DESIGN PROPOSAL FOR AN ULTRA MODERN ABATTOIR ABUJA WITH EMPHASIS ON IMPROVING SANITARY CONDITIONS OF NIGERIAN ABATTOIRS

BY

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CERTIFICATION

The thesis titled "ULTRA MODERN ABATTOIR, ABUJA meets the requirements governing the award of degree of master of technology in Architecture of Federal University of Technology, Minna, Nigeria, being approved for its subscription and literacy presentation to the pool of knowledge.

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DEDICATION

I Dedicate this thesis to my parents, Rev and Mrs. Musa Manzhi. May almighty God nourish your sown seed to an overwhelming glory. Amen.

ACKNOWLEDGEMENT

Omnipotent God, all praises are due unto thee. The architect of me being an architect thy shadow guided me through the hectic task to a joyous end. May the rest of my struggle in life be anchored by you. Amen.

My unceasing gratitude goes to the pillar of my success. Arc/Mrs. S.Z Labafilo. The time and resources you sacrifice to see me through this task made an impact beyond imagination. Little Hilda, you are marvelous.

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My sincere gratitude to my class mates, (Aso studio members), my friends and all that lighten the dark path for me to follow. Your unrelenting effort to see me through shall ever remain in memory.

May Gods blessings be our potion.

Amen.

Musa Barnabas

2000

ABSTRACT

An abattoir is a slaughter house for animals, a place where meat is processed for meat retailers and caterers. Nigerian abattoirs have not experienced Technological development as in the use of modern Techniques of operation. More to this there is the problem of poor sanitary condition of the abattoirs. This motivated the author to making a detailed research on the sanitary problems of the abattoirs, in which various sanitary problems in the abattoirs were identified and solutions proffered.

Consequently, this thesis has not only identified and highlighted the negligence, sanitary, services and planning problems by the use of case studies and through literature review, but has also presented the solutions to the problems both in physical and theoretical terms. This is done by making planning and design proposal for a new ultra modern abattoir, Abuja. With adequate facilities and detail functional analysis of abattoir.

Circulation paths for animals, staff, users and vehicles have been separated by stratification of units into vertical floors and separate buildings inter-linked by walk ways. Services problems have also been looked into by the use of articulated layout in relation to existing services around.

This thesis has highlighted the sanitary problems and proffered solutions which will in-turn propel and encourage meat hygiene from processing to consumption, reduce environmental pollution and ensure maximum utilization of the by-products.

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CHAPTER ONE

1.1 INTRODUCTION

Abattoir is a slaughterhouse for animals. It is a building where animals, (mostly mammals) are slaughtered and processed for human consumption.

Abattoir is from a French word meaning " To fill". This name emanated from the early method of processing meat. Here the animals are slaughtered by humane methods. The carcasses are bled and the hides, extremities, and viscera are removed, washed and hung, then, they are cut into wholesale parts. But with the advancement and technological innovations, modern abattoirs which are some times refered to as meat packing houses have a more convenient and fast method of processing meat. This is done mechanically.

Despite the modern method of processing meat, Nigerian abattoirs are faced with the problem of use of old methods due to lack of facilities. This results in poor sanitary conditions, though not only as a result of lack of facilities but due to lots of factors as will be highlighted in the write up.

The sanitary problems in Nigerian abattoirs are many and despite that, little or no attempt is made in improving the sanitary condition of the abattoirs. A study of ministry for Federal Capital Territory abattoir, Garki, shows that sanitation is given little attention. An abattoir in Federal Capital Territory where the blood and the washed waste are allowed to run or drain to an express way. This is a critical situation that need urgent attention and solution.

In view of the above, the author wishes to propose an architectural environment that will house meat processing and packaging with adequate facilities that will provide and ensure sufficient sanitary in the environment and also ensure utilization of by products. This if done will provide meat of good hygiene for consumption and foster the interaction between abattoirs and affiliated industries.

Research, investigation and data collection were carried out through visits to existing abattoirs; visits to veterinary and livestock departments in ministries of agriculture and natural resources of the Federal Capital Development Authority (FCDA) Abuja and state capitals; visits to veterinary hospitals; visits to meat shops (markets) ; interviews; visit to libraries and personal observations.

The proposed project has critically and broadly expressed the sanitary problems in Nigerian abattoirs and an attempt has been made to provide a modern and satisfying architectural environment that will cater for the problems identified as well as serve the normal function.

1.2 MOTIVATION

Animals are mostly subjected to lots of hardship and struggle during slaughter for food. There is the need to regard the life of the animals and this is by ensuring that animals slaughtered for food are dispatched without unnecessary suffering and that bleeding shall be as complete as possible. This moved the author to propose this project with the view of achieving the above mentioned.

A critical look at the existing abattoirs calls for urgent attention. The waste products are not properly disposed, the sanitary condition alarming and the environment littered. This is why the author laid emphasis on improving the sanitary condition of Nigerian abattoirs.

Environment pollution has become a common feature in Nigerian abattoirs, unhealthy surroundings and smell of bad odour. This subjects and exposes the people within to an untold health hazard and inconveniences. As such, to ensure a healthy and pleasing environment the writer proposed the said project.

Animals that are not fit to be slaughtered for food are mostly processed in Nigerian abattoirs this is due to absence of animals market within and lack of quarantine and veterinary services within the abattoirs, to curtail the above the author was moved to

proposing the project MODERN ABATTOIR, 'Improving the sanitary condition of Nigerian abattoirs.'

1.3 AIMS AND OBJECTIVES

The project is ultimately aimed at designing an architectural ediface that will serve as meat processing and packaging house. It is targeted at ensuring supply of safe meat to the community. This will be done by designing and environment that will ensure good sanitation. The design is also aimed at making provision for market and quarantine services to ensure that only healthy animals that are fit for consumption are slaughtered.

The project will make provision for proper use of the by products this is by providing facilities that will process the by product for storage to be sold to affiliated industries.

The project is also aimed at designing an abattoir that will provide a safe, hazard free, healthy and convenient environment for the staff and users to operate.

1.4 RESEARCH METHODOLOGY.

Data collection, research and investigation on modern abattoir, activities in abattoirs, meat processing and parking was done through an extensive search of information. The descriptive data collection method in which the data collected are primary data was used. This method involves data collection by the researcher himself or his assistants in the field. This method was adopted by the author because it ensures accuracy, enhance confidence of the research in the quality of his data, detailed information is gathered and observations are not influenced. Various methods of primary data collection include, direct personal observation, oral interview telephone conversation and questionnaire method.

Major data collection on existing abattoirs was done through visits to existing abattoirs, in which interviews were carried out and questions asked. Photographs and dimensions were taken to add to the personal observation. There were visits to veterinary

and livestock department of some ministries of agriculture in Federal Capital Territory and States, during which interviews were carried out with professionals in the related subject matter. There was also personal observation of the condition of abattoirs and the way meat is processed, visit to the site of the proposed project and synthesis of relevant standards.

To give a broad knowledge of the subject matter other methods of data collection were also employed, this include, review of literatures from text, journals, thesis works and public statements.

1.5 SCOPE AND LIMITATIONS.

The scope of the thesis shall be limited to activities in an abattoir as it relates to quarantine, selling and buying of animals, processing, packing and storage of meat; processing, storage and sale of the by-products; processing, disposal of waste products by making provisions for the required facilities as listed below.

Emphasis is laid on improving the sanitary condition of the abattoirs due to the numerous sanitary problems identified in the course of the research.

The following facilities shall be incorporated to ensure smooth ruining of the abattoir.

- Administrative and Records facilities.
- Market facilities
- Grazing facilities
- Meat processing storage facilities
- Drainage and refuse disposal facilities.
- Electricity, water, parking and other supporting facilities.

These are to be provided to ensure and achieve the set goals and ensure smooth operation in the abattoir.

In the course of research within the stipulated time some factors determined documentation, data collection and extensive travelling. Prominent among them are limited funds, time and man power constraint.

1.6 IMPORTANCE OF STUDY

The project will serve as a model for the new millenium abattoirs, provide first class hygienically prepared meat and healthy environment for the users and people within. It will also resurect affiliated industries e.g. feed mill shoe factories and others, it will also bring about new ones.

The thesis will serve as database for future reference and thus serve as a contribution to the pool of knowledge.

1.7 DEFINITION OF TERMS

ABATTOIR- A slaughter house or meat processing and packing house. It is a building were not only slaughtering of animals are done, but lots of activities such as selling and buying of animals for slaughtering preparing animal for slaughtering, selling meat in whole sale and processing by products.

LAURAGE- is an area made in pens made to accommodate animals awaiting slaughter. Cows are usually kept for 24 hours in larage within they are only given water.

STUNNING- stunning is part of processing meat where an animal is made unconscious before bleeding.

VISCERA – viscera is a general term for internal organs of an animal.

CARCASS – carcass is the edible meat of an animal when the bones and the hide/skin has been removed.

PITCHING – this is done after stunning before bleeding. It involve inserting a long thin rod or closely coiled wire into the hole made by the penetrating bolt of the pistol. The insertion of this rod destroys the motor center of the brain so that reflex muscular action does not occur at sticking, thus avoiding injury to operatives and speeding carcass dressing.

OFFAL ROOM – A room were offal's such as liver, lungs and kidneys are trimmed and them placed in a chill or freezing room.

GUT AND PIPE ROOM – A room were the initial separation and emptying of stomachs and intestines in carried out.

SLAUGHTER HALL – this is were the processing and packing of meat is done.

CHAPTER TWO

2.0 LITERATURE REVIEW.

The term meatpacking was first used in medieval time. Until the 17th century meatpacking (as it was called) was largely a family affair in the United States. A few animals were raised and then slaughtered in the fall of the year so that the meat could be stored for use during the winter months. For warmer seasons, the meat was salted, dried, smoked and packed for later use. In 1662, William Pynchon of Aston became the first commercial meat packer in North America. As the population of North America grew it became increasingly urbanized and nonagricultural and created a growing market for meat products. As transportation, preservation, distribution, marketing and industrial technological efficiencies developed, traditional meatpacking practices were replaced by a complex, diversified meat industry. This was as a result in trying to find solution to the issue of spoilage of salted and smoked meat during storage.

This difficulty was not overcome unit the 19th century. Local met stores of the late 1800's grew into large companies that process thousands of animals each day into fresh meat. The abattoirs thus, became common features in every meat industry.

According to brief instory of the united states meat and livestock industry by JR and Ziegier; in the united states today, more than 6,000 small and large companies covert over 130 million hogs, cattle, calves and lambs to about 40 million pound (18 billion kg) of carcass that are distributed as fresh meat or as hundreds of processed meat products. The main feature of every meat industry is the abattoir, because virtually all of the meat packing is done in an abattoir.

A meat science staff of University of Wisconsin (Romans 1974) wrote that United states ranks first in meat production followed by Mainland China, the USSR, west Germany, Argentina, France, Brazil, Australia, Poland and the United Kingdom. The leading country in per capital consumption is Australia, followed by new Zealand, Argentina, the United State, Uruguay, Canada, Belgium, Austria, West Germany and France.

Perhaps the most striking statistic about world food production and consumption is that United State produces ad consumes 35 percent of the world's meat supply (new standard Encyclopedia vol. 9) Britain, the United States and Germany are major importing Countries; Argentina, Australia, new Zealand and Denmark are major exporting Countries. Many Countries are both exports and importers of meat products, importing one kind of meat and exporting another. The United States for example, imports processed meat and canned hams and exports processed meat products to the Caribbean and United States Territories. The world's major meat exporting areas are South America, Oceania (Australia, new Zealand) and western Europe; North America and western Europe are Major Importing areas. The world's chief cattle producing countries include India with 176,000,000 head; the United State, 109,000,000; Soviet union, 97,000,000; Brazil 90,000,000; and China 63,000,000; The leading sheep producing countries are Australia, 167,000,00; New Zealand, 60,000,000; Argentina, 48,000,000; India 42,000,000; Republic of South Africa 38,000,000; United States, 22,000,000; and Ethiopia 13,000,000. The major hog-producing countries are Brazirl 63,000,000; United States 55,000,000; and west Germany 19,000,000.

As discussed earlier, major producers are also generally speaking, the major consumers. The highest per capital red meat consuming countries are New Zealand 224, pounds (102 kilograms) per capital per year; Uruguay, 218 pound (99kilgrams); Australia, 204 pound (92 kilograms); Argentina 220 pounds (100 kilograms); United States 185 pounds(84 kg). But United Kingdom not a major producer, is a major consumer with 138 pound (63 kilograms) per capital with certain countries like India, rank low in consumption, despite high production, apparently owing to religious prohibitions.

The meat of rabbit, horse, goat and deer are regularly consumed in some countries and various other mammalian species are eaten in small quantities in some parts of the world. Seal and polar bear are included in the Eskimo diet, while Rhinoceros, Hippopotamus and Elephant are occasionally consumed by the tribes of central Africa. Though for the purpose of this thesis and the location, the author will center on mammals such as cattle, sheep, goats and hogs.

Several industries have emerged since the Mid of 17th century. These industries are chiefly engaged in production of things that required the by-products of abattoir as its raw materials. The Utilization of by products resulting from slaughtering and processing operations is the basis of several important industries. For example, the tanning industry processes hides into leather; rendering companies convert fats and oils into usable chemicals and soaps and bone, blood organs and viscera are converted into gelatin, sausage casings, animal feeds and fertilizers. Hormones, Enzymes and other biological materials are extracted, purified and prepared by pharmaceutical companies to service many human health needs. For instance, insulin is extracted from the beef pancreas for use by diabetes, and fresh pigskins are supplied as temporary dressings for burn victims.

The government plays a significant role in the meat industry. It provides legislation to prevent monopolistic practices. It provides a packers and stockyards act program to ensure fair trades of livestock during marketing. Federal and state agencies are responsible for ante and post mortern inspection of meat animals. It also provides a market news service and a grading livestock and meat on a cost basis to the industry.

In the Nigeria context, Abattoir operation differ from the wastern world, this is due to factors such as; lack of facilities, socio-cultural factors and the ownership of abattoirs. Nigerian Abattoirs will be discussed in sub chapter 2.5. Nigeria does not export processed or fresh meat but it imports processed product of meat. Though there is no clear or exact amount of meat imported. Meat produced are sold locally as fresh meat or refrigerated meat.

2.2 MODERN ABATTOIR AND IT'S OPERATION.

Different activities take place in a modern abattoir from maintenance of the animals to already prepared fresh meat for sale, refrigeration of processing into meat products. To have a vivid knowledge of operations in an abattoir the processes have to be critically analyzed from beginning to the end.

Purchase of animals for food is done in the animals market within the abattoir (if

Fig 2.1 Animals Image

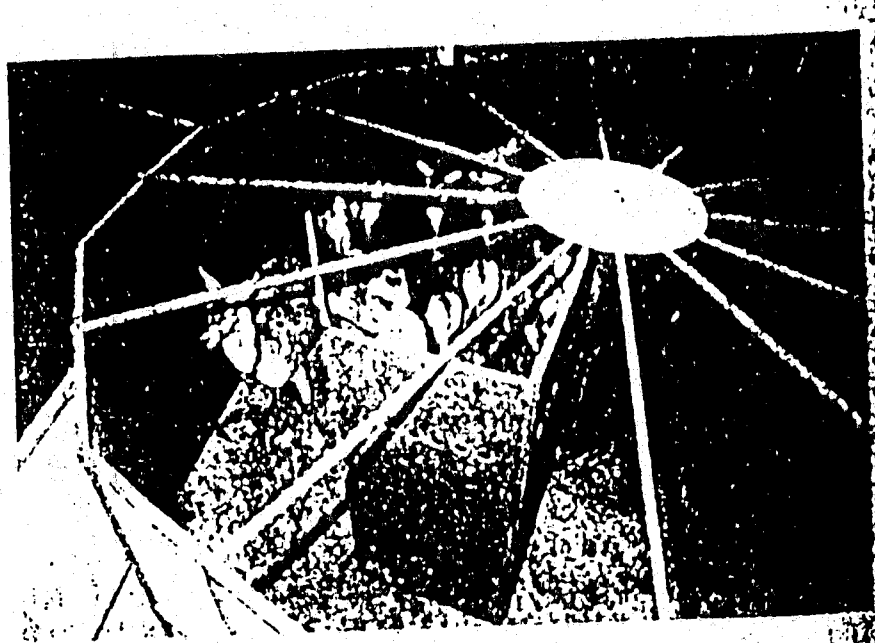


Fig. 2.2 Goats Image.

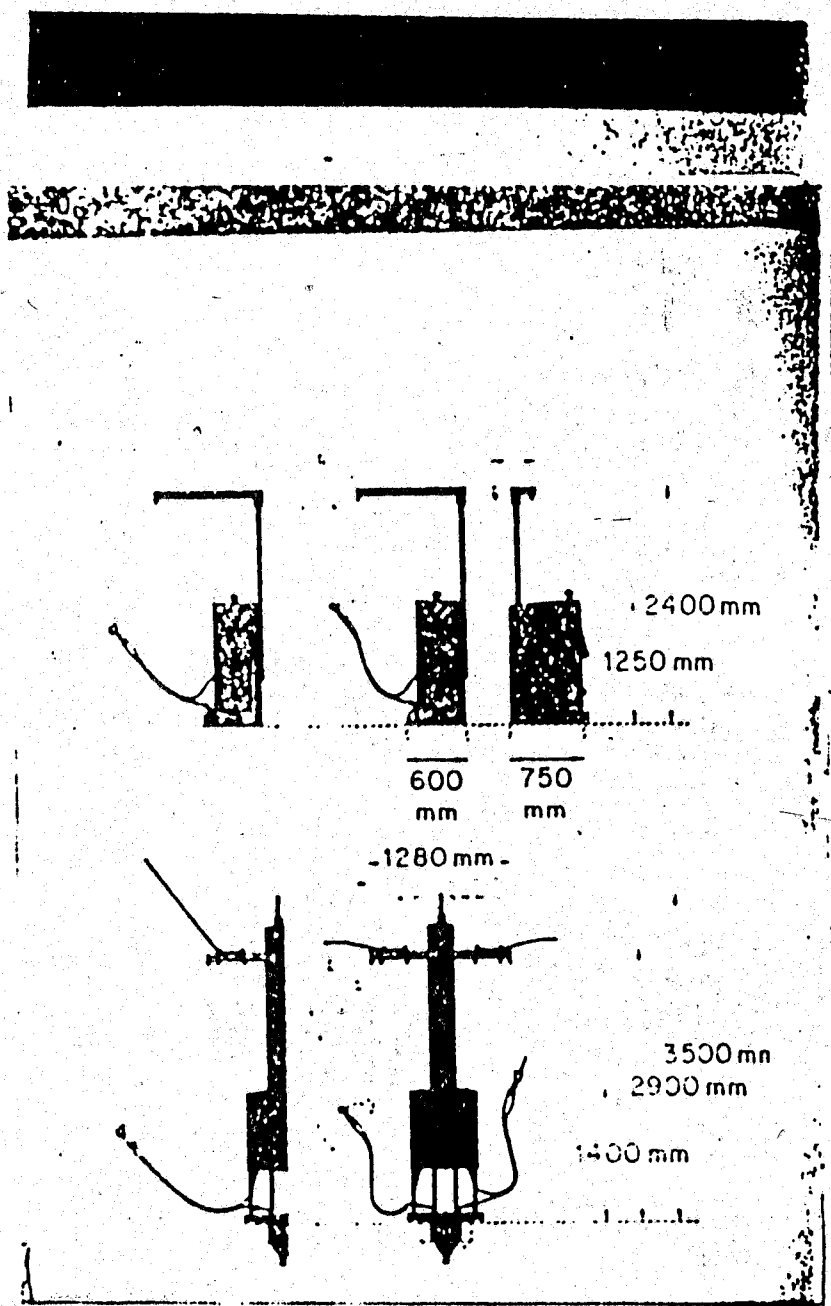


Fig 2.3. PITCHING DEVICES.

there is in a public abattoir) or from farmers. The abattoir activities or operations begins. The Animal is kept in lairage for 24 hrs. The aim of keeping animals in lairage is for it to have enough rest, prepare it for slaughter and for easy removal of the intestine and emptying. The importance of suitable lairage accommodation for animals awaiting slaughter cannot be over estimated, for a period of rest before slaughter has a beneficial effect on the appearance and subsequent marketability of the carcase.

Considerable quantities of lairage waste in the form of bedding and dring required periodic removal preferably to an elevated covered site near the lairage from which it can be conveniently reloaded for removal.

Animals are usually well fed in the lairage until the of the slaughter.

Animals are sometimes taken directly to slaughter Hall from lairage while sometimes they are kept at holding pen for final preparation. Many abattoirs in tropical from above as they move along the race connecting the mistering pen and stunning pen. Cleansing of bellies, legs and feet by horizontally directed water spays fitted on both sides of the race or alternatively by a water bath is a practice to be strongly recommended in warmer countries. In temperate countries, however, particularly during the winter months when animals are housed, spraying is contradicted. In all cases every effort should be directed towards keeping clean as possible.

Slaughter could be done manually or mechanically with knife after which it is allowed to bleed. But the most modern method of slaughter is the stunning-pitchin-bleeding method. Here the animal is made unconscious by electric schlock or pistol bolt, after which the pitching is done. After the pitching the animal is taken for Bleeding. This is also done mechanically as shown.

When bleeding is completed, the animal goes for dressing. It is here that removal of viscera, hide, Horns, Hoof and bones are done after which the meat is washed and stored in chill room sold to buyers or given to the waiting owners.

A typical modern abattoir has the following facilities: -

1. Administrative Unit.

- Manager

- Accountant
- Veterinary office
- Meat inspector
- Vet. Laboratory
- Clerks office
- Maintenance
- Sales office
- Changing room
- Laundry
- Store
- Convineces.

2. Slaughter House
   - Slaughter Hall.
   - Holding pen.
   - Stunning area
   - Bleeding area
   - Dressing area
   - Refrigeration accommodation
   - Defained meat room
   - Condemned meat room
   - Gut and pipe room
   - Offal room
   - Cutting area / room
   - Fresh meat dispatch area
   - Waiting area.
3. Animals' market.
   - Market manager

- Offices
- Convinieces
- Stores
- Agents accommodation / commission men

4. Manure / solid waste bay.
5. Vehicle washing.
6. Food canteen.
   - kitchen
   - store
   - eating area
   - laundry and conveniences.
7. Kiosks
8. Grazing area
9. Parkingares
10. Ancillary facilities.

Abattoirs have the following by-products.

HIDE- used in the manufacture of leather goods, sizing, paper boxed, wallpaper, sandpaper, emery cloth. The gelatin (from hide rimming) is used is the manufacturing of cardy, ice cream, jellied food products and photographic film. While the Hair is used in the manufacture of lent, plaster binder and upholstery.

BLOOD– use in the manufacturing of livestock fees, adhesives, fertilizer. The blood albumin is used for making leather preparation, mordant (dye fixative).

BONE- the Bones are used in the manufacturing of livestock feeds, fertilizer, Bulletins, dice, crochet needles, knife and umbrella handles, pottery clay additive, hardening steel and refining sugar.

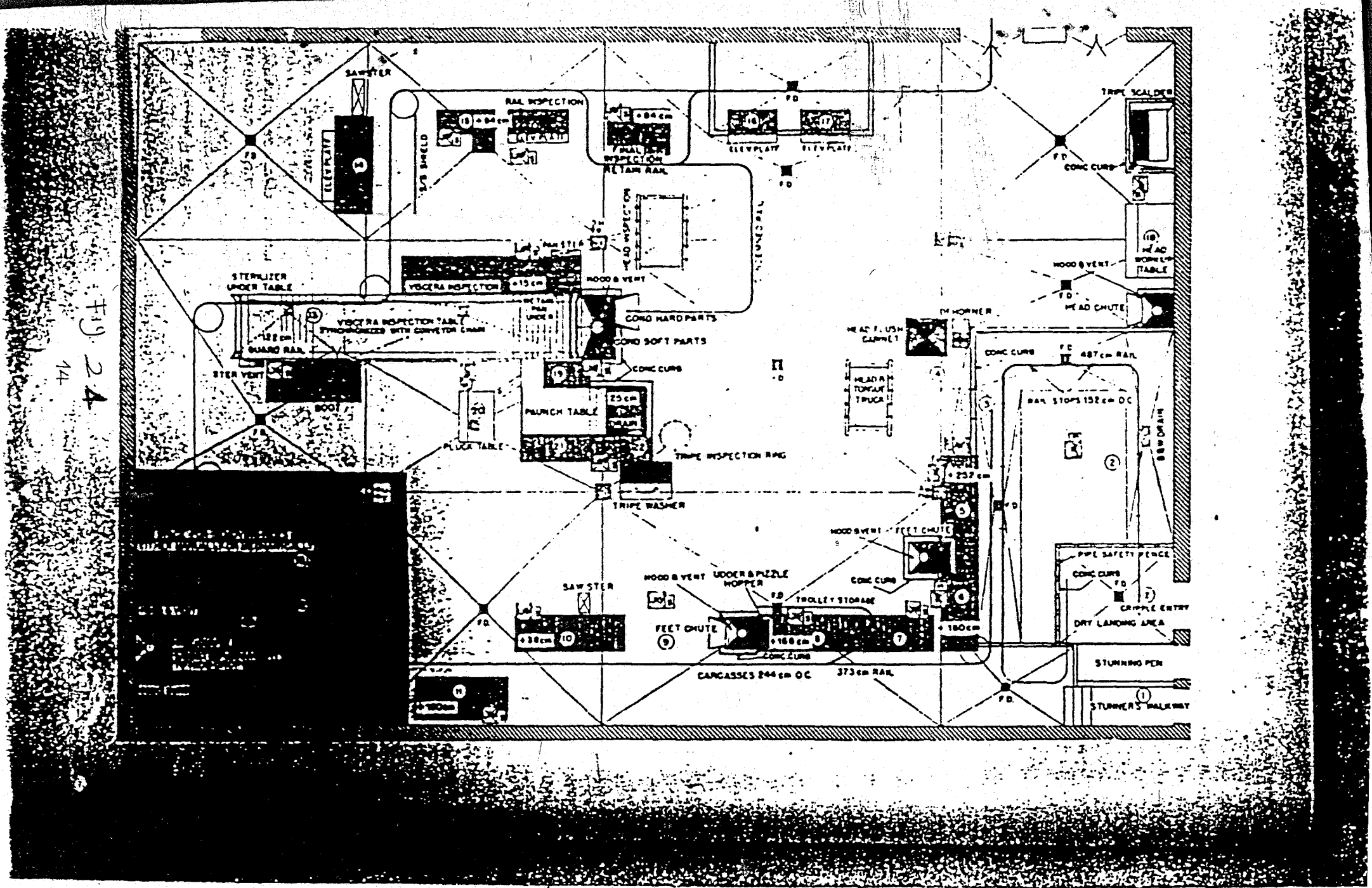

SAW STER
RAIL INSPECTION
ELEVPLATF
SS SHIELD
RETAIN RAIL
ELEVPLATF
TRIPE SCALDER
COND CURB
HOOD & VENT
STERILIZER UNDER TABLE
VISCERA INSPECTION
HOOD & VENT
HEAD CHUTE
VISCERA INSPECTION TABLE
SYNCHRONIZED WITH CONVEYOR CHAIN
GUARD RAIL
COND HARD PARTS
COND SOFT PARTS
IN HORNER
HEAD WASH CABINET
STER VENT
BOOT
CONIC CURB
PLUNCH TABLE
HEAD & TONGUE TRUCK
RAIL STOPS 152 cm OC
TRIPE INSPECTION RING
PLUCK TABLE
TRIPE WASHER
HOOD & VENT
FEET CHUTE
PIPE SAFETY FENCE
CONIC CURB
SAW STER
HOOD & VENT
UDDER & PIZZLE HOPPER
TROLLEY STORAGE
CRIPPLE ENTRY
FEET CHUTE
DRY LANDING AREA
CARCASSES 244 cm OC
373 cm RAIL
STUNNING PEN
STUNNER'S WALKWAY

Fig. 24
14

FAT– Used making poulty feeds, margarine, bakers hortening, candies, chewing, gum, filler for leather, industrial oils, lubricants, candles, tanning preparations soap and glycerin.

INTESTINE– use as sausage, Gold beater skins (used in the manufacture of gold leaf), tennis strings, musical string, surgical ligatures.

STOMACH– Used as ingredient in cheese making.

As discussed above, one can conveniently say that abattoirs by products are of great importance to economic development. But it is not a common practice in most countries to prepare and store the by-products for the affiliated industries. This is due to lack of patronage, as such the by-products are disposed off.

2.3 SANITATION IN MODERN ABATTOIR

'It costs less to be clean than to be dirty'(Gracey, 1992) sanitation is one of the most important functions in a meat plant and involves a technology no less detailed than that of slaughter and carcase dressing. It demands well trained and responsible. Operatives whose influence or meat quality, product, self-life and working condition should not be under estimated.

Hygiene is every one's responsibility. It is necessary to recognize a sanitation unit under a responsible and competent supervisor and to establish a working rontine. This will include the areas and equipment to be treated, cleaning techniques to be adopted, the frequency of treatment, types of detergents / sanitizes to be applied, safety precautions etc. A system of daily, weekly and monthly cleaning operations properly related to particular areas and items combined with efficient routine must first be established As a further means of emphasizing the great importance of plant hygiene a Daily sanintation repott should be kept by the inspector as a daily record of overall conditions. This will include all pant of the plant, including the lairage, and indicate wether satisfactory or unsatisfactory conditions obtained and the action taken. The standard of pest control and personal cleanliness of staff should also be noted. If properly used, such a record detects

problem areas improvements of deterioration, and be of value in improving techniques and where changes of staff occur.

The segregation of clean from dirty operations is a prime responsibility.

In order to produce a workable sanitation procedure two main areas of opwration must be recognized.

1. General House Keeping Functions e.g. floor cleaning, prevention of unnecessary pile up of waste products (blood, meat and fat, scraps, bones etc) removal of waste material, control of smoke etc.
2. Meat and meat product handling. e.g carcase dressing procedures, sterilization of knives and steels hand, arm, apron and boot washing .

2.4 ANIMAL AS FOOD FOR HUMAN COUSUMPTION

The primary bond between man and animal, that is food, continues to be as important today as it ever was. Weather we eat to meet the hunger, pangs or for maintenance of life and promoting growth for pleasure, "Eat we must"

Animals are the biological machine which coverts often valueless ray materials to fine palatable products which, as balance diet for man, produce energy, provide materials for body building and help maintain life and regulate the body processes.

Since ages man have lived at subsistence level and hence adjusted their diet to the available food. Meat is outstanding for it's nutritive value base on the daily recommended allowances for a 22 year old man, a 3 1/2 ounce (99gram) serving of cooked meat provides 45 percent of the needed protein, 9 percent of the calories, 36 percent of the iron, 31 percent of the thiamin 15 percent of the riboflavin and 26 percent of the niacin. Because of its appearance aroma and flavour, meat has almost universal appetite appeal. Such palatable food aids in digestions by stimulating the flow of the digestive juices. Meat has a high satiety value, giving a feeling of satisfaction and well being that staves off hunger for longer periods than other foods. Protein is essential to growth and life. Differences among proteins are reflected primarily in the amount and kind of amino acids

they contain. Amino acids, consisting of carbon, hydrogen, oxygen, Nitrogen and sulfur are the building blocks of proteins, Eight of the amino acids that humans cannot synthesize are essential for growth and maintenance of body tissues. Proteins containing all of the essential amino acids in the proportions most useful to the body are described as having biological value. Meat proteins are among the most important of these. Extreme protein deficiency may result in poor muscle tone and posture lowered resistance to disease, premature aging anemia, stunted growth in children, tissue degeneration, edema and slow recovery from illness or surgery, severe cases of protein. Deficiency disease in children, known clinically as kwashiorkor and often found in tropical countries, can be avoided by supplementing diets with high quality protein.

Meat is an excellent source of B vitamins, including thiamine, one of the most important. Pork is the best source of thiamine, liver is next and skeletal muscle, from any meat source, is third. Extreme thiamine shortage may result in beriberi, disease common in far-east. Liver is an excellent source of riboflavin, another B vitamin that combines with protein in the body to form important oxidative enzymes. All mats supply niacm, which helps to build and maintain a healthy skin, nervous system and digestive system. Meat is also a good source of the essential minerals iron phosphorus, potassium, sodium and magnesium.

