RAILWAY TERMINUS, ONNE

RIVERS STATE

"Effective Circulation in Railway Terminus"

BY

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DECLARATION

I Akinola Olakunle Olusola, declare that this thesis work is done entirely by me under the supervision of my supervisors Prof. Arayela O. and Dr Olutuah O.A of the department of Architecture, Federal University of Technology, Akure and has not been presented either wholly or partly for any degree elsewhere before.

All sources of information contacted have been dully acknowledged.

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CERTIFICATION

This is to certify that this dissertation was carried out by AKINOLA, OLAKUNLE OLUSOLA, as part of the requirement for the award of masters of Technology in Architecture (M.Tec) of the Federal University of Technology, Akure, Ondo State.

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DEDICATION

To the Almighty GOD for seeing me through this programme in good health.

To my family for their encouragement.

AKNOWLEDGEMENT

While writing this paper, I came across so many individuals who in one way or the other contributed to the successful completion. Their motivations have brought me this far and so I must acknowledge them. Due to the fact that they are so many, I must apologize before hand to these who one way or the other have been omitted. It is not intentional.

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ABSTRACT

Urban life involves movement. Physically, this movement is in transportation, providing transfer of people and goods from one place to another.

Transport problems in a city are related to it's size and shape. The land use pattern and transportation system should not only maximize the possibility of communicating, but also minimize travel time and cost.

In Nigeria today, urban centers in particular, the most common forms of transport are the motor vehicles and motor cycle. Despite substantial expenditure on modern road system, traffic hold ups are still a daily occurrence while the cost of transportation can be seen as exhorbitant by the masses.

Motorways influence urban development to sprawl and because it is difficult to get to central areas due to heavy traffic (time and movement) , central areas degenerate, hence there is the need to look for an alternative to road transport : the railway.

Although the railway has been in existence for quite a while, it is not very popular mode of transportation in Nigeria today. This has led to the neglect of most of the present railway stations and railroads (lines). This study seeks to address the problem of the railway and rail stations and how to encourage the public to revive the interest in use of railways by improving the facility of rail stations and the rail system as a whole.

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CHAPTER 1

1.0 INTRODUCTION

Throughout the civilized world, transport in one form or the other is a basic and essential part of the daily routine of life. Although the precise contribution that transport infrastructure makes to the economic development varies from country to country, economists agree that a country can not realize its development potentials unless it has an adequate transport network, and adequate connections to the rapidly globalizing economy. In developing countries, transport is generally regarded as one of the most important factors in the overall development process though the nature of demand is likely to vary in different circumstances and at different stages of development.

The relationship between transport and development is complex and changes both in time and space. Without transport, exchanges of goods, people and ideas cannot exist and economies can not grow. The availability of an effective transportation system can open doors to development and transport can be seen as an initiation of development and as an indication of development achieved.

The precise nature of the relationship between transport and development is difficult to define because the modes and system of transport differs greatly and the levels and type of development are diverse.

Although development also depends on other factors such as technology level, economic policies, political conditions and available resources, one of the most influential can be seen as transport; in this case, mass transport.

1.1 SCOPE OF THE STUDY

This study comprises two major parts:- the research and design. The research aspect involves gathering of relevant information into concepts which are necessary in planning for a good railway station design.

The design component incorporates a detailed and comprehensive study of all the spaces resulting in a good railway station complex. The study will also entail the zoning requirements that helps in achieving a functional and good design proposal. The pedestrian and vehicle traffic flow patterns, population requirements, loading and off-loading paths and bays circulation within the station complex and how all these are related to the proposed design will also be considered.

1.2 AIMS AND OBJECTIVE

The study is aimed at:

I. Encouraging the use of rail roads as a major link between coastal areas and the hinterland.

II. Designing a proposed railway terminus.

III. Understanding the need to proffer solutions to existing design flaws especially with regards to circulation in railway stations.

IV. Making a comprehensive study of existing railway stations so as to aid in the design of a new railway station.

V. Making mass transportation easy, convenient and comfortable through

proper circulation at stations and to show the relationship between effective circulation in the station and how it can affect the general community, after all charity begins at home.

1.3 RESEARCH METHODOLOGY

Relevant information will be obtained from literature reviews and interviews will be conducted on the field. This will enable the researcher appreciate the quality of spaces to be provided for the development of the design proposal.

Data will be collected by various means and various forms some of which include;

i. Review of earlier studies on railway station design.

ii. Survey of facilities and conditions of existing railway stations through case studies.

iii. Observation of railway station proceedings.

iv. Design and evaluation of proffered alternative.

v. Visitation and analysis of existing site to familiarize the researcher with the environment.

1.5 JUSTIFICATION / PROBLEM STATEMENT.

The upgrading and construction of roads, introduction of facilities at sea ports and airports show that transport is a dynamic element in modern economies. In central areas, there are too many people in too little space. Private cars are identified with the higher income groups, while most people (masses) rely on public transport- buses, taxi cabs, or motor bikes for transportation. When these vehicles come into central areas, there is limited space for movement. This is the traffic problem.

Railways have traditionally provided the essential backbone of most Tropical African transport system and pattern of economic development since the beginning of the twentieth century by linking coastal ports with inland areas or points of production for export or population concentration.

