sie ihre Vollkommenheit beibehalten. Erfahrungen der Firma Baker Perkins auf diesem Gebiet gewährleisten eine Auswahl der zur Verfügung stehenden Systeme, wobei das Temperaturgefälle während der Kühlung entsprechend den herzustellenden Keksarten ausgeführt wird.
Die Kühlsysteme in Grundausführung sind auf der gegenüberliegenden Seite veranschaulicht. Es stehen viele Varianten derselben zur Verfügung, die für Installation in einem, bzw. in mehreren Gebäudegeschossen geeignet sind. Durch Anwendung von Gliederband — Kurventransporten, gemäß Abb. 3, kann die Förderrichtung der Kekse geändert werden.
Wendetrommeln, Abb. 4 und Schema 5, senken bzw. heben die Kekse auf unterschiedliche Niveaus zwischen den einzelnen Transportbändern.
Falls erforderlich, können die Kekse vor ihrer Übergabe vom Ofenband gekühlt werden, siehe Schema 6.
Normalausführung der Anlagen in Arbeitsbreiten von 800, 1000 und 1200 mm.

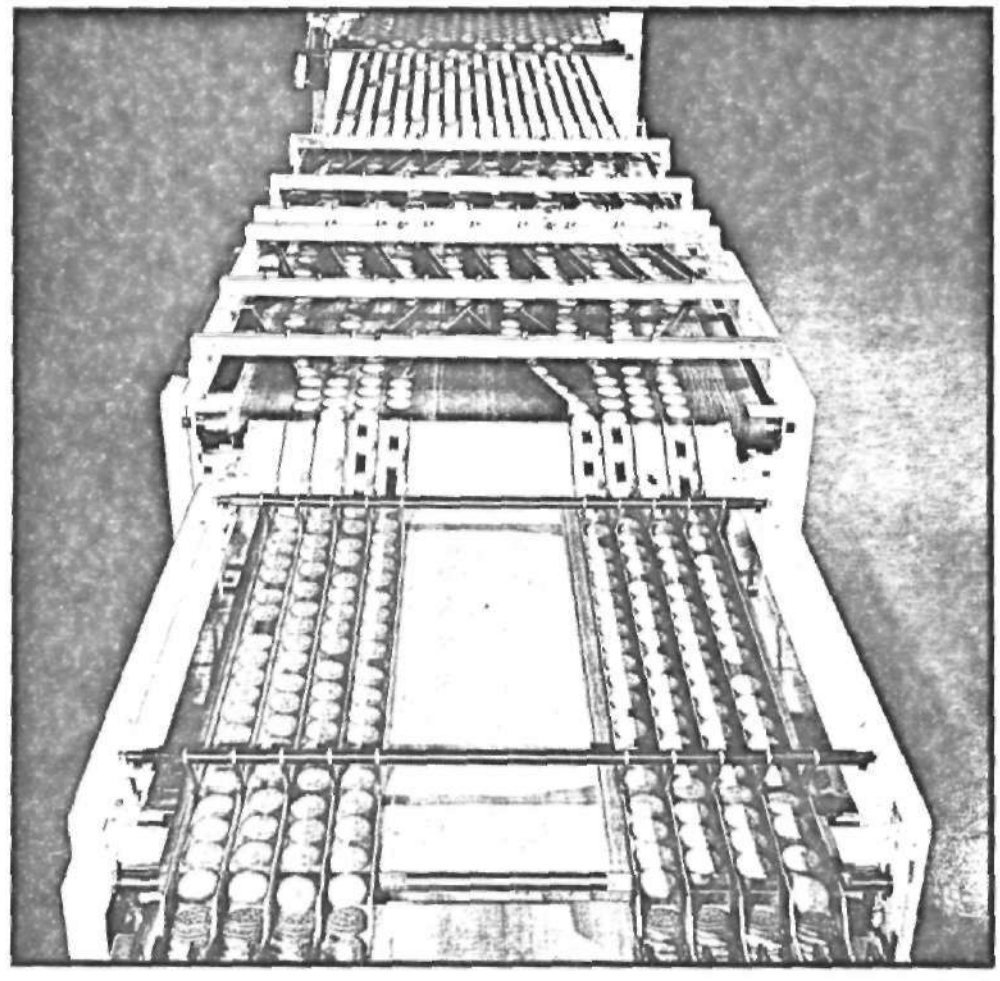


Biscuit cooling and handling

Refroidissement et manutention des biscuits

Kühlen und ordnen der Kekse

Baker Perkins



Special applications

Applications spéciales

Sonderausführungen

Rose Forgrove, a Baker Perkins company, in co-operation with Baker Perkins Developments Limited, have many years of experience in the requirements of high speed stacking and handling of biscuits for feeding directly into the wrapping machines. Photograph (10) shows rows of biscuits across the cooling band being reduced to match the wrapping machine feed, two or more rows can be reduced this way. In photograph (11) biscuits are being multiplied, this method is used when the number of rows across is less than required by the wrapping machines. Like the reducer it produces evenly balanced distribution in the outgoing rows.
Round, square or rectangular biscuits can be handled in most of this equipment. Control of biscuits in this way is particularly useful for feeding to chocolate enrobers and cream sandwich machines.
