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PRESENTED TO THE DEPARTMENT OF ARCHITECTURE

FACULTY OF ENVIRONMENTAL DESIGN

OF

AHMADU BELLO UNIVERSITY

ZARIA

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REQUIREMENTS FOR THE DEGREE
OF

MASTER OF SCIENCE IN ARCHITECTURE

BY

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CAR SERVICE STATION ZARIA

IN

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M.Sc. (ARCHITECTURE) THESIS CAR SERVICE STATION ZARIA
DATA ON ZARIA ROAD SIDE MECHANICS, MARKET STUDY

1. What is the name of your workshop?

2. What brand of cars do you service?

3. How many cars do you service daily

 a. major service e.g. engine overhavg, transmission
 service
- b. routine maintenance service
4. What is the total number of employees
 (i) Head
- (ii) Engine Mechanics
- (iii) Panel Beaters
- (iv) Painters
- (v) Volganizers
- (vi) Electricians
- (vii) Others
-
-
5. What are the most frequent
 Car problems do you recieve from customers
-
6. Do you get customers more, less or equal to the capacity
 of your workshop
7. Do you also sale parts
-
8. Why did you choose your present location
9. Do you have any dis advantages with the location?
10. What is the capacity of your workshop
11. Do you have any intention to expand it
12. How far (to what capacity)
13. What do you need that you don't have
14. How do you attract customers

Thank you for your co-operation you have cuven to me.

Workshop Manager

Student

APPENDIX A

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TRAFFIC ANALYSIS

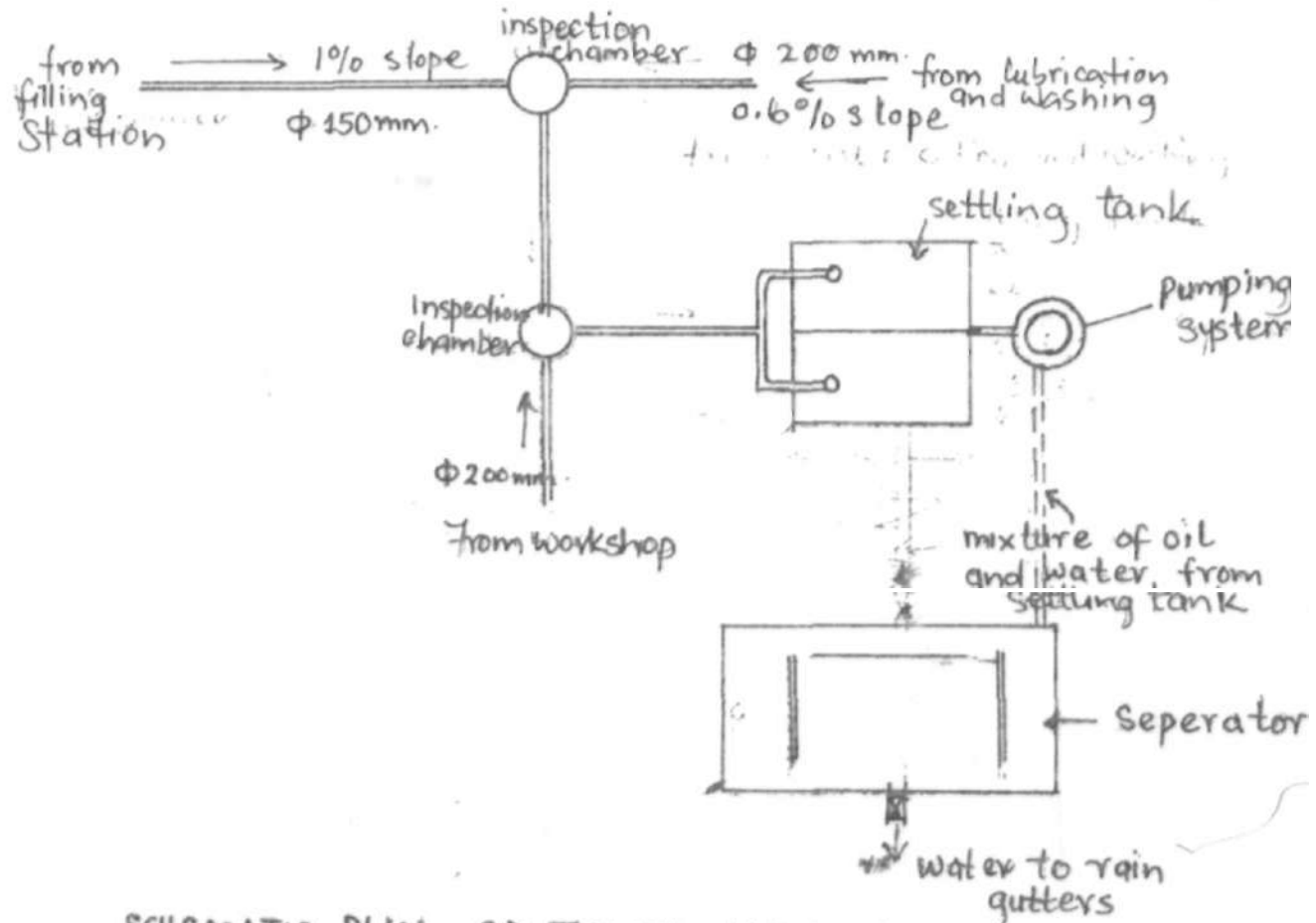
CLASS OF VEHICLES	P C U				ZARIA TRAFFIC ANALYSIS		
	URBAN STANDARD	RURAL STANDARD	ROTARY DESIGN	TRAFFIC LIGHT DESIGN	PCU/hr		
					MORNING	AFTER-NOON	EVENING
1. Private cars, Taxis, light goods vehicle (pick up)	1.00	1.0	1.0	1.0	1200	243	1202
2. Motor cycles and Scooters	0.75	1.0	0.75	0.33	369	84	360
3. Medium or heavy good vehicle - vehicles whose unloaded wt. is 3cwt and also horse drive cars	2.00	3.0	2.80	1.75	318	78	462
4. Passenger Bus (50 seats) coach, Trolley Bus, Trailers Truck	3.0	3.0	2.80	2.25	576	189	279
5. Pedal cycle	0.33	0.55	0.50	0.25	23	37	42
				Total	2486	631	*2345

Passenger car Unit (PCU) is equivalent to one passenger car having four seats.

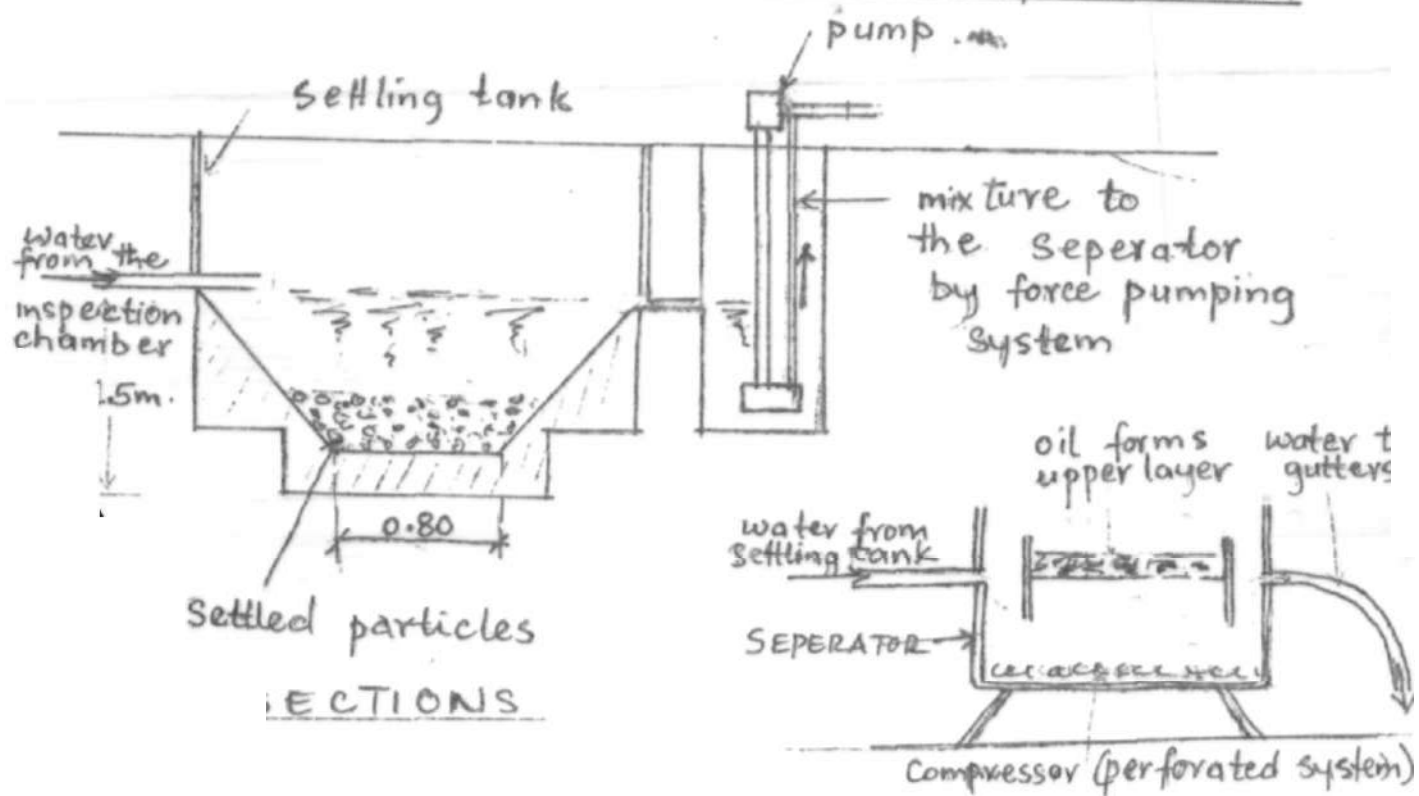
* OUT OF THESE NUMBER, 550 are peugeot cars
ratio = 550:1795

$$= \frac{1}{3}$$

Therefore $\frac{1}{3}$ are peugeot cars



SCHEMATIC PLAN OF THE OIL WATER DISPOSAL SYSTEM



CROSS SECTIONS

APPROVAL SHEET

This design project has been read and approved as meeting the requirements of the Department of Architecture, Ahmadu Bello University, Zaria.