The industrial revolution in Europe bring about a charge to modern are where foods relationship is improved. The development of increase in demand for livestock products has lead to tremendous advances in livestock production, food animals. Also the special ability of animals to transform the food stuff that cannot be directly consumed by human into edible nutueous and disable human food the animal also have a role in maintaining soil fertility and soil water conservation, apart from acting as a source of power.

2.5 ABATTOIRS IN NIGERIA.

Abattoirs and it's practices in Nigeria differ slightly from that of the western

world. This is due to some factors such as, socio-cultural life, lack of facilities, sanitary problems and maintenance.

Abattoirs in Nigeria are public properties and due to religious belief there are selected animals that are slaughtered in the abattoirs. This slaughter in the past was done on slabs. The slab made of concrete and slopes toward a dug pit for collection of blood. But with the technological development the built abattoirs came into existence though not as sophisticated as in the developed Countries.

Cows, sheep and goats are usually sold in the cattle market within the abattoir. The purchase is done from the cow dealers through their agents or commission men. The purchase is usually a day prior to the slaughtering by meat dealers and caterers. It is at this stage that the meat processing begins. The animal (mostly cows) are taken to the lairage and kept for 24 hours within which they are not fed but given water. This is to enable easy emptying of the stomach and intestines.

The rail systems of Nigerian abattoirs have been abandoned due to lack of maintenance as such the stunning or humane slaughter is not practice, rather the manual knife slaughtering is done. In this the cow is knocked down. In this, the cow is knocked down tied with rope and then slaughtered. The skin, the vicera and the bones are removed from the carcss. The work tops and cutting area are located close to the slaughtering area since there is no rad system. As such the caress is taken to the cutting area by the butchers for spoiling and subsequent delivery to the waiting owners of the meat.

In the light of the above meat Slaughtered in Nigerian abattoirs is own by different people. The abattoir is a public building that render butchering services to the public at small charges. As such Nigerian abattoirs have waiting areas where the owners of the meat wait to see how their meat is processed and to collect the meat.

Charcoal is not used in Nigerian abattoirs during roasting of sheep, goats, caw heads and legs. This as they claim is very expensive. As such the smoky burning of tyres is employed which bring about air pollution. Realising this adverse effect of the method employed in Nigerian abattoirs compelled the government to adopt new methods in order to reduce air pollution. These include the use of charcoal constriction of chimneys.

A study of good numbers of abattoirs in Nigeria shows that quern the services are not well practice, rather is only veterinary personnel that check the cows at the lairage and the meat after slaughter. In some cases the animals are not even checked. This has resulted to lost of cows due to easy spread of diseases from infected cows are allowed into the cattle market.

Nigeria is yet to start the private abattoirs operation due to lack of big meat packing industries.

2.6 ABATTOIRS IN FCT

According to the veterinary and livestock unit of the Department of Agriculture and Natural resources, Federal Capital Territory, Abuja. Abattoirs in the capital city number up to five. But the modern abattoir though not to standard among them are three. The Garki abattoir karm abattoir and kubwa abattoir. Each of the abattoirs provide services for area within which it is located. The biggest of them all is the Garki abattoir in which about 100 cows are slaughtered daily. But due to growing population of the city, the abattoir is becoming small according to a source in the abattoir. There is therefore the need for expansion or another or another.

In view of the above, location of the proposed ultra modern abattoir in Abuja is imperative.

2.7 REVIVING NIGERAN ABATTOIRS AND AFFILIATED INDUSTRIES

Except for the sanitary problem, Nigerian abattoirs have faire well in the discharge of its primary functions, provision of meat. But one thing weighting the industry down is lack of patronage of by products, which are of economic importance. This ordeal is as a result of little or no existence of affiliated industries.

To revives the industries government and individual must invest into meat and meat packing industries and well as the by-product industries. Polices should be

introduced that will encourage the establishment of the industries. By such doing the industries will be available to patronize the Nigerian abattoirs and this will consequently reduce sanitary problem being faced by Nigerian abattoirs.

Industries affiliated to abattoirs include, leather goods industries, candy industries, felt, plaster bind ice cream upholstery, industrial oils poultry feed and bone meals, soap, fertilizer (farming) etc

CHAPTER THREE

3.0 IMPROVING SANITARY CONDITIONS OF NIGERIAN ABATTOIRS

Sanitation in abattoirs has to do with personal cleanliness and condition of the physical environment (the surrounding, air and facilities available). Though sanitary condition of an abattoir is chiefly attributed to lack of facilities and aminities. Individuals and staff have contributed to deplorable sanitary conditions of abattoirs through lukewarm attitude towards the sanitation of the abattoirs. Abattoirs require constant routine maintenance and cleaning due to the nature of the activities carried out there. Gracey and Collins, 1992) says, Abattoirs requires a routine cleaning of the slaughter hall of least three times daily either used or not.

Most countries in which meat hygiene is of a high quality possess regulations which set standards for meat premises in relation of overall layout, type of construction, material used, lighting, drainage as well as to the different types of departments to be included. All building must be vermin proof and kept free from flies and the surrounding area must be well maintained so that there is no risk to the plant from vermin or insects. Maintenance should be of high standard whether this be related to equipment or to operations such as plastering, painting. All paint used should be of a lead-free type.

While the type of building and it's equipment is important, so also are facilities for cleaning. An ample supply of good hygienic, preferable soft water and an adequate number of hose points are essential. An ample supply of hot water at a temperature of not less than 60°c is essential, preferably boosted with steam to about 82^0. Steam alone is not an efficient sterilizing agent. Because it cools when it contacts a cold surface. Water pressure must be high enough to remove the accumulation of fat, blood bone and dust, from floors and other surfaces. The usual method of applying hot water in meat plants is

through high pressure jet cleaners, the final pressure at the hose nozzle being in the region of 14 kgtlcm2. A recent system of packing house cleaning adopted in the limited states is the Manual operation of spray guns in which the pressure is in the 35-49 kgf/cm2 range, the volume of water being low, averaging about 9 liters per minute. For greater efficiency the hot water is usually combined with a fixed amount of detergent. Thorough cleansing. Using high pressure hot water is usually carried out at specified times when operations are suspended or at the end of the days kill. Vertical hoses using hot water at low pressures must be used to supplement these procedures and thus make the cleansing operation a continues one. Cleansing operation must be frequent to prevent any build –vp of bacteria particularly on trolleys looks and gambrels, etc which come in contact with the meat. These may be sterilized in cabinets on the over head rail or in the sterilization room where they are immersed in batches in tanks containing hot detergent solution hot rinses, derusting, and oiling solutions. Hot water jet hoses may be uses to clean certain types of equipments such as strucks, beef trees etc but these and smaller items such as meat containers knives, scabbards, cleavers con be effectively sterilized in cabinets which utilize a hot water detergent solution.

An upper storey slaughter floor permits higher hygiene standards, as feet, hides, fleeces, etc are discharged to the by-products areas below through a system of chutes and there is less cross-traffic of trucks and personnel.

Many different combinations of cleansing equipment exist in different meat plants, the aim being to perform a task efficiently quickly and with the minimum of labour. While increased mechanization and automation have reduced production manpower requirements, have reduced production manpower requirements, highly sophisticated cleansing installations are not always the most efficient and in much cleaning still has to be done manually.

It is essential, therefore to have a schedule of cleansing which effectively removes gross material and prevents the build-up of scale. Recently two methods of detergency

have been introduced which greatly reduce the need for manual work. These compound contain chemicals appropriate to the soil and surface being cleansed. The foam or gel adheres to the surface, allowing time for the chemical to break down the soil which is then rinsed away with hot water under pressure.

Too little attention has been given in the past to the cleansing of meat plant and meat processing premised and equipment. In many instances like more than hosing with cold water was carried out. No thought was given to water pressures and temperatures or the means by which the cleansing method was applied. Lengthy unwieldy house are both a nuisance and a danger. Hoses should be adequate in mummer (both not and cold) and of short length. If hung vertically they can be more effectively applied to restricted areas.

In the process of cleaning a meat plant, it is necessary to carry out the following procedures

- Remove all gross fat skin and meat scraps in the slaughter in particular this is a round the clock operation and must be associated with tidy working methods.
- Apply cleaning compounds at proper temperature for their optimum activity.
- Rinse with hot water
- Sanitize.

Sanitation in Nigerian abattoirs has been given little Abattoirs are left in littered environment with air polluted of smoke and odour. The physical environment unhealthy and disgusting.

Abattoirs being places that require good hygiene nee to be kept in good sanitary condition, and achieving this has to do with personal discipline, improving sanitation routine daily cleaning and sterilization of plant, employing specialist and hard working personnel to be in-charge of cleaning, waste and by products disposal

3.1 WASTE DISPOSAL AND PLANT CLEANING IN NIGERIAN ABATTOIRS.

Plant cleaning and waste disposal in Nigerian abattoirs dippers from one another.

The methods employed depends on the size of the abattoir, it's patronage and the man power in the abattoir. Various method employed in cleaning and disposing waste has to do with the nature of the waste. Solid wastes have its means of cleaning and disposal which differs from the liquid and semi liquid waste

Plant cleaning in Nigerian abattoirs is a daily routine this is chiefly the slaughter hall, lairage and other facilities. Slaughter house after use is cleaned with water, mostly running water from tap or tank. This cleaning with water is not done as earlier discussed and it is mostly done when the blood, fat and protein waste is beginning to dry up. There is a total absence of detergent cleaning and sterilization of the hall, this attributes to production of meat that is not bacteria free in our abattoirs and odour in slaughter hall. The cleaning process in the hall is equally same in the lairage as such the animal dung not properly washed brings about smell and flies. These flies that are attracted to the lairage subsequently get into slaughter hall due to the absence of net or flies prevention mechanism.

Blood, fat, protein and bone dust is usually disposed through the drainage. The drainage system in Nigerian abattoirs is mainly made of the drains (gutters). The drainage are uncovered, they are surface drainage and the cases of covered, they are usually covered with welded iron rods which slightly or does not make any difference with the uncovered. The drainage are allowed to run into bushes, valleys or streams. This has contributed to the pollution of the air and the streams water. Septic tanks for collection of the drains are absent and even if available, the are mostly in bad condition or abandoned. A visit to one of the abattoirs made this assertion worse. The drainage is to an express road in which the waste is allowed to run to the road making the area unpleasant for passers by and other road users. There are the major characteristics of the drainage systems in Nigerian abattoirs except for some recently constructed abattoirs or the ones that are planning to rectify the problem.

Method of solid waste disposal such as animal dung, the waste from the bellies and intestines, refuse and garbage from the littered surrounding are major contribution or cause of sanitary problems in abattoirs. To start with the surrounding is not always kept clean from the rubbish and even when collected there is no specific location for the disposal. There is absence of incinerators as such even when collected in a specified place it still does not solve the problem. Solid wastes from the slaughter are usually used as manure by gardeners. But before that, it is usually drained and dried in the abattoir. Nigerian Abattoirs are characterized by dumping of these solid waste on the ground this makes it difficult for the waste to drain and dry as such bring about smell. There is absence of solid waste draining bag and stores. The wastes are usually accumulated in hips till when who ever needs them show interest. Most times the waste are allowed there for months and this result to smell.

The waste from roasting of goats sheep and cow heads are mostly allow to be, interest is not shown on disposing them. They are allow to be littered on the surrounding utill wind or rain wash them away. This attributes to the fact that such wastes are of no financial benefit to the abattoir.

Personal cleanliness of the staff is imperative in the sanitary improvement. Apart from personal hygiene and body cleanliness, the manner in which the staff dispose the refuse in their offices matters a lot in the abattoirs visited there are absence of refuse / dust bins in offices. As such they freely dispose off refuse any where. This is as a result of the feel or impression that abattoirs is a place were dirty operation takes place.

Bones, horns, hooves and other by products are usually dried stored and sold to affiliated industries. In Nigeria the case done not differ, except for the fact that the affiliated industries are few and this has made the affiliated industries are few and this has made the processing and storage of the by products a difficult thing in Nigerian abattoirs. The by products are allowed or gathered in hips of various locations. In is when

one place order that they process the by product and sell. Those that are in hips are allowed to be there until when it get spoil. This is becoming a treat to the sanitary of Nigerian abattoirs. Blood, instead of drying and selling for blood meat, is washed off into the drainage due to lack of patronage. It is only in few occasions that they are patronize.

In a broad view, there has not been a consistent method of wasted disposal in Nigerian abattoirs and there has not been any government regulation on it.

3.2 ABATTOIRS AND SANITATION IN FEDERAL CAPITAL TERRITORY, ABUJA.

A critical look at abattoirs in the Federal Capital Territory shows that, they do not observe any sanitation routine and there are no sanitary officers attached to the abattoirs as such, despite the littered environment sanitation, is done at will. Some of the abattoirs clearly shows that abattoir is out of question due to the nature of the surrounding, they look abandoned.

The above was a great motivating factor that made the writer to make a detailed research in the sanitary condition of Nigerian abattoirs with a view of proffering solutions to the identified problems and means of achieving a lasting maintained environment.

3.3 SANITARY PROBLEMS IN NIGERIAN ABATTOIRS.

Sanitary problems in Nigerian abattoirs emanates mostly from the design, lack of adequate facilities and maintenance. A clear look at the abattoirs, shows that most of the design are done without provisions for adequate sanitary. This lies within the lairage and the slaughter house. Floors does not slope well into drainage and not enough hoses points are available for washing the plants. Due to the absence of these the abattoirs are faced with unclean slaughter hall and plants. Most of the plants are stained with blood fat and other waste. This make the place smelly and the meat liable to bacteria infection. The

usually method of washing plant with hot water of about 82°c is not a common feature in Nigeria. To worsen situation, sterilization of plants is not done in Nigerian abattoirs the common use of hot water is absent what more of the use of disinfectants and detergents. These has made the abattoirs very liable to bacteria infection, odour and unpleasing looking plants.

Drainage's are vital provisions in an abattoir. It well being and maintenance is very vital the ill-luck associated with this is that, most of the drainage's are surface drainage's they are opened within the circulation area. This make the place look dirt as the runoff of the waste is unpleasing to the eye and too much exposure to it brings about bacterial infection. There drainage's mostly run-off into bushes, valleys, streams and roads. This is due to lack of septic tanks. The waste accumulates over and over again until rain wash it way during rain season, if not it pollutes the environment with smell and provide unpleasing air to the people around the area.

There is a common use of tyres for roasting in Nigerian abattoirs, these tyres when burnt produces thick smoke and carbon. This had made smoky and black foggy environment common in Nigerian abattoirs. The polluted in air is not bearable to some people and can cause hart related disease. The methods are employed in the roasting of the goats and sheep due to the absence of chimney and the convenient method of the use of charcoal. Refuse and rubbish collected are not properly disposed off. They are accumulated in hips and burnt. This also contributes to the pollution of environment with fumes. This is due to lack of incinerators in abattoirs the surroundings in Nigerian abattoirs are littered with debris. The users of the abattoirs seems not too concern about the neatness and tidiness of the environment. Used nylon bags packets of industrial goods and other dirty making things. There is no control of dirtying the environment and cleaning as such the environment is shamble.

Most of by products are not sold of. They are rather accumulated in hips in the abattoirs awaiting buyers. The absence of store to put them causes the accumulation and

this accumulation bring about unpleasing environment. Due to lack of proper keeping of the by product. Due to lack of proper keeping of the by products make them not recognize as important thing by the public. The blood is disposed off through the waste in drainage this makes the drain smelly and stain plants due to improper cleaning.

Cleaning of the lairage and the slaughter house is not properly done as such it brings about odour and bacterial infection on meat.

Adequate provisions are not made in Nigerian abattoirs to prevent flies from getting access into slaughter house. This exposes the meat to bacterial infection

Inadequate water supply has without proper wasting. This bring about with blood this also contributes to improper clearing of plants.

3.4 SOLUTIONS TO SANITARY PROBLEMS IN NIGERIAN ABATTOIRS.

To change the condition of the existing abattoirs we have to start from the design construction to the use and maintenance of the structure.

All building if constructed, should be vermin proof and kept free from flies and the surrounding area must be well maintained so that there is no risk to the plant from vermin and insects. By this doing the bacterial infection by meat is done away with. Floor and walls should be of smooth impervious material, with corners covered porcelain tiles may be advantageous in certain places, but modern epoxy paints which present a hard durable easily cleaned surface may in time replace them or the floor made of terrazer floor. The type of equipment use should be of good quality, durable easily cleaned and non toxic to meat and meat products. The aim of the above is to provide easy cleaning of the materials and maintenance. This cleaning is done through wasting and sterilization.

Cleaning of plants and equipment should be done with hot water of about 82°c and a pressure of 14kgf/cm^2 to allow easy removal of fats and proteins. Detergents and disinfectants should be used in the cleaning of abattoirs. To ensure healthy meat, clean

slaughter house and hygienic meat dressing the abattoir should clean with; disinfectants, detergents, enzyme based foam cleaning agents, germicide and sanitized. To produce a workable sanitation procedure two main areas of operation must be recognized; General house keeping operation as mentioned above and meat and meat product handling carcasses dressing procedures, sterilization of knives, and steels hand arm, apron and boot wishing. All areas ad items must look clean, feel clean and smell clean. This is aim at; visual hygiene - freedom from obvious dirt; chemical hygiene - No residues of cleaning compounds; microbiological hygiene - freedom from potential pathogens.

To attain the required sanitary standard in Nigerian abattoirs trained and special persona on sanitary issues has to be employed in the abattoirs. They are to make schedule arrange and do the general cleaning of abattoirs this if done will be efficient since they will be attached to that responsibility and if it is not done, the authority knows does to be approached.

One of the major sanitary problem is the drainage's. to do away with these problem is the drainage's if constructed should be wide enough, have a good slope and be of slippery surface. This will ensure easy runoff of waste. The drainage should be covered around the circulation area, since there is movement of people around the place. This is to prevent the people from seeing the irritating waste running off. The covering of the drainage's could be done with pre-cast concrete slabs to ensure easy opening when there is blockage.

The irritating odour of abattoirs can be reduced by provision of septic tanks. The septic thanks should be built in a distance that will allow enough circulation at the same time a distance that will allow easy slope into it from the drain. The septic tank should be bit enough to accommodate the waste for along period in other to reduce cost of emptying and provisions should be made for two. This will give rooms for maintenance when necessary so that the other one will be function when maintaining the other.

Solid wastes should be well disposed off drying bay for solid waste should be provided.

Since there is constant removal of soil waste from the abattoir, enough provision should be made to accommodate the waste and it should be in such a way that they are in cartigories so that the fresh solid waste are not mix with the ones that are getting dried. The waste bag should be in such a way that water is drained through perforated base. After this large store should be provided for storage of the dried waste that could be use as manure by farmers. By this doing the sanitary problems associated with solid waste is completed waste is completed done away with.

Government should enforce a law on the use of charcoal instead of the smoky tyres burning method there should be chimneys in abattoirs so that if the charcoal method cannot be employed, fire wood should be used which will take the smoke high above. Though this method is not completely controlling air pollution, it reduces it.

Incinerators should equally be provided for burning refuse and debris instead of accumulating them in hips. This incinerators while also provide a safe place to dispose spoilt meat or contaminated meat by burning caws that are usually found unfit for food are usually destroyed by burning. This could be done in the incinerators instead of disposing in the bush as done now.

Other measures to be employed to reduce and alleviate sanitary problems include; routine cleaning and checking by cleaners and sanitary officers.

Stores should be provided to store ready to sell by products.

Affiliated industries should be revived to allow good patronage of by products .

Butchers and other workers in the abattoirs should also be educated on the necessity of sanitation in the abattoir and how to go about achieving it.

CHAPTER FOUR.

4.0 CASE STUDIES

4.1 CASE STUDY ONE

MINNA MODERN ABATTOIR , MINNA.

Minna modern abattoir was constructed in 1990 and commissioned in January 1999 it was constructed under the supervision of the state ministry of works and housing. For the state government.

The abattoir was constructed as modern abattoir with rail system of dressing. But due to lack of inadequate maintenance, the rail system is out of use. Is able to attain the needed services to the capital city of the state. An average of about 25 cows are slaughtered daily, 65 sheep and 100 goats.

FACILITIES AVAILABLE.

Facilities in Minna abattoir are up to date but when compared with the western world it is lacking. The modern facilities of the abattoirs as to now are not functioning and there is no any plan as of now for it repairs.

Facilities available include.

A. The main building: -

- lairage
- Slaughter hall.
- Waiting area
- Administrative offices
- Cold rooms
- Kitchen
- Stores
- Conveniences

3. Cattle market
   - Offices
   - Market place.
4. Drying rooms
5. Off loading bag
6. Grazing area.

SERVICES

1. DRAINAGE.

Typical of Nigerian abattoirs the Drainage is within the main building. The drains are open drainage which are disposed to a septic tank. The septic tank is now out of use as such the waste has been channeled to exposed pit. The human waste sewage) are properly disposed to septic tanks and soak away through underground p.v.c. pipe.

(ii) VENTILATION

At first the general ventilation was partly natural an artificial, depending on which facility. But with the lack of maintenance and other factors, the abattoir completely depend on natural ventilation. This bring about inadequate ventilation. Though fans are used in those areas that so much need artificial ventilation, but it is insufficient

(iii) LIGHTING

Natural lighting is majorly used in the slaughter hall during the day. This is due to sufficient openings in the hall, except in the night that artificial lighting is used when work done.

As the problem of ventilation exist in some offices, so the lighting. A good number of the offices are lighten artificially.

(iv) **LAYOUT AND CIRCULATION.**

The planning is properly done as it is based on relative functions and on disperse layout, complete separation of service entrance and main entrance. Supporting facilities are well located in relation to their functions.

(v) **LAND SCAPE.**

There exist no landscape as the only few hard landscape elements that ever existed was unkempt hence lost its value.

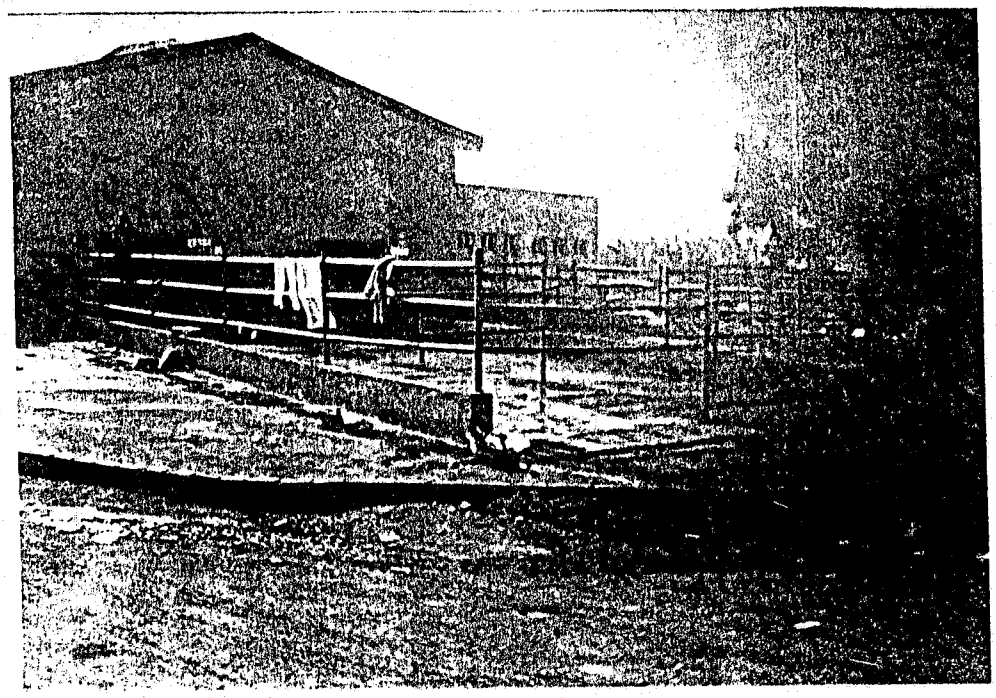
APPRAISAL.

(1) **MERITS.**

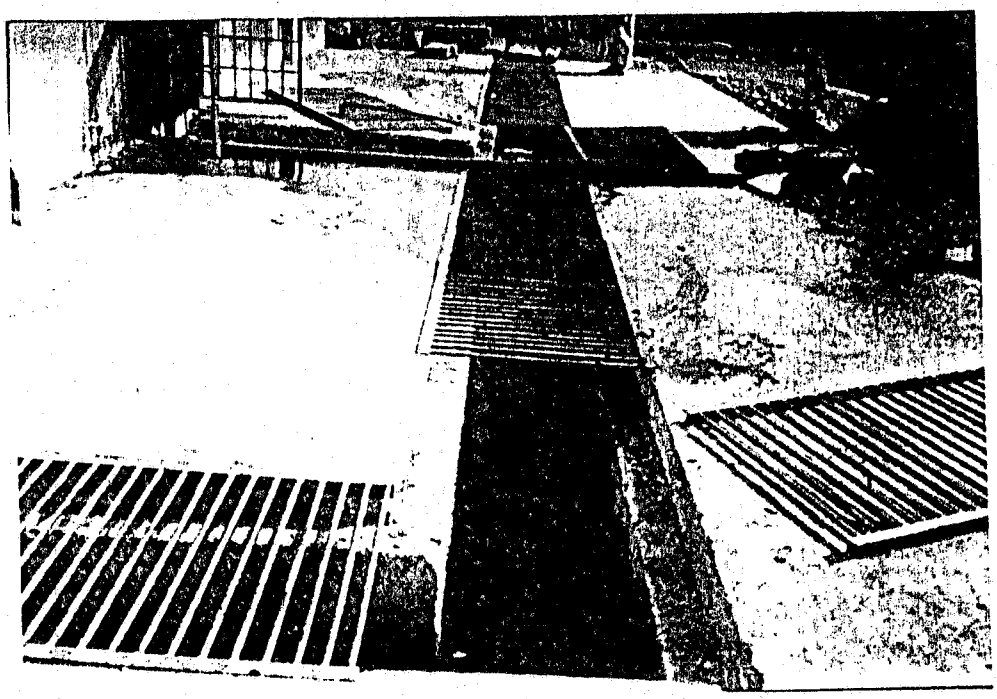
- Enough facilities and space for expansion.
- Big over head tank.
- Easily accessible though not near road
- Enough grazing area
- Offices for cattle dealers.

(ii) **DEMERITS**

- Absence of septic tank.
- No solid waste drying bay.
- Absence of stores for by products which bring about unnecessary hips of by-products
- There are no shops and food canteen. As such hawking is common.
- No defined circulation path. And no clear distinction between vehicular and pedestrian traffic.



THE MAIN Building.



Drainage system.

PLATE 3. GAMKI MODERN ABATTOIR. GAMKI.

4.2 CASE STUDY TWO

LAGOS MODERN ABATTOIR

Lagos abattoir is one of the most recent abattoirs in the country. It is located at Oko-oba Agege. The operation in the abattoir is mechanically done and the sanitary condition to some extent is fair. As a routine clearing exercise is sometime carried out.

FACILITIES AVAILABLE.

Facilities available at Lagos abattoir include:-

- Administrative unit
- Slaughter House
- Lairage
- Cattle Market
- Retail Meat / Provisions Market. (Open shops)
- Drying stores
- Grazing area

SERVICES

(i) DRAINAGE:-

The abattoir is made up of underground drainage system, covered with iron rods. All the drainage are channeled into a septic tank. While human waste are channeled to soak-away through PVC pipes.

(ii) VENTILATION:- The general ventilation is Natural, but due to it's in adequacy artificial ventilation of air conditioners and fans is employed.

(iii) LIGHTING:- The lighting is said to be natural in the day time and artificial during night operation.

(IV) LANDSCAPE.

Though not properly maintain, Elements of hard and soft landscape still exist which if properly maintained will give a good effect.

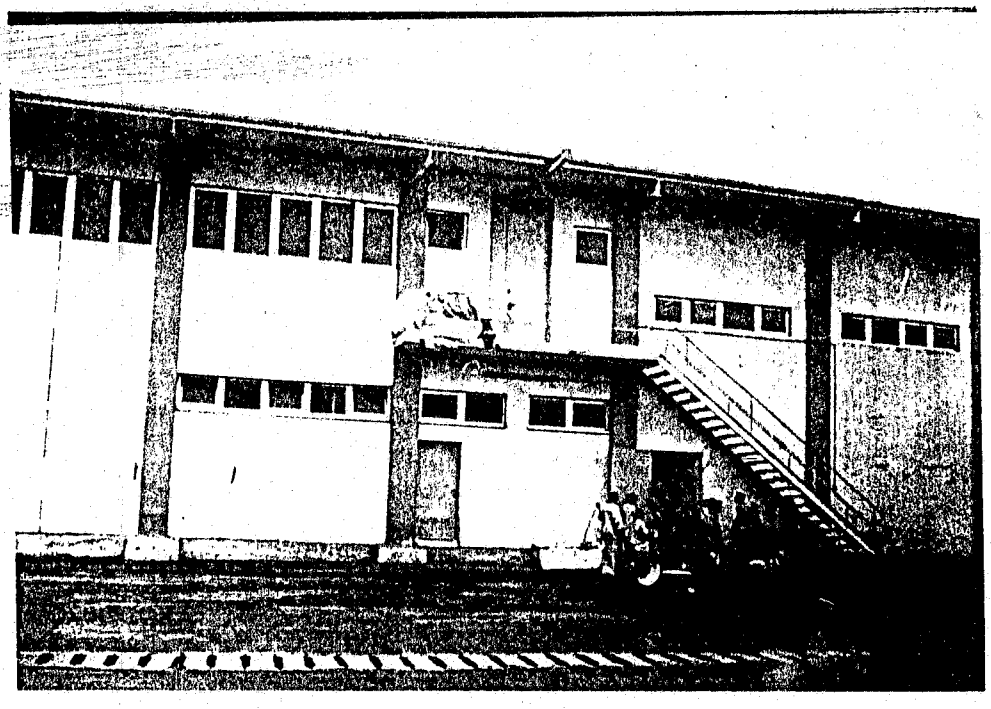
APPRAISALS

MERITS

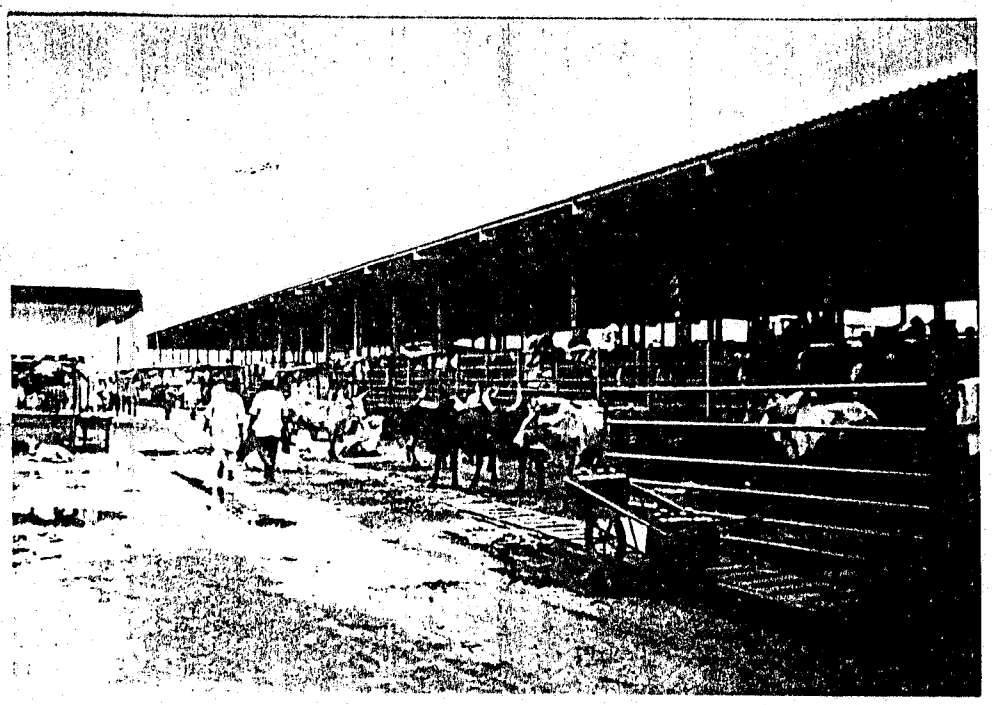
- Open shops in the market which allow continuous activities.
- Over head water tanks to supplement water supply.
- Well drained landscape
- Enough space for future expansion.
- Big cattle market.
- Large lairage

DEMERITS.