Rose Forgrove supply a range of wrapping machines and automatic feeders for a variety of biscuit packs as shown on the back page of this leaflet.

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11



BISCUIT

6. RECIPE FOR CABIN BISCUITS

INGREDIENTS	QUANTITY IN KGS.	% YIELD ON DRY BASIS.	YIELD IN KGS.	REQUIREMENT FOR 1000 Kg OF BISCUITS
	KGS.	%	KGS.	KGS.
WHEAT FLOUR	300	87	261	1,010
SUGAR	20	100	20	67
FAT	23	100	23	77
GLUCOSE	4	80	3.2	13.5
AMMONIA-BI-CARB	3.5	-	-	11.8
SODA-BI-CARB	1.8	-	-	6.1
LECITHIN	0.45	-	-	1.5
SODIUM-META-BI-SULPHITE	0.25	-	-	0.84
BUTTER FLAVOUR	0.1	-	-	0.34
SALT	1.8	100	1.8	6-10
			309	

+ 1% Biscuit moisture will give yield 312 Kg.

- 3% Production loss will reduce yield 303 Kgs.

- 2% Oven defectives will give good Biscuits 297 Kgs.

BISCUITS

7. RECIPE FOR GEM BISCUITS

INGREDIENTS	QUANTITY IN KGS.	% YIELD ON DRY BASIS	YIELD IN KGS.	REQUIREMENT FOR 1000 KG OF BISCUITS
	KGS.	%	KGS.	KGS.
WHEAT FLOUR	100	87	87	827
SUGAR	22	100	22	182
FAT	13	100	13	107
GLUCOSE/SYRUP	3	80	2.4	25
AMMONIA-BI-CARB	1.2			9.9
SODA-BI-CARB	0.5			4.13
SALT	0.6	100	0.6	5.0
LECITHIN	0.2			1.65
SODIUM-META-BI-SULPHITE	0.2			1.65
SKIM MILK POWDER	0.5	96	0.5	4.13
BUTTER FLAVOUR	0.5			0.42
			125.5	

+ 1% Biscuit moisture will give yield	126.8 Kgs.
- 3% Production loss will reduce yield to	123.0 Kgs.
- 2% Oven defectives will give good biscuits	121.0 Kgs.

BISCUITS

8. RECIPE FOR MARIE BISCUITS

INGREDIENTS	QUANTITY IN KGS.	% YIELD ON DRY BASIS	YIELD IN KGS.	REQUIREMENT FOR 1000 KG OF BISCUITS
	KGS.	%	KGS.	KGS.
WHEAT FLOUR	254	87	221	782
SUGAR	54	100	54	166
FAT	50	100	50	154
GLUCOSE/SYRUP	9.1	80	7.3	28
AMMONIA-BI-CARB	1.12			3.45
SODA-BI-CARB	0.67			2.10
LECITHIN	0.45			1.40
SODIUM-META-BI-SULPHITE	0.1			0.3
BUTTER FLAVOUR	0.28			0.86
SKIM MILK POWDER	4.5	96	4.3	13.85
SALT	1.8	100	1.8	5.54
			338.4	

+ 1% Biscuit moisture will give yield	342 Kgs.
- 3% Production loss will reduce yield to	332 Kgs.
- 2% Oven defective will give good biscuits	325 Kgs.