Project Supervisor

Evaluator

Evaluator/External Examiner



ABSTRACTCAR SERVICE STATION ZARIA

This design project was intended to serve motorists to maintain their cars. Research was conducted by means of a questionnaire passed to most of the car mechanics in Zaria. I also visited to J. Allen and WAATECO services workshops in Kaduna and Kano where I was conducted round the different departments to see how they operated. To calculate the traffic volume in Zaria, from which I derived the capacity of my Service Station (20 cars per day) I consulted the Licence Office in Zaria to get the number of registered vehicles as from 1974 to this time. I assumed cars registered as from 1974 to the present day are still on the roads. I also assumed cars leaving Zaria are replaced by those coming in. I picked a buziest point near my site, near the Kano junction and counted the number of vehicles passing per hour expressed in passenger car unit (PCU 1 hr) 1 PCU = a car which can carry 4 passengers. I repeated the process in the morning, afternoon and evening. Using this method I counted the number of Peugeot cars per hour in PCU 1hr. From all the data gathered, I arrived to the following findings:

1. The sequence of operation in the service station
2. The different departments in a service station and how they are related.
3. Selection of equipment and all the necessary services required.
4. The general organisation of a service station.
5. The ratio of peugeot cars to all other vehicles = 1:3
6. 10% share of peugeot cars went to my service station from which I derived the capacity of 20 cars daily.

I therefore concluded:

The car service and repair workshop is supposed for peugeot cars only.

Function:

- (i) servicing of cars and car repairs
- (ii) refuelling
- (iii) sale of new cars
- (iv) sale of spare parts.

The site along Zaria - Kano bye-pass is quite flat with a slight inclination to the east. Size of site is 2 hectares. The main task is to design the facility in good relation of its functional parts in correspondence with the flow of

1. Workers
2. administrative technical and sales staff.

- 3.. customers for car servicing and repairs
4. customers for spare parts
5. customers for new cars
6. cars for servicing and repairs
7. new cars
8. supplies

The following lines are shown in the design.



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

I wish to acknowledge my thanks and gratitude to the following:- Mr. JERZY S. GNIADZIK, my mentor whose untiring efforts encouraging criticisms and advice made the Design thesis a reality. Mr. C.S. John who had rendered all the help he could afford to reach a workable solution. Mr Ciborski for his advice and assistance on water supply and waste water disposal services. Dr. Marek and Engineer Husaini A. Tahir for their useful information. J. Allen Motors and WAATECO Companies for their permission to conduct me round their establishments and saw how they operated. The staff of Zaria Licence Office for giving me the number of registered vehicles in Zaria.

The Zaria car mechanics for filling my questionnaires. I would like to express particular thanks to my wife Aishatu M.K. Hammanga for her assistance, support and patience during the period of my M.Sc. (Arch.) Design Thesis programme.

Finally, I wish to thank all those whose valuable contribution in one way or the other led to the success of this design project.



VIEW OF THE SITE FROM THE EAST



EXAMPLE OF EXISTING CAR SERVICE
STATION.

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CHAPTER ONE

I. N T R O D U C T I O N

We are now in an age of speed and service and this demand should be met for success. The car is no longer a luxury, it has become a necessity in Nigeria. It is now used by many and demand for a car increases everyday. This demand could only be met by adopting new design, new materials and new methods of manufacture. In a word they resorted to planning. With renovations rising rapidly thousands of motorists are looking ways of maintaining their vehicles. Unlike the past, today conditions have improved in the motor Industry; wages have increased, components are much cheaper and more readily obtainable and repair charges are lower. Whereas the charges for repairs have fallen, the number of possible repairs has increased. This is so because we have high efficiency engines with low horse-power and high compression ratio. Engines used to be high horsepower with low compression ratio. Therefore the income of the business is now derived from a large turnover of small profits rather than small turnover of large profits. The old kind of thorough overhaul is now replaced by the one in which the repairer is mainly concerned with replacement of components which are cheaper to renew than to repair.

In a modern garage and car dealership we have a filling station, unit replacement work or amintenance service (i.e. complete service) with addition of a showrooms, stores and accessories. They can be effected by large or small concerns either seperately or in combination. But for success, planning is very important. In this direction the chapters below are designed to serve as a guide to the accommodation requirements so as to ensure the greatest possible income under the prevailing local economic conditions.

A service station is a building built solely as a profit-making, sales out let for a petroluem company products. Any service or accommodations are provided for the purpose of increasing sales and contributing to profit from the business construction and equipment easts plus expensive real estates make the present day service station a costly investment. To realize the most from this investment careful planning is necessary. The design should fulfil the functional need of a contemplated operation. A design can be no better than the analysis of the functions to be performed. An accurate service projection establishes the basis for a profitable operation which must be supported by good design.

CHAPTER TWOGeographical Location: Climate and Weather

Zaria is located on a Plateau at a height of about 660m above sea level in the centre of Northern Nigeria and 640 km away from the sea. Zaria $11^{\circ} 3'N$, $70^{\circ} 42'E$ possesses a tropical continental climate. The continental type of climate is more pronounced during the dry season especially in December and January. The mean daily maximum temperature shows a major peak in April and a minor in October. The daily maximum temperature rises gradually from January and attains its highest value in April. Then drops rapidly to its lowest value in August it rises again to its secondary peak in October the mean minimum temperature rises from its lowest value in December - January to its highest in July - August. Zaria lies within region which has tropical savannah, climate with distinct wet and dry season, the wet season occurring in the high-sun period. The dry season is practically rainless. The total annual rainfall in Zaria is not high. The mean annual rainfall is about 43.0 inches (1075mm) (mean of 1931 - 1965). This low and seasonal character of rainfall makes its mark on the vegetation of the area which assumes various shades of green in the wet season and turns brown pale or yellow in the dry season.

According to Thornth Waite's moisture index the climate of Zaria is dry sub-humid. On the basis of the relative importance of the dry continental north easterly air and the humid south-westerly air and the consequent weather the year in Zaria can be divided into the following seasons:-

1. Dry season - November to February
(Winter season the season of harmattan)
2. Hot season - March to April
3. Season of thundrstorms and squalls - May to June
4. Wet season - July to October.

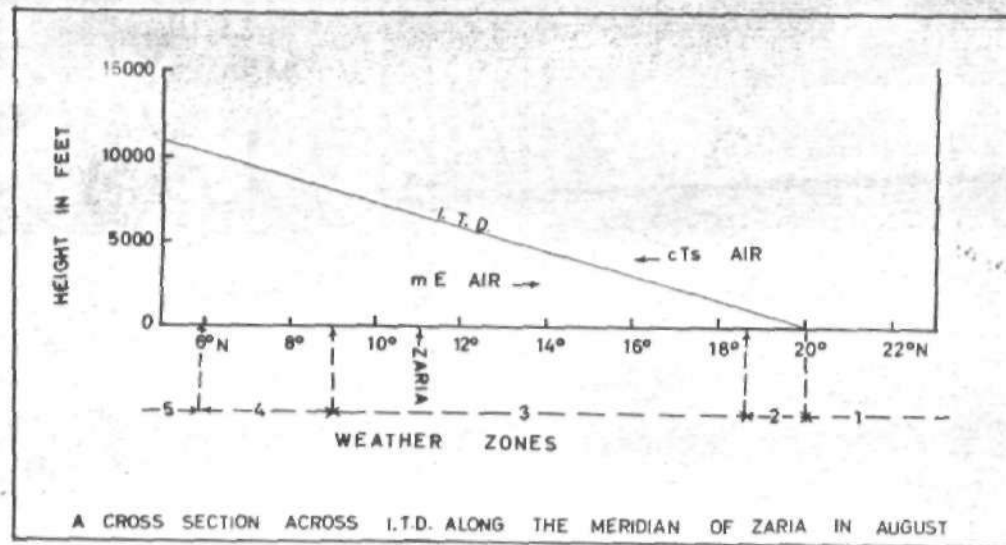


Figure 4. A cross section across I.T.D. along the meridian of Zaria in August.