- No stores for by products as such brings about hips of. By – products.
- The solid waste bay is not well located and is very close to the market
- Inadequate parking space
- No main food canteen or restaurant



THE MAIN BUILDING



CATTLE MARKET.

PLATE 2. LAGOS MODERN ABATTOIR. OKO-OBA LAGOS.

4.3 CASE STUDY THREE

GARKI ABATTOIR, ABUJA.

Garki abattoir was constructed in 1993, under the Ministry for Federal Capital Territory (MFCT) which after construction was handed over to the veterinary and livestock department of the department of Agriculture and Natural resources of the same ministry. The idea was chiefly to provide meat for public consumption and caterers.

Due to the growing population of the City, the abattoir is becoming small in providing the needed meat. As such there are certain facilities in the abattoir that are being expanded.

A total of about 100 cows are slaughtered on daily bases and about 200 goats and sheep.

FACILITIES AVAILABLE.

The facilities present in Garki abattoir are being improvised, though they are not up to date when compared with technological advancement of the world.

Facilities are group based on relative functions.

1. The main building.
   - Slaughter hall
   - Waiting area
   - Administrative offices
   - Cold rooms
   - Conveniences
2. Cattle market
3. Lairage
4. Drying Rooms
5. Solid waste drying bay.
6. Parking area

7. Off loading bay.
8. Grazing area.

Services.

(i) Drainage

The entire abattoir is not drain. The drainage system is within the main building. The wastes are disposed through surface drainage (gutter) while the human sewage and other wastes are adequately disposed with the use of underground pipe to the septic tanks and soak away.

(ii) Ventilation.

The general ventilation is partly natural and artificial, depending on which facility. Though air-condition units are in most offices and Rooms but they are not functioning, instead fans are used where artificial ventilation is needed.

(iii) Lighting:-

Natural lighting is majorly used in the Slaughter Hall in the day, except if work is done at night which usually is due to emergency. The offices are lighten artificially due to limited openings.

(iv) Layout and circulation.

The planning is based on disperse layout. The auxiliary facilities are scattered about.

(v) Landscape:-

There is no defined landscape. There are few hard landscaping elements with total absence of soft landscaping elements. The hard landscaping element available is not maintained so it has loss it's value.

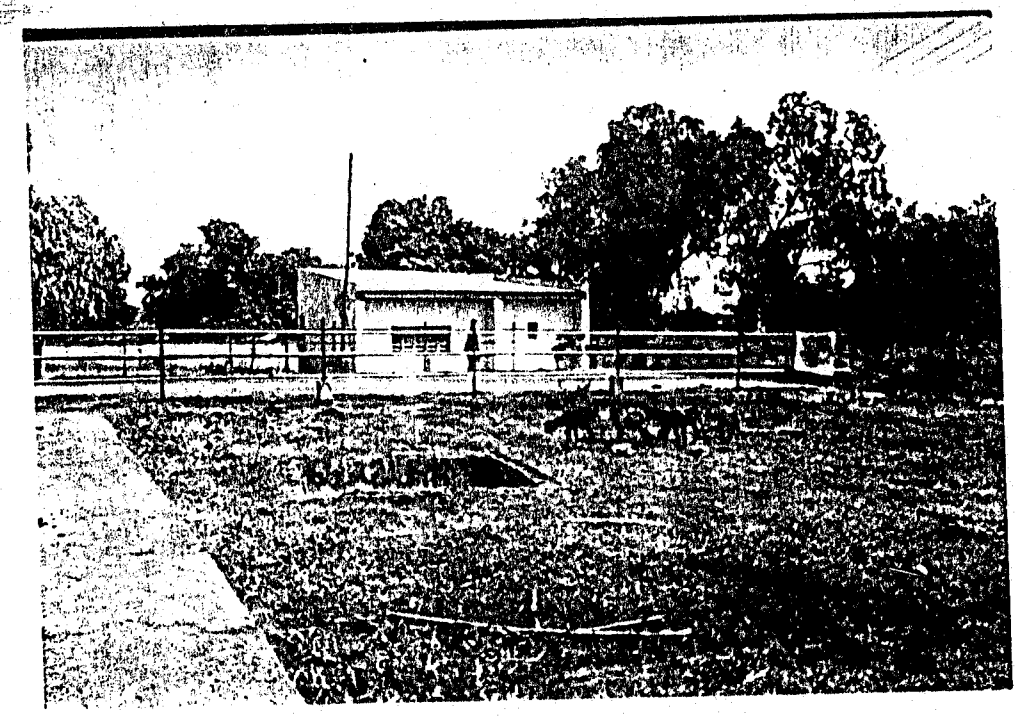
APPRAISAL.

(i) Merits

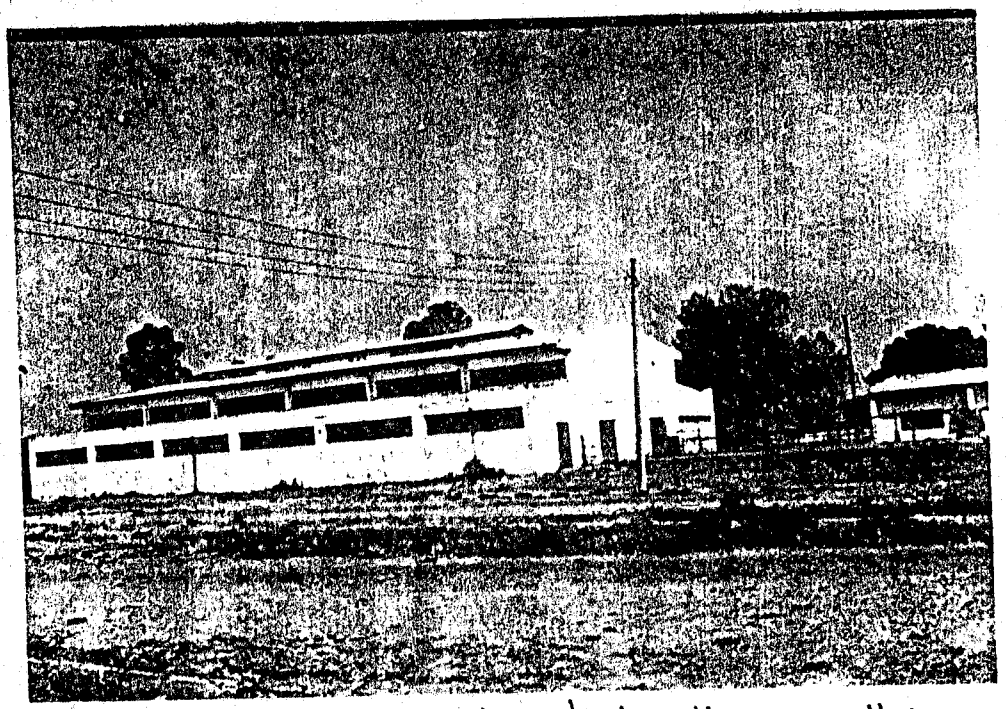
- There is easy access to the abattoir due to its approximate to road.
- Enough space for facilities and expansion
- The Slaughter House is big.
- There is over head tank and water tanker
- Off loading bay is big enough to accommodate a good number of trucks at a time.

(ii) Demerits.

- Absence of septic tank for the waste from the slaughter Hall.
- The lairage is small
- No accommodation for cow dealers and their agents as such there are erection of illegal structures.
- No food canteen and shops. Hence unnecessary Hawking.
- Inadequate parking space
- No incinerator
- No solid waste disposal facilities
- Small overhead tank.
- The cold rooms are out of use.



Admin. Block/Laimage.



Main Building/Slaughter House.

PLATE 4. Kiaru Abattoir, Kiaru.

CASE STUDY FOUR

KARU ABATTOIR, KARU.

Karu Abattoir was constructed around the same time with Garki abattoir. A source in the abattoir said there is no any record at their disposal that states when the abattoir was constructed. The abattoir has a similar design with the Garki abattoir, except for size and facilities available.

Karu abattoir is not as busy as the Garki abattoir. It serve Karu, Yanya and other neighbouring satellite settlements. An average of three cows, two sheep and 16 goats are slaughter on daily bases, peaking to 15 cows, 25 sheep's and about 100 goats on market days.

FACILITIES AVAILABLE.

Facilities available in Karu abattoir is more of manual and Local butchering. Though activities still take place in the abattoir, it looks abandoned.

Facilities available include.

1. Manager's residence
2. Administrative block

Managers' Office

- Veterinary Office
- Clerks Office
- Store.

3. Slaughter House

- Slaughter Hall
- Chill rooms
- Stores.

4. Lairage
5. Off Loading bay.
6. Parking area.

SERVICES

(i) Drainage

The drainage system of Karu abattoir is not something to say much about as there virtually exist no drainage. The only drainage is the floor drain in the slaughter hall that extends outside just a few metres away from the Hall into a valley.

(ii) Ventilation:- .

Ventilation is completely Natural as there exist no artificial ventilation as in air – condition except fans.

(iii) Lighting:-

Natural lighting is used in the abattoir due to the simplicity of the design.

(iv) Layout and circulation.

The planning is based on disperse layout as in the Garki abattoir. The auxilliary facilities are close to each other:-

(v) Landscape.

There is no defined landscape in the abattoir.

APPRAISAL.

(i) Merits.

- the design is well ventilated.

- Facilities are not dispersed

- Enough space for future expansion.
- The lairage is big Enough

(ii) Demerits

- No water supply. This bring about use of water in tank and hence improper cleaning of the plant.
- No Drainage System in the abattoir
- There is absence of market as such cows are brought from outside without any test
- No veterinary services
- Absence of Incinerator which bring about hips of dirt and rubbish.

CHAPTER FIVE.

THE STUDY AREA.

5.1 BRIEF HISTORY OF ABUJA.

The idea of having Abuja as the Federal Capital Territory came into limelight during the administration of late Gen. Murtala Mohammed in 1976.

After a careful, extensive survey and consultations it was agreed that many local inhabitants in the area needed to be moved out of the area for planning purposed and be resettled outside the area in places of their choice at government expense.

The Federal Capital Development Authority was established to plan and administer the territory. The authority started work immediately and the seat of the government moved to Abuja after about 15 years. Garki and wuse exist as central districts surrounded by satelite towns like Nyanya, karmo Garki Village Apo e.t.c.

Abuja is an 8,000 square kilometer area surrounded by Niger, Kaduna, Plateau and Kwara states. It lies on longitude 7^{o} 11 East and latitude 9^{0} 92 No. Abuja is central to Nigeria lying just above the not and humid low-lands of the Niger/Benue through but below the drier parts of the country lying to the North. It lies just North of the wide alluvial plans, formed by the confluence of the Niger and Benue Rivers. The Jama'a platform continuation of the Jos. Plateau, extends well into the middle of territory.

5.2 CLIMATIC CONDITIONS.

The mechanism controlling the climate of the Federal Capital Territory and the rest of West Africa are often simplified. In broad terms the climate is controlled by the interaction of two widely deferent aim masses and the movement of the zone of convergence of these air made (known as the tropical convergence zone) relative to the ground.

In the month of November to March the hot dry north easterly air stream often laden with fire red dust from the Sahara (Harmattan), dominates and leads to low relative humidity, high day time temperature, worth East winds and ritually zero rainfall. At this time the tropical convergence zone is Abuja. The subsequent North ward movement of the Tropical convergence zone increases the influence of the coal moisture laden South westerly air mass which become dominant in Abuja around April. There for from period to October, the day time temperatures are lower, relative humidity high, winds from the South West and the vast majority of the annual rainfall occurs.

The motion of the tropical converges zone as a extensive physical feature has been shown to be largely untenable as it is often untraceable and even when it can be located, rainfall is not always associated with it. Specific rain producing mechanisms often appears to be local rather than regional and to be associated with westerly air movements. However, despite its theoretical inadequacies, the conceptual models of the annual oscillation of the tropical convergence zone provides la useful, simple picture of the seasonal pattern of the climate of the area. (see figure 5.6).

5.2.1 TEMPERATURE.

The mean air temperature experience varied with the seasonal changes. The maximum mean temperature occurs in February to June, peaking at April to about 35.8c, while the mean monthly minimum air temperature of 14c occurs in the months of December to February and it stay at about 17c (see figure 5.1)

5.2.2 RELATIVE HUMIDITY.

Relative humidity determines the comfort level of an environment and it value varies with changes of dry and wet seasons. The lowest relative humidity is experienced in December to February at about 13.4 percent and highest in August to a level of about 85.3 percent (see figure 5.2).

5.2.3 RAINFALL.

The rainy season in Abuja start in April and ends in October. Spanning Seven months, with mean annual total rainfall of about 1099 millimeter (seefig 3.3).

Although rainfall in Abuja is generally moderate yet it does create serious erosion problems due to poor drainage potential of the soil. As a result the choice of drainage system, roof and floor treatments shall properly be considered in the proposal in order to allow for effective water drainage.

5.2.4 WIND PATTERN

The types of aim masses over Abuja, the north east trade wind which is continental in origin is dry, cool and dusty, creating general discomfort for people between the months of November to March and is known as harmattan.

Due to hardship of Northeast trade wind on the environment. It should be masked and all opening should not face Northeast direction.

The other type id the southwest trade wind which blows from over the Atlantic ocean. It is cool, moisture laden and bring rainfall to the inter land. Thus at enhance comfort in building and should be admitted into the interior by creating opening in diet direction for cross ventilation. (See fig 6.5 and 6.6).

5.2.5 SUNSHINE AND CLOUD COVER.

Due to seasonal movement of the sun couple with the rotation of the earth, the hours of Sunshine received varies throughout the year. More hours of Sunshine is received between October to March peaking at February while between April and September is moderate. The mean monthly Sunshine received is about 8.1 hours/day and the average net radiation is about 200 cal/cm/day. The angle of sun declination varies from 57 in December to 70 in August. The Federal Capital Territory is exposed to an average of 2,000 Sunshine hours annually.

5.3 VEGETATION

The Federal Capital Territory has a mixed vegetation of Savanna grass land and parkland forest with thick undergrowth. Savanna is tropically a stratified community with a discontinuous canopy, shrubs and grass layer. The revering complex occurs on low-level channel banks of water courses and along stream valley bottoms of ferine interrupted by patches of rain forest, shrub, Savanna vegetation occurs on flatter plains and undulating terran. It is comprised. Mainly of shrub vegetation with developed grass layer and a few scattered evergreen trees like Daimler, parkia, Khaja, neem (dry zone mahogany) and Albizia. The Abuja vegetation is characterized by park lands gallery forest, with grass height of about 120 centimeters and scattered deciduous tree, the type of tree commonly found are shear butter, locus beam, Baoba and others.

Thus to improve the vegetation in order to improve the aesthetics and natural quality of the environment landscape elements shall be incorporated with ornamental trees.

5.4 GEOLOGY AND TOPOGRAPHY

The Federal Capital Territory, Abuja is largely under lain by undifferentiated basement complex of maginatites granites geneses and metasediments overlain by letterset. Also, steep isoclinal folding of Abuja metasedments resulted from organic movement in precambinan time with the formation of North East and North/North East striking fault, this reflect the major component of movement being transverse dextral fault exhibit transverse displacement of between 2 and 16 kilometer.

Abuja is made Hills and valleys continuation of(Jos Plateau). The Topography is not plain. The available plain are utilized for infrastructural development.

5.5 SOCIO-CULTURAL LIFE

The socio- cultural heritage of Abuja can no be easily traces as the city is mainly occupied by immigrants, except the displaced original inhabitants. Even among them, the civilization is waving the sociocultural way of life, as everything is done in the Western way.

6.5.1 ECONOMY AND COMMERCE.

Like all other places, commerce in Abuja covers business, house hold, and personal services required to supply goods and services to its population. Abuja consist of retail establishments and traditional forms coupling the government policies on provision of space infrastructure, licensing, patterns of entre-prenenrship and goods distribution, nationally and locally.

Traditional markets of two types exist at Abuja. The first is a central market located in the central area of Abuja (Wuse) served by direct truck access from the peripheral highways and within walking distance of the transit spine. The second type is a local facility market located in the central of the city. The final scale of commercial services comprises of informal trading and service industries.

5.6 DEMOGRAPHIC DATA.

Three key characteristics of the year 2000 population were developed to determine such planning factors as number of housing insist required, service facility requirements such as schools, health facilities and social amenities. These characteristics are age/sex distribution, the number of households and the anticipated income distribution for the year 2000 population. In determining these characteristics the extrapolation was based on the latest available statistics.

There is no authentic statistics or data on the population, age distribution, sex distribution and other demographic data due to massive rush to rush to a Abuja. The population has being increasing geometrically since 1997 without registering or noting the number of people that move in. It has been possible to obtain the population of civil servant coming into Abuja. But that of peasant traders and unskilled laborers have deferred the estimating of the population.

5.7 TRANSPORTATION AND TRAFFIC FLOW

There are two distinct categories of transpiration services which must be provided to insure a viable and efficient Capital City. The first of these deals with the provision of facilities to accommodate the daily functioning of the Capital City itself. Roads, Streets, public transport services and a myriad of Auxiliary facilities and service, required to enable diverse movement of people and good essential to the operation of any major urban area. The second category of transport services are those required to allow the new Capital to interact with the rest of the Country as well as rest of the world in fulfilling its national function. Air service, inter regional high ways, Rail road and trucking services are major components of the total transport system.

Abuja as of now has a network of highways and roads within the city. This provide easy flow and moment except for satelite towns like Karmo and Nyaya were there is high traffic congestion during early hours and evenings. The major road linking Abuja and other parts of the country are the Kaduna express way, airport road and Keffi Road.

5.8 EXISTING LAND USE AND FUTURE TRENDS.

The master planning process which shaped the Capital City program around the objectives and issues of the Capital City led to the definition of basic organizational structure for the city.

- A new national capital design as a viable urban environment for the seat of national government and the full range of supporting and complementary activities.

- An overall land use pattern continued to a crescent shaped site defined by developable land about elevation 1200 feet in the Gwagwa plains below escarponent surrounding the auter area of the crescent shaped site including the bold promontory of the Aso hills.

Re location is recommended on the Capital City Site, the game reserve area the reservoir water shads, the airport area and key Federal Capital Territory access prints. For the remaining settlement a special strategy has been suggested. This strategy is based on the following principles: -

- Reinforce the existing larger and more accessible Villages and Towns such as Gwagwalada, Datia and Dagara as satellite Towns and service provisions
- Establish a zone for economy with controlled land use along A-2 in conjunction with the Agric, forest, extractive and construction industry activities.
- Economy the natural consolidation of smaller and less accessible Villages by strategic distribution of services and infrastructure and relocation policy. Provide an improved standard of public services.

TABLE 5.1 MEAN TEMPERATURE

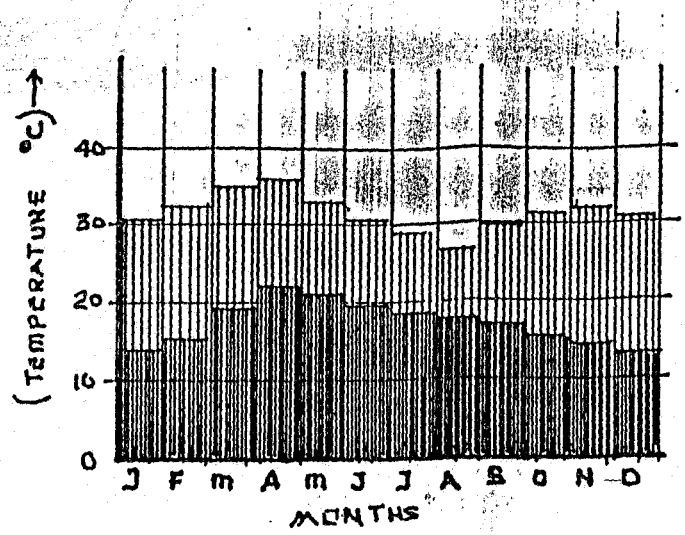


TABLE 5.2 RELATIVE HUMIDITY

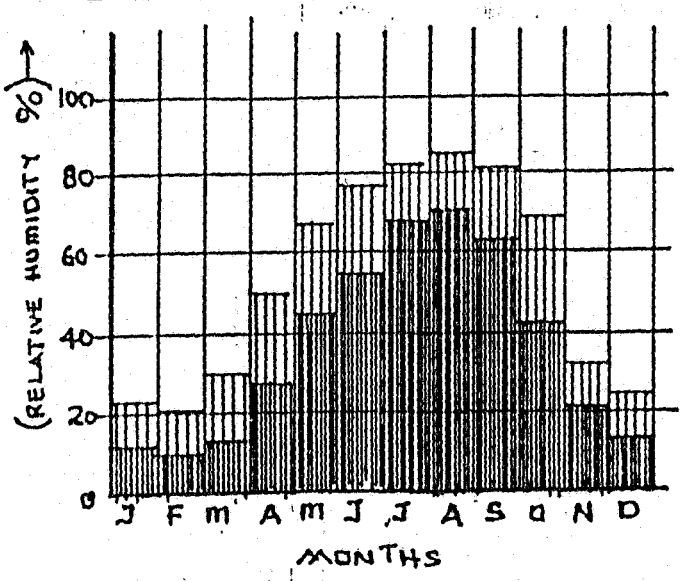


TABLE 5.3 MEAN MONTHLY RAINFALL

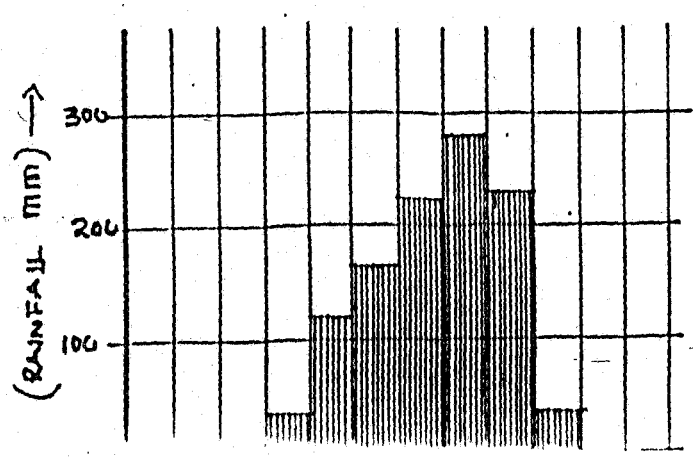


Table 5.4 MEAN DAILY SUNSHINE.

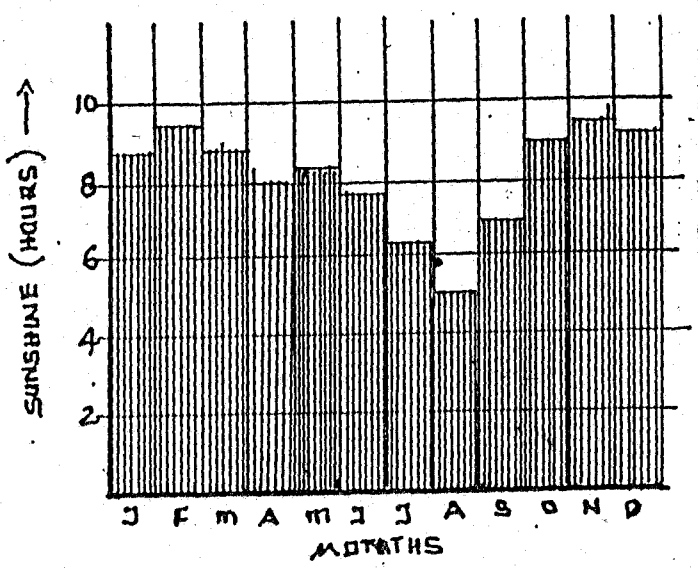


Table 5.5 MEAN MONTHLY WIND SPEED

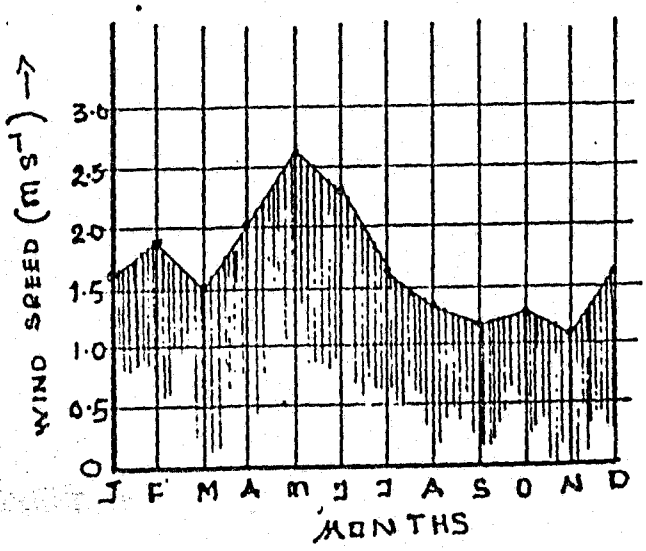
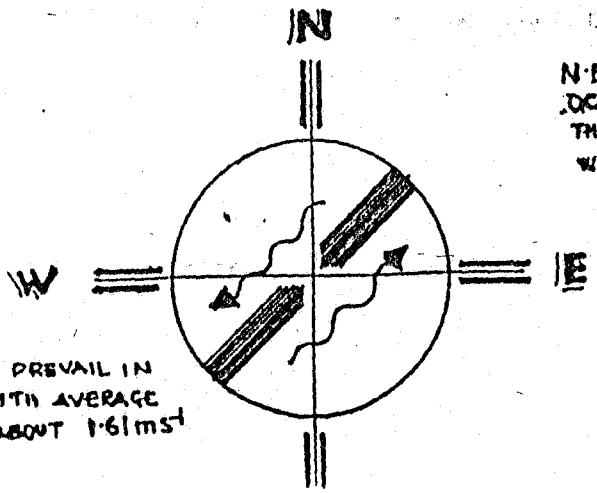


Fig 5.6 PREVAILING WIND DIRECTION



N·E TRADE WIND PREVAIL
OCTOMBER TO MARCH :
THE AVERAGE WIND FOR M
WITHIN THIS PERIOD IS 1·41

S·W TRADE WIND PREVAIL IN APRIL TO SEPT. WITH AVERAGE WIND SPEED OF ABOUT 1·61ms⁻¹

CHAPTER SIX

SITE ANALYSIS.

6.1 LOCATION OF SITE

The site in question is located at Abuja, the Federal Capital City. It is located at the eastern part of the city along the extension of Kaduna Abuja express way.

The project is located at Abuja due to the growing need for meat. As the population of the City is at a geometrical increase there has been high demand for meat in which the existing abattoirs in the city (Garki abattoir) is finding difficult to meet up.

Abuja being a Capital City needs to serve as a model. In view of this there is need for modern and up to date facilities. As such the location of ultra modern abattoir in the City will foster the development..

6.2 SITE SELECTION.

The site is a crucial aspect of our environment, it has a biological, social and psychological input that goes far beyond its accepted influenced on cast and technical functions. It limits what people can do and at the same time open new opportunities for them.

The writer therefore chose Abuja as his site bases on the following point.

6.2.9 LOCATION : -

Abuja being the Federal Capital has the highest number of people rushing to make a living, hence higher demand for meat. In cognizance with this the site is most suitable so that the center will serve the community to relieve overgrowing number of illegal and unhealthy slaughtering, of Animals, encourage possible future expansion and reduce environmental pollution. The project site is outside the congested central built up area along Maitama - Army Barracks road which is an extension of Kaduna express way.

6.2.2 ACCESS TO COMMUNITY: -

The grater the distance between the abattoir and the community the more difficult there will be both in arranging animals for slaughtering and movement of the meat to market and other places which is essential to any abattoir. Sanitary officers visit also play a major role in maintaining good sanitary standard and this can be achieved only when the site is located close to community.

6.2.3 TOPOGRAPHY: -

The site selected is relatively flat, swamp free and not liable to flooding. At the extreme end of the North Eastern part, the land ascend up due to the site proximity to hills. The development cost. The site is also suitable in shape to allow proper orientation of various buildings to be erected.

6.2.4 SERVICES:

All the three major needs, electricity, water supply and drainage are right now not available on the proposed site. But with the location of the site, it will be easy to provide those service at low cost, hence there exist high tension cable that pass via the site. Major water pipe line also passes via the site as such the services can easily be taped.

6.2.5 AMPLE AMOUNT OF LAND:

Large amount of land is required for the physical plant and for all possible expansion in the future. It may also be necessary to have a buffer zone of vacant land to avoid encroachment of private construction. The site has enough space for the above mentioned provision.

6.3 ACCESS AND CIRCULATION

The site is easily accessible on foot except due to distance from the express way. Vehicular ingress and Egres is not possible as of now due to lack of motarable road into the site.

The Author proposes access road into the site from the express road which lead into the circulation road network in the site and into parking spaces and delivery area of loading bay. The aim of circulation is to achieve a complete separation of pedestrian and vehicular movement and wholly pedestrian core since some of the users are not to use vehicles. It is also aimed at easy flow of people to all parts and facilities in the abattoir.

6.4 SITE INVENTORY.

The site is relatively underdeveloped except for adjoining sites where construction has taken place while some are under construction. As such the feature on the site are natural features.

The site are analysis will be based on physiographich characteristics and perceptual characteristics. The physiographic factors include topography, climatic factors, vegetation, service and soil, while perceptual analysis is aimed at identifying usual or perceptual assets and liabilities as a basis for determining major opportunities and constraints for design process. Perceptual liabilities are defines by area of aesthetically positive qualities such as noise intrusion, dust / vehicle pollution and high way access.

6.4.1 UTILITIES:.

Utilities are essential in any site. The site in question is a new undeveloped site. As such there is complete absence of utilities but via to the site is (Electricity) (electricity) and water supply pipe which are the major essential evervices needs in a Modern abattoir.

6.4.2 EXISTINIG FEATURES :

There exist no built features on the site but at the far right and left hand side on the site from the express, there exist buildings. One of the Building is construction company manyard.

6.4.3 CLIMATIC AND ENVIRONMENTAT FACTORS.

- HUMIDITY. There is low humidity during the dry season with high afternoon temperature. In the raining season humidity is high with low temperature, this creates heat trap and environment becomes uncomfortably hot.
- TEMPERATURE. Highest temperature is recorded during the dry season which sometime rises up to 35oc. During raining season temperature is reduced.
- SUNSHINE. Sunshine is about 2,500 hours annually and is always reduced during the raining seasons. Sunrise is always from the Eastern part of the site and the site is very liable to intensive heat and solar radiation
- RAINFALL. 60% of climatic rainfall is in the month of July to September, with duration of 180-190 days. Thunder and lightening, strong winds characterize the raining period.
- TOPOGRAPHY. The site is relatively a plain land. It has an unnoticeable gentle lope towards the South Western part of the site. This makes the construction of the site less tidious and easy draining of the site.
- SOIL. The soils are deep and well drained. The soils belong to the sandy loam soil and has a reddish brown colour. It generally belong to the Wuse type.
- VEGETATION. The characteristic vegetation type is park Savannah which normally produces open but partially shaded environment. There exist few scattered trees with plenty grasses and shrubs. This makes the clearing of the site much easier.
- ACCESSIBILITY AND VISIBILITY. The site is easily from the road. Thus is possible due to the nature of the site. It is plain and has scattered trees. Accessibility is very easy due to its proximity to the road.

6.4.4 ENVIRONMENTAL PROBLEMS.

- WIND AND DUST. Two major air masses dominate the site. The Southwest trade wind and the Northeast trade wind. The southwest trade wind blows from over the Atlantic in the south, mostly moist and brings rainfall. It prevails from April to October. While the northeast trade wind blow from Sahara desert in the northeast, mostly dry and bring harmattan. It prevails from November to March. The dust of the harmattan wind brings about pollution of the surrounding and dust on the equipment.
- NOISE. Via the gate is a source of noise from vehicular traffic to the site and vehicles using the road. This make the site noisy since there is no any other noise breaking barrier.
- ARCHITECTURAL DEDUCTION. from the analysis of the site, the following deductions were made:-

Design solution must cater for proper ventilation and buildings should be broad for breeze penetration.

Buildings should be with roof over hangs, verandah, covered walkways. Sun shading devices should be used to reduce radiation, protect openings from sun, sky glare and driving rain.