BISCUITS

9. RECIPE FOR COASTER BISCUITS

INGREDIENTS	QUANTITY IN KGS.	% YIELD ON DRY BASIS	YIELD IN KGS.	REQUIREMENT FOR 1000 KG OF BISCUITS
	KGS.	%	KGS.	KGS.
WHEAT FLOUR	100	87	87	907
SUGAR	16	100	16	145
GLUCOSE	5	80	4	45
FAT	8	100	8	72.5
AMMONIA-BI-CARB	0.8			7.25
SODA-BI-CARB	0.8			7.25
SALT	1.2	100	1.2	11
SODIUM-META-BI-SULPHITE	0.05			0.50
			116.2	

+ 1% Biscuit moisture will give yield	117.2 Kg.
- 3% Production loss will reduce yield to	113.7 Kgs.
- 3% Oven defectives will give good biscuits	110.3 Kgs.

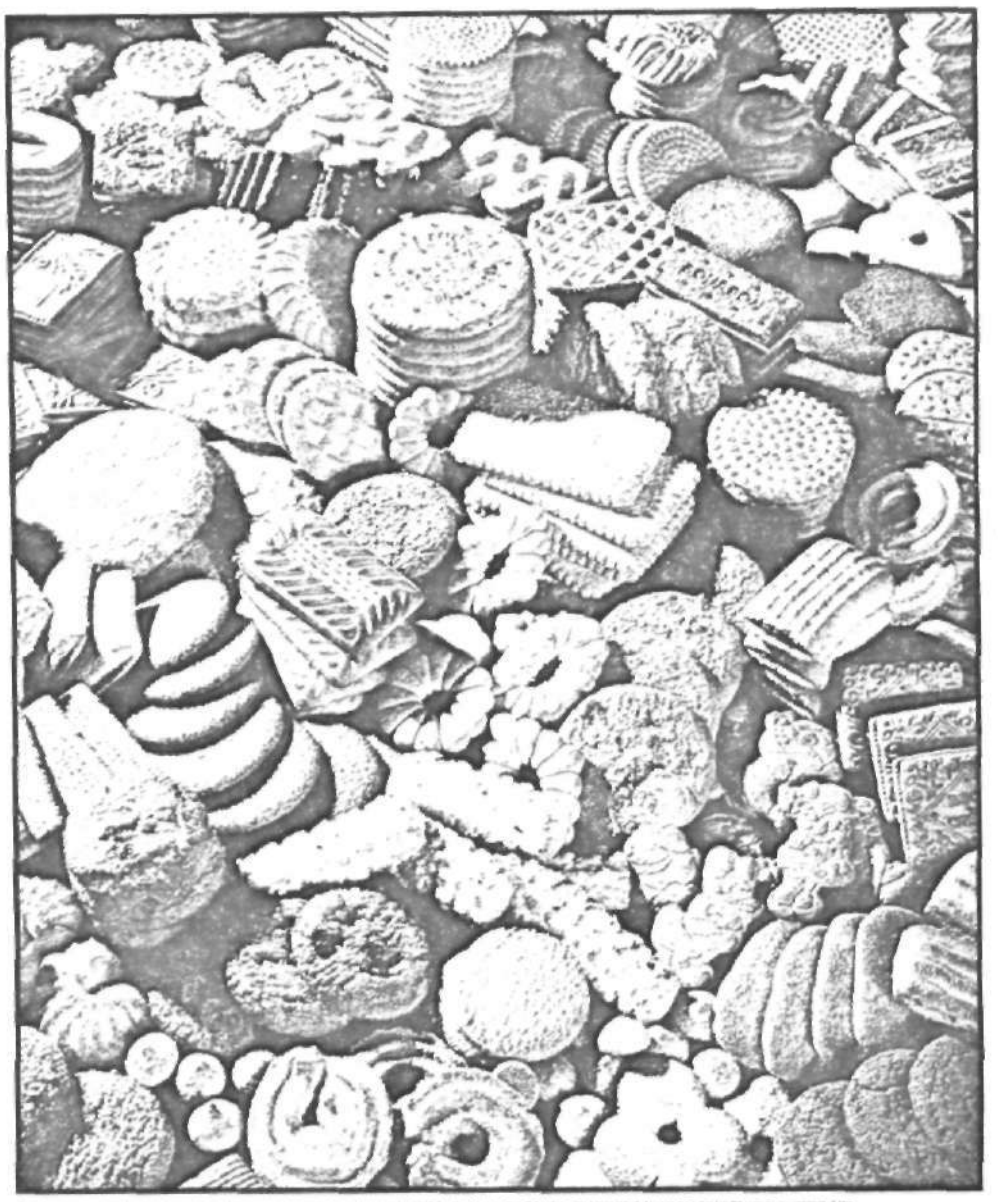


«Tri-Zone» is a trademark.

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Printed in England 4/78



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BPL/188/1
Printed in England 4/75

10. Cost of Packing Materials For 6,300 tons)

PACKING MATERIAL	VARIETY PACK.	PER TON OF BISCUITS	QUANTITY OF BISCUITS	PACKING MATERIAL REQUIRED	PRICE ₦	Value ₦
Printed Cellophane	Cabin 5 Bis.	21.12 Kgs.	2,200 Tons	46.45 Tons	3.10/Kg.	143,995
" "	Gem 50 Gms.	24.89 Kgs.	1,575 Tons	39.20 Tons	3.10/Kg.	121,520
	Marie) Coasier) 5 Bis.	23.44 Kgs.	1,575 Tons	36.90 Tons	3.10/Kg.	114,390
Unprinted Cellophane	Cabin 900 Gms.	6.35 Kgs.	950 Tons	6.00 Tons	2.45/Kg	14,700
						394,605
Printed Cartoons	Cabin 900 Gms.			1,055,000 Nos.	100/1000	
Gumed Tape				3,960,000 Meters	10/1000	
Corrugated Boxes	Cabin 5 Bis.			540,000	312/1000	169,480
" "	Cabin 900 Gms.			61,200	655/1000	40,086
" "	Gem 50 Gms.			331,200	312/1000	103,344
" "	Marie) Coaster) 5 Bis.			198,000	338/1000	66,924
						37,889
						416,723

(xi) Value for Sales

Variety	Quantity kgs	Price, Ex-factory	Net Value