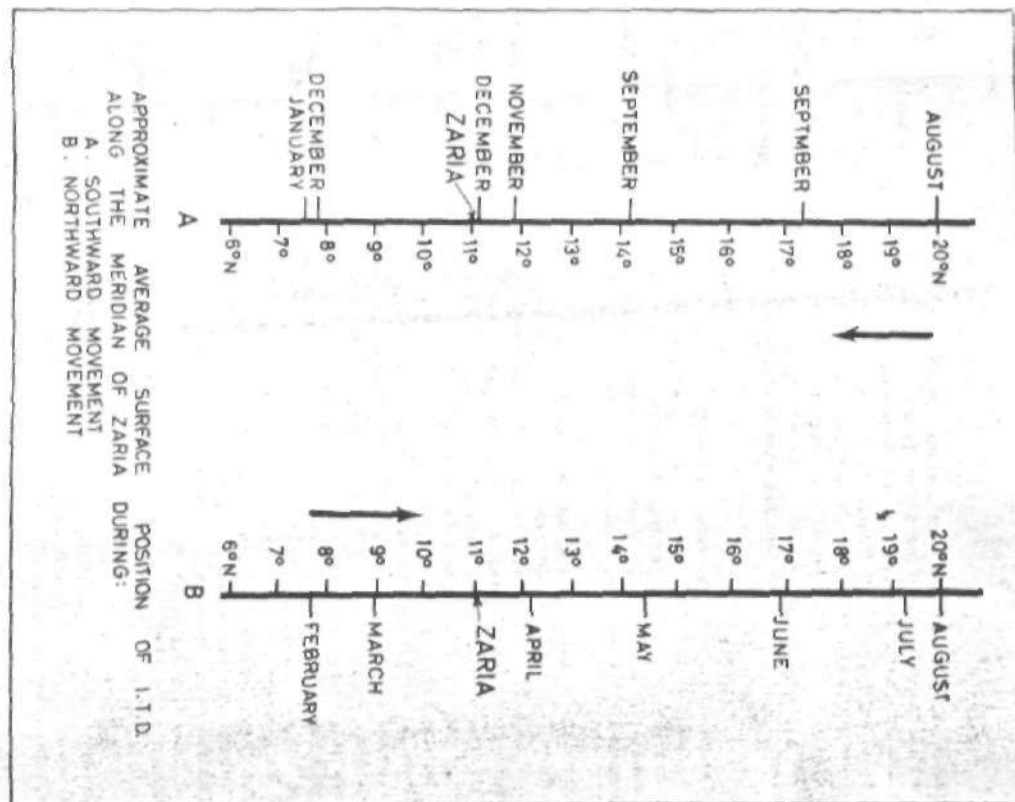


Figure 5. Approximate average surface position of I.T.D. along the meridian of Zaria

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period. April is the hottest month in Zaria. The daily maximum screen temperatures on some days in April may rise to 100°F or more. Maximum temperatures in the sun may be many degrees higher. Table I shows the highest daily maximum and lowest daily minimum temperatures recorded in Zaria in different months of the year during 1959-1968. During this period (March-April) Zaria experiences very hot 'sticky' weather similar to that of coastal Nigeria. Fortunately this does not last for more than 2 to 3 weeks in normal years.

Local heating during this period may sometimes produce unstable lapse rates resulting in the formation of cumulus clouds in the afternoon. Some of these cumulus clouds may rapidly turn into cumulonimbus clouds producing thunderstorms in the afternoon or early evening. The frequency of these

Table I. Highest daily maximum screen temperatures and lowest daily minimum screen temperatures recorded in Zaria (Samaru) during 1959-68.

Month	Highest Maximum Screen Temperature °F	Lowest Minimum Screen Temperature °F
January	96	47
February	99	49
March	101	57
April	102	59
May	99	61
June	95	61
July	89	61
August	87	60
September	90	63
October	93	62
November	93	54
December	93	51
	96	46

thunderstorms increases from March to April. Immediately before the thunderstorm the air becomes calm with high temperatures and high humidity. The cumulus transforms rapidly into cumulonimbus accompanied with light ~~light~~ thunder and heavy panning them are strong gusty winds rarely last for more than 25-30 minutes. Accumulated roofs and uprooting trees, especially in rural areas. A very refreshing effect of these thunderstorms is the sudden drop in air temperature brought about by the down-draught of cool upper air by the thunderstorm. During the oppressive 'sticky' heat of this period this drop in air temperature caused by thunderstorms is very much welcomed. The whole operation of transformation of cumulus cloud to cumulonimbus and subsequent thunderstorm with heavy showers and gusty winds may be over in less than an hour. But the cooling effect remains much longer bringing relief from the humid heat. Nights become pleasant after afternoon and evening thunderstorms. A drop of 10°F or more in A.T. temperature is not uncommon in Zaria after thunderstorms. The frequency of ~~that~~ ~~period~~ of course, depends on the synoptic conditions of that period of

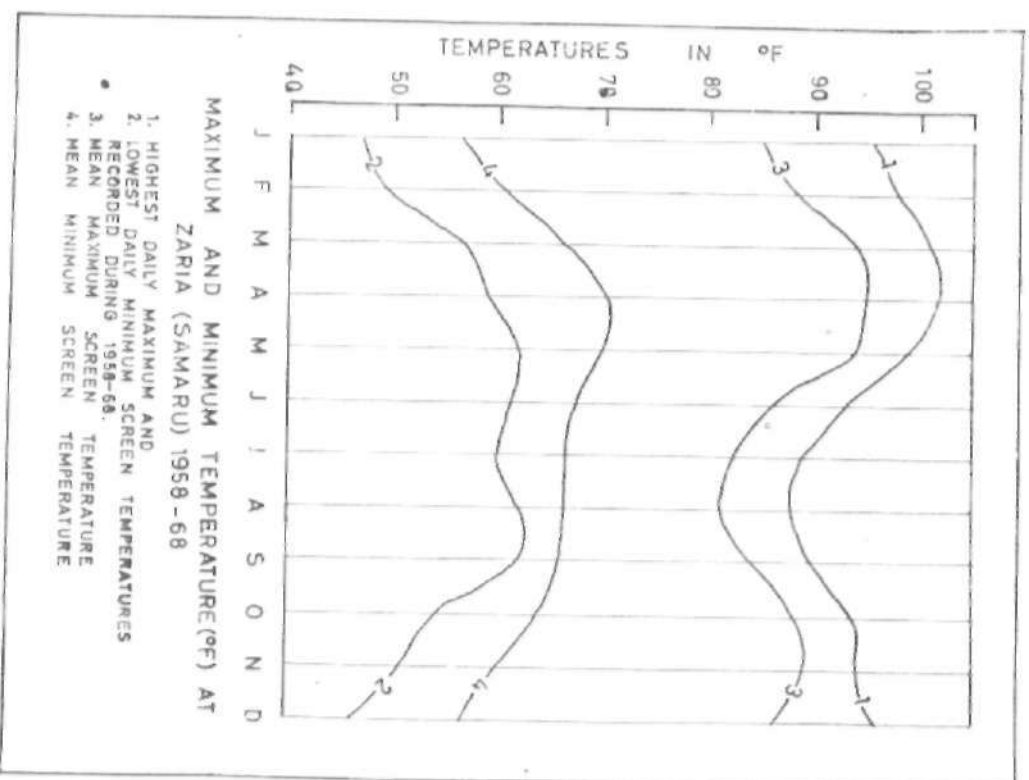


Figure 7. Maximum and minimum temperatures (°F) at Zaria (Samaru) 1958-68.

Table 3. Median values of the monthly rainfall (in inches) in Zaria (Samaru) during the period 1931-1965.

Here

Month	Rainfall in inches
January	0.00
February	0.00
March	0.00
April	1.30
May	4.65
June	6.27
July	8.02
August	10.66
September	9.30
October	0.87
November	0.00
December	0.00

Table 4. Co-efficients of variability of monthly rainfall in wet season.

Month	Co-efficient of variability of rainfall* %
July	47.9
August	39.4
September	21.5
October	258.6

*Co-efficient of variability (CV) is calculated according to the formula:

$$CV = \frac{\text{Inter quartile range}}{\text{Median}} \times 100$$

Rainfall is not continuous during the wet season. There are dry days in between successive falls. Dry spells of more than 7 days are very few, and such long dry spells occur mostly at the beginning or end of the rainy season.

The first rain of the year, as stated earlier, falls with hot season thunderstorms, and the frequency of such rains increases in May and June. To a farmer, water-supply engineer, or irrigation engineer the rainy season starts from the date on which an effective precipitation occurs followed by no unusual intervening dry spell before the next fall of rain. He would take that date as the beginning of the rainy season without bothering whether the upper air condition is typical of the rainy season or not. This seems to be a practical way of looking at the beginning and the end of the rainy season. This date could be taken as the beginning of what may be called the effective rainy season, which in Zaria may start by mid- or late May and end by early or late October.

In October daily maximum temperatures rise, and rainfall is very little.