Trees should be planted as wind breakers to protect site from erosion and periods of the wind.

Buildings should be oriented to take the advantage of North South zones.

Openings on North and south walls should be from 40% -80% and infrastructure provisions; water, electricity, and drainage should be provided.

6.5 DESIGN CONSTRAINTS.

6.5.1 THE PROJECT SITE.

Before one begins to design and construct a building, one should carefully consider the implications of its proposed physical context, the building site. As discussed in the site analysis, the climatic region in which the project is sited will influence the overall building form and the construction type.

In the months of November to March, the site is always hot and dry because of the North Easterly air stream often laden with fine red dust from the Sahara (Harmattan). This leads to low relative humidity, high day temperature, Northeast winds and zero temperature. In the months of April to October, the site is cool due to the moisture laden South Westerly air mass. This implies that the day time temperature are lower high relative humidity, winds from the South West and the vast majority of the annual rain fall occurs.

At this site therefore, there is the need for the buildings that will be erected to have cross ventilation. For dust emanating from Sahara, there is need for screening against it.

The following are the recommendations for the appropriate building form and construction types for the climatic region in which the building is sited.

COMPOSITE CONSTRUTION

Composite construction often means seasonal use of the spaces. This can be achieved be dividing the building into zones, not purely based on activity functions, but on times of occupancy.

COURTYARD CONCEPT.

In courtyard houses one building may be massive and another one light weight. The light weight spaces on the other side or top of the massive one insulates and shades the massive one. This is important, as frequently of over heated days is greater than cold nights. For cross ventilation, well insulated openings can be 40% - 80% (in South) of the external wall area, even for the massive shaded spaces. The impact of court yards in modifying the microclimate cannot be over emphasized partiarculation through convections currents. At night, cool damp air is formed at ground level which slowly seeps into the rooms this making them cool at last for a good part of the next day. In addition, court yards also act as a buffer against the noise from the streets and stop the entry of dust and sand into habitable rooms.

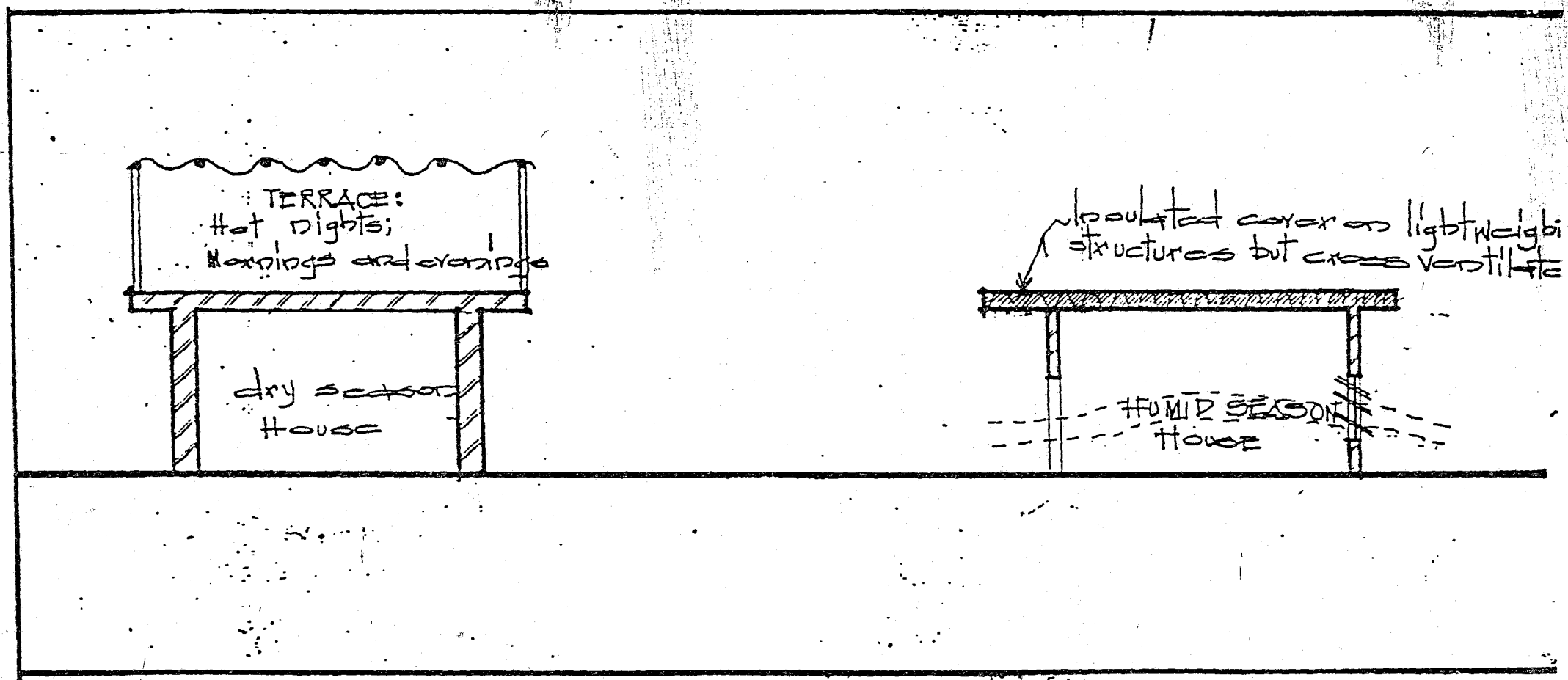


fig. 6.1. COMPOSITE CONSTRUCTION.

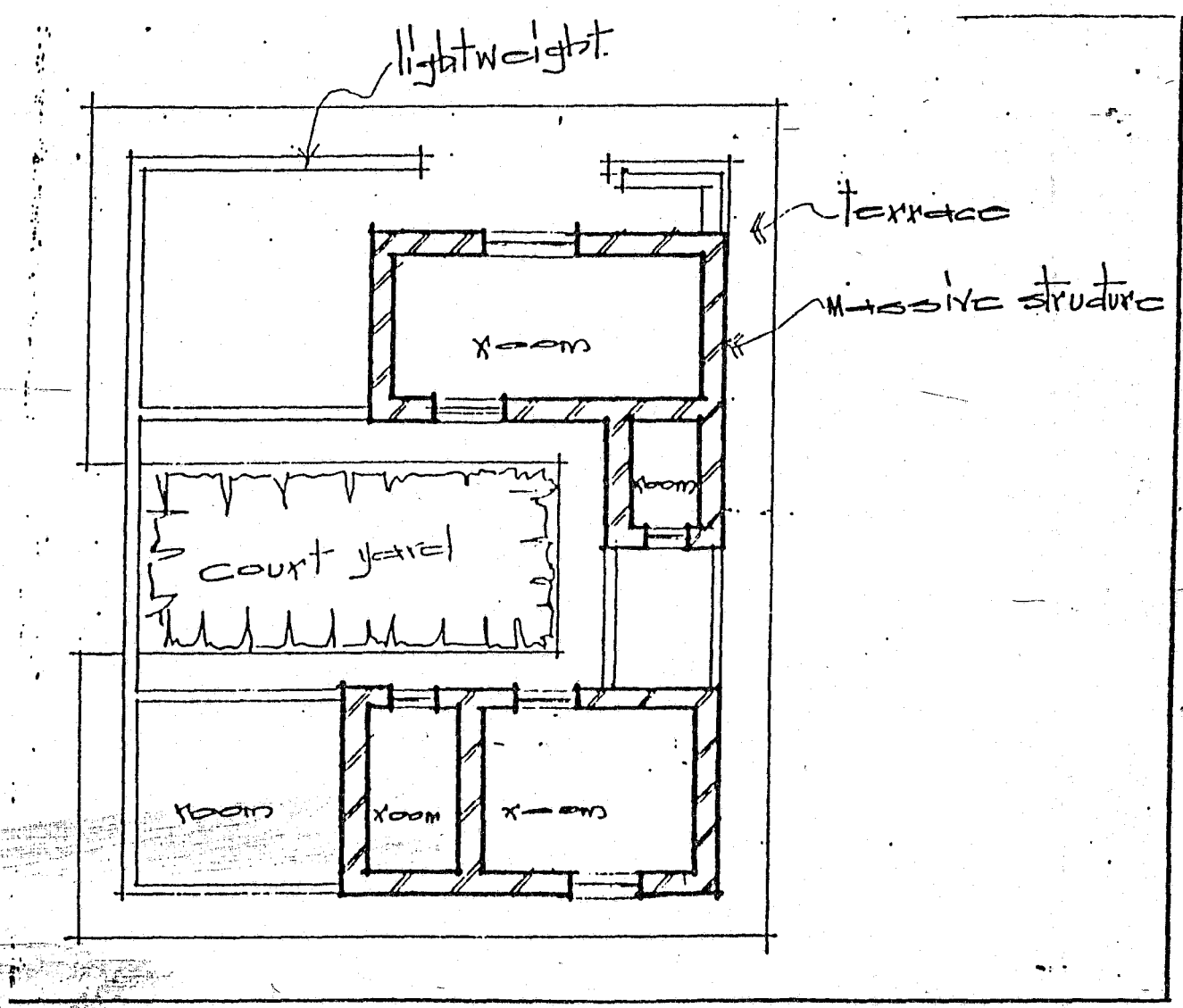
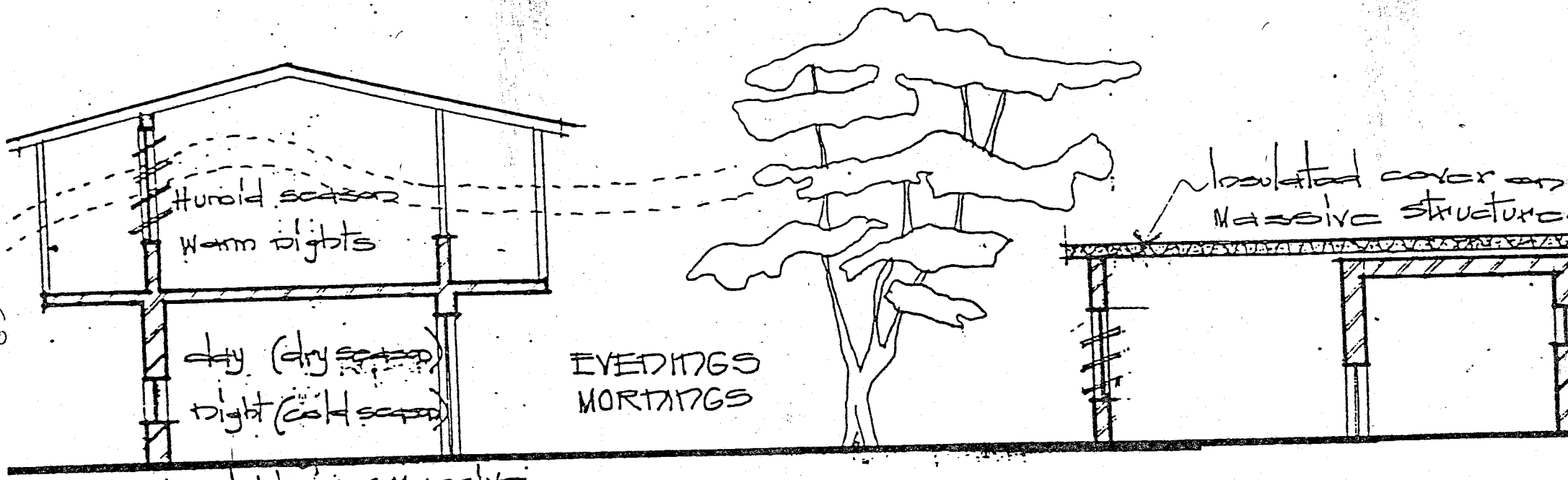


Fig. 6.2. COURT YARD CONCEPT.



Lightweight over Massive

Fig. 6.3. COMPOSITE CONSTRUCTION.

In addition to its value as a modifier of climate, the court yards offer many other advantages in hot dry/ humid lands. Firstly, all or most rooms open to it. Consequently apart from security, it ensures absolute privacy. As been said, the court yard acts as a buffer against street noises and this can often be further helped by placing secondary service rooms near the street. This in turn helps to reduce development cost, since the connection to services available along the main road is simpler. The court-yard provides a useful living and sleeping area for adults at times when the weather permits such activities while in summer it is used mainly in the evenings and for sleeping purposes. In short the court yard virtually becomes an extension of the house proper, thus adding to the total space available to the dwellers.

6.5.2. COMFORT REQUIREMENTS.

Within the range of conditions necessary for survival lies a smaller range which is judged as comfortable (that is, neither too warm nor too cold or thermally neutral). In these conditions the strain on the body's thermo-regulatory mechanism is minimal.

Because of the location of the site landscaping will be necessary so as to control the environment-climatic conditions for human comfort

THERMAL COMFORT

The effect of the sun on given site will, to a large degree be determined by the size, nature and texture of the various surfaces on which it falls. Every type of natural ground cover, such as grass, shrubs and trees, paved surfaces walls and roofs will have a perceptible effect on the micro-climate of the site. Natural growth tends to stabilise temperatures and minimise extreems in them. Man made surfaces on the other hand tend almost without surfaces on the other hand tend almost without exception to exaggerate it.

It is generally found that grass is cooler than exposed soil surfaces. The difference

Source Rabbinate 6.0 plants and environmental quality –(1972)

Temperature being between 5°c and 6°c. The temperature differential may be much more greater between grass and paved surfaces. Further, there is a considerable difference in temperatures between paved surfaces made of different materials.

On a bright day, concrete and similar light colored surfaces will reflect only about 10-15 percent of the incident light. Fig 6.4

NOISE CONTORL

Besides satisfying the instinctive need for aesthetics, trees also perform many services which better man's immediate physical environment. Trees and shrubs, if densely planted form a barrier or considerable reduce the level of air borne noise. Fig 6.5

DUST AND SAND CONTORL

In the months of November to March the North Easterly wind easterly winds (Harmattan) crossing over the site, carries some quantity of dust and sand particles along. This is a nuisance to human comfort and could be controlled by a judicious landscaping of the surrounding with trees. Trees and shrubs having leaves with viscous surfaces catch the dust and filer the air. Therefore the type of trees used is of great importance. They should be selected from point of view of both their appearance and the amount of shade they provide. Vertical tree is the best for this purpose they could be used as wind barrier and dust screen placed at some distance from the building .fig 6.6

WIND CONTROL : -

The various landscape element surrounding low structures can have definite effects both on air flow patterns and on wind velocities trees and shrubs, walls and fences all create high and low pressure areas around a dwelling in relation to position of openings in walls. The following are some of the recommendations made by Robert B.D.

If planted near a building, trees and grass allow the heavier cool air to flow inside, provided the building has low opening. The greater the number and size of trees and the larger the lawn the more cooling there is.

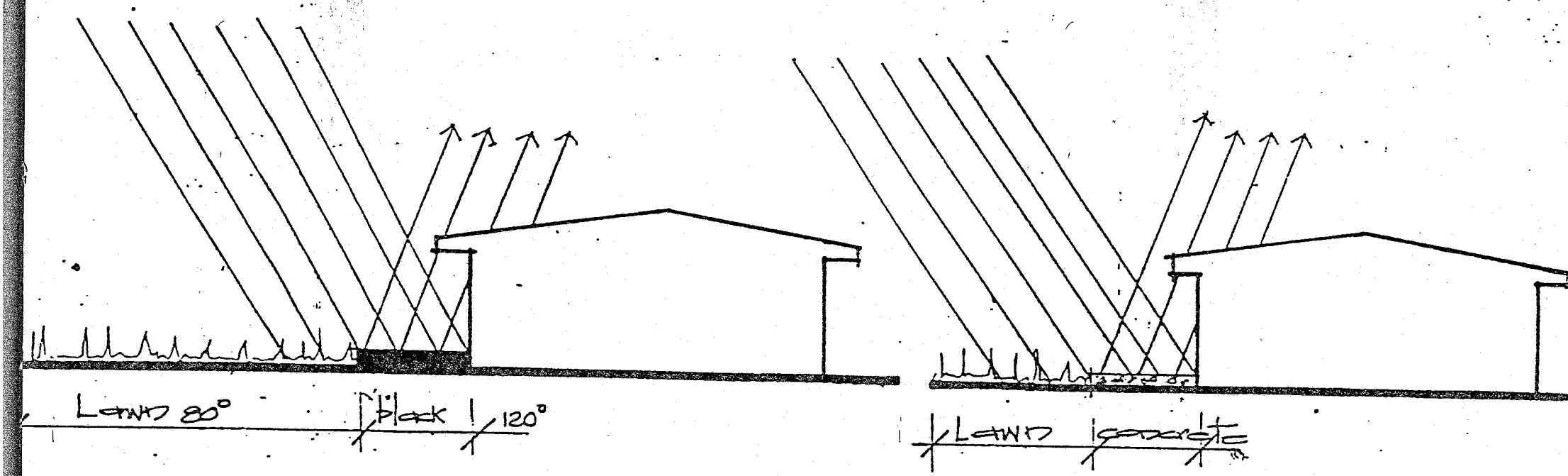


Fig. 6.4. Thermal control.

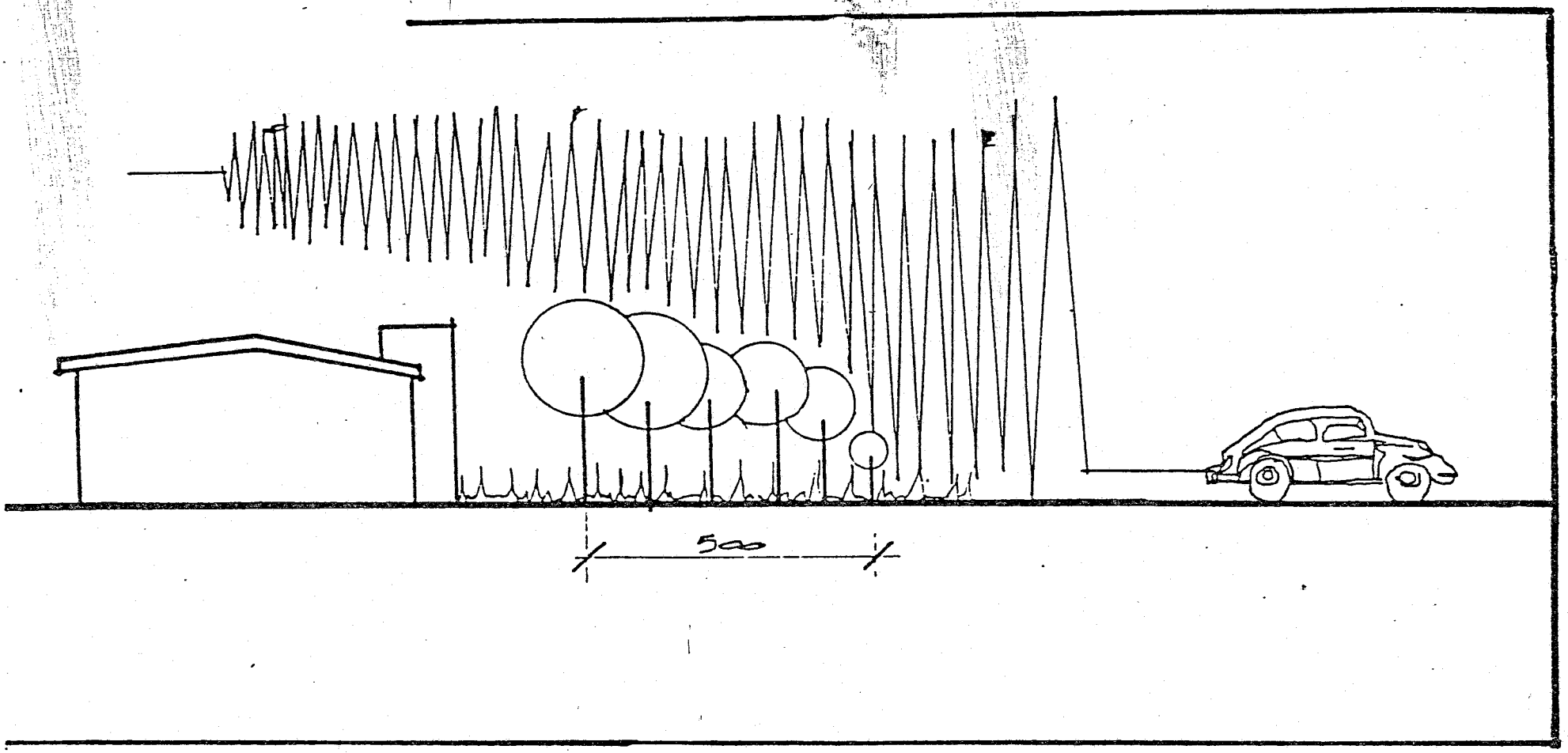


Fig. 6.5. Noise control.

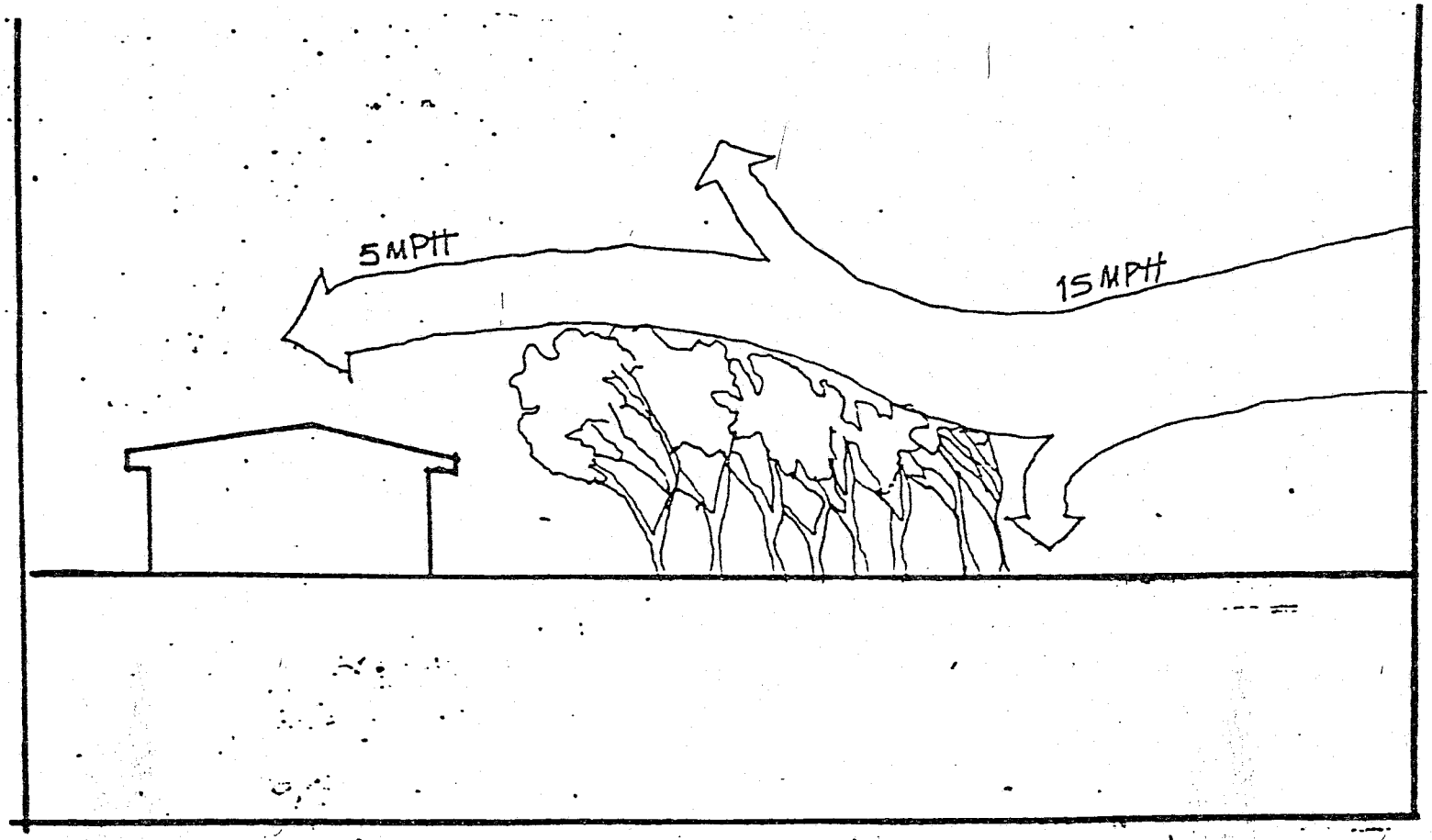


Fig. 6.6. Sand And DUST control.

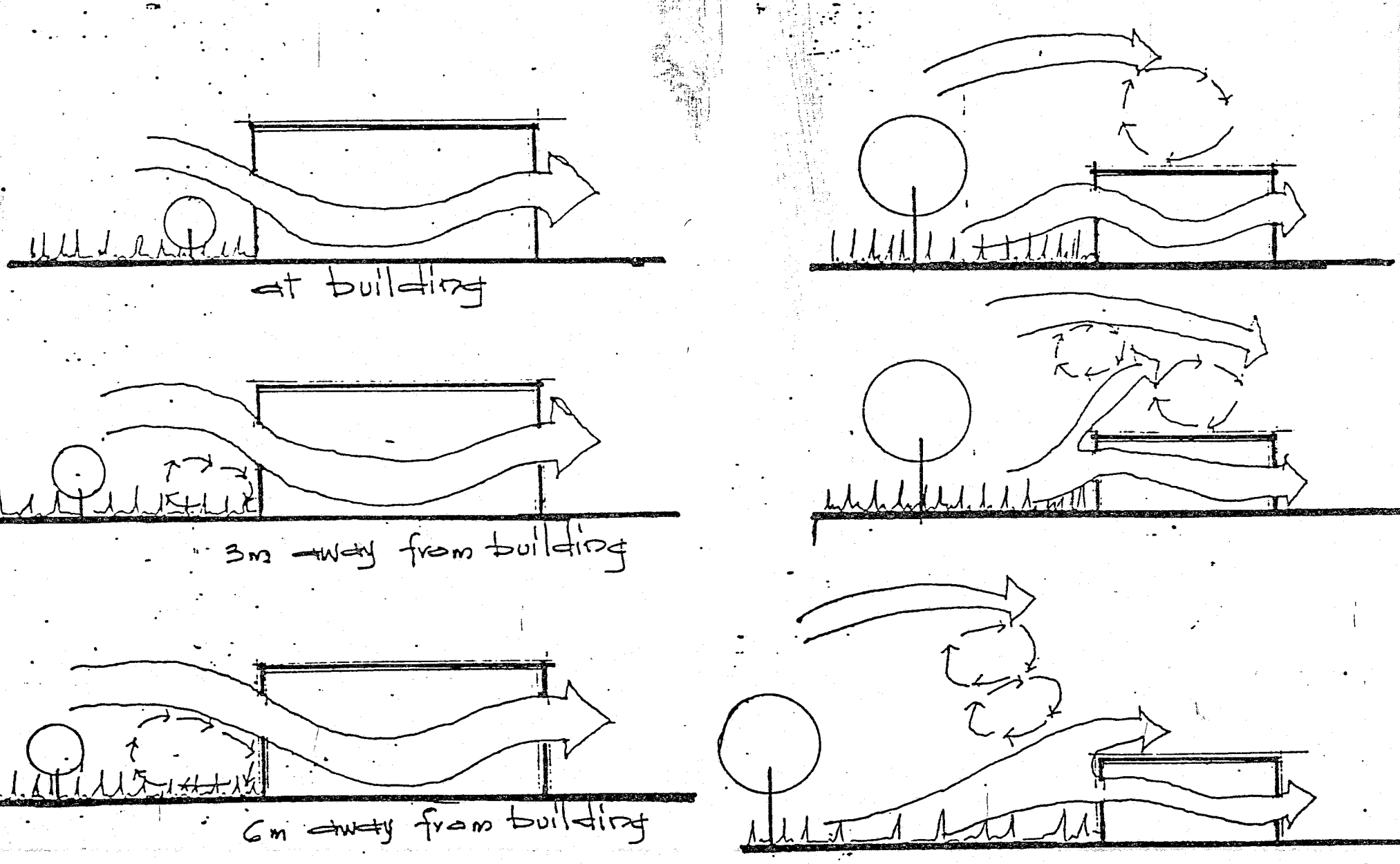


Fig 6.7. Wind control.

Radiation may be partially stopped by the use of wall covered. This creates a cool air space between the foliage as much as possible should be shaded as much as possible by trees to prevent heat absorption.

From the comfort requirements discussed above, it is realised that landscape plays the major role in attaining the comfort needed in buildings as it gives a natural touch on any living environment, gives good view and soften the hardship imposed by artificial elements on man sight, enhance good parking spaces and circulation path, increases the aesthetic to the environment with good flowers, planting, shrubs and hedges. It reduces air borne noise catches the dust and filter the air and it aid privacy absorbing the solar radiation, shade the building and prevents sun penetration into interior, reduces glare and create natural environment.