Onne has important implications for transport due to the population concentration because it is both a commercial center and also an urban center. The presence of a sea-port also makes it necessary to transport goods and people to and from the mainland with minimum delay, thus the need for a railway terminus near the seaports.

This paper proposes the use of a railway service as efficient, reliable and economic public transport system in Onne. Thus the proposed railway terminus in Onne, Rivers State

This project is made feasible by the recent proposal to review the railway system by the Federal Government of Nigeria.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 MASS TRANSPORTATION

The chambers 21st century Dictionary of contemporary English defines "Transportation" as " a means of carrying passengers, goods or luggage from one place to another" and "mass as a gathering together in large numbers", thus mass transportation can be defined as " the movement of passengers, goods or services from one place to another in large numbers".

The history of transportation is intimately tied to the history of mankind. It is the story of mass courage and ingenuity in overcoming obstacles to conquer land, air, sea and recently space.

The development of quick, safe and economical transportation has helped transform the world. By carrying raw materials, finished goods of commerce and industry to the worlds markets, transportation makes. Food, clothing's and other necessity of life readily available to large numbers of people. Transportation has helped to spread ideals, cultures, foster international understanding and co-operation by bringing distant people into contact with each other. Until the development of telephone, T.V , radio , telegraph and recently E-mail, transportation provided the only means of communicating information over great distances.

2.2 DEVELOPMENT OF LAND TRANSPORTATION

In the earliest times, man was forced to move from place to place in search of food and shelter. In migrating from one area to another, populations had resorted to those routes where transportation conditions were most favorable. With time, man learnt to substitute his limited physical abilities for the energy of animals and nature, he later harnessed steam, electricity and the atom.

Now, to meet the challenges of rapidly expanding transportation needs, extensive research and development projects are being undertaken, planners are trying to develop a co-ordinate system of public and private transport in an attempt to reduce or eliminate the problems such as congestion, delay and air pollution that modern man encounters in transporting himself, goods and produce over land.

2.3 EVOLUTION OF THE RAILWAY

The railway has fascinated a lot of people over the years. There is considerable information in literature on the railway which include history, scientific description as well as mystery and adventures in which trains have played a significant part. Pictures and models of trains, past and present can be found preserved in museums or on postal stamps.

The railway is a mode of land transportation in which flange-wheeled vehicles move over two parallel steel rails (or tracks) either by self propulsion or by propulsion of a locomotive.

The railway first came to being in European mines in the early 16th century. From the inception, railway cars were built with flange wheel to keep them on the tracks or make them self steering.

The earliest railway cars were pulled by men on horses and the modern railway did not emerge until 1804 in Wales, England. The Stockton and Darlington railway which began operation in September 1825 was the first to carry passengers and freight. It was followed by the Liverpool and Manchester railway in 1830, which with the introduction of the Stephenson's locomotive "Rocket" can be considered the beginning of the railway era.

2.4 BRIEF HISTORY OF THE RAILWAY IN NIGERIA

The railway came to Africa as a result of the Brussels Conference in 1890 which passed a resolution for the provision of railway network in the Africa continent. The general act of the Brussels conference called for " the construction of roads and in particular, railways in view of substituting economical and rapid means of transport for the present means of carriage by man"

The transport system of Nigeria by the middle of the 19th century was essentially undeveloped. Except for the few foreign contracts along the coastal areas, and in the extreme north where the caravan trade with North-Africa already existed, most of the country, particularly the interior, remained in near complete darkness to the outside world. Without doubt, a good transport

system was needed to spread British influence and to expose the country to modern commerce an essential factor for growth and development. The success of railway construction in North America stimulated interest in similar projects in West Africa. There was also the urge to export the natural resources of West Africa, which could be made easier with effective transport system stretching into the interior. The British Government realized the importance of the railway system in order to develop the latest resources of the country and expedite effective administration.

Governor Carter of Lagos should be given the credit for initiating railway building in Nigeria. As a result of his journey into the hinterland of Lagos and Yoruba land in 1892, he urged that a beginning be made in railway construction. Mr. Shelford, an engineer accompanied Governor Carter on his journey to ascertain possible routes from Lagos to Abeokuta. Mr. Shelfords recommendations resulted in a surveys and report in October 1895 prompted Mr. Joseph Chamberlan, the then colonial secretary to give approval for the Nigerian Railways. Thus a road from Lagos to Otta(32km) was authorized. By April 1899, the line was extended to Abeokuta and the following year, it reached Ibadan (Ibadan being the center of cocoa producing region then), and by 1907, Osogbo and Jebba (bank of river Niger). Soon after, suggestions were made to the colonial office that railways from Lagos be built inland and extended to Kano.

A few years elapsed before a decision was taken concerning the next railway project. The delay was due to divergent views as to location. Lord

Frederick Lugard favoured a railway line from River Niger to Kano. In a memorandum sent to the colonial office, he suggested that "every yard of railway ..... would by superseding the present caravan transport, tend greatly to promote the development of trade,.... nor was it only a question of trade, communication was needed to facilitate internal administration and for rapid concentration of troops and supplies."

In August 1907, the colonial secretary approved construction from Baro (on the River Niger