Cabin	2,000,000	90 kobo/kg	1,800,000
Gem	2,000,000	95 "	1,900,000
Coaster	2,500,000	95 "	2,375,000
Nice	1,000,000	120 "	1,200,000
Lincoln	1,000,000	110 "	1,100,000
Short cake	1,000,000	115 "	1,150,000
	9,500,000		9,525,000

CHAPTER 6

The role of the food and Drugs Administration:

SECTION

Introduction:

The food and drugs administration is the section of the Federal Ministry of Health that is responsible for ensuring that food, drugs cosmetics and devices in Nigeria are manufactured sold, advertised imported, exported or distributed as stipulated by the Food and Drugs Decree 1974.

A. Prohibition of sale or advertisement of Food, Drugs, Cosmetics and Devices:

No person shall sell or advertise any food etc. which

a. Has in it or upon it any poisonous or harmful substance not being a food additive or contaminant of a type, and within the level, permitted by the regulations made under this decree.

b. Is unfit for human consumption or may be used as treatment, preventive or cure for any of the diseases, disorders or abnormal physical states specified in schedule 1 of this secree except as provided by the regulations.

c. Consists in whole or inpart of any filthy disgusting, rottens or diseased substance.

2. No person shall sell or advertise any article of food etc. which was manufactured, prepared, preserved, packaged, or stored under insanitary conditions.

3. No person shall sell or advertise any articlecof food etc. which is adulterated.

4. No person shall sell or advertise any costmetic or device which may cause injury to the health of the users when used.