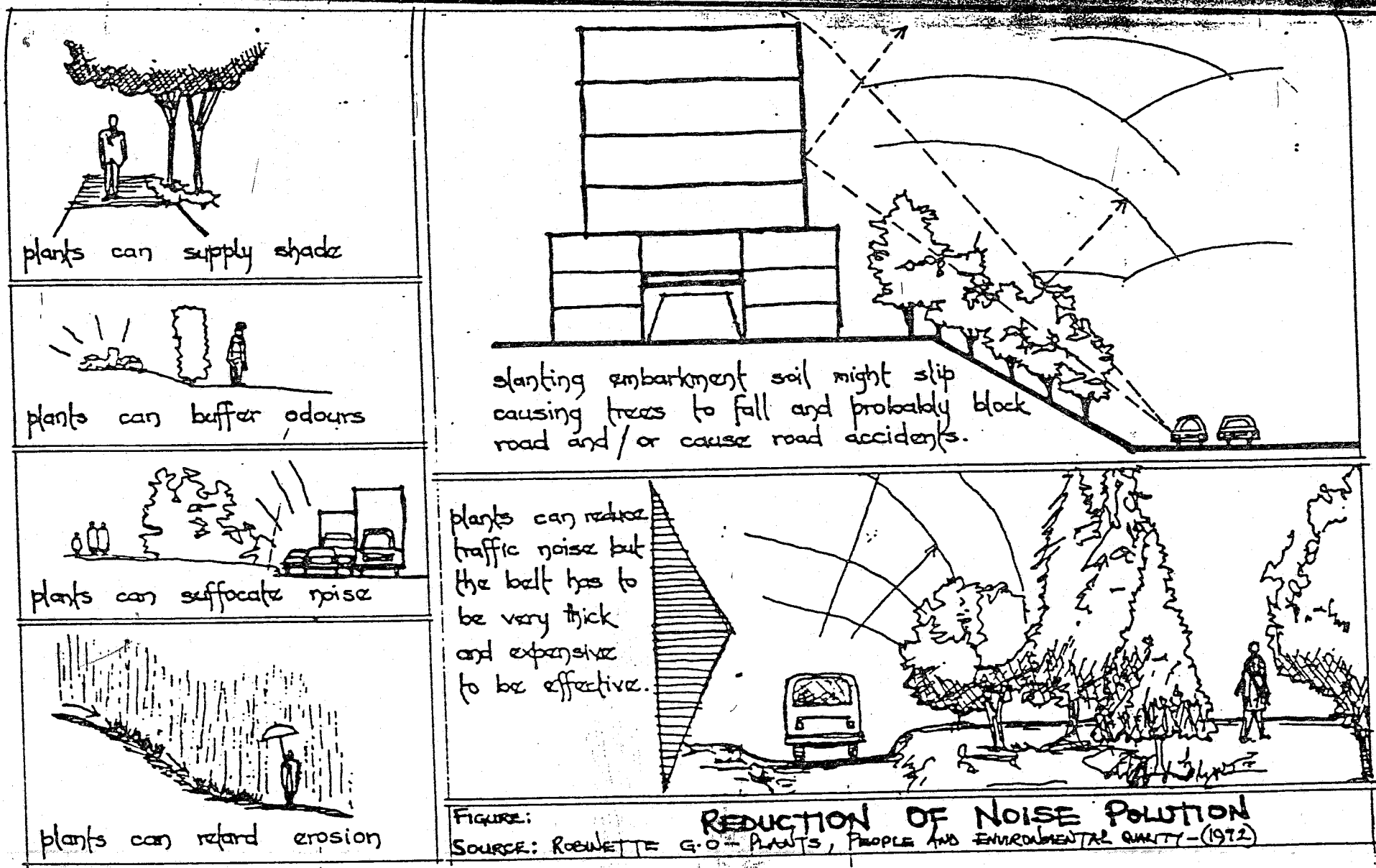
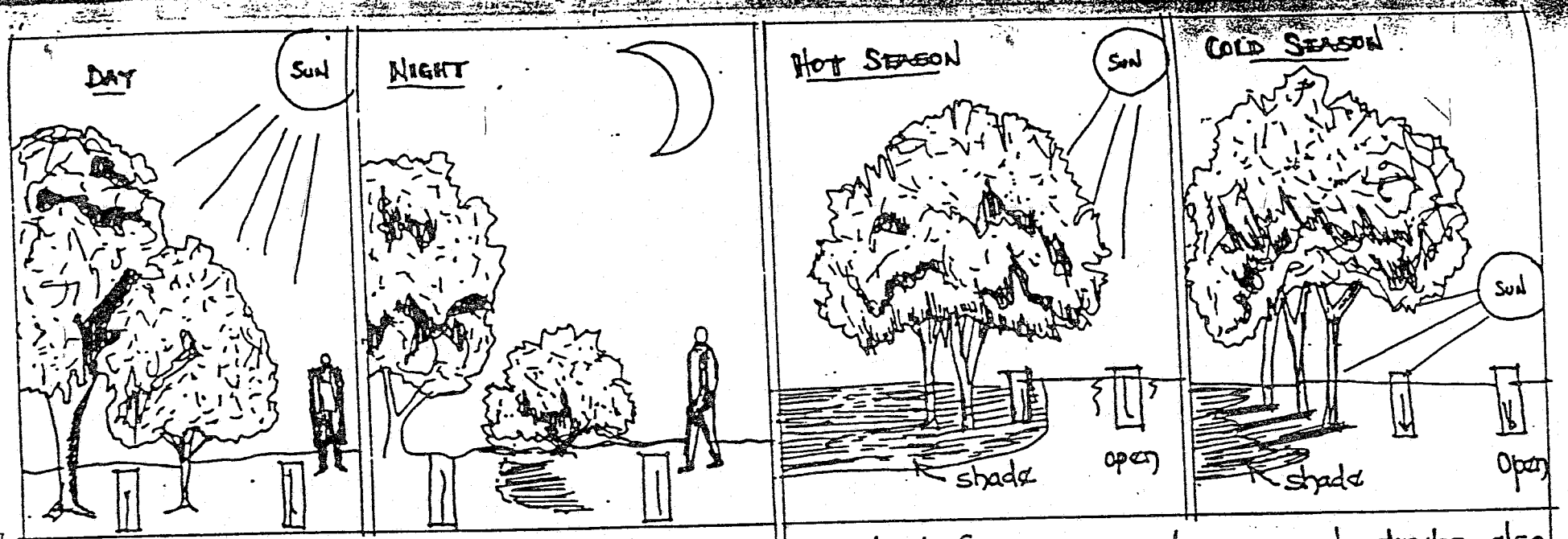


FIGURE: REDUCTION OF NOISE POLLUTION

SOURCE: ROBINETTE G.O - PLANTS, PEOPLE AND ENVIRONMENTAL QUALITY - (1972)

FIG. 6.8. REDUCTION OF NOISE POLUTION USING PLANTS.



plants reduce light intensity and moderate wide diurnal variation in ground temperatures by reducing radiation from the sun and preventing excess radiation from the soil to the sky on a clear, cloudless night

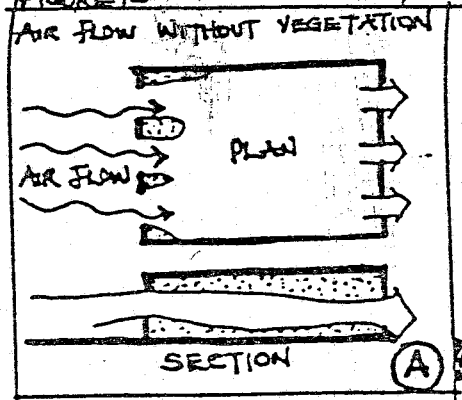
broad leaf evergreen trees and shrubs also reduce light intensity and wide seasonal temperature variations by modifying radiation at the soil surface.

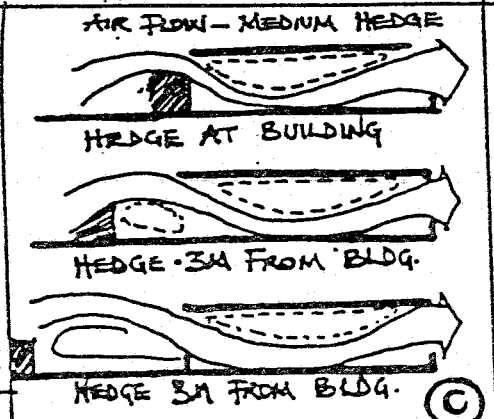
HEAT MODERATION

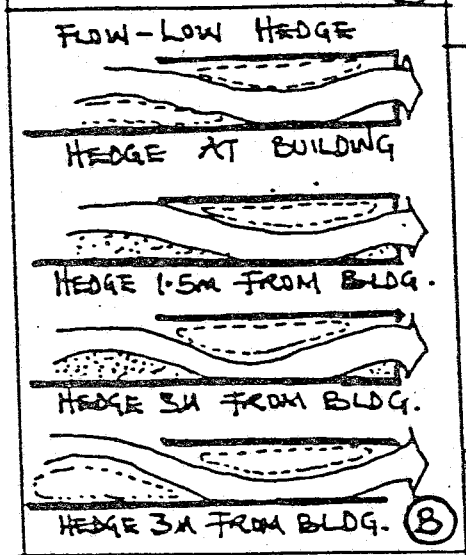
SOURCE: ROBINETTE G.O-PLANTS, PEOPLE AND ENVIRONMENTAL QUALITY – (1972)

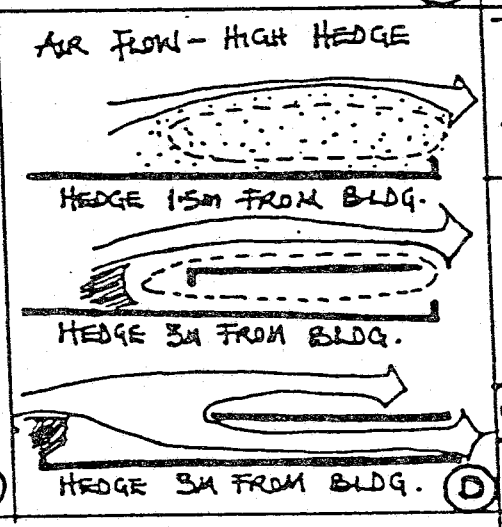
FIG. 6.9. EFFECT OF LANDSCAPE ON SOLAR RADIATION.

FIGURE:-



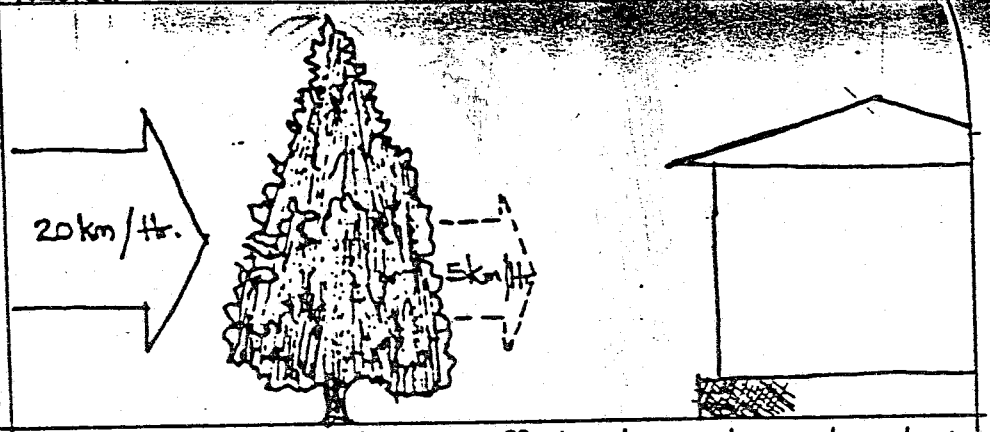




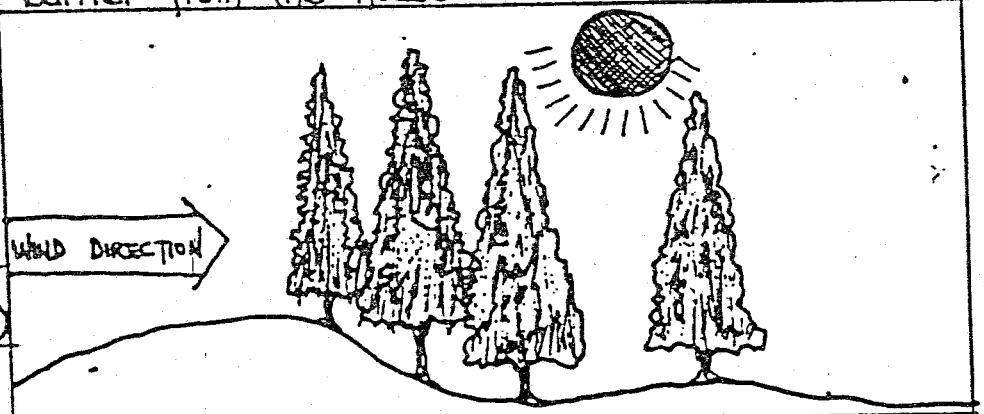


A-D - Shows wind flow pattern
(A) - Without Vegetation
(B) - With a high hedge
(C) - With a medium hedge
(D) -

SOURCE: DEEDHARA & KAPPELMAN - URBAN PLANNING CRITERIA (1975)



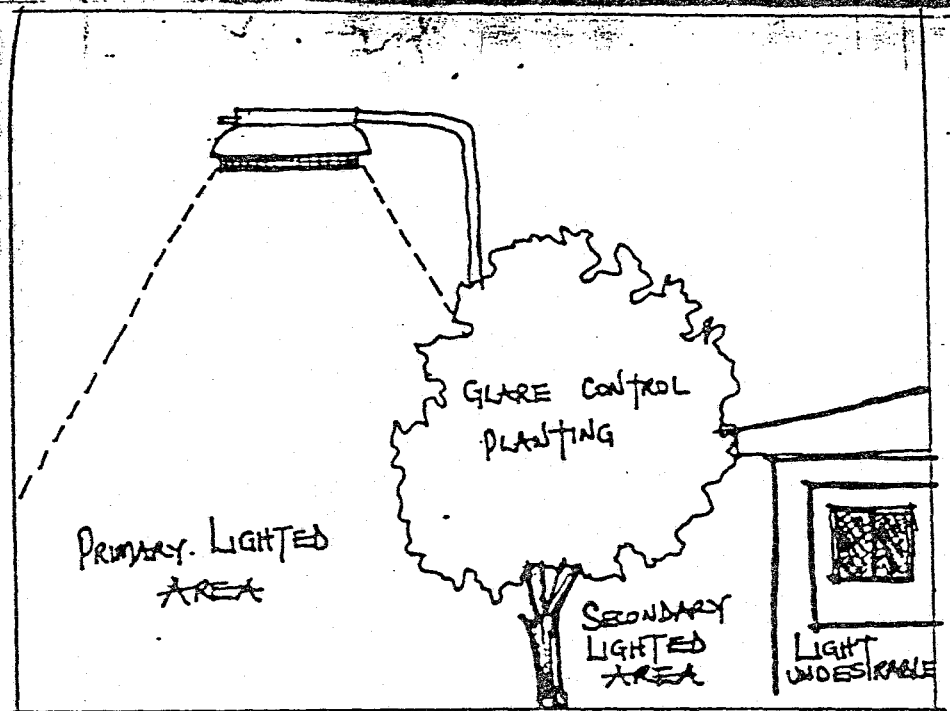
Trees, Shrubs and Hedges effectively cut wind velocities next to structures when planted as a distance which is at least house twice the height of the barrier from the house.



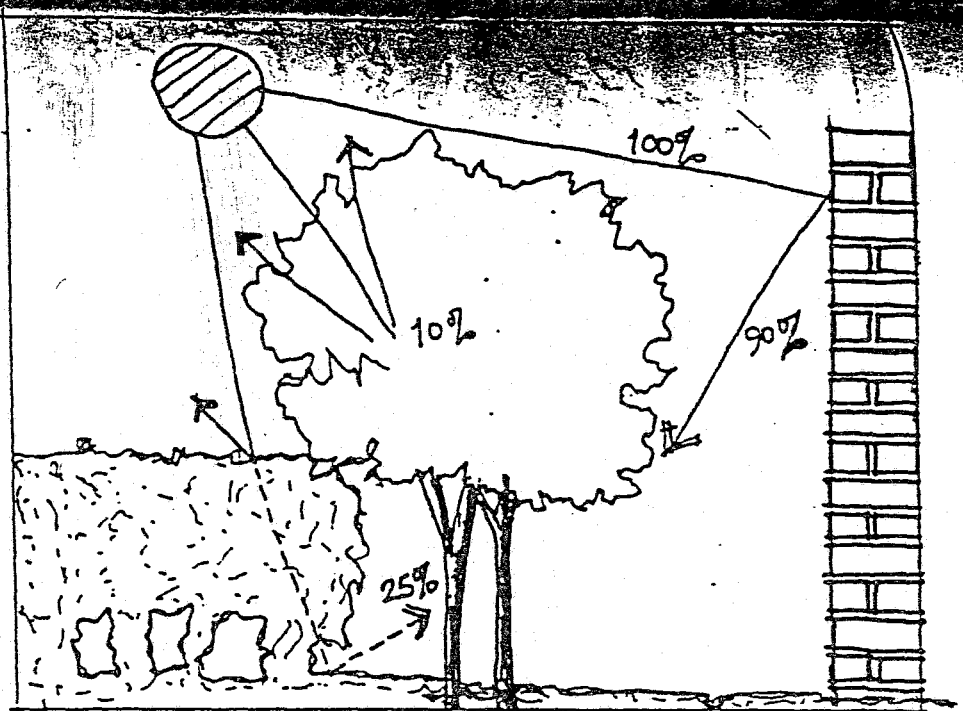
Evergreen conifers are effective as wind breaks to winds close to the ground level where their foliage are denser and more spread out.

SOURCE: ROBINETTE G.O; PLANT & PEOPLE & ENVR. QUALITY - 1972

Fig. 6.10. PLANTING AID VENTILATION AND AIR FILTRATION.



street light glare can be modified or completely controlled by planting trees in the proper location.



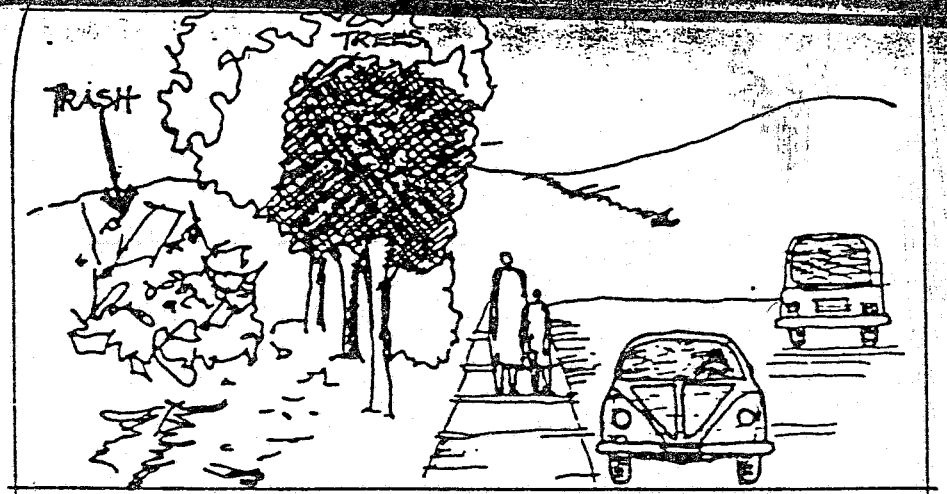
plants can remove glare and solar radiation by absorption and reflection by individual leaf surfaces and the foliage as a whole.

FIGURE

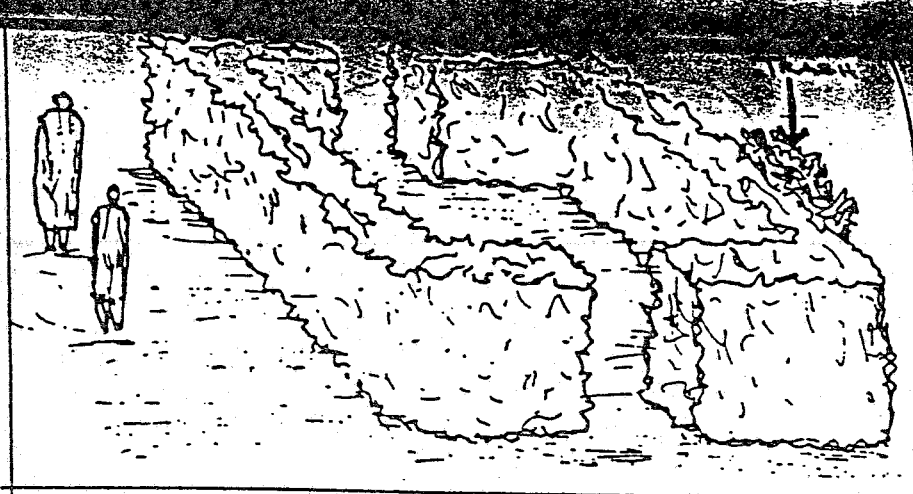
GLARE CONTROL

SOURCE : ROBINETTE G.O. – PLANTS, PEOPLE AND ENVIRONMENTAL QUALITY – (1972)

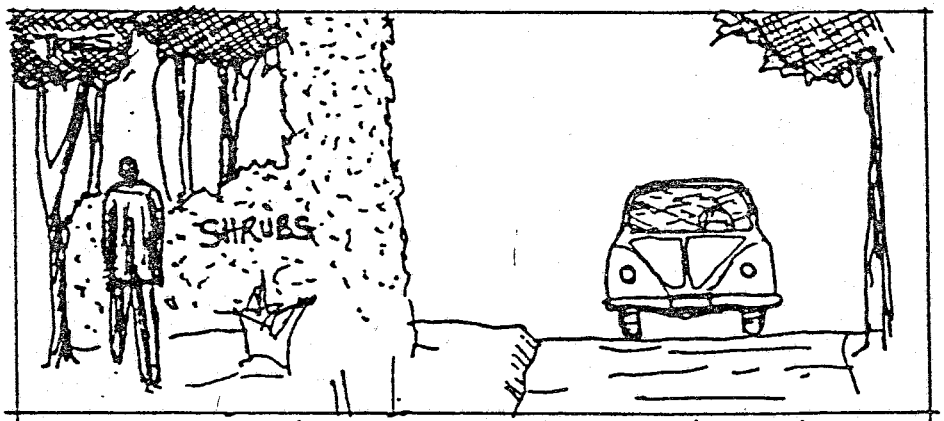
Fig: 6.11. Glare control.



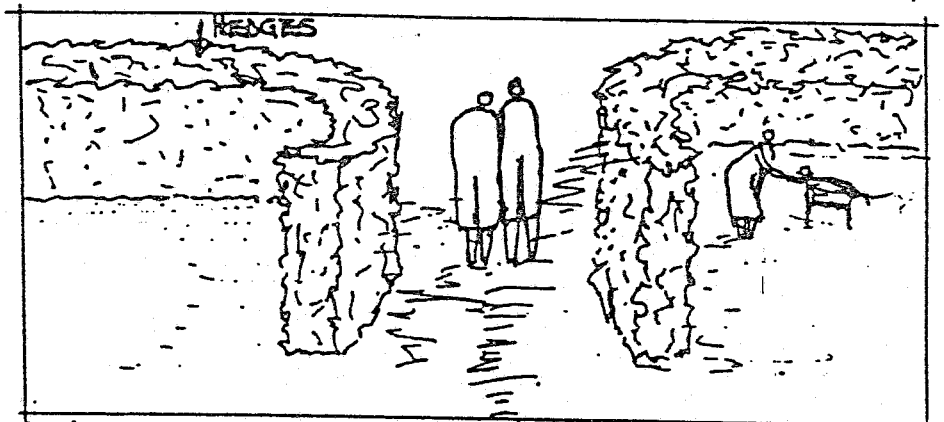
screening undesirable view by the use of trees - visual screening, not as effective as when hedges are used.



hedges are best for an almost total visual screening compare with screening by trees.



privacy control planting with trees and shrubs visual enclosure. Also not as effective as when hedges are used.

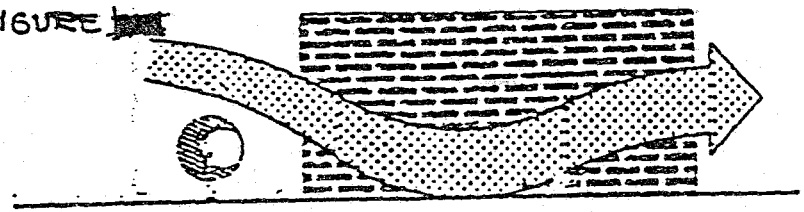


privacy control - planting using hedges proves more effective than using trees and shrubs which leave the ground level still exposed.

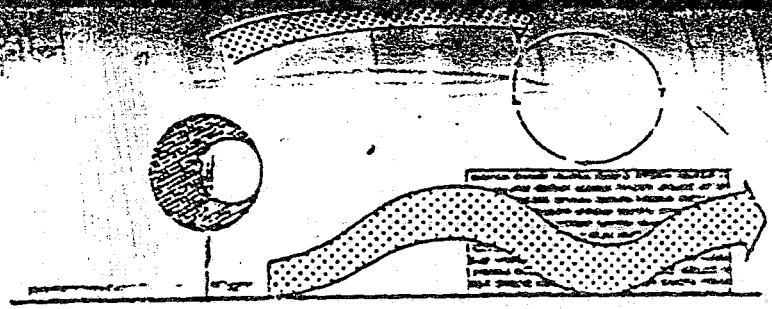
FIGURE:
SOURCE: ROBINETTE G.O. PLANTS AND ENVIRONMENTAL QUALITY - (1972) ➡ PRIVACY CONTROL / SCREENING OF OBJECTIONAL VIEW

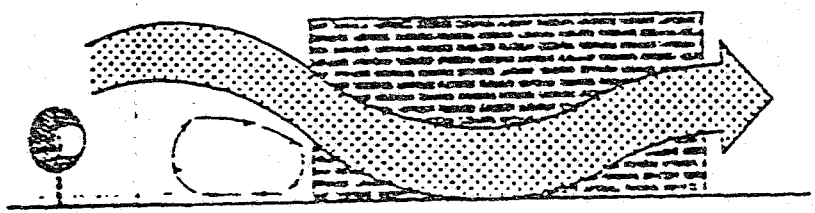
Fig. 6.12. LANDSCAPING AS A SCREEN ELEMENT.

FIGURE

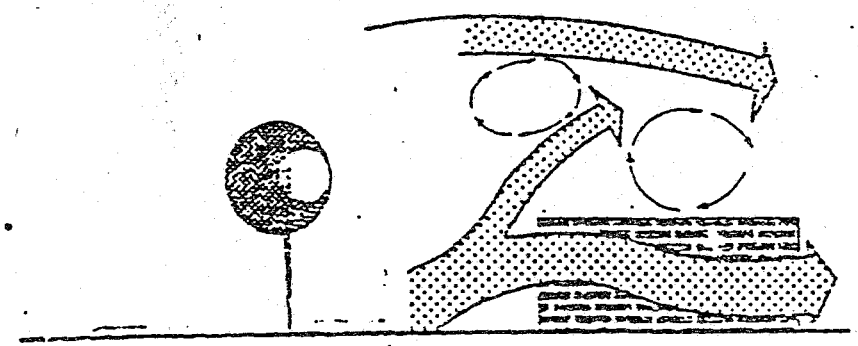


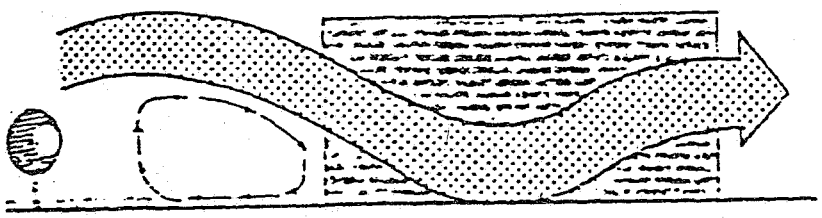
at building



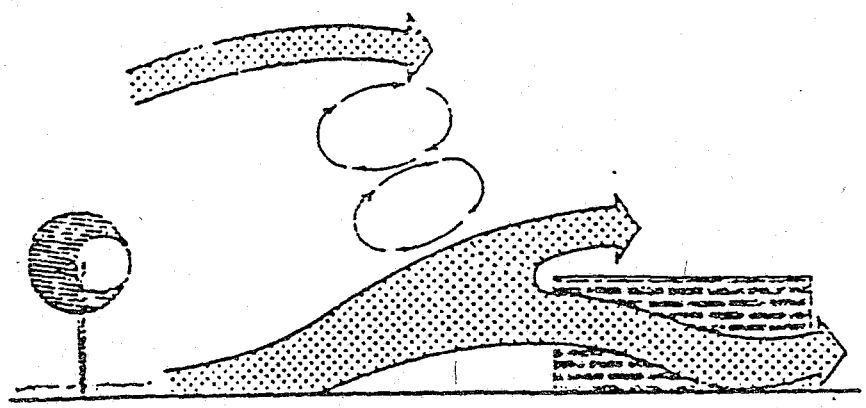


10 feet from building





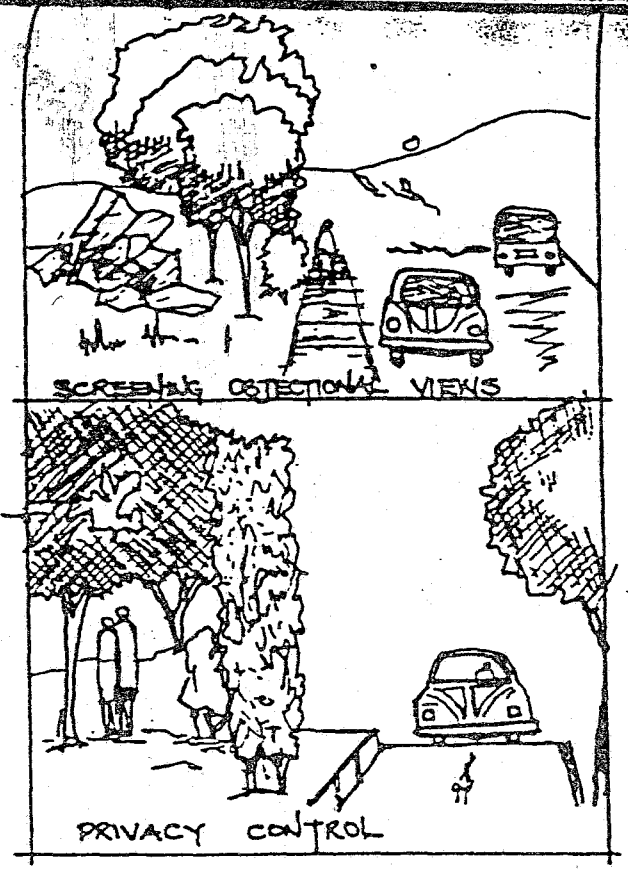
20 feet from building

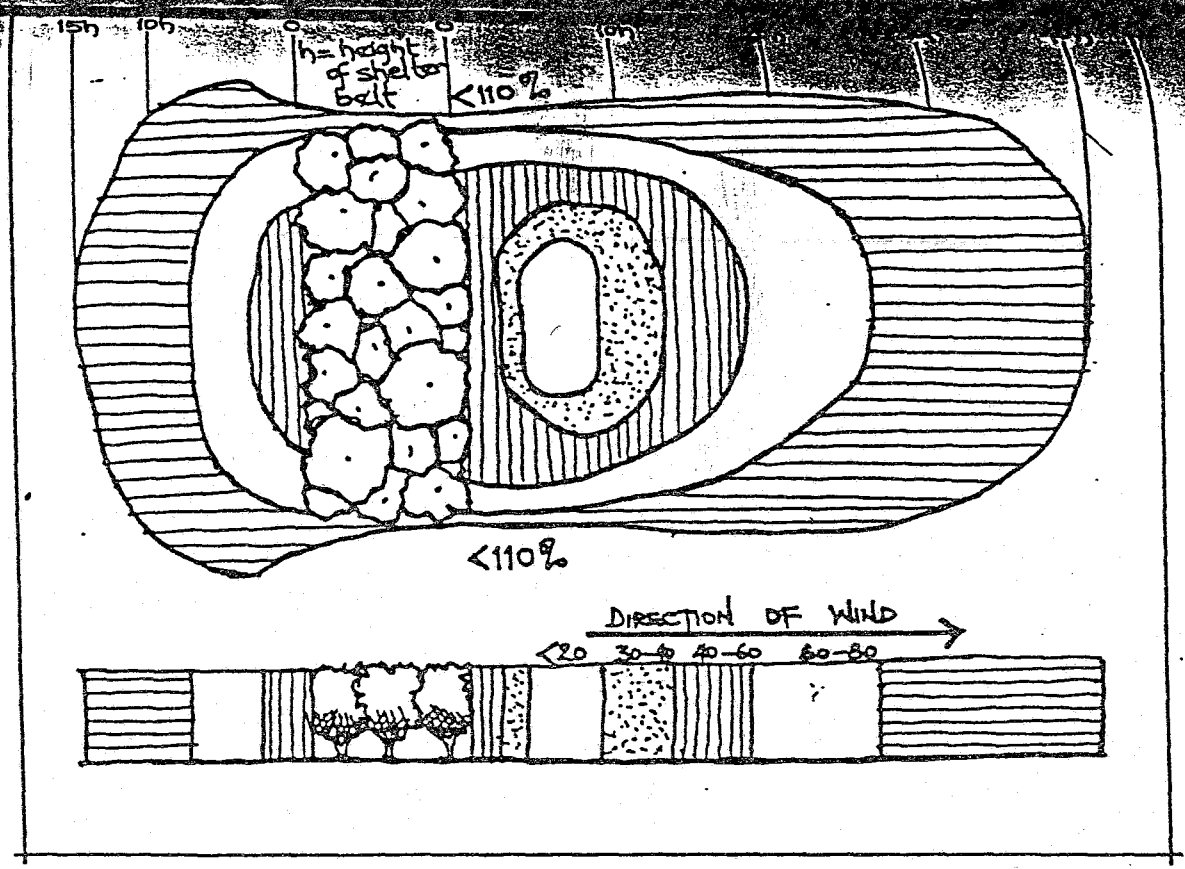


MEDIUM HEDGE NEAR AND

LARGE TREE NEAR AND

Fig. 6.13. Effect of Landscape on Airflow.





□ plants screening undesirable views and providing privacy.

□ diagram showing reduction of windspeed obtained from shelter belt protection.

FIGURE:
SOURCE: CALVIN B; -'TREE PLANTING' LANDSCAPE TECHNIQUES -(1979)

Fig. 6.14. LANDSCAPE AS A SCREEN ELEMENT.

CHAPTER SEVEN.

7.0 THE DESIGN.

7.1 CONCEPT AND DESIGN

7.1.1 DESIGN PHYLOSOPHY AND CONCEPT EVOLUTION.

The methods used in meat processing are changing hence the need for facilities with some float that will not be absolute as soon as the activities begin to develop and change.

Architectural motives and ideas are responses to important symbolic design themes, the deviation of those ideas and then subsequently follow a sequence of reasoning, the nature of the environment or the function of the design, could be some of the basic factors influencing its development. The guiding principle of this design, evolved as a response to the functions of the design. However, it strives to satisfy the design aims and objects as well as the function of the building.

Considering environmental factors such as lighting and ventilation, a multiple floor system was adopted to give an architectural environment that will ease lateral growth and development, ease movement for efficient service and good circulation, provide a cheerful and welcoming edifice.

7.7.2 SITE ZONING

One of the objectives of abattoir is to make animal not to pass through unnecessary hardship during slaughter. One of the ways is through easy movement. This has to be clearly demonstrated by site planning of the centre so that animals do not go through much stress before slaughter as this even reduce meat quality. The site is equally planed as to ease movement and activities of the users to ensure efficiency.

For this the site is zones into neat zone; comprising slaughter hall, meat collection, administrative offices parking, food canteen, agents and commission men accommodation.

Semi dirty zone or neutral zone comprising market, by products stores, drying bay, goats and caw head roasting etc

Dirty zone, solid waste drying bay, incinerator septic tank and grazing area.

7.1.3 SITE PLAN CONCEPT.

The site plan concept is based on the separation of circulation path of animals and men, and also the separation of soiled, dirty material from the clean material. It is also bases on vehicular traffic routes feeding into parking lots and delivery bay and offering a direct access to the interior through defined and articulated entrances. Grid type of planning is also employed to represent and respond to the idea of organic growth which is typical of any commercial farm. The growth should conform with the site zoning concept.

7.1.4 FORM CONCEPT

This is based on simplicity, functionality and total integration of the various functional units in a complex, with adequate linkages, which is the spine to which all functions refers.

This explicitly explains how the author arrived at various shapes used in the design. Different form concepts were used both in plans and elevations to express and symbolise different yearnings, as pirations and to achieve the architectural goal of the design. Except in the elevation of the main building in which an abstractual concept was used. Since the main building is to contain the Administrative concept was used. Since the main building is to contain the Administrative block and slaughter house, it means that it will be solely responsible for control and coordination of activities in the abattoir. The has which equally do same in an animal was adopted as the concept. Cow which is the major feature in an abattoir was picked. No abstractural concept was adopted in the floor plans this is to facilitate effective functioning, good functional linkage between function and possible future expansion.

7.1.5 DESIGN CONCEPT

This gives and explicit clue on the idea behind the arrangement of functions in this design. Just as in the form concept, the design concept is based on functionality, simplicity and total integration of the various functional units in acomoplex, with adequate linkages which is the spine to which all other functions refers.

Considering the mono block concept which emphasis's vertical departmental linkage and the pavilions concept which emphasized vertical departmental linkage and the pavilion concept which. Preach horizontal functional linkage with adequate distance between the functional spaces. So a balance between the two concept is soft. And it is a plateau concepts which preaches low story with functional spaces of close function link be grouped on the some floor and those with such link be at other floors.

7.2 SPACE REQUIREMENTS.

7.2.1 FUNCTIONAL ANALYSIS.

Of this design was systematically carried out by first out lining all the needed or essential facilities for the abattoir and then, followed by these stages: -

- Units triangle of functions for each unit of design to ascertain the kind of relationship that exist between them, either hot, warm or cold relationship.
- Units functional flow diagrams which are based on the kind of relationship each facility has with the other to from an effective and convenient flow of functions
- Finally an integrated triangle of functions and final flow diagrams were drawn based on the individual triangle and functional flows, to give influence to the overall site layout.

The abattoir will be made of the following functions: -

- Administrative unit.
- Managers office
- Secretary
- Accountant /computer

- Sanitary officer
- Cleaners / officer
- Records /computer
- Sanitary officer
- Cleaners / maintenance
- Veterinary office
- General store.
- Convimences

SLAUGHTER HOUSE

- Slaughter hall
- Cold rooms
- Meat collection area
- Goats/sheep collection area.
- Lairage
- Changing room,
- Conveniences

CATTLE MARKET

- Market
- Offices
- Accommodation
- Mini clinic

FOOD CANTEEN

- Dining /eating hall.
- Kitchen
- Stores
- Laundry
- Changing room
- Toilets /bath

OTHER FUNCTIONS INCLUDE

- Roasting area
- By products stores
- Solid waste stores
- Drying halls (skin, blood and Bones).
- Solid roast drying bay.

AUXILIARY FACILITIES

- Over head tank
- Generator house
- Parking area
- Grazing area
- Off loading area.

7.2.2 SCHEDULE OF SPACES

- Administrative unit
- Manager-30m^2
- Secretary – 24m^2
- Accountant / cashier 24m^2
- General office 32m^2
- Records / computer 24m^2
- Sanitary officer 24m^2
- Cleaners / maintenance 30m^2
- Veterinary office 24m^2

SLAUGHTER HOUSE.

- Slaughter Hall 435m^2
- Cold rooms –96m^2
- Waiting area –136m^2
- Meat collect 90m^2
- Goats /sheep collection 25m^2
- Larage 731m^2
- Changing –39m^2

CATTLE MARKET

- Market – 800m^2
- Offices –100m^2

- Accommodation 1000m^2
- Mini clinic – 100m^2

FOOD CANTEEN

- Eating Hall – 200m^2
- Kitchen – 40m^2
- Stores – 25m^2
- Laundry 18m^2
- Changing rooms- 18m^2
- Toilets / Baths –15m^2

7.2.3 SPACE ANALYSIS

A diagram of integrated functional flow of spaces.

CHAPTER EIGHT.

8.0 SERVICES

To ensure the smooth rooming of the abattoir and maintain high standard of sanitation, the following services should be provided.

8.1 DRAINAGE AND SEWAGE DISPOSAL.

The most important function should have floors in wet areas that slope uniformly to drains, the gradient being 6.35cm/ 3.05m Good drainage depends to a large extent on the type of floors provided. Floor drains are fitted at the rate of the one drain for each 37.2m sq of floor area.

Low places where water and blood could collect are being guarded against water lodging.

Where blood tends to collect, e.g under dressing rail, special provisions have been made to supply drainage valleys, which slope to drains in the valley at a gradient of at least 3.18cm/ 3.05m and the valleys are 610mm wide and continue under dressing lines for the collection of all blood and dust.

Catch basins for grease recovery and traps and vents on drains are provided, both are properly sealed and easily clearable and the latter is effectively rented to outside the building.

Special arrangement have been made for dealing with stomach intestine contents and solid waste the drains for bovine materials are 2032mm in diametre and for the smaller species 1524mm.

Grids covering the drains are made of concrete slabs (pre-cast) with air spaces.

Close attention has to be given to the drainage. This is essential for hygienic operations besides assisting in cleaning procedures.

8.2 WATER SUPPLY

Mains water is expected at an ample supply and must pass standard test relating to quality of water intended for human consumption. The water must meet the requirements of potable (drinking and wholesome) water. The water is distributed to all parts of the plant under adequate pressure which is about 20 psi in the mains pipeline, but due to low pressure in Nigeria water supply system, a pressure pump is provided at the plant to aid in the water distribution at the required pressure Hot and cold water are necessary: - as such a central heating system has been provided (heating at not less than 820^0 c)

On site, water storage tanks holding at least one days consumption are usual. The recommended water requirement is 45 liters / day / per cow, 272 liters /day per bovine, 45 liters /day per sheep plus 25% at a reasonable pressure of 15 psi. As such storage tank of 158,750 liters is provided on the site and another 50,000 liters tank for animals feeding.

Non –potable water is used for refrigeration and fire control which is carried in separate lines and are identified.

8.3 ELECTRICITY AND LIGHTING.

The Nigerian Electric power Authority (NEPA) is expected to supply power. An industrial three phase Electricity supply has been provided. But in case of failure, for activities to continue normally at the abattoir, a 500 KVA capacity stand by generator is provided as a supplement.

Other Electrical services provided include:-

- External security lighting around the car park area and service entrance
- Street lighting along the major vehicular roads and walkways.
- Split unit air conditioners for units and central units for the chill rooms.
- Fire alarm detectors
- Telephone system at the administrative block and other relevant areas.
- High powered Electrical machines in the slaughter halls.

- Conduit wiring systems for buildings
- Computers in the records office.

Adequate natural and artificial lighting has been provided throughout than meat plant. Natural lighting took the form of efficient north light the lighting are made in such a way that they do not distort the colours and the over all intensity are not less than;

540 lux (50 foot candles) in all inspection points.

220 lux (20 foot candles) in word room

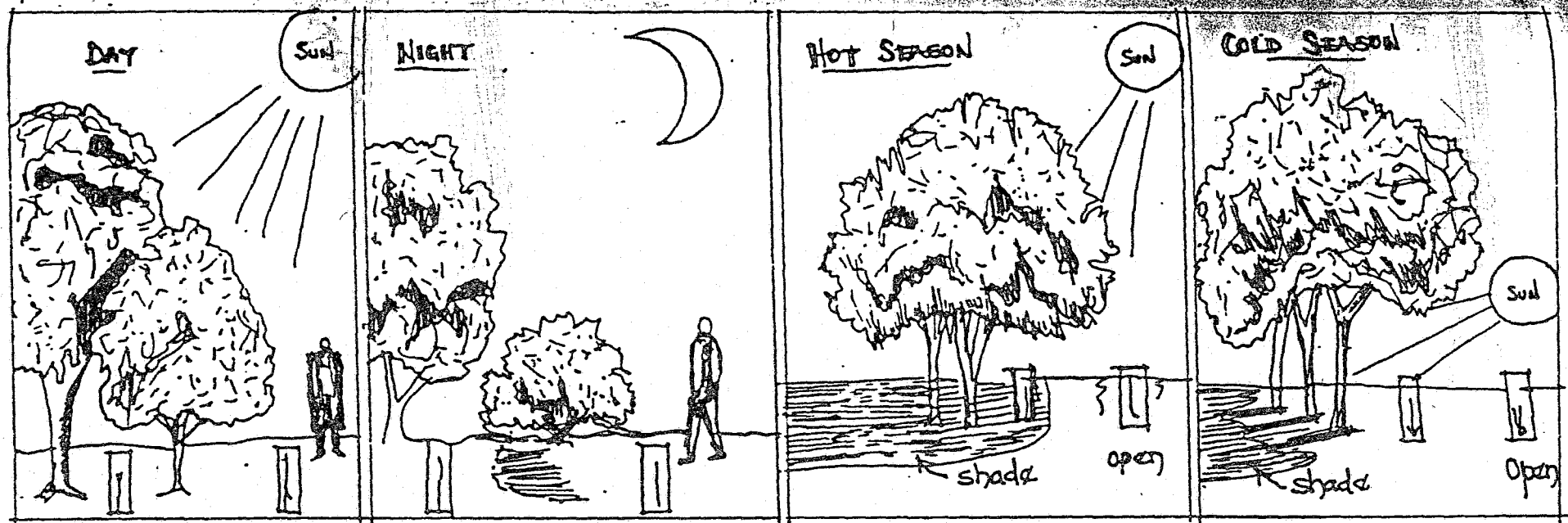
110 lux (90 foot candles) in other areas.

The intensity of the lights has been taken at levels of 0.9m from the floor except in inspection areas where the height is1.5m.

8.4 VENTILATION

Adequate Ventilation has been provided to prevent excessive heat, steam and condensation. North facing windows will largely preclude solar gain. Frosted glass and glass fitted with solar fill is provided to reduce solar radiation. Ventilation prevents the accumulation of odours, dust etc but it should not cause draughts and thus problems to staff. Particularly in multi storey plants, draughts arising from lift wells, stairways, chutes etc has been prevented. Opening ventilators and windows are secreted and internal windows sill sloped.

To moderate the heating and cooling of the plant and other facilities, air- conditioning units have been provided with central water-heating system for the required Hot water. Landscape has also been provided (soft landscape) elements to enhance the Heat moderation of the abattoir (fig. 8.1).



plants reduce light intensity and moderate wide diurnal variation in ground temperatures by reducing radiation from the sun and preventing excess radiation from the soil to the sky on a clear, cloudless night

broad leaf evergreen trees and shrubs also reduce light intensity and wide seasonal temperature variations by modifying radiation at the soil surface.

HEAT MODERATION

SOURCE: ROBINETTE G.O-PLANTS, PEOPLE AND ENVIRONMENTAL QUALITY – (1972)

FIG. 8.1.

8.6 REFUSE DISPOSAL.

The Refuse collected in the surrounding is to be disposed off to the incinerator provided. Abattoir is a place that is commonly found littered, as such a functional required capacity incinerator has been provided in which the refuse are disposed, dried and burnt(fig 8.2).

8.5 SOLAR CONTROL

Due to the intensity of the sun and solar radiation in the site soft landscape elements (as in fig 8.1) has been provided to reduce effect of solar radiation. Windows screen are also provided with fins and window hoods provided with fins and window hoods to reduce the effect of solar radiation.

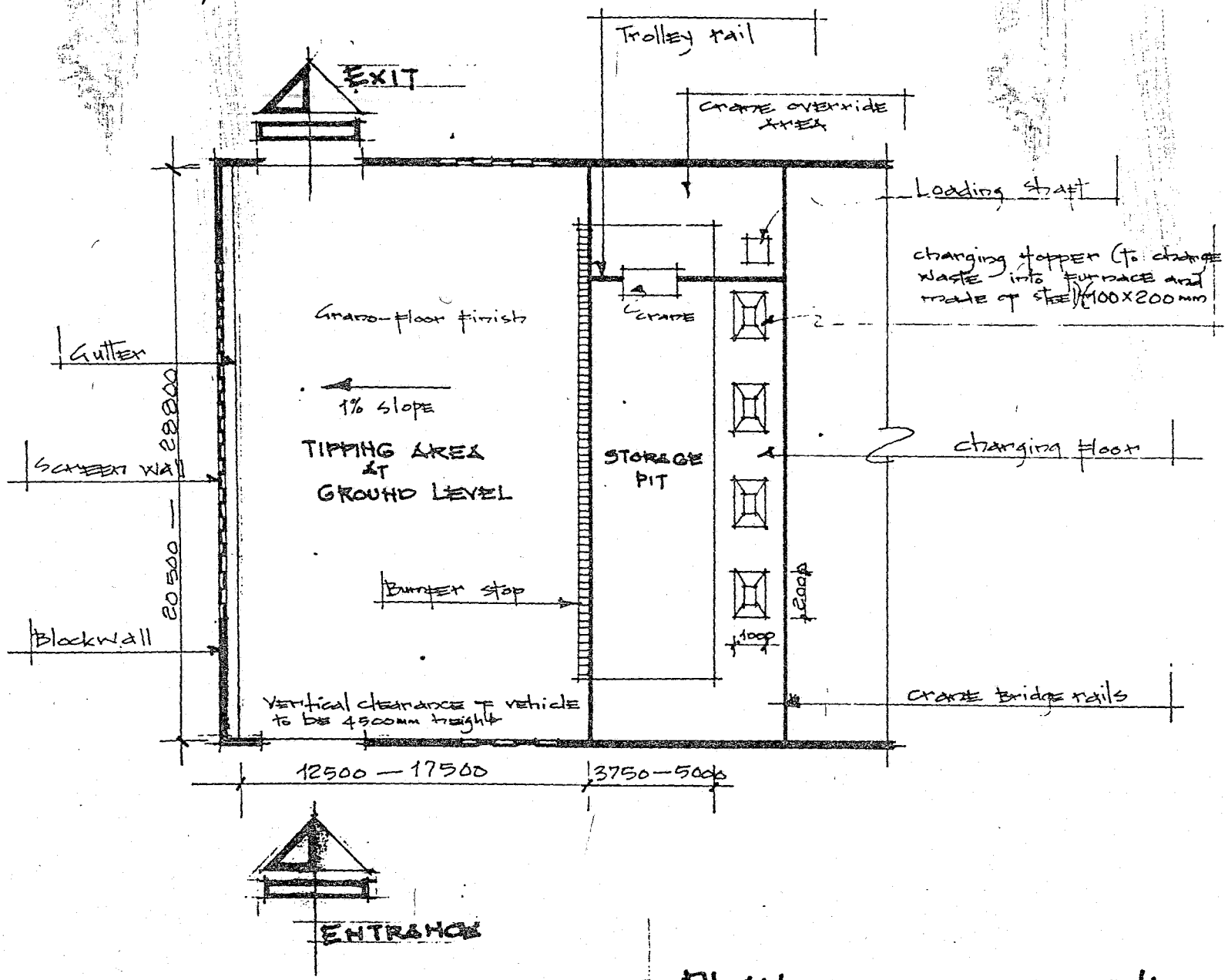
8.7 FIRE SAFETY.

In an abattoir animals cannot help themselves in case of fire accident (that is incapacitated beings). In this case, fire safety measures are adopted so that safety level is improved, animals and plants are rescue during fire out-break. The following measure and facilities are provided for fire safety.

(i) Fire Detectors- the out break of fire occurs with combustion of gas, smoke and then flame so before the fire get out of control, fire detector raises alarm to signifies fire out break there are different detectors, which include- smoke detector, Heat change detector, flame detector, and other fire detection and suppressions devices. (fig 8.3).

The detector are fixed on the ceiling and located in corridor, control store and other areas.

(ii) Fire Alarms. Alarm is a device to create awareness in case of fire out break, the alarm will blow to create state of unsafe so that necessary precaution to suppress the fire will be taken, before it gets out of hand. The fire alarm are automatically attached to the detectors



PLAN OF TIPPING AREA/PIT

Fig. 8.2

INCINERATOR

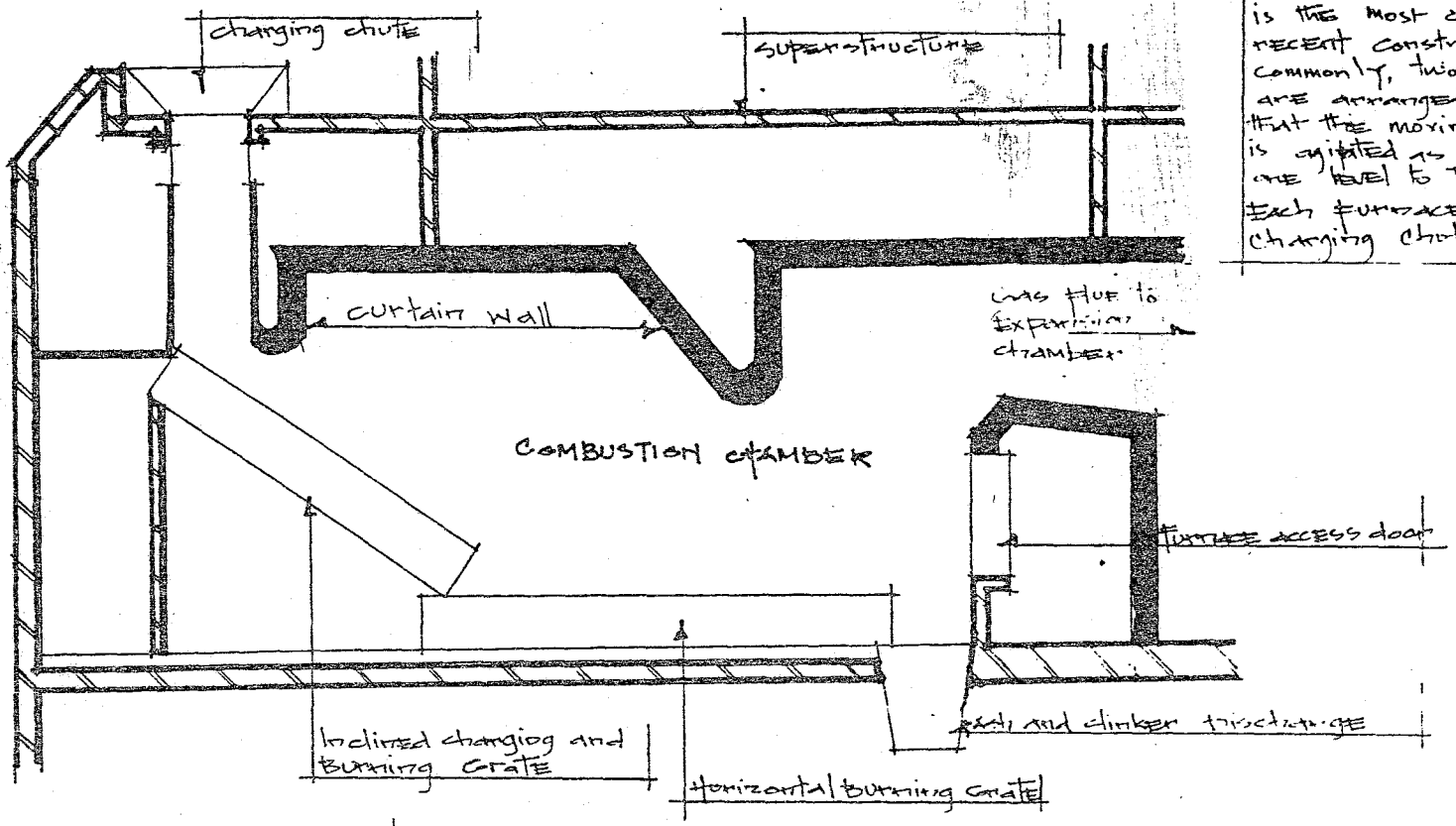


Fig. 8.2 RECTANGULAR FURNACE

OPERATION

The rectangular furnace is the most common form in recent constructions. Commonly, two or more grates are arranged in tiers so that the moving solid waste is agitated as it drops from one level to the next lower. Each furnace has only one charging chute.

06

(iii) Fire extinguishers and Extinguishing systems. For fire to occur, three basic elements have to come together, these are fuels, gas (oxygen) and heat, with absence any of the three fire cannot break out. It is based on this principle that extinguishers are design and operated. The way to extinguishing fire can be.

- Starving/ remover the fuel.
- Smothering /remove the air (i.e oxygen)
- Cooling /remove the heat.

The function of an extinguisher depend on the extinguishing agent it carries. There are tree types of extinguishers.

- water extinguisher
- vapourizing liquid
- carbondioxide
- dry powder
- foam.

From above, the types of extinguishers used in the abattoir are the water extinguishers (by provision of water hoses) and carbondioxide (by provision of carbondioxide extinguishers at various points. (fig 8.6).

8.8 SECURITY

Security provision is essential in every design this is to secure the equipment from theft and vandalization. The security provision in the abattoir include, security post at the gate to check the exit of the users High fence to control check movements in the abattoir. Because of the size and importance of the abattoir and nature of the equipment, security wire net work is provided on the fence with watch towers at strategic positions

8.9 MAINTENANCE.

In view of maintaining hight sanitary standard in the abattoir maintenance of the abattoir is mostly based on cleaning. Cleaners office is provided to house those that will cater for cleaning of the surrounding and the plants.

To ensure this, three cleaning systems are provided in the abattoir. This include cleaning in place system. (cip) , central cleaning system (ccs) and self contained cleaning system.

The cleaning in place system is closed system in which cleaning compounds are circulated by a pump through a series of pipes to the components to be cleansed. Althouth it can be tapped for external cleaning it is basically designed for cleaning internal surfaces only.

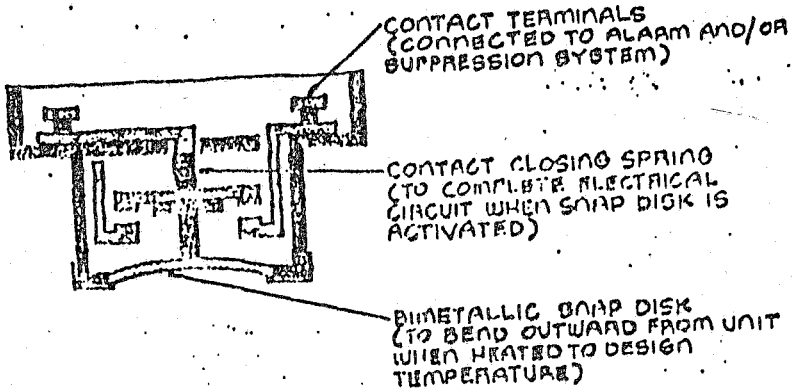
The central cleaning system has a central pumping source supplying cleaning solutions under pressure to remote locations in the meat plant. The unit is capable of achieving pressures of 35-49 kgf/ cm^2 and a flow of 136 181 litres/min.

The self-contained system is provided with pumping source and chemical spray systems contained in one unit.

Out of the cleaning systems, the most functional one is to be the central cleaning systems though others are provided to serve in case of failure of the central cleaning system (fig. 8.7).

Heat Detector

To detect fire, heat detectors use the physical or electrical change of a material caused by exposure to heat. For example, detectors using a bimetallic disc (as shown below) alarm at elevated temperatures when the snap disc bends completing an electrical circuit. Bimetallic materials are made of two metals, with different thermal expansion characteristics, bonded together so they will bend when heated. "Fixed temperature" detectors alarm when the temperature of the operating element reaches its design level (usually 135°F). "Rate-of-rise" detectors alarm when the rate of temperature change exceeds about 15°F/minute which indicates a rapidly developing fire. Expansion of air in a chamber with a calibrated vent can be used to detect temperature rise.



Smoke Detector

To detect smoke, ionization detectors use the interruption of a small current between electrodes in the ionized sampling chamber (containing Americium 241 or Radium 226 source). In a dual-chamber detector, the reference chamber (exposed only to air temperature, pressure, and humidity) reduces false alarms caused by changing ambient conditions. Ionization detectors, with a single chamber, are also commercially available.

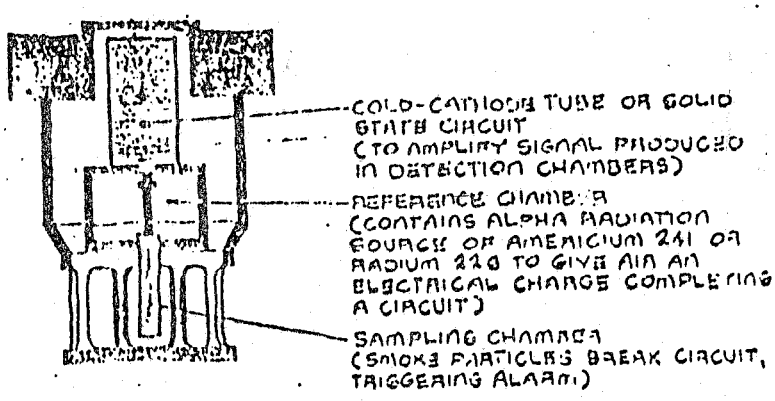


Fig. 8.3

FIRE DETECTION AND SUPPRESSION—WATER FLOW INDICATORS

Water flow-sensitive devices in sprinkler system piping can be used to trigger alarms indicating fire, leakage, or damage. This alarm feature is especially important where water damage would be disastrous (e.g., computer equipment rooms, storage rooms for valuable documents). The devices normally detect water flow of about 10 gpm or greater. A time-delay mechanism helps prevent false alarms by absorbing fluctuations from routine water surges. When installed on each floor of a building, water flow indicators help fire fighters to locate the area of sprinkler operation. In addition, water control shut-off valves should be provided on each floor.

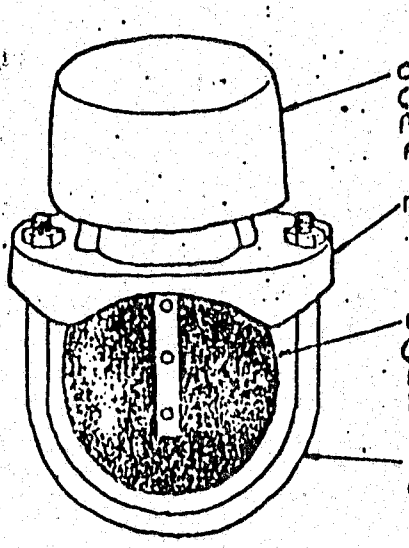
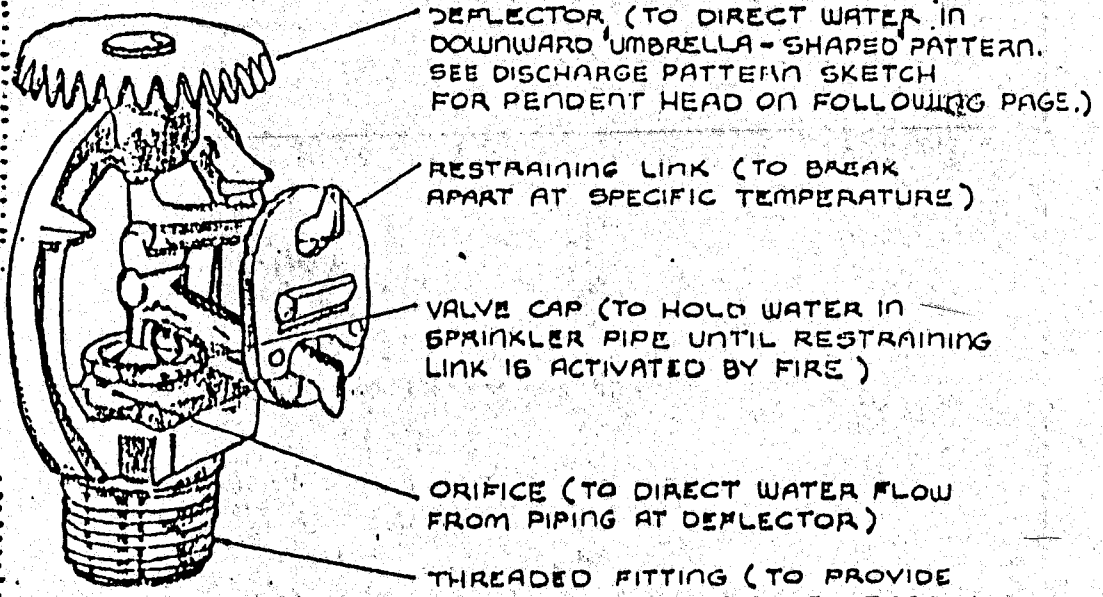


Fig. 8.4

FIRE DETECTION AND SUPPRESSION—SPRINKLER HEADS

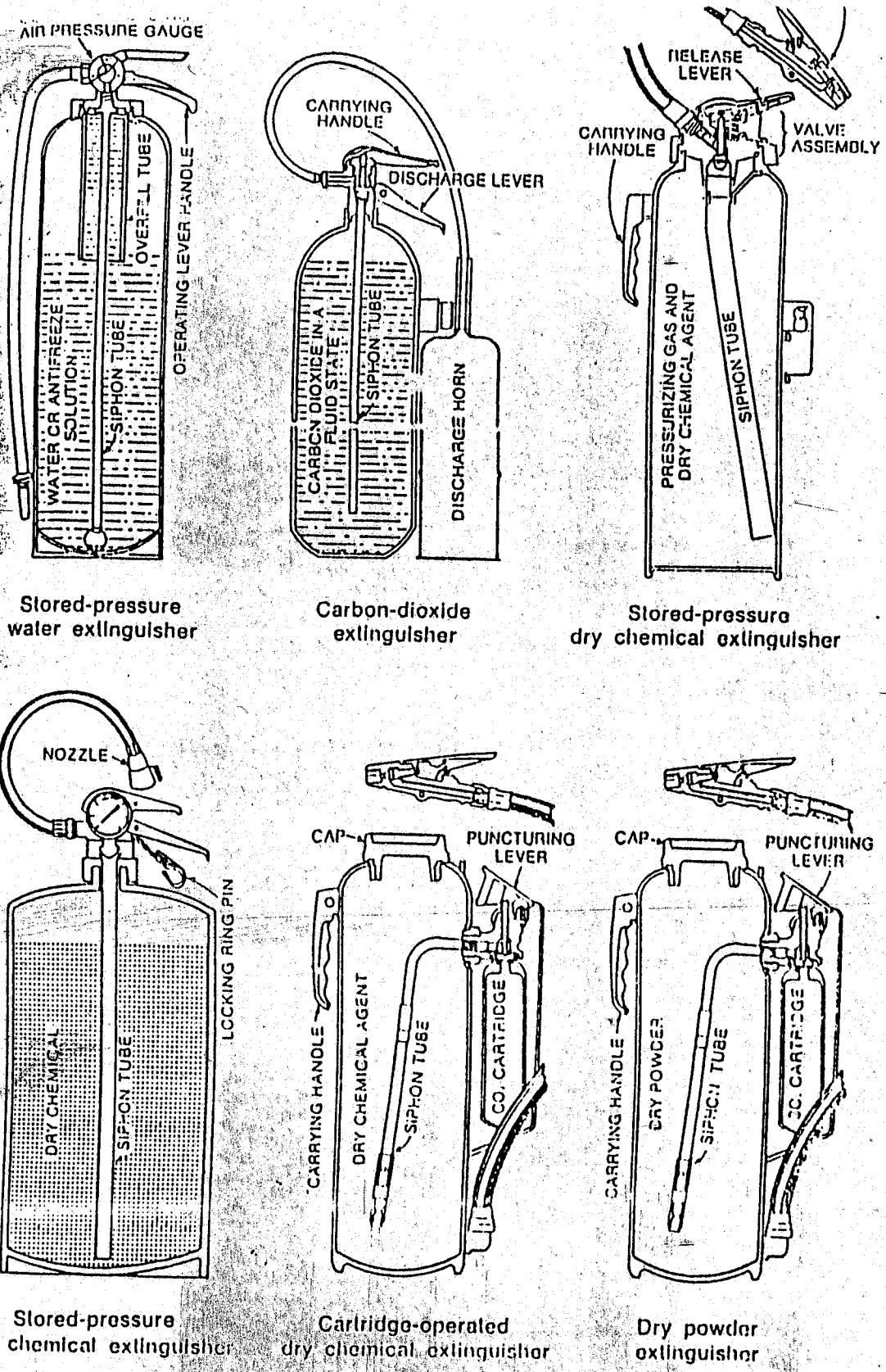
Sprinkler heads are designed to discharge finely divided water particles in the event of fire. Finely divided particles of water have increased surface area and therefore greater ability to absorb heat. The conversion of one gallon of water into steam absorbs up to 9500 Btu of heat depending on the size of the water particles. Sprinkler heads can be activated by soldered link (breaks apart when heat melts solder), glass bulb (liquid expands when heated, breaking glass), chemical (melts allowing a strut to collapse), or electrical (quick-response device discharges molten metal on heat-sensitive sprinkler element).

Sprinkler heads are constructed so they will open at predetermined temperatures within the range of 135 to 575°F, depending on application requirements. Heads are also rated for use at maximum ceiling temperatures within the corresponding range of 100 to 475°F to help prevent premature operation from extended exposure where elevated temperature is normal. The sprinkler head shown below is an upright type that uses a deflector to direct water over its area of coverage. Upright heads are less susceptible to water flow obstruction from accumulation of sediment in the water piping than are pendent heads.



UPRIGHT SPRINKLER HEAD

Fig. 8-5.



Stored-pressure water extinguisher

Carbon-dioxide extinguisher

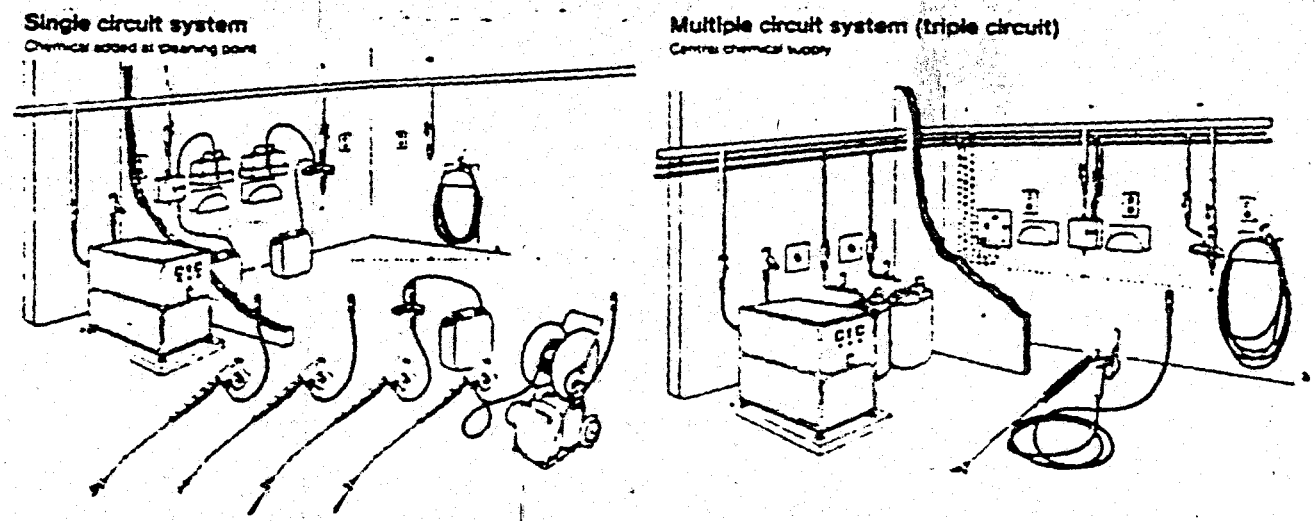
Stored-pressure dry chemical extinguisher

Stored-pressure dry chemical extinguisher

Cartridge-operated dry chemical extinguisher

Dry powder extinguisher

Fig. 8.6 Fire extinguishers.



Centralized high-pressure in-plant cleaning system showing high-pressure unit and chemical metering (B) and detergent added at cleaning point in (A). (By courtesy of Kärcher (UK) Ltd., Banbury, Oxon, UK)

Fig. 8.7. Abattoir cleaning systems.

CHAPTER NINE

9.1 CONSTRUCTION MATERIALS

Typical of Abattoirs the materials used in the construction of the abattoir are quite numerous. Materials that will provide lasting functional and appealing structure these include the building and landscape materials.

Special attention was given to the choice of materials, considering the weather and climatic factors affecting the site as analyses in chapter six (6.4 site inventory), and bearing in mind that, there are indoor and out door facilities. Due to direct effect of weather on out door facilities, special attention was given in the choice of materials of their construction.

Materials, used for the soft landscape materials and the hard landscape materials. Soft landscape materials include, tree, flowers grasses etc while hard scape materials include, trees, flowers, grasses etc while hard landscape materials include; built structures, concrete kerbs, walk way slabs, stones etc.

Plants that grow well in Savannah region were selected for the landscape, they include : -

Royal palm- Basically used for aesthetics and to create harmony between the built environment and the natural surrounding.

Umbrella trees- planted to provide shades and to reduce direct effect of radiation from sum.

Mango, Guava and Orange trees are planted in the grazing area for fruits and to create a feel of natural environment.

Hard landscape materials include : -

Concrete walkways and terraces to create friction and reduce slippery effects friction and walk paths.

Concrete seats within the market and accommodation under direct weather condition and frees to provide a feel of natural environment.

Brick moving margins, to protect edge of grasses from kerbs, concrete kerbs were used to prevent the lateral spread of the road control surface water drainage from the road and to discourage the encroachment of vehicles on to foot paths.

Building materials include : - Long span aluminum roofing sheets due to its non corrosive nature, durability and aesthetics was used for roofing of the center.

Ceramic floor tiles are used for floor finishes in the offices while polished terrazo granite used in the slaughter to allow easy in cleaning with porcelain tiles at the coners and covered.

Landscreed hollow blocks and concrete used in the construction of walks. Textcote wall furnishes for quality durability aesthetics and to prevent people from leaning on the wall was used on the external walls.

Wooden and metal upholstery furniture for Offices, metal railings for balconies and terrace, glass doors and windows to bring landscape into interiors.

9.2 CONSTRUCTION TECHINIQUES

The construction is geared towards promoting efficient and hygienic operations. It is also based on the system of operation in the abattoir.

Construction begins with site clearance, which involves removal of all obstructing elements on site. This could be done manually and or with machine depending on the area involved

The foundation type is determined mainly by the soil type which is sandy and coarse in nature, with a well compacted hard core raft foundation spread all over the entire area of building.

Structural systems such as columns and beams were introduced. Columns, beams, roof gutters and lintels are reinforce with steel bars.

Walls are mainly of hollow sandscreed block of (225 x 450 x 225)mm for internal and external walls and (150 x 450 x225)mm for dwarf walls (planters).

Doors of public areas are made of glass and aluminum frames to allow for a feel of the landscape in the interiors and easy flow of Animals Users and meat. Toilets and bathrooms have standard flush doors.

Windows are generally of pivoted framed glass for slaughter Hall and sliding types for public areas and offices to enhance the landscape from outside.

The roofing materials used are long span aluminum roofing sheets with a minim slope of 15^0, this is to allow easy water run-off to the ground drainage or into roof gutters which run off into drainage on the ground. Skeletal roofing members (roof carcass) are steel T- Sections, rectangular sections and Z -sections.

Ceiling materials include celotex boards to create lagging/insulation between the roof members and room enclosure.

Fillings are the final installations made on construction site. They range from electrical fittings switches, sockets etc plumbing sinks, baths water closets etc.

9.3 AESTHETICS AND GENERAL APPRAISALS.

The ultra modern abattoir, Abuja, when viewed from above as a landscape feature, the design and beauty would them become very apparent. From this vintage point, the recreational facilities are seen as a whole some entity with, the meandering design of walkways lawns connection. From one area to another mass and sparse planting of trees, flowers and ground cover of different varieties and the blend of the built area to give a picture of creative application of the design phylosophy which is functionality.

The punctuative use of special structure as in the main building. A concrete shell structure was applied to achieve what kemel used snow to achieve. It basically serves for uniqueness and to create distinct beauty and flexibility of functional space.

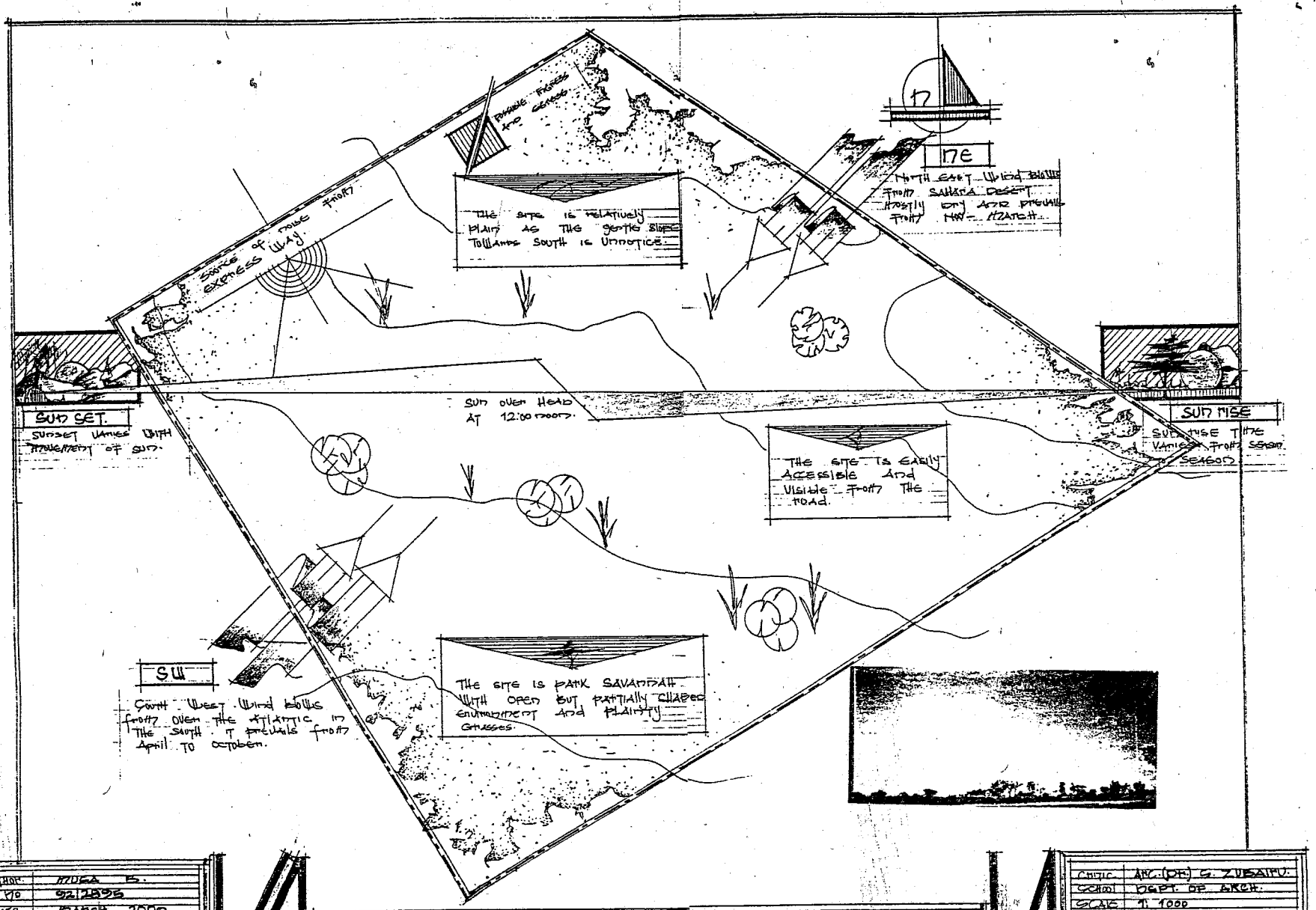
The combined use of circular and other regular forms of rectangles is to achieve a good blend of the form with the concept and to achieve the good flow of functions. The elevation forms were given close links with plans to achieve same effect.

CONCLUSION

The Abattoir is expected to meet the need of users, butchers, catrers, and meat retailers. The design is simply a whole some reformation architectural environment and broadly a meat world.

The project work has been able to arrive at a logical halt by providing solution and recommendations for the identified problems, so that it will serve as a functional analysis of an abattoir.

In the event of proper execution of this project with proper maintenance the scheme will be an epitome of architectural excellence.



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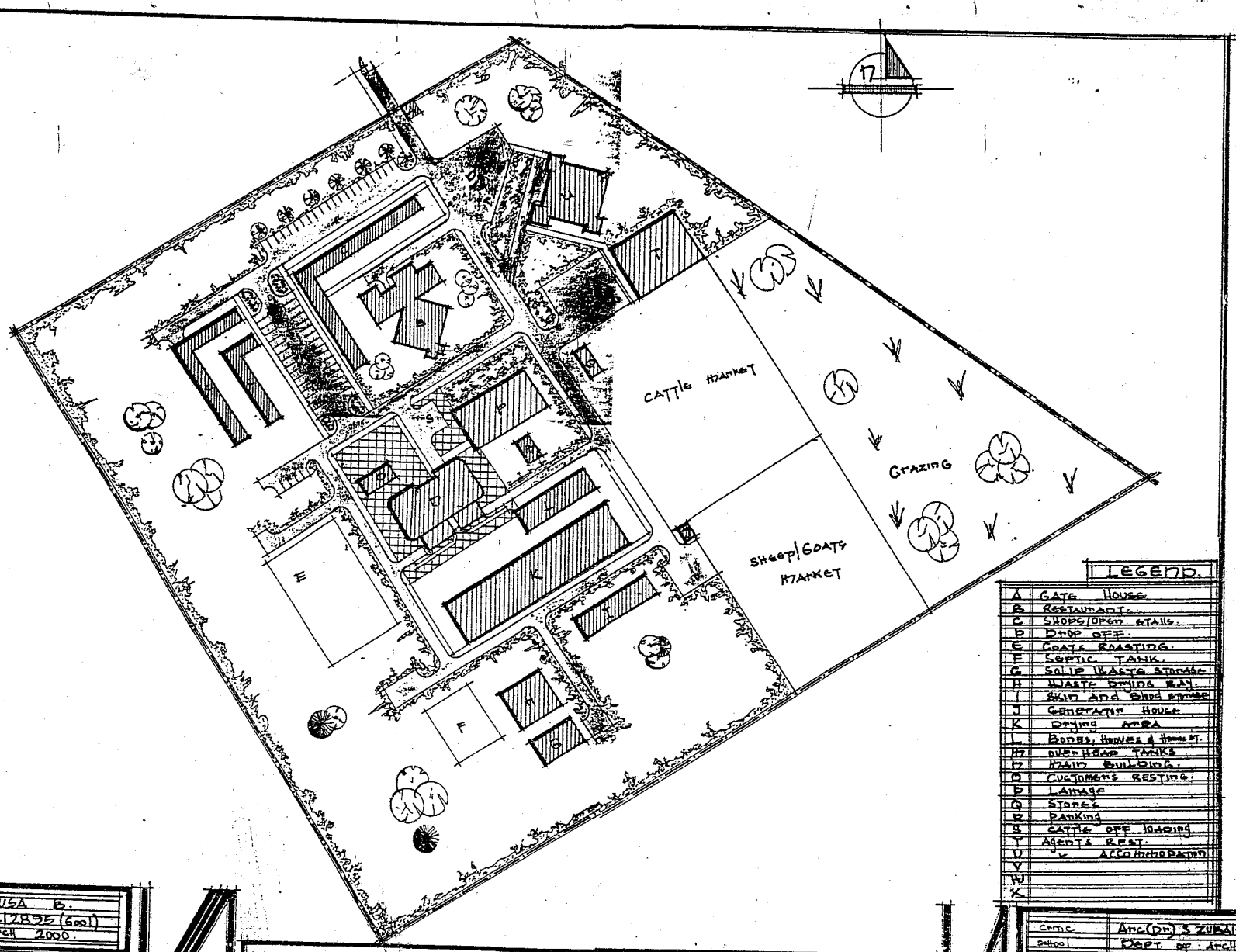
JA NO	92/2895
DATE	MARCH 2000

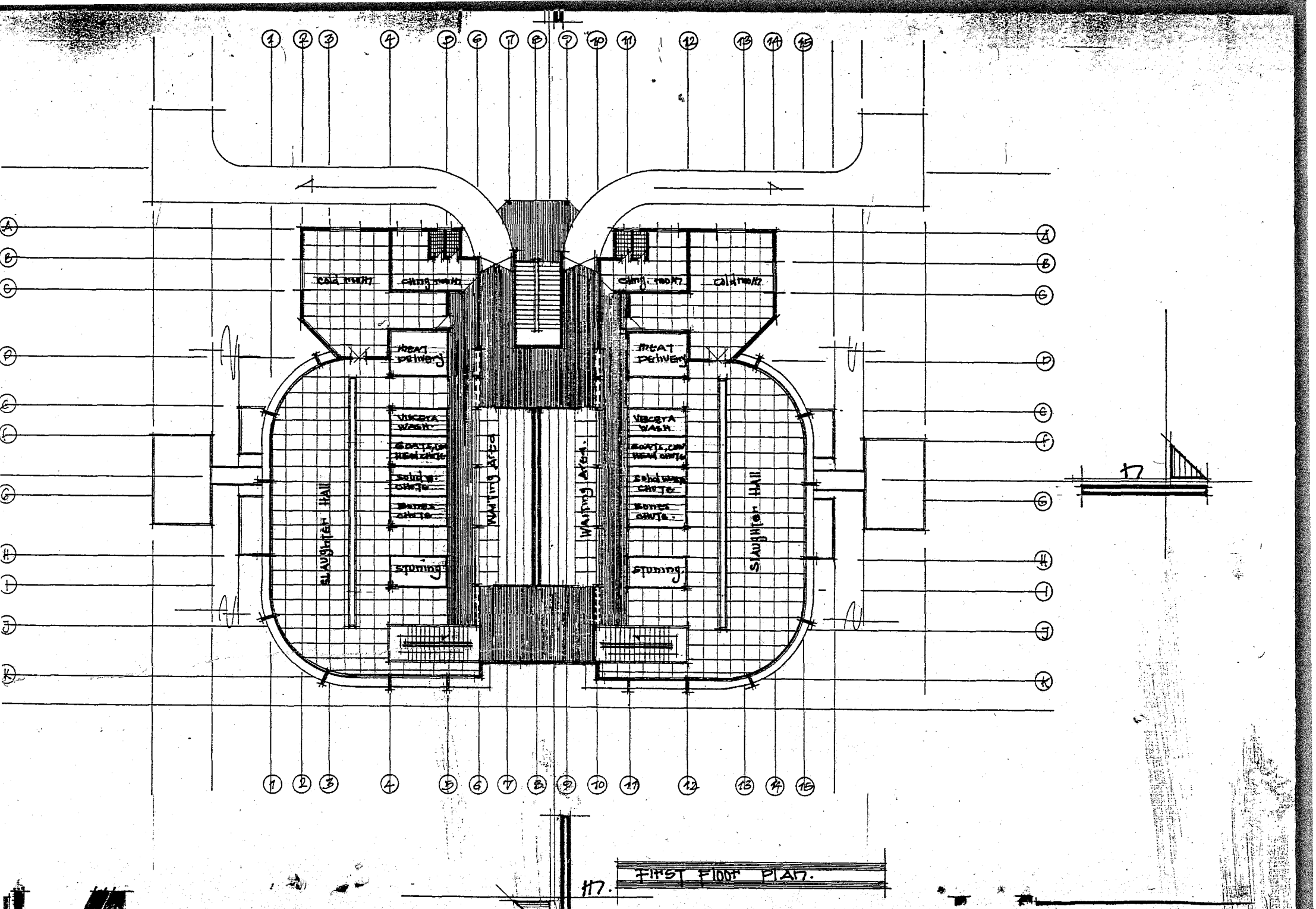
SITE ANALYSIS.

ULTRA MODERN ABATTOIR, ABUJA.

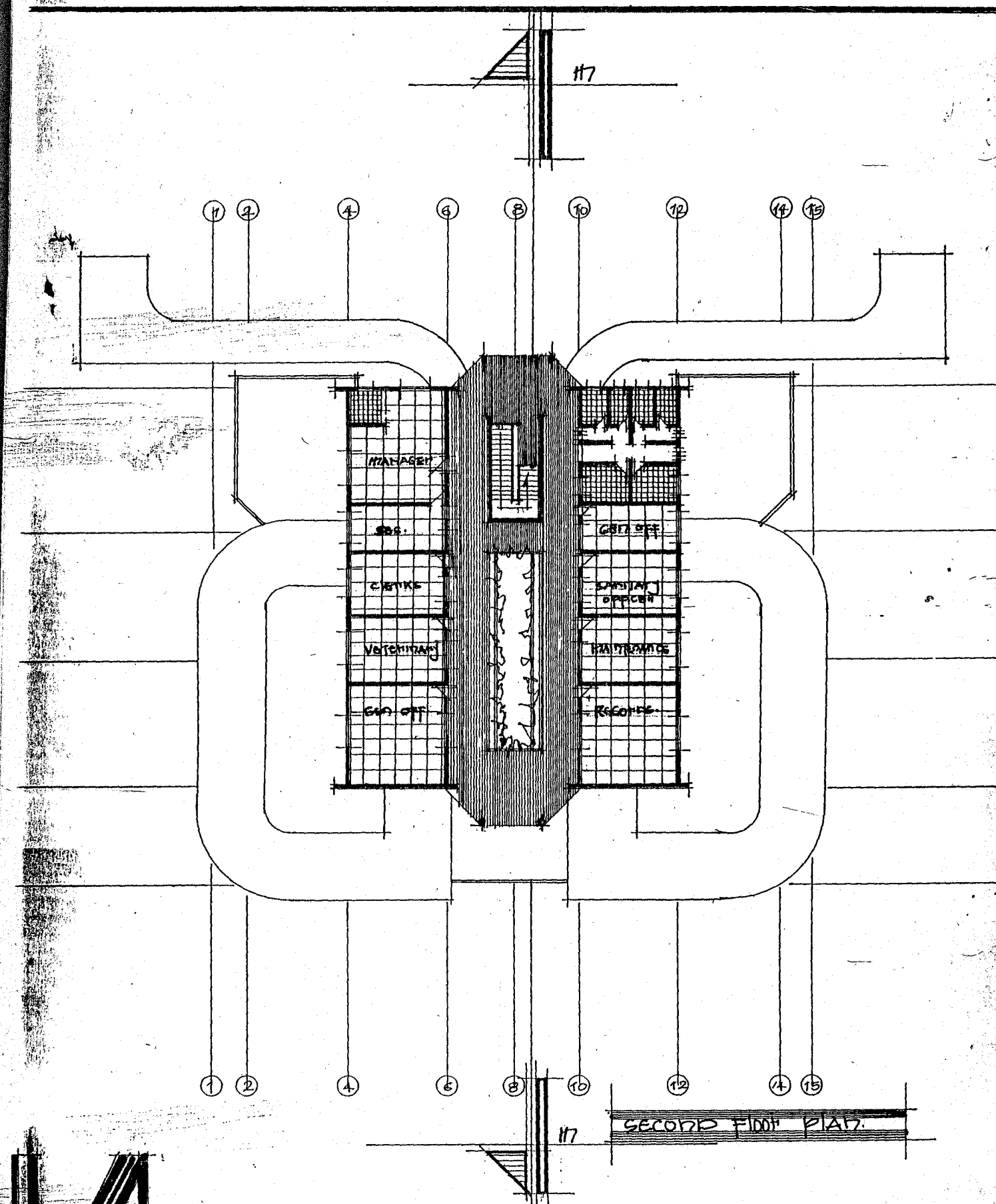
CRITIC	ARC. (DR) S. ZUBAIRU.
COURSE	DEPT. OF ARCH.
SCALE	1: 1000


CATTLE MARKET
GRAZING
SHEEP/GOATS MARKET
E
F
LEGEND.
A GATE HOUSE
B RESTAURANT.
C SHOPS/OPEN STALLS.
D DROP OFF.
E GOATS ROASTING.
F SEPTIC TANK.
G SOLID WASTE STORAGE
H WASTE DRYING BAY.
I SKIN AND BLOOD STORAGE
J GENERATOR HOUSE
K DRYING AREA
L BONES, THORNS & HORNS ST.
M OVERHEAD TANKS
N MAIN BUILDING.
O CUSTOMERS RESTING.
P LAIRAGE
Q STONES
R PARKING
S CATTLE OFF LOADING
T AGENTS REST.
U
V
W
K
Author MUSA B.
Id no 92/2855(600L)
Date. MARCH 2000.
SITE PLAN
Ultra Modern
Abattoir Abuja.
Comic Arc(Dr) S ZUBAIRU
School DEPT. OF ARCH.
SCALE 1:1000

#7 GROUND FLOOR PLAN.

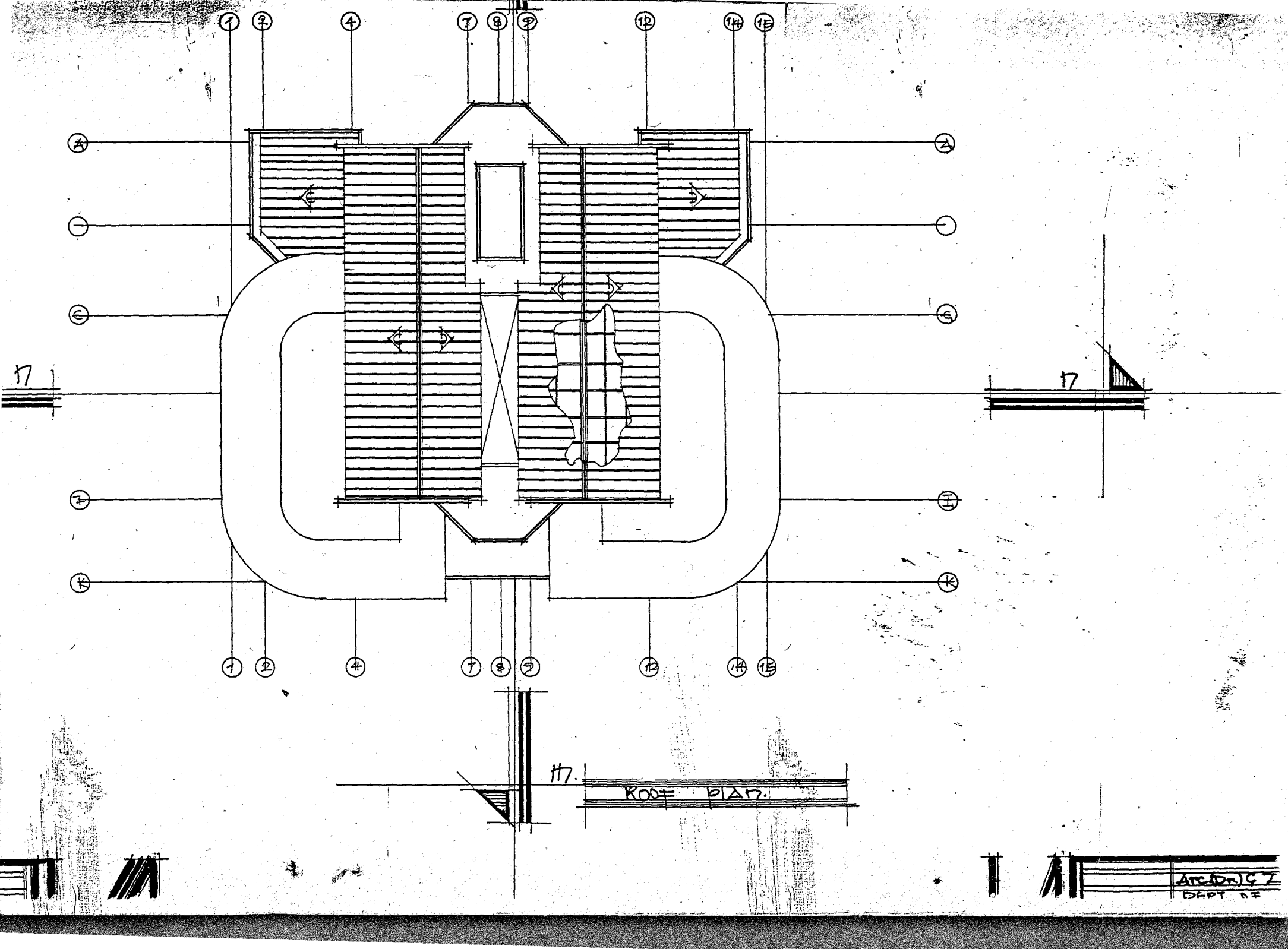


17. FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

ULTRA MODERN ABATTOIR, ABUJA.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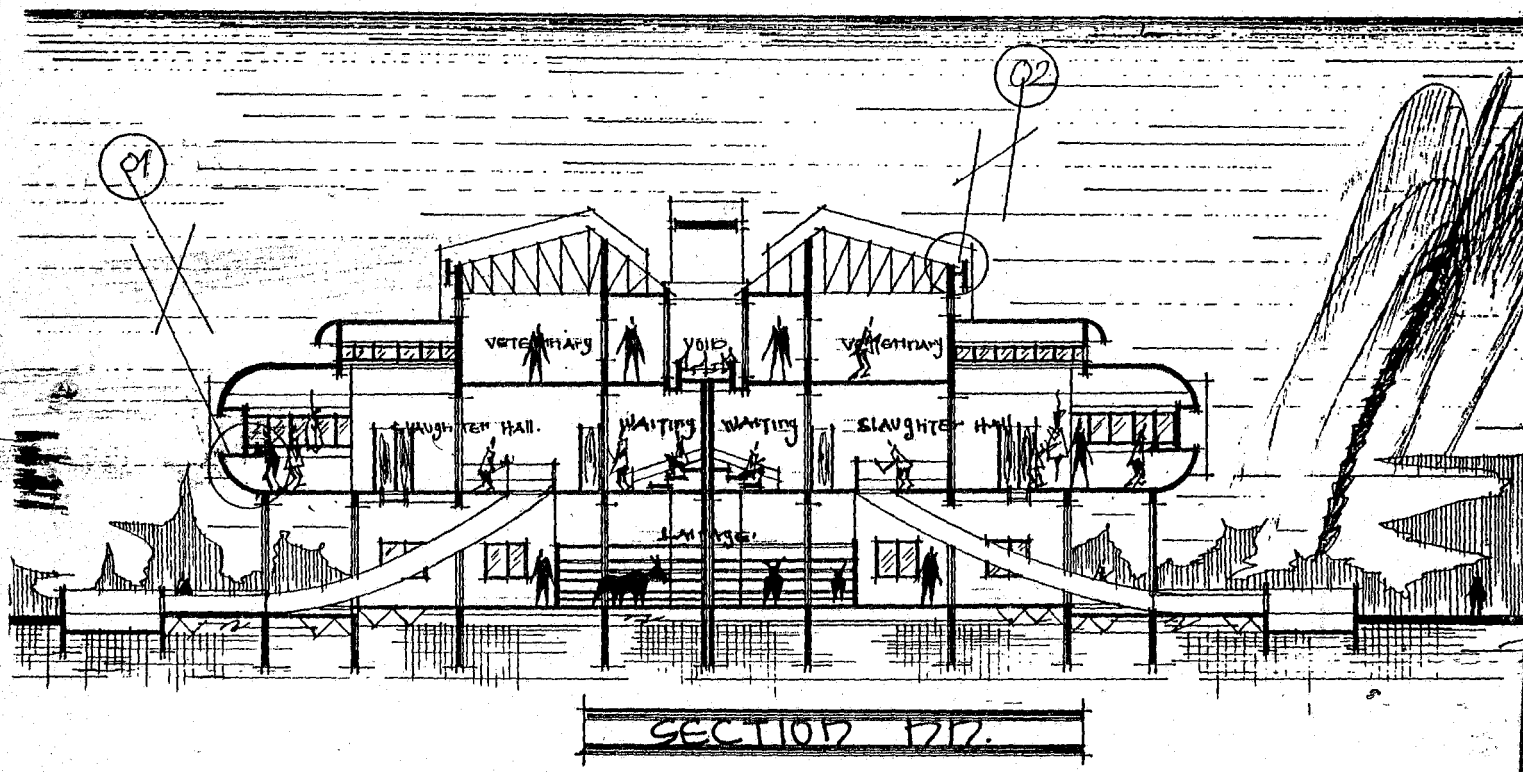
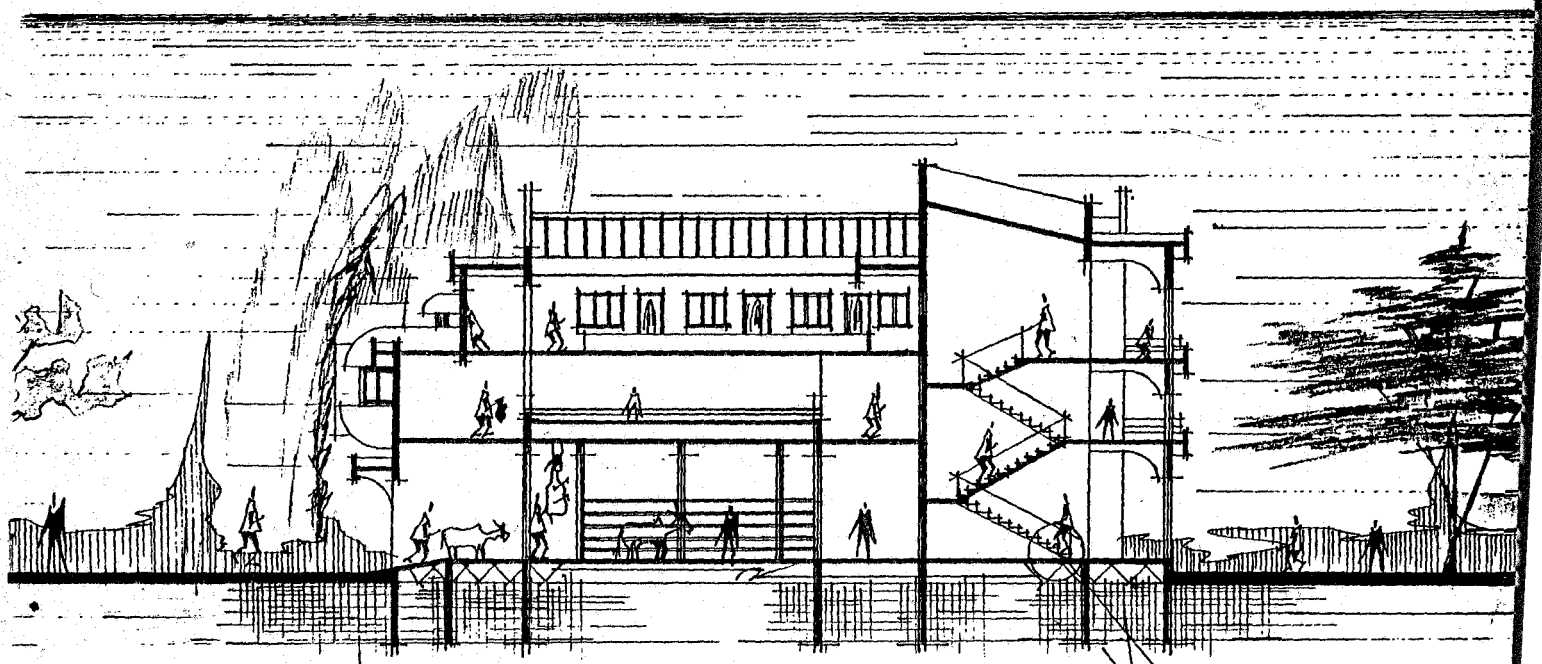
17.
ROOF PLAN.

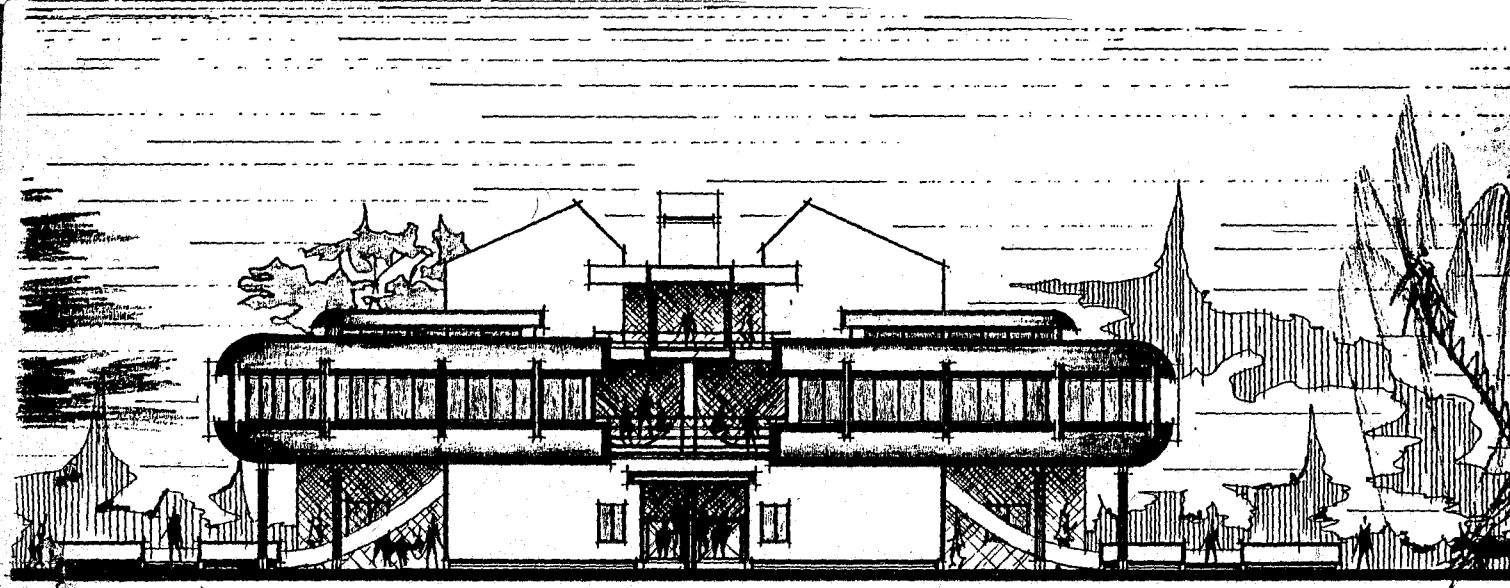


SECTION 1/12.

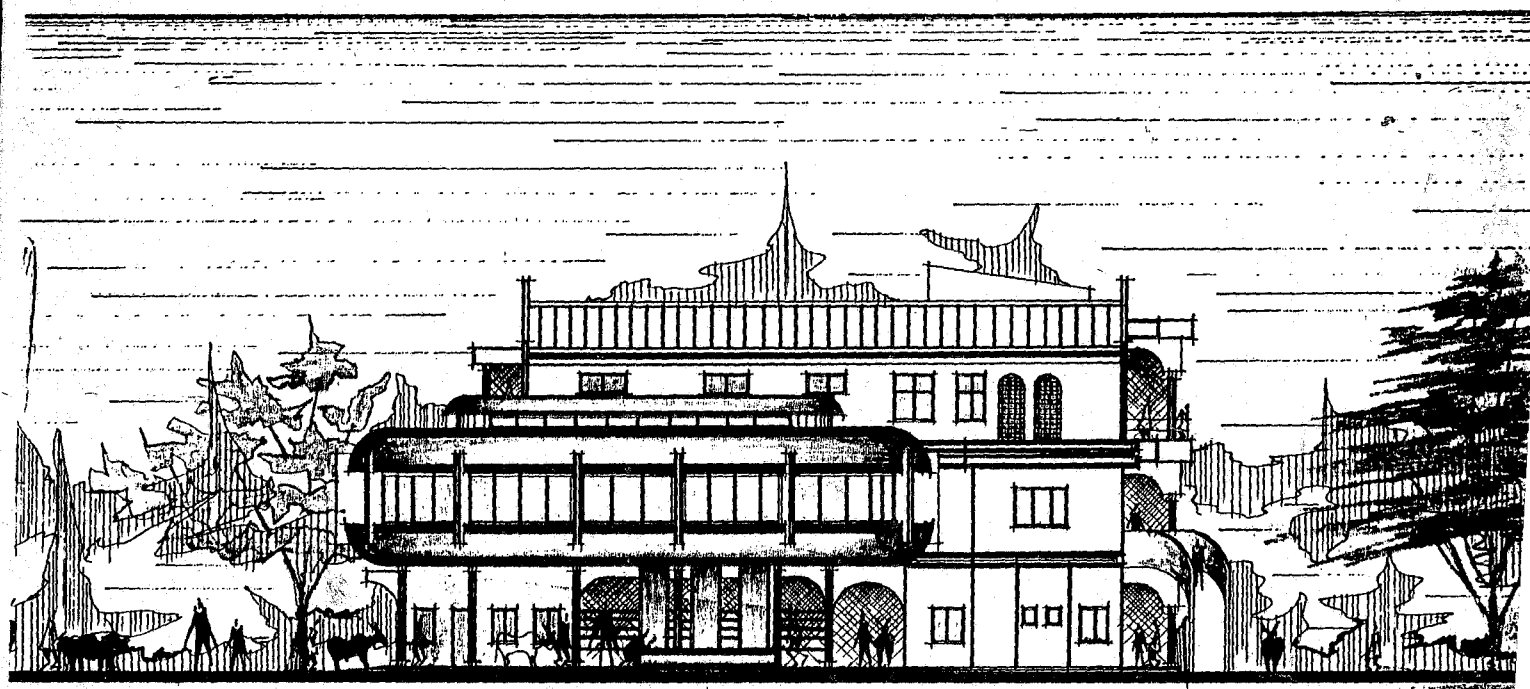


SECTION 11/12.

ULTRA MODERN ABATTOIR, ABUJA.

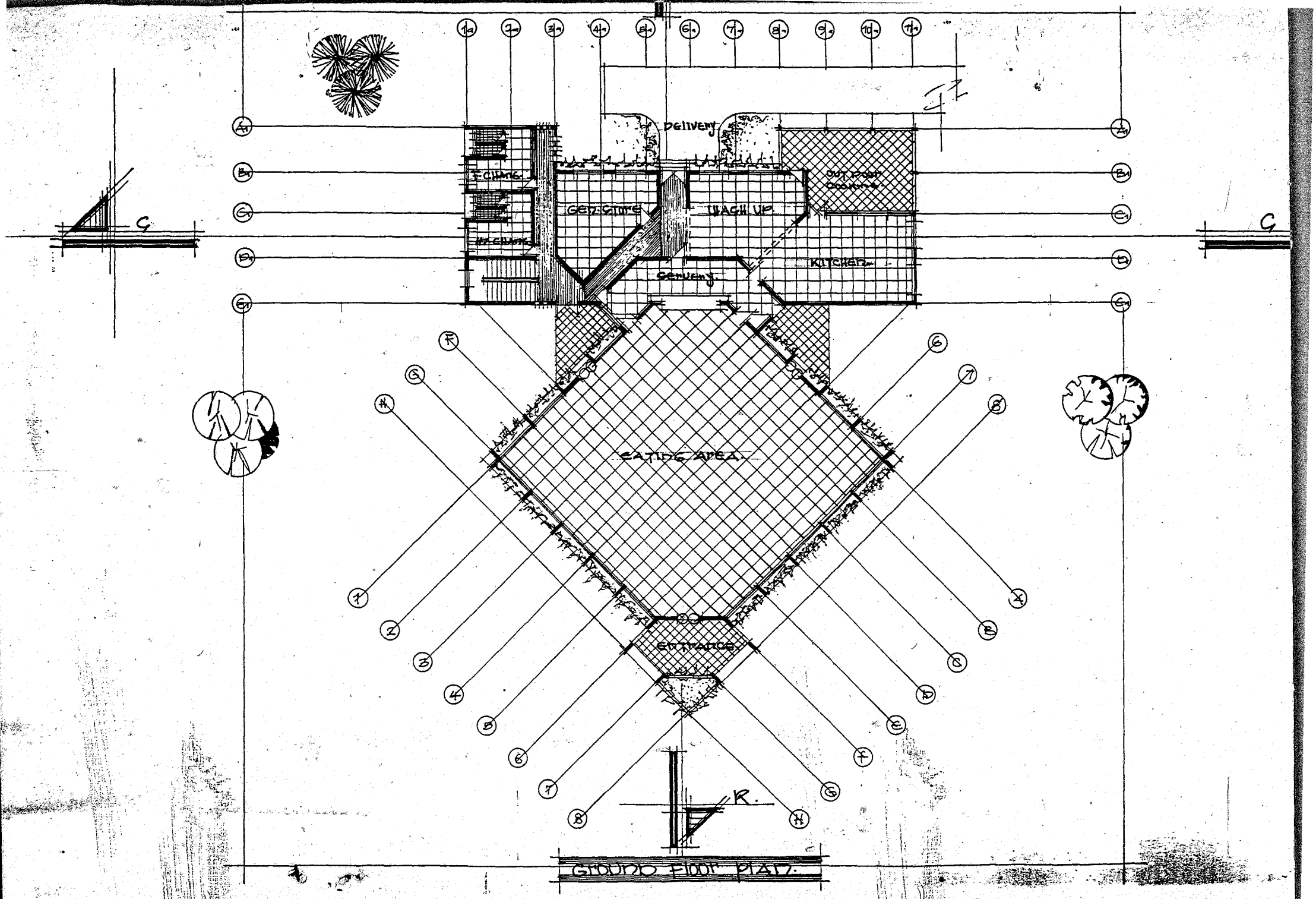


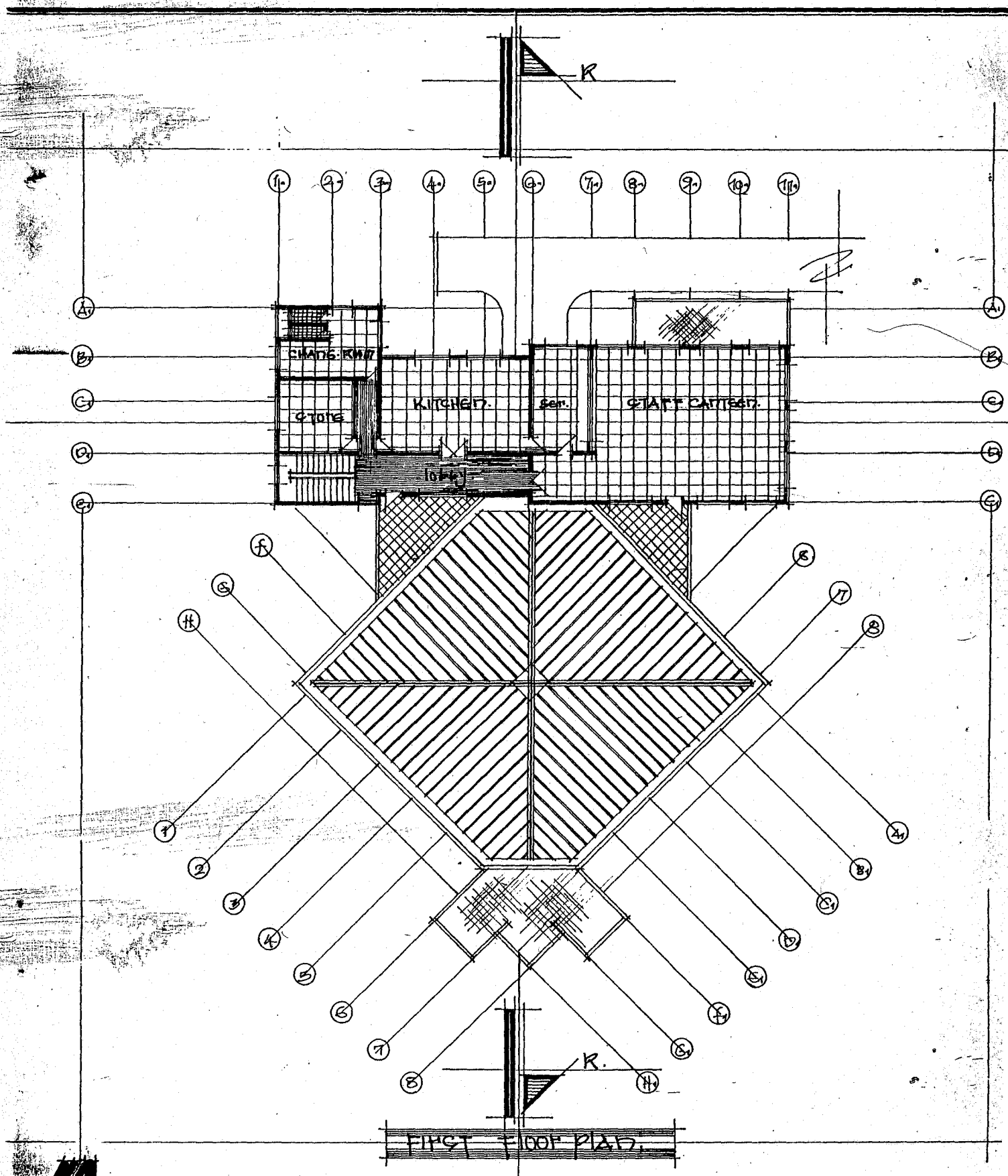
APPROACH ELEVATION.



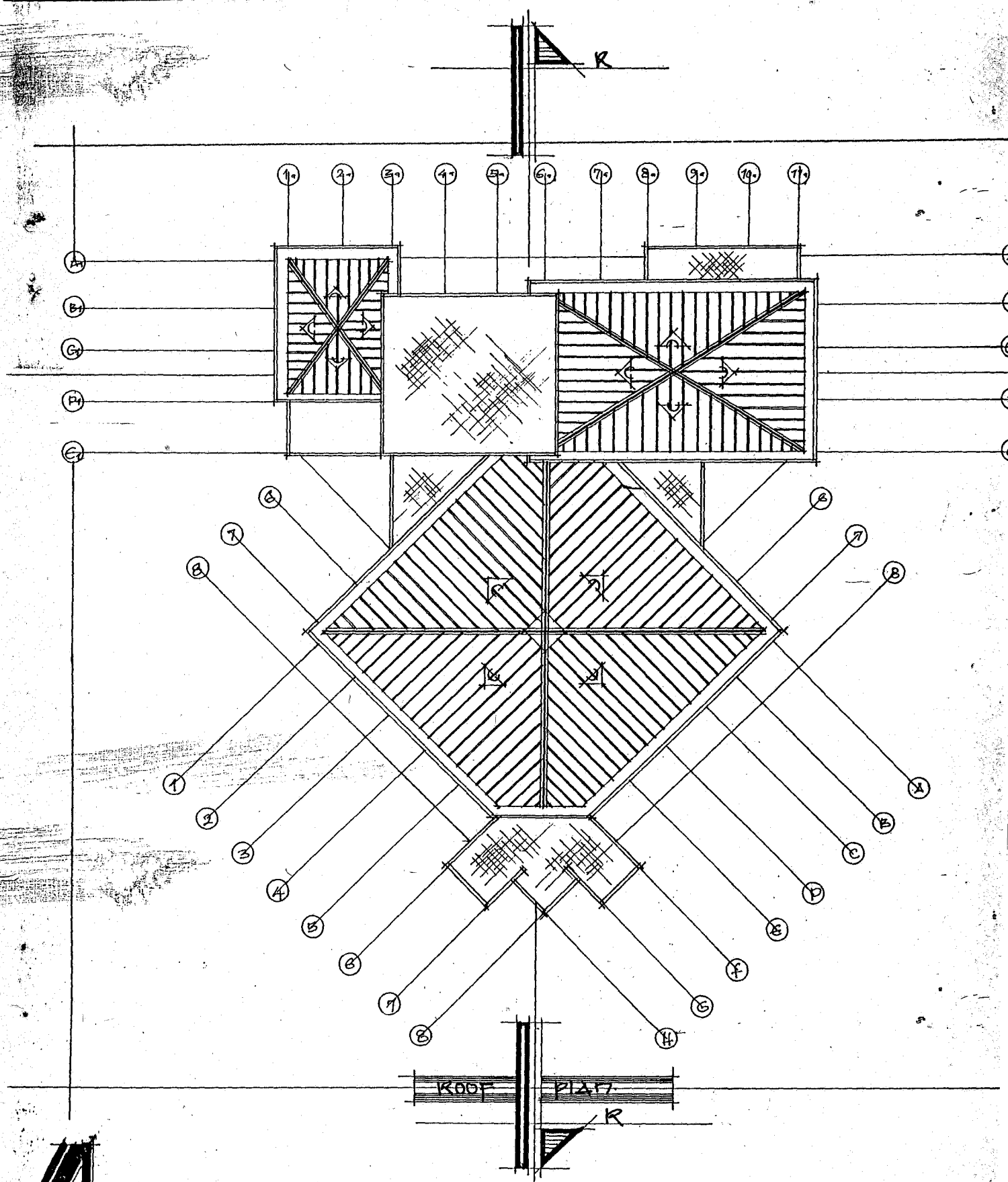
TYPICAL SIDE ELEVATION.

ULTRA MODERN ABATTOIR. ABUJA.

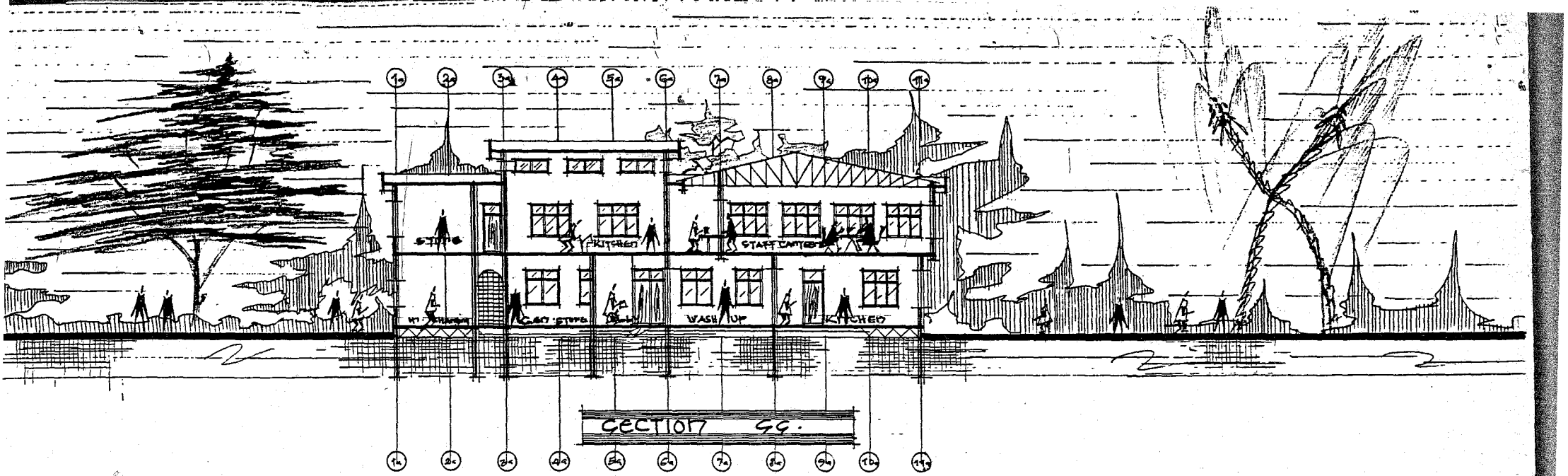

delivery
GEN. STORE
WASH UP
KITCHEN
SERVERY
EATING AREA
ENTRANCE
R.
GROUND FLOOR PLAN.



ULTRA MODERN



Ultra Modern
Abattoir Abuja.



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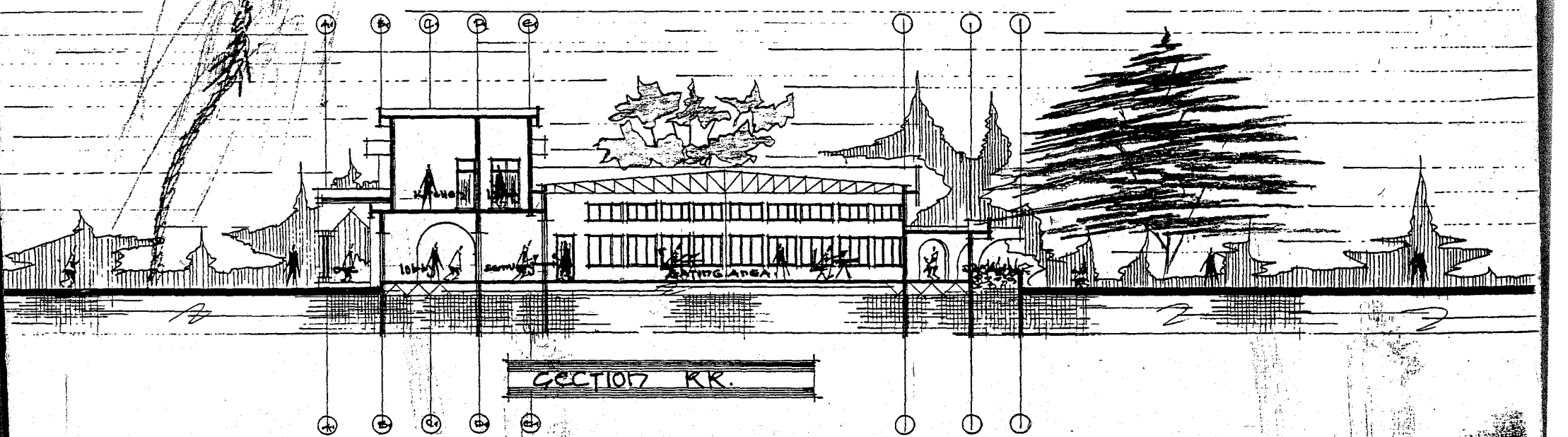

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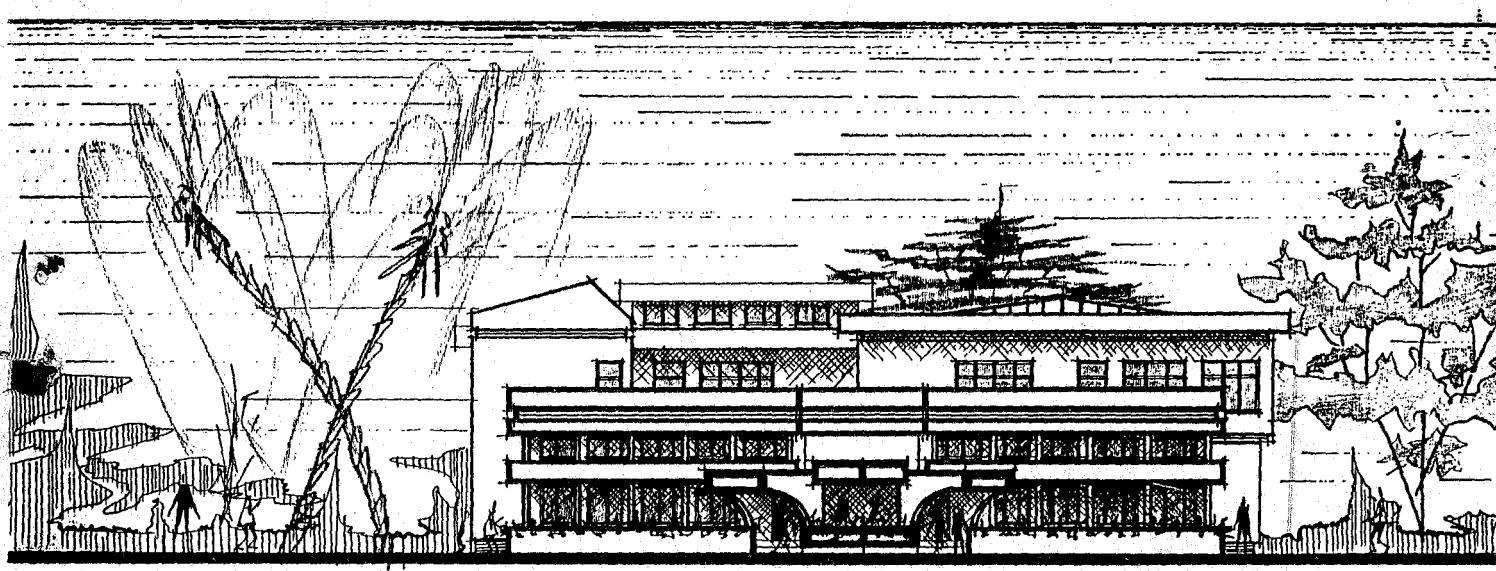
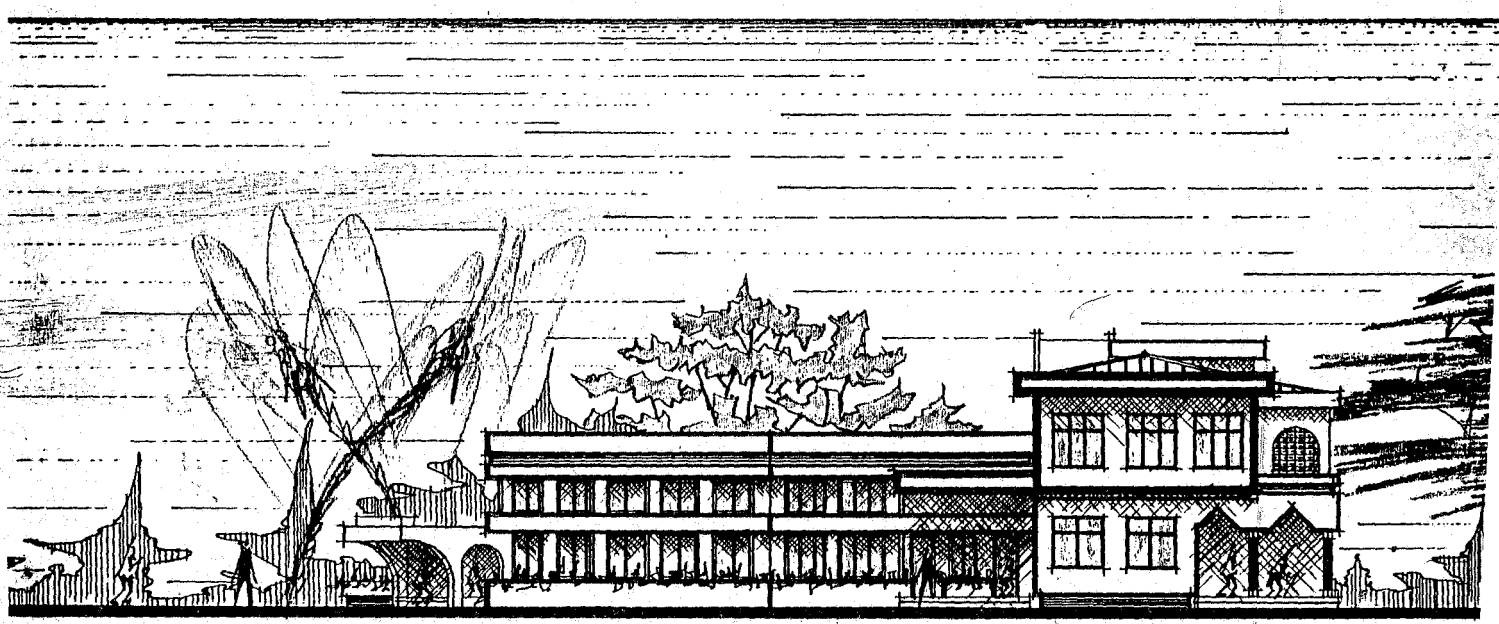


APPROACH ELEVATION.



RIGHT HANDSIDE ELEVATION.

Ultra Modern Abattoir Abuja