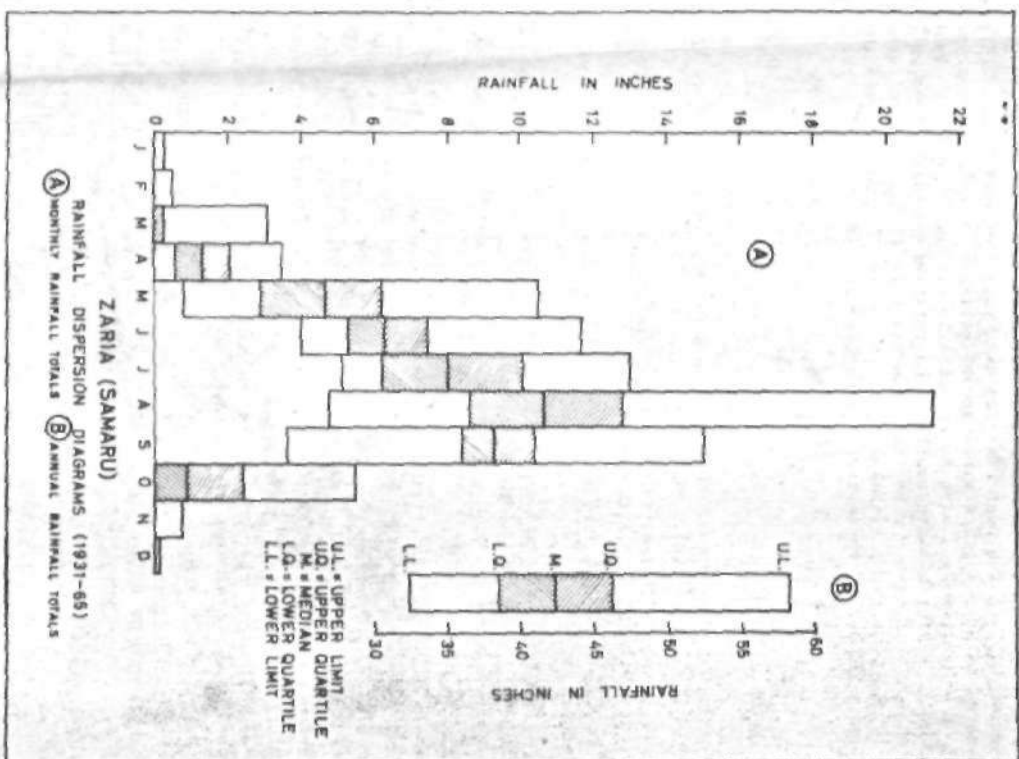


Figure 8. Rainfall dispersion diagrams for Zaria (Samaru) 1931-65.

CHAPTER THREESITE AND SITE ANALYSIS

The site for service station is located along the Kano road about half a kilometer from the junction. It has almost a flat land with an unnoticeable slope toward east. The ~~Kano road~~ carry a high volume of traffic especially during the peak hours in the evening. Presently it is the major road linking Kano and Kaduna through Zaria. It is a typical 2-lane high way with useable shoulders. According to the proposed master plan, a bye-pass will replace the road to avoid traffic interference in Zaria. The road therefore will no longer remain a highway linking cities but will ~~serve~~ for the purpose of a major road or an access road within Zaria town. The site is in the proposed area for the light industries. The site is located near services; it is near the water board booster station near the location of the tanks. The local distribution lines for both the telephone and the electricity pass near the site. It is also near the railway line. It is located in such a way motorists would wish to stop as they approach the junction, not very far away. The site is located such that there is a wide strip of Land up to 45m. between the major road and the boundary of the service station. The site has opportunity for future expansion.

SITE PLANNING

Ingress and egress are vital to a good service station. These involve the approaches and drive ways. I have provided an approach width of 9m. enough to allow two vehicles pass conveniently at the same time including a 7.5m wide pavement strip on either side for pedestrian walking. Location of the approach is placed in such a way it is easily accessible to the island and other services in the forecourt. To avoid sharp turns a width of 25m. is provided for the forecourt. This allows sufficient room for inner drive width, space for parking outside for customers, Island for refuelling, washing and lubrication for customers in transit and room on the first floor above the mini market. Each Island has dual dispensers space 1.5m. from centre to centre. The Islands are spaced so on can be accommodated on both sides without incoming or outgoing traffic.

Identification signs should be provided on the streets. Pedestal sign is provided at the property lines. Building signs is also used along with letters on the building. The approaches received flood lighting so that they can be seen clearly by the approaching motorists. Perimeter lighting (lighting at the property line) is accomplished by fluorescent fixture mounted on poles.

Floodlighting for parking areas and additional areas of the driveway may also be desired. Those areas not receiving light from Island lights or canopy lights such as the fronts and sides of the building, should receive face lighting.

SITE

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CHAPTER FOUR

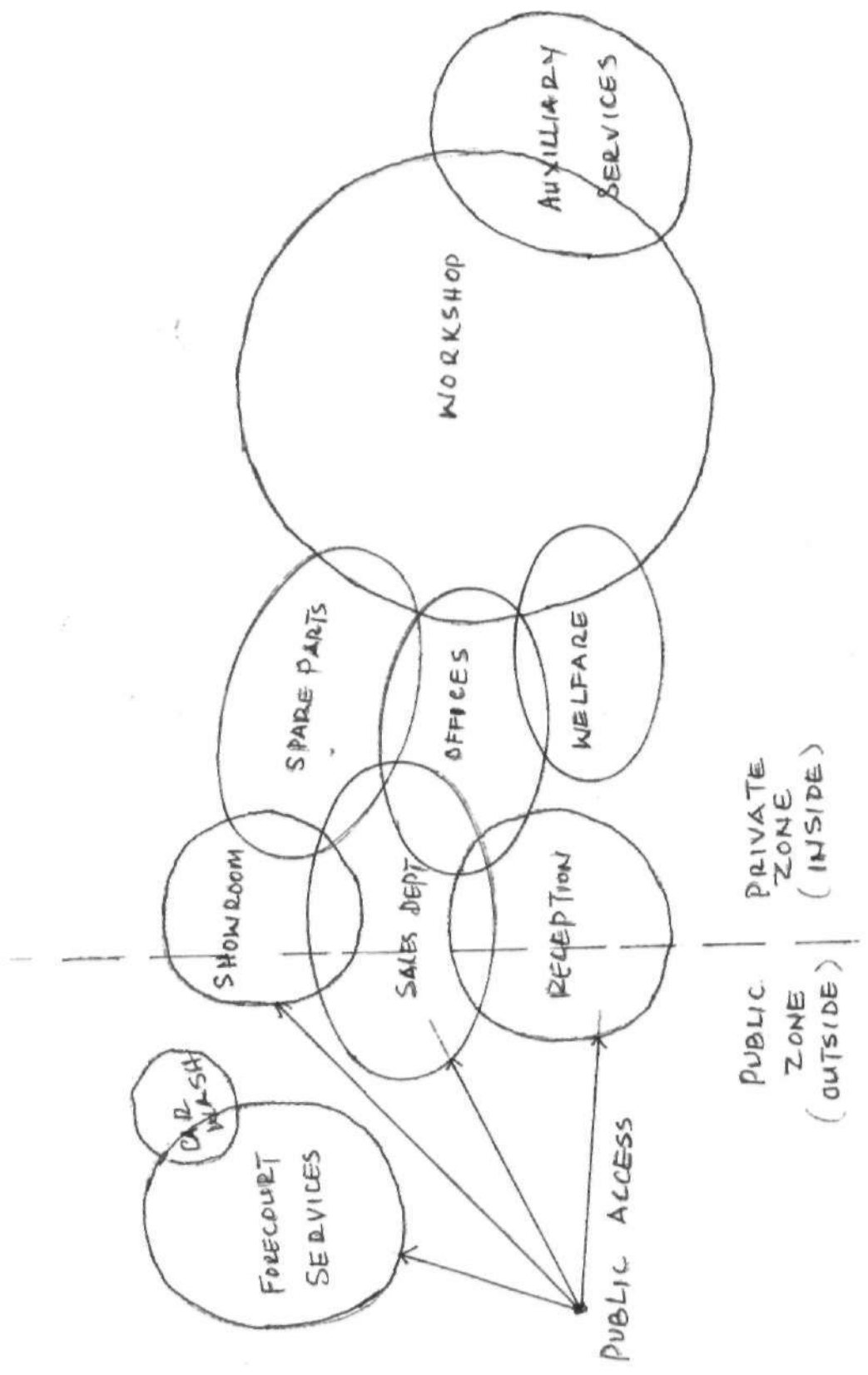
The Building organisation and Planning concept

The service station operates for public and private zones. All services in the forecourt constituting car wash, lubrication, fuel Islands, sales of accessories and parking for customers are not restricted to the public. They form the outside zone or the public zone. The zone partially includes the showroom, sales department and the reception which are partially included in the private zone or inside zone. The private zone is restricted to the public. It is only for customers who have come to service their cars or the staff of the establishment. The zone constitute the administration store for spare parts, workers' facilities, the workshop and parkings for new cars serviced cars, waiting cars, and the scrap yard. The diagram below shows the flow of operation.