(i) According to the directions on the lablel or otherwise accompanying the cosmetic or

(ii) For such purposes and by such methods of use as customary or usual thereof; or

B. Power of Commissioner to obtain particulars in respect of certain substances:

Where any person carries or any business in the course of which any substance-

a. Is used in the preparation of any food, drug or cosmetic; or

c. Is imported, produced or sold for use in the preparation of any food, drugs or cosmetic,

the commissioner or any person authorised by the Commissioner in that behalf may serve on that person a notice requiring him to furnish to the commissioner within such time as may be specific in the notice such particulars about the substance.

C. Prohibition of various misleading practices:

No person shall:

a. Label, package, treat, process, sell or advertise any food, drugs, cosmetic or device in a manner that is likely to create a wrong impression as to its quality, character, value, composition merit or safety.

b. Label, package, treat, process, sell or advertise any food, drugs, cometics or device in a way that doesn't conform with the required standard.

D. Declaration by manufacturer:

The commissioner or any person authorised by him in that behalf may order the manufacturer of any food etc. to furnish a declaration in the prescribed form that the article in question was manufactured in accordance with the provisions of this decree.

No food etc. must be imported or otherwise brought into the country unless it is accompanied by a certificate from the manufacturer that it was manufactured in accordance with relevant code of practice.

E. Designation of Inspecting Officers and Analysts:

The commissioner may, on the recommendation of the food and Drugs Advisory council, and subject to the provisions of this section designate:-

a. as a food and drug analyst or

b. as a drug analyst, or

c as a food, and drug inspecting officer, any person (whether or not a member of the public service of the Federation) who possesses such qualifications and fulfils such other requirements, if any, as are prescribed under this section and shall furnish to every person so designated a certificate of designation.

F. Powers of Inspecting Officers:

An inspecting officer may in the course of his duty at any reasonable time and on production of his certificate of designation if so required:-

(a) enter (if need be by force) any premises in which he reasonably believes that any article to which this Decree or the regulations apply is manufactured, prepared, preserved, packaged, stored or sold.

(b) Examine any article in the premises he suspects.

(c) Take a sample or specimen of any article he suspects.

(d) Examine any books, documents or other records found on the premises which he reasonably believes may be useful to him.

(e) Seize and detain for such a time as may be necessary for the purposes of the Decree any article or documents found on the premises.

2. The owner or person in charge of any premises entered by an inspecting officer pursuant to this section and every person found thereon shall give all reasonable assistance in their power to the inspecting officer and shall make available to the inspecting officer all such information as the officer may reasonably require for the purposes of this Decree.

G. Forfeiture:

(a) Where the owner of an article seized under this Decree consents to the forfeiture therefore the article shall thereupon be forfeited to the Commissioner.

(b) Any article or thing forfeited to the Commissioner under this section may be retain by him or he may cause it to be destroyed or otherwise disposed of as the commissioner think fit.

H. Penelties:

1. Any person who contravences any provision of this Decree or the regulations or fails to comply with any requirements imposed on him by a notice from the commissioner shall be guilty of an offence and shall be liable on conviction to a fine not exceeding ₦1,000 or to imprisonment for a term not exceeding two years or to both.

2. Where an offence under this section committed by a body corporate is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of, any director, manager, secretary or other similar officer of the body corporate, or any person purporting to act in any such capacity, he as well as the body corparate, shall be deemed to be guilty of the offence and shall be liable

to be proceeded against and punished accordingly.

3. Proceedings for an offence under this section shall not be commenced except within six months of the commission thereof.

CHAPTER 7: CONSTRUCTION AND STRUCTRAL ANALYSIS

1. Foundation:

The foundation of a structure is a very important element in the building. It must be able to support the whole structure without failure since the site soil has good load bearing capacity, no special foundations are required. Reinforced cast-in-place concrete pedestal is used for the factory and the administrative building. The welfare buildings use strip concrete foundation.

2. Load bearing Elements:

The factory and the administrative block use reinforced concrete colums and beams. The welfare buildings has 230mm local bearing sandcreate hollow blocks.

3. The Skin:

The external skin is made of 230mm hollow block in the administrative, welfare building and the southern side of the main factory. The northern side of the first phase of the factory is skinned by profiled aluminium cladding wall panels. The panels can be easily dismantled separately during expansions.

4. Floors:

Reinforced concrete floor slab of about 15 cm is used for the welfare and the administrative buildings. Thicker reinforced concrete floor slab (20cm) is used for the factory to take care of the machinery. No special flooring is needed for the main factory as the machinery do not vibrate adversely. Service and process piping are under the factory floor for flexibility in locating connections.

5. Doors and Windows in the:

Factory: The doors to the receptions and despatch of goods are either of standard crittal-hupe or G.M.P.

Roller shutter or sliding folding doors, is recommended. Sliding folding doors are recommended for the two entrance doors to the factory.

The traingular openings below the folded plates of the factory are covered by fixed windows (non-opening). The two sets of high level windows (above and below the ring beam use casement windows bottom hung type. The low level windows of the factory are casement windows (top hung type)

Dinning: All the windows are casement windows top hungs. The doors are glazed sliding folding.

Kitchen: All the windows are casement type top hung. The doors are plywood flush doors with metal frames.

Stores and Toilets: Casement windows, top hung, the doors are plywood flush doors with metal frames.

Rest-room: and the Lobby

Casement windows, top hung are used, All the doors are glazed sliding and folding type.

Wash-up rooms and the main entrance Lobby

All the windows are the casement top hung type, they are at high level. All the doors are sliding and folding type.

Clinic: All the windows are casement, top hung type at low level. All the doors are plywood flush doors in metal frames.

The Administrative Block:

The main entrance door is made of reinforced polished plate glass with brass trimning. It is double swung type and the hinge is some distance away from the edge. All the other doors are of plywood flush in metal frames. All the windows are casement, top hung.

vi Roofing:

Three types of roofing system are used.

(a) Folded Plates:

This is used over the main factory, the entrance to the factory and the main administrative block entrance. Folded plate is a space structural system created by the combination of flat plates connected with each other under certain angles.

Prefabricated reinforced concrete is used to make the folded plates. In the case of the folded plates over the factory, the stiffening ribs and the columns are monilithically connected to the ring beam. The other folded plates use upstand stiffener. Folded plates has high strength, great rigidity. It requires cheap framwork, can be precasted and can cover large area without intermeoliete support.

(b) Flat reinforced concrete Slab:

The rest-room and the wash-up room for the female workers are covered by 15.0cm reinforced concrete slab on top of which are laid 3 layers of bituminous felt finished with mineral chippings.

(c) Lean-to lattice Truss:

The Dinning hall, Kitchen, Store, Wash-up room for male workers, clinic and the administrative blocks are covered by lean to lattice truss.

7. Finishes:

(a) External walls:

The external wall of all the buildings and factory except the administrative block are rendered with sand cement rendering and painted with light colors for reflection purposes. Those of the administrative block are faced with mosaic tiles. The inner side of the factory walls are faced with white wall tiles.

(b) Internal Walls:

They are rendered with sand cement and painted with selected light colors. In toilets, the walls are glazed wall tiled up to door height.

Floor Finishes:

Concrete Floor Tiles:

Normal duty concrete floor tiles (30cm x 30cm x 2.54cm) is used in the factory.

Terrazzo Floor Tiles:

These tiles are used in the dinning hall, kitchen, stores, toilets, wash-up rooms and the clinic, they are also used in lobbies and corridors.

P.V.C. Tiles:

These are used in the rest-room and all offices.

Ceilings:

Asbestos Cement Fibre:

The surfits of concrete floor slabs of the rest-room and the administrative block's lobby are sprayed with asbestos cement fibre to a thickness of ¼".

Ceiling Boards:

The other rooms of the welfare buildings and the administrative blocks use ceiling board.

CHAPTER 8: LIGHTING AND VENTILATION

1. Introduction:

Adequate illumination ensures effective industrial operation. Natural lighting provides cheaper and reliable source of illumination. The North-South orientation of the factory buildings coupled with the use of very large windows will provide good illumination.

A given light source illuminates its surroundings in all directions, all points equistant from the source have the same intensity of illumination. Artificial light can then be carefully placed to supplement natural lighting where necessary.

2. Approximate Foot- Candles Required for Adequate Visibility:

(a) Rough work, furnace space, locker rooms, warehouses and places requiring only a little visibility ..... 5ft candle.

(b) General manufacturing of large objects and offices requiring moderate visibility ..... 10ft candle.

(c) General work and offices requiring moderate visibility ..... 15ft candle.

(d) Processes, drafting rooms and work requiring really good visibility ..... 20ft candle.

(e) Special fine work of manufacturing and inspection, fine drafting and things requiring excellent visibility ..... 20-50ft candle.

3. Useful Data About Openings:

1. For windows of height (h) in one side wall only, the limit of the useful working space is about (2-3 h) back from the windows. Beyond that, the intensity is generally less than 10ft candle. When windows are on both sides and the building is only 50-60ft wide, the useful space may be about 3 times the sum of the window height.

(ii) The maximum intensity of illumination on the working place should not be greater than about 3 times the minimum, the latter being generally at least 10ft candles. Greater variations, unless very widely separated and with a gradual change of intensity are likely to be unsatisfactory. A uniformly distributed, moderate intensity of light is likely to be better than bright sports scarttered in relatively dim areas.

(iii) The area of windows should be at least 30% of the floor area if 10ft - candles are to be available on cloudy days and with 6 months dirt on the windows.

(iv) The uper part of the window is the most effective in lighting the central portion of a building.

(v) Increasing the size of the side windows effects the minimum intensity more than indirect proportion to the change in size, whereas it has less effect upon the maximum intensity.

(vi) Sloping windows (when clean) let in more direct sunlight then do vertical ones. However, experience shows that they collect more dirt and are more difficult to clean than the latter ones.

(vii) In general vertical windows "6 months dirty" lose about 50% of their efficiency whereas those on a 30° slope with the vertical lose about 75% and those at 60% slope (skylights) may lose about 83%, 75% of the dirt would be on the inside, as rain and wind cleans the outside.

(viii) The direction of the daylight and the shadow cast by it should be considered when the layout and detail locations of equipment are planned so that men will not cast shadows on their own work. Colors on the interior if pleasing may add to the workers efficiency and comfort and can be used to warn them about parts that are sources of danger.

SECTION 2:

Electric Lighting:

1. Introduction:

Electric lighting are best for securing loeal lighting of minimum quality, intensity and flexibility. The vertical angle of a man's field of vision is far less than 180^{o} but his horizontal angle is near that. The eye gets tired if subjected to rapid variation of intensity or poorly illuminated situation. Reflection from polished or glossy surface is troublesome to the eye.

2. Lighting System:

There are four main kinds of lighting systems:
(i) direct (ii) semi-direct (iii) indirect and (iv) semi-indirect.

(i) Direct Lighting

This may be defined as a system wherein practically all the light on a horizontal working plane comes directly from the light source. This system though efficient may cause glare. It causes high brightness and dark shadows.

(ii) Indirect Lighting:

This may be defined as a system in which all the light reaching the working plane is reflected from the ceiling, walls and other objects, more of the lighting units being visible to the worker's eyes. It is characterised by diffused lighting of lower brightness but with no sharp shadows. This system would be wasteful in a building with roofs supported by exposed trussed and having sidewalls with projecting columns and crave girders because of obstruction. Interior surfaces have to be clean.

(iii) Semi-direct Lighting:

This is a system in which the greater part of the light on a horizontal working plane comes directly from the lighting units but nevertheless a substantial part comes by reflection from the inner surfaces of the room or from other objects. They also provide diffused lighting but are not very comfortable when their globes are too close to the workers' working field of vision.

(iv) Semi-indirect Lighting:

This system provides appreciable light directly from the luminaries to the working plane, but the greater part of the light is provided by reflection from the interior surfaces of the room and from its contents.

SECTION 3: Ventilation

1. Introduction:

Industrial plants require adequate ventilation in almost all cases. The term ventilation, in this context, means the removal of spoiled, heated or used air and its replacement by clean fresh air. Ventilation by natural forces is called airation while that by mechanical equipment is called mechanical ventilation.

2. Airation (Natural Ventilation)

(a) Other things being equal, the volume of air exhausted through a roof of any type will vary as the area of the openings.

(b) The difference in temperature between the air inside and outside of a building decrease as the quantity of air flowing through the building increases.

(c) The shape of a roof-monitor here no appreciable effect if the monitors and openings are the same.

(d) Obstructions infront of windows should be minimised, e.g. Tall buildings and cliffs.

3. Mechanical Ventilation

Mechanical ventilation can be used to supplement airation or used alone in places where airation is not possible. The essential parts of a mechanical ventilation system are as follows:

1. A central power operated fan
2. An inlet duct
3. An air washer in the inlet duct to clear the air of dust and to humidity it.
4. A duct system to the point of distribution of air in the building.
5. A return duct system if recirculation is used.
6. A heating or cooling unit.

(i) Fans

Fans are used mainly in the production hall, the dinning hall, the kitchen, the rest-room, clinic and offices.

(ii) Air-conditioner:

Unit air-conditioners are used mainly in the offices and the rest-room.

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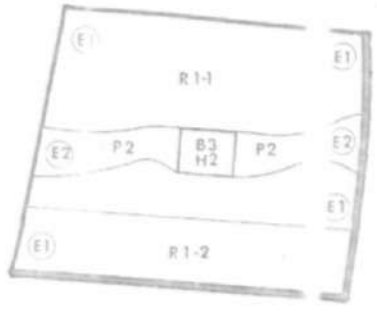

Shao
to Kaduna and K
Railway
Army Area
(existing)
Athletic
Center
College of Technology
(reserved)
Heavy Industry
Area
Oke Oji
to Jebba
to Kaiama
Recreation
Hosp.
(reserved)
School
(reserved)
Residential
Industry
Nursing
School
Teaching Hospital
(reserved)
Residential
Residential
Future Center
Dam
(existing)
Industry
(existing)
University Lands
Enlarged Airport
Transportation
Terminal
projected dam
Residential
Transportation
Terminal
Air Force
Base
projected lake
Eiye
Nkorin
to Ibadan and Lagos
Railway
to Ajasse


TO KADUNA
TO KADUNA
TO KADUNA
ARMY AND POLICE BARRACKS
COLLEGE OF TECHNOLOGY
HEAVY INDUSTRY AREA
TEACHING HOSPITAL
TO ABUJA AND KADUNA
DORMITORIES, STAFF AND FACULTY HOUSING
FURTHER EXPANSION OF COMMERCIAL CENTER BEYOND THE YEAR 2000
UNIVERSITY OF ILORIN
SCHOOLS BUILDINGS
AIRPORT
AIR FORCE BASE
TO AJASE
Ilorin Master Plan
Ilorin Road Network
Commercial and Civic Center
0 miles

ZONING PLAN



ENLARGED COMMUNITY SHOWING INTERIOR ZONING




I 5
I 6
I 16
I 17
II 4
I 4
I 7
II 5
I 15
I 18
I 2
I 8
II 3
II 6
II 11
I 1
I 14
II 12
I 9
II 10
I 10
I 13
II
II 13
IV 4
IV 6
IV 7
II 7
II 18
II 19
II 14
IV 8
III 13
IV 14
II 15
II 17
II 20
IV 3
IV 9
IV 2
IV 12
IV
III 24
III 5
III 12
III 16
III 23
IV 16
IV 1
IV 11
IV 10
IV 17
III 12
III 17
III 22
IV 18
III
III 7
III 10
III 8
III 18
III 21
III 9
III 19
III 20



WATER SUPPLY TEN

EXISTING

Main Water

Pressure Ma Pipe

Water Suppl reservoir

Ground Leve ater T

Elevated Wa Tank

PROPOSED

Main Water

Secondary M Pipe

Pressure Wa Pipe

Water Supply reservoir

Ground Leve ater T

Elevated Wa Tank

STORM WATER SEWER SYSTEM FLOW DI



River and Natural Water Courses

Proposed Storm Drains

DOXIADIS ASSOCIATES - CONSULTA


MAJOR ROAD NETWORK
Freeway
Major Roads
Minor Roads
Airport
Railway
Major Intersections
Transportation Terminal