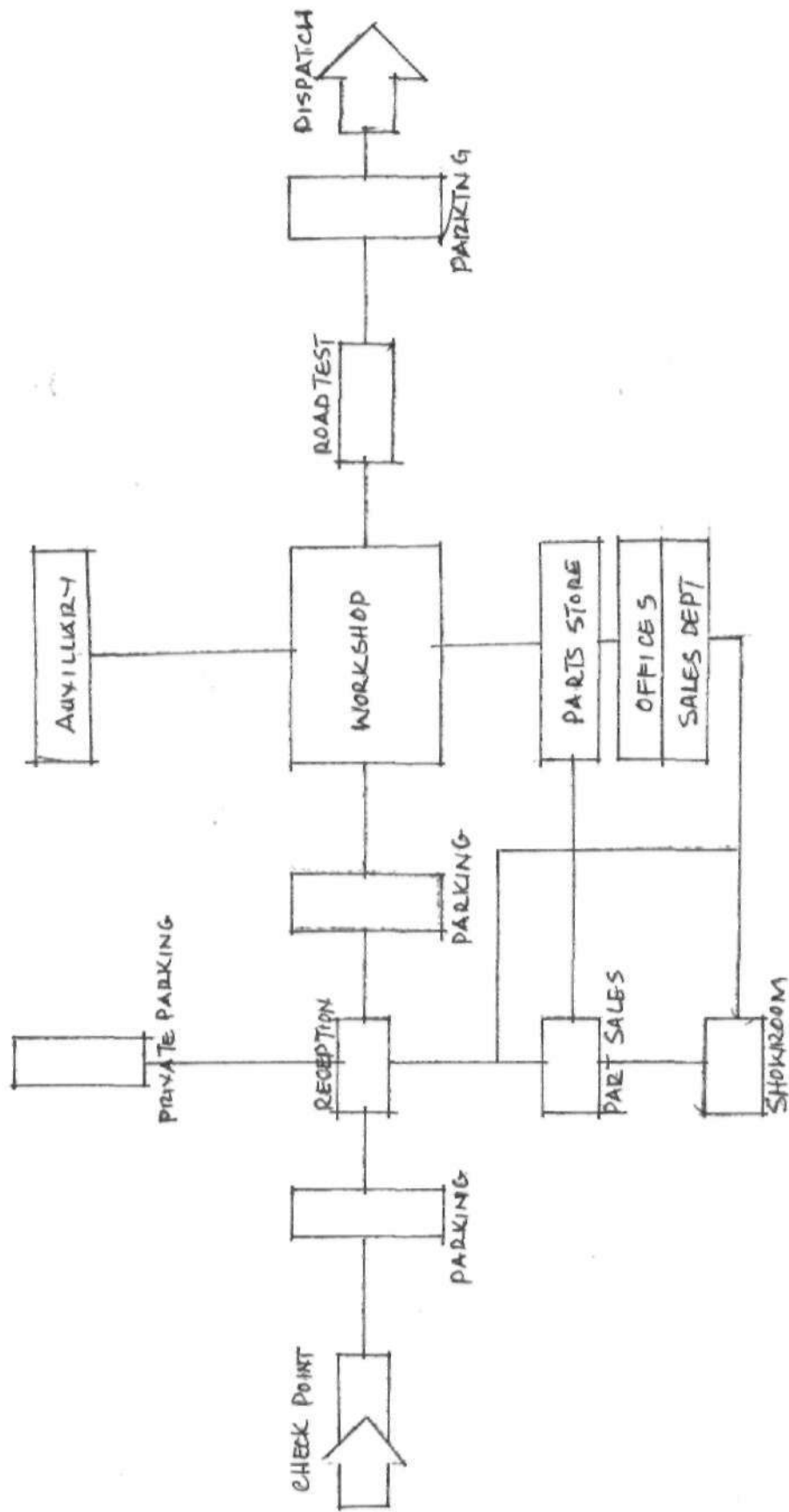
Normal elements considered in the building planning are

0. reception
1. sales department
2. service workshop
3. showroom
4. offices
5. Forecourt services
6. spare parts store
7. auxiliary services.

FUNCTIONAL RELATIONSHIP DIAGRAM



FLOW DIAGRAM



The Reception Office

Positioned on the extreme right hand forward corner of the main building, this office is such a position that the receptionists can deal expeditiously with vehicles that enter the establishment for service in addition to vehicles leaving the establishment. It is provided with an enquiry window. All job cards made out in the reception Office, passing with their appropriate vehicles to the service control adjacent. It is approached externally from an area providing enough room for parking. It includes a clerk responsible for detailing of staff time and absentees.

The service control Office

All records of vehicles for service and ready vehicles are controlled in this Office. It is where the service Manager stays. Near the service entrance it is directly connected to the service department.

Sales Office

Just near the showroom directly opens in to the showroom. This permits the sales Manager to observe the showroom unperceived while inviting inspection of the showroom by clients who would like to do so. It controls sales of new cars and delivery.

Sales of parts provides space for a counter with operator's desk. It has maximum visibility - open to waiting room for customers. There is essential space for the display of items in the Office and has a clear view of the drive way in the forecourt. The display features racks and shelving display.

The Waiting Room

The problem of preventing clients from wondering about the premises is certainly overcome by the provision of a waiting room. What, however, is not generally realised is that such segregation is by no means good unless every endeavour is made to relieve them of boredom.

With this aim in mind, I have located the waiting room near the sales display shelves and between the showroom and the general Office and toilet sections. It is furnished with comfortable armchairs and settees with a decent centre table with magazines. Telephone is installed and access to the showroom and communication with the dispatch clerk in general office is not restricted. Access to common facilities such as the toilets from adjacent or near office by those not in the waiting room is accomplished without their having to pass through the waiting room. The cashier is directly visible from the waiting room. All activities taking place in forecourt are observed from the glazing in the waiting room.

General Office

The Office will be ran on modern lines involving simplest of card-indexing and accountancy systems and the smallest staff. Dispatch is operated within this Office where the job cards from the reception Office are endorsed and eventually filed for further reference. The contents of the Office will be filing carbinet, standard type desks and all that usually accompanies them, dictaphone apparatus, automatic telephone and typewriter, complete with low desks e.t.c.

The Manager's Office

Since apart from the general administration of the concern, the Manager is often called upon to talk to the dients especially when they require major issues concerning sales of new cars, I have located his Office just near the showroom adjacent to the sales Manager. He is within easy reach of all concerned, yet sufficiently remote from those who might wish to interview him. His Secretary is just next to him for any consultation before seing him if one's demand could not be met with the Secretary.

The Director's Office is near the Manager's Office since they work hand in hand, with the Secretary serving both of them.

Staff Meeting and Resting

This is located on the 1st floor on top of the waiting room. It occupies a large area sufficient to accommodate the staff. Other activities could be carried out there such as seminars or a party. Kitchen, store and toilets for female and male adjoin to the room. Workers can go there and rest during their leisure time. They could have shade too.

Workers Facilities

The workers facilities consists of the following

(i) 1st aid room located contrally such that both the workshop workers and the administrative workers can use it conveniently. It is connected to the other departments by the walkway convered top link.

(ii) Next to the 1st aid room is the workers canteen to serve the administrative workers and workshop workers. It is directly connected to the kitchen with a counter at the severy. The supervisor's Office is located in such a way activities taking place in the kitchen are observed.

(iii) The workers' washing, changing and (Cloak) lockers rooms are near the workshop.

CHAPTER FIVEThe Workshop

The workshop consists the following:

Battery shop

Electrical shop

Engine (Power unit) and transmission shop lubrication,

tyre service, valeting service, general repairs, painting.

All body works i.e. panel and beating and welding

upholstery. The foreman's office diagnosis and all stores

for paints, finishes, tools and immediate needed parts. There

is also a compressor stand room and a generator room.

The Battery Shop

The route of operations through the Battery shop are:-

1. Constant current charging
2. Constant portential charging
3. Water distilling
4. Battery test
5. Battery heating
6. Battery dissembly
7. Battery plate service and assembly.

The battery shop is entirely enclosed and should have exhaust fans to extract both the battery fumes arising from charging and the fumes of the degreaser.

Since a considerable amount of battery charging will be done independently of battery repairs and general overhauls, this section is located in such a way as not to interfere with other sections. For equipment the repair bench will require high rate tester, hydrometer with thermometer having a temperature correction scale, filling syringes and funnels, a battery steamer of the electric heating kind, plate press, plate guillofine, moulds for battery straps, terminal connectors etc; sink with drain board, rubber aprons and gloves, jars of distilled water and electrolyte at 1.340 S.G, acid and water carboys each with syphon and stop flow clips on oxy-acetylene bad burning plant battery truck, group extractor and foots. On the charging side there would be a cadmium tester, a water tester, supply of jumpers a 4 to 6 circuit constant current charger a three busbar, constant portential charger say 300 amps and a battery stand which incidentally would receive the finished jobs from both benches.

THE ELECTRICAL SHOP

The system of operation in electrical workshop is as follows:-

Lighting and starting

1. general test - magnetor and distributor head, dynamo and starter.
2. Dismantling of dynamo, starter and switch box.

3. Component test (lighting and starting set)
4. mica under cutting
5. replacement
6. assembly

Ignition

7. armature and coil tests
8. dismantling
9. component test
10. Remagnetising
11. Plug service
12. replacements and assembly.

The electrical shop is situated next to the battery shop. All work to do with ignition service passes clockwise. The equipment included:-

Compression plug tester, coil and magnetor armature testers, power magnetiser spark plugs dismantling kit, ball race drawer, sundry vice, drawers and trays. All work to do with lighting and starting passes anti-clock wise. The equipment includes:- test bench, drop tester, mica undercutter, pole piece clamptype screw driver, growler, cable stand, sundry vices, trays and so on. In the centre a portable dispatched rock is placed for finished jobs. On the shelves not shown on the drawing will be such instruments as voltmeter, ammetre voltameter, megger high and low volts test lumps, jimpers and

special tools such as brush bedding jigs, brush and springs lifters and brush spring, spring-scale tension testers, electric soldering irons, insulated pliers etc.

The compressed air will also enter this section since it is particularly useful for the removal of carbon dust and dirt.

POWER UNIT AND TRANSMISSION SHOP (ENGINE)

The sequence of operation in the room is:-

Engine

1. Engine dismantling and cleaning
2. component inspection
3. Cylinder boring honing
4. Crankshaft big-end and control service
5. Valve service
6. Main bearing service and engine assembly.

Rear axle

7. Rear axle and gear box cleaning
8. Rear axle component inspection
9. Rear axle replacement service
10. Brake service
11. Rear axle assembly
12. gear box component inspection
13. gear box replacement service
14. gear box bench assembly
15. power unit assembly.

In regard to the selection of equipment and dealing first with that necessary for the service of engine, a suitable selection include the following items:-

1. A paraffic cleansing tank of the portable and powerful jet rotating turntable type, together with cleaning brushes and so on.
2. Inspection measuring tools
3. A number of trays (steel or wooden)
4. Cylinder boring and honing plants.
5. High grade crankshaft truing tool.
6. A kit of remetalling moulds and clamps, together with gas ring and shroud soldering iron, metal pot and cadle.
7. A big-end and main bearing boring tool of the vice mounting type.
8. A con-rod aligning jig
9. A main bearing boring bar.
10. A couple of potable engine stands one heavy and one light.
11. electric valve refacers
12. A universal counter borer
13. Work benches
14. A light high speed electric drill and mixture.

15. A hydraulic press set of plain set of plain, pilot and adjustable reamers, drills and tools.
16. A paraffin carburetter air filter cleanser and dryer of the type. operated by compressed air.
17. A supply of special purpose tools in the way of drawer, extractors and pullers to carter for timing wheels ball races and clutch assemblies.
heavier machine includes:-
18. high speed piston turning and grinding machine capable of producing or reducing round, cam straight or tapered pistons.
19. modern shaft rigrinder.
20. The latest type of con-rod borer and grinder.
21. A horizontal surface grinder.
22. A dynamometre for the running in and testing of engines.

The General service Area

To permit of the ready ingress and egress of vehicles the shop is composed of sliding doors at both ends. These are so arranged as to slide one over the other, thus enable vehicles entering take up positions immediately which they will occupy throughout their repair period. There are 20 spaces for cars operating at once.

These spaces include the diagnosis area, tyre service, pits and hoists while most of the spaces are flat where cars remain parked when their components are being dismantled for service. Each space has an area of 33.75m^2 , (7.5 x 4.5m) including 1.5m space to give allowance to open doors and circulation. It also gives enough room for dismantling and assembling of units. Working benches are provided in the general service area.

Service Operations

1. reception and diagnosis
2. removal of accessories etc.
3. radiator draining
4. tank unloading
5. sump draining
6. Radiator flushing and general repairs
7. reclamation
8. preparation for rear axle removal
9. rear axle removal or partial with drawal for engine removal.
10. power unit removal
11. preparation front axle removal
12. front axle, spring and steering repairs.
13. Frame straightening, wing or body welding and surfacing.
14. wheel alignment and brake adjustment

Enough light is sufficient and is therefore provided by roof lighting and glazing windows. The spraying booth are 4.5m wide by 7.5m long.

The Stores

The stores for paints and finishes are directly accessible to the body shops. Cupboards are distributed in all the service sections for immediate use of materials without the need to concentrate on the main storage. The main store for the spare parts is placed in such a way parts can easily be moved in to the workshop. Store for working tools is provided; ~~aligned to the auxiliary services~~ which serves the workshop centrally. Both the generator and the compressor stands rooms are adjacent to the paints stores on the extreme right.

Valeting service

This provides two places for two cars at the same time. In case of any cut of water supply a space for storage tank is provided for storing water. The spray type of washing is used.

The washing service is located centrally to accomplish the functional relationship to rest of the departments. There is always a need to wash following general service and there is also a need to wash before going to paint shop. The washing area is made up of easily removable grill-like sections constructed of squared-mesh open steel over a pit.

Parking

Parking bays are provided to all places where it is found necessary in the establishment.

Before the reception, 34 places are provided in the forecourt. This parking area is used by cars before they are okayed for service, customers to the sale department, customers for the forecourt services and visitors. After the gate house, is the parking for the workers which is in the same row with the parking for awaiting dispatch cars. Sixty places have been provided for these.

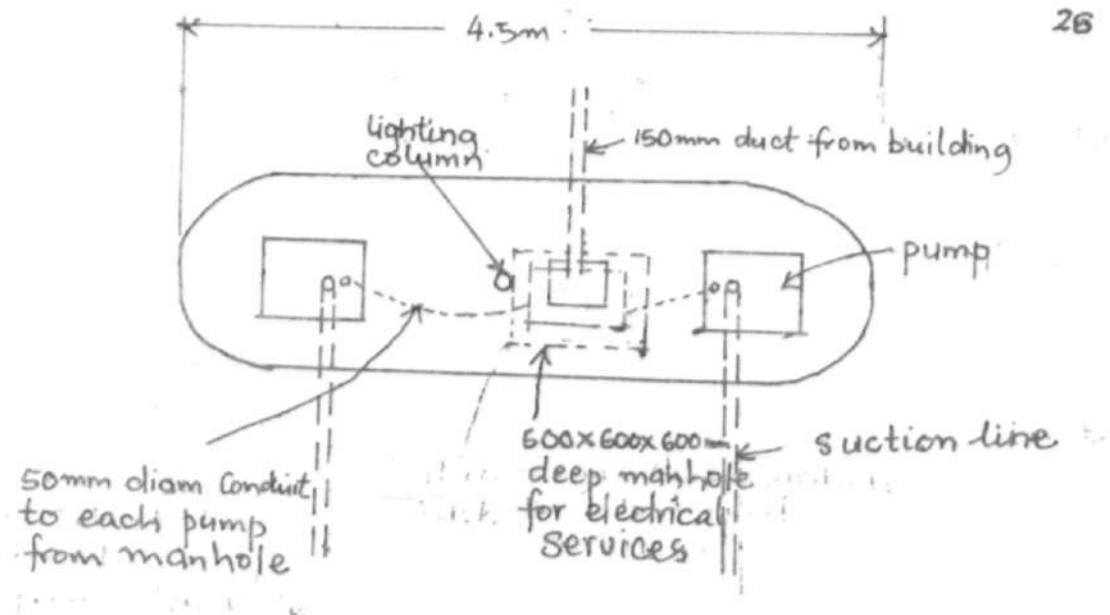
The inner parking bays are used by cars awaiting valet service, body service and general service. Thirty nine places are provided for these bays.

Large parking bays are used for new cars. The parking occupies all the bays on the other end of the building for new cars. The extension in the rear wards provides space for the scrap yard where abandoned cars are parked as well. A gate is provided for the disposal of these scraps to the rolling mills.

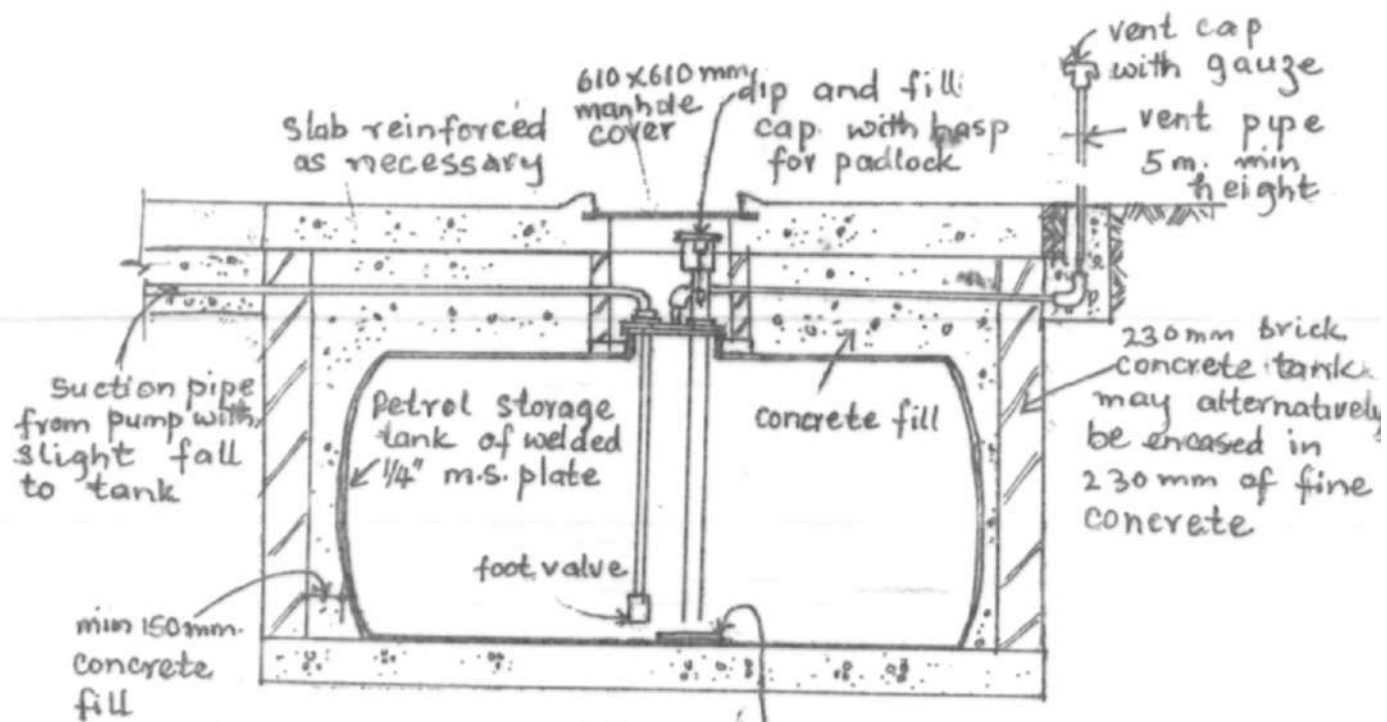
CHAPTER SIXFilling Station:

With regard to the design in general, the filling station form part of the profit giving in the business. It forms the outer zone (Forecourt) which is not restricted to the public. Quick services in the forecourt such as car wash, lubrication and sales of accessories are incorporated to the filling station it operates all the time. It has three Islands for the sale of Super diesel and ordinary fuels. Each Island has two pumps. Each Island has a 5000 gallons (22730 litres) capacity tank with an extra tank in addition for any future brand of fuel which might be introduced.

A clearance of 10m. between the footing of the nearest Island base to the main building aligning the show room is given to control fire in case of any disaster. The Super and ordinary fuel Islands are under same roof supported by two columns and are connected to the vending by same pattern roof continued. Each Island is placed on 4, 5m long X 1.4m. wide base. The column is between the pumps and rain water pipes run along the columns to the draining gutter. Lighting bulbs and fire extinguishers are mounted on the pillars of the roof. The distance of 1.5m. from centre to centre of the pumps is sufficient enough to accommodate a 45cm manhole for regular checking.



LAYOUT OF PUMP ISLAND SHOWING PIPING



- NOTE**
1. Pit not fill in until air test of tank is completed and approved
 2. all pipelines including vent pipe where below ground encased in not less than 800mm of fine concrete

360x100mm m.s plate welded to tank to take impact of dip stick

UNDERGROUND PETROL STORAGE TANK

Inspection of tanks is accomplished by providing manhole covers which die above the centres of their respective tanks (see also diagram).

The distance of 6m. between the islands gives enough room for two rows of cars queueing up without interfering with the other movement of cars. Cars can queue up from the Islands to the extreme entrance end with other cars coming in and going out without being disturbed.

Access is provided for the location of the underground tanks such that a tanker filling the tanks wouldn't interfere with the flow of traffic. A parking space for the tankers has been provided at the extreme exit end to accommodate up to three tanker lorries. Bus stop is situated on the outer side of the premises - on the first reach end and buses can smoothly move in and take a turn or proceed to refuel.

The Complete Plan

General requirements.

1. Sewerage and drainage should be provided for the whole area within the boundaries.
2. All the roads and parking lots should be hard surfaced.
3. Water supply should be provided for the main workshop and all other shops, toilets, charging and washings for the workers, filling station and all other services in the workshop.

4. Electrically should be supplied by the N.E.P.A. connecting to the main distribution panel in the gate house.
5. The whole area should be equipped with security lights.

Taking the various departments discussed and arranging them in the manner suggested gives us a complete plan of what, in my opinion, is an ideal service station.

The station can operate successfully even when situated in the middle of a row of buildings. The symmetrical structure of the workshop gives an easy manoeuvrability of cars. With the orientation due north and south, the maximum amount of day light through the windows and roof lighting leads to low artificial lighting costs and without the sun rays penetrating in to the working areas.

Circulation in the forecourt is well planned such that vehicles leaving or entering do not hamper the movement of vehicles leaving or entering the other part of the establishment. The service area is at the rear of the building which is not visible to public. With the section devoted to administration and public accommodation in the forefront of the establishment, the chances of contact between operatives and public are remote. While the departments function as self contained units, each is in complete liaison not only with the others but with the administration.

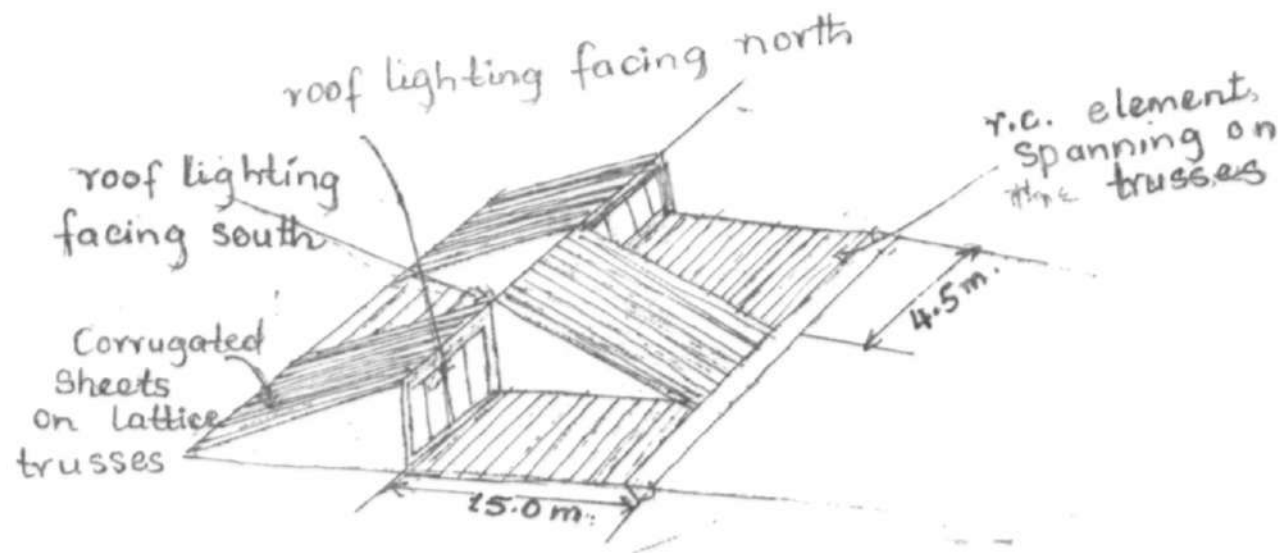
CONSTRUCTION:

The roof construction is a combination of reinforced concrete slab panels and a lattice trusses with corrugated asbestos/aluminium sheets.

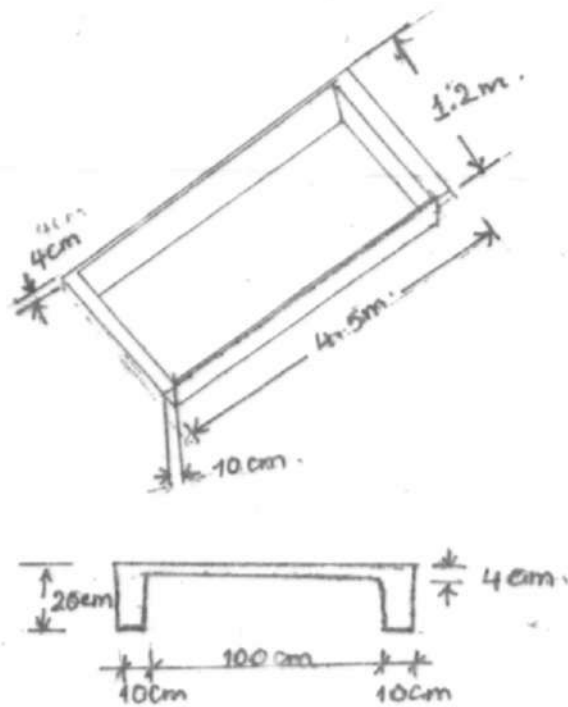
To avoid direct sun rays in the workshop, the structure of the roof is made in two levels. With r.c. elements at the lower level and corrugated sheets higher, it is arranged alternately making a continuous interesting pattern. This pattern has three advantages.

1. It is so arranged that we have the roof lighting in an alternate repeated arrangement from north and south only. This protects the hot rays of the sun entering the workshop.
2. Easy assembling of the precast elements on the lower member of the lattice trusses to form the lower roof. The fact that the elements do not require purlins compensates the expensive reinforcement of the elements.
3. The elements forming the lower part of the roof structure gives security being resistant to fire.

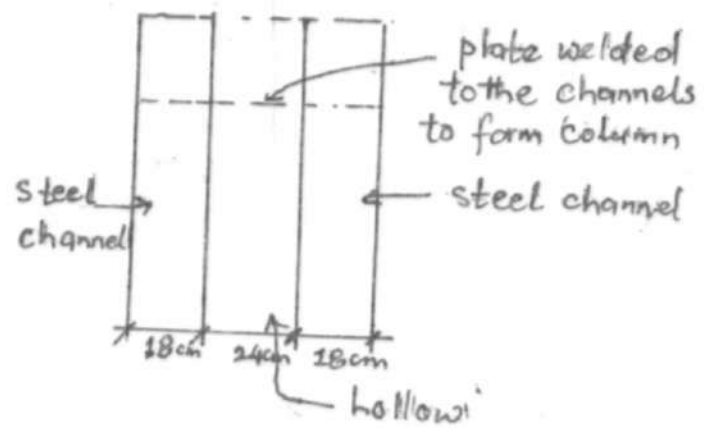
The whole roof is supported by steel columns. Two channel members combined by welding them to plates 60cm apart which gives the column a light structure and easy to construct. The column rests on a steel slab base and mass concrete pad foundation.



WORKSHOP ROOF STRUCTURE IN SKETCH



R.C. ELEMENT



COLUMN CONSTRUCTION

The reinforced concrete floor slab rests on a well filled hardcore. The floor is finished with stainless polished terrazo with drains provided. The floor slopes $\frac{1}{2}\%$ to wash it easily to the drains. To provide maximum light and ventilation windows occupy 60% of the faces. Concrete blocks form the enclosing structure and non-load bearing. The construction of the workers welfare department and the offices is made of concrete blocks with corrugated sheets flat roof. The store for spare parts, sales dept, showroom are concrete blocks walls as enclosing elements and steel columns supporting precast r.c. elements. The mini market, lubrication and washing in the forecourt are wall tiled in addition to the brick wall with steel stanchions.

CHAPTER SEVENSUMMARY OFSERVICES AND ACCOMMODATION REQUIRED AND COMPUTATION OF
WORKSHOP CAPACITY.1. Forecourt

(i) fuel sales - 3 Islands of super, ordinary and gas
- 5000 gallons (22730 litres)
capacity tanks for each of the
Island plus one additional tank;
each tank is 5950mm. long and
2290mm diameter.

(ii) lubrication - 1 place (4.5m X 8.0m)
and general
repairs

(iii) washing - 1 place (4.5 X 8.0)

(iv) slae of accessories
and snack for customers
in two floors plus
toilets for males and
females - area = 75m²

(v) Parkings and
circulation outside

Total area = 2,500m²

Parking Spaces Inside

- workers parking and waiting		
dispatch cars	-	60 places
- cars waiting for service	-	39 places
- new cars	-	60 places
- abandoned cars	-	22 places
Total	=	181 places
Total area	=	181 X 15m ²
	=	<u>2715m²</u>

BUSINESS AND PERSONAL SERVICES FOR STAFF SPACE

<u>SPACE</u>	-	<u>Area in sq M.</u>
gate house	-	12
reception	-	21
service control	-	21
general office	-	30
Accounts	-	12
Sales Manager	-	18
Manager	-	18
Visiting director	-	18
Secretary	-	18
Customers waiting	-	36
toilets men	-	9

<u>SPACE</u>		<u>Area in sq M.</u>
Sales	-	12
Cashier	-	12
Staff meeting and recreation	-	60
Staff canteen	-	120
Changing, wcs, showers and washing for the workshop workers	-	90
Kitchen and stores	-	120
Kitchen supervisor	-	12
First aid room	-	42
Store for parts	-	560

WORKSHOP:

<u>SPACE</u>		<u>Area in sq M.</u>
auxillary services	-	825
general repairs	-	1210
body repairs	-	684
stores	-	135
scrap yard	-	385
breakdown Ambulance	-	36
Mobile workshop	-	36
generator and compressor stands	-	36
Valet service	-	72
circulation	-	40% of the area of the establishment.

COMPUTATION OF EMPLOYEES FOR ESTABLISHMENT

<u>EMPLOYEES</u>	-	<u>Number</u>
Total workshop Mechanics	-	45
electricians	-	4
body repairers	-	8
painters	-	8
valet service	-	2
tyre volganizers	-	2
diagonists	-	2
upholesterers	-	4
Kitchen employees	-	7
service manager	--	1
sales manager	-	1
general manager	-	1
visiling director	-	1
Secretary	-	1
accountant	-	1
cashier	-	1
clerks	-	6
1st aid employees	-	2
messengers	-	2
watchmen	-	3
receptionists	-	2
store keepers	-	3
fuel attendants	-	6
cleaners	-	4
time keeper	-	2
Total Employees	=	118

DATA COLLECTION:

The capacity of the workshop was based on the true data collected from various places in and around zaria. The number of vehicles to be serviced daily was based on mathematical calculation using the figures from the data collected.

The ratio of peugeot cars to other vehicles was obtained by counting the vehicles passing at a chosen point per hour based on passenger car unit (P.C.U. = car with four seats).

Method of calculation:

- (i) The number of registered vehicles obtained from the Licence Office in Zaria as from 1974 to April 1981 (to the nearest one thousand) is 23,000.
- (ii) The average ratio of peugeot cars to other vehicles expressed in PCU is one to three (1:3).
- (iii) From the questionnaire and Zaria survey of traffic concentration and motor mechanics distribution, I arrived at 10% share for my service station.

Based on the facts above, assuming all the cars registered as from 1974 to this day are plying Zaria roads regardless to those coming and leaving which are assumed equal, we have

$$\begin{aligned} & \frac{1}{4} \times 23,000 \\ & = 5600 \text{ peugeot cars} \\ & 10\% \text{ of } 5600 = 560 \text{ peugeot cars.} \end{aligned}$$

Now assuming each car goes to the garage for service at least once a month, then we have

$$560 \div 30 = 18 \text{ peugeot cars}$$

Therefore we have at least 18 peugeot cars going to the garage for service daily.

I therefore arrived at the capacity of twenty cars per day, five cars for major repairs and fifteen for minor.

See also appendix

CHAPTER EIGHTSERVICES

Electricity will be supplied by the National Electric Power Authority (NEPA). A stand-by generator should be provided in case of any power failure. Water is supplied by the Water from its nearest booster station. A storage tank should also be provided.

In addition to water and NEPA lines, the telephone line also passes near the site. Services can easily be tapped without much cost.

Water SupplyFor workers

If 1 person consumes 50l/day for visitors and Office workers and 100 litres/day for the production workers, we have

(i) administration	- 40 persons	X 50l/day = 2000l
(ii) production	- 80 persons	X 100l/day = 8000l
(iii) visitors	- 50 persons	X 50l/day = <u>2500l</u>
= Total drinking water		= 12500l/day

PRODUCTION WATER:

Washing - 60 cars/day x 400l/car = 24000l/day

repairs - 20 cars/day x 100l/car = 2000l/day

Total production water = 26000l/day

Total water demand per day

$$= 12500 + 26000 = 38500l/day$$

$$\cong 40m^3$$

Water is supplied from the main through a cast iron pipe diameter 100mm. to a water meter just below ground level. The meter point has two valves in parallel connection to avoid water flow disruption during the cleaning process. Distribution to various departments in the establishment is made through 50mm. diameter cast iron pipes.

Waste water: disposal

$$\begin{aligned} \text{quantity} &= 12500 \times 0.9 \\ &= 12m^3 \end{aligned}$$

If each person requires $0.25m^3$ volume for disposal

Take 120 persons + additional 50 persons

$$\begin{aligned} &= 170 \times 0.25m^3/\text{person} \\ &= 44m^3 \end{aligned}$$

$$\text{Volume of septic tank} = \underline{\underline{44m^3}}$$

Since the capacity of septic tank = $44m^3$

The dimensions could be

$$\underline{\underline{1.7m \times 9m \times 2.8m}}$$

Disposal of oil water:

From the gullies the water goes to the Inspection chamber. From the Inspection chamber the waste will first go to the settling tank where sand, dust and particles settle. Two settling tanks will be provided. So that one is used while one is being cleaned. Adjacent is a pumping system to carry the water to the separator. In the separator, the oil is separated with water. Water is disposed through the rain water gutters and oil is collected in barrels for the refineries for further purification.

See diagrams.

Security and Protection

For the security of the service station, security lights are mounted at all the necessary points. In addition it is fenced and security man placed at the gate house. The security patrols the station throughout the night.

Advertisement:

Sign boards are put to their respective departments. The station sign boards are mounted high at strategic locations visible to motorists.

CAR SERVICE STATION

7ARIA

1:500

HAMMANGA MK
M.Sc. THESIS
JUNE 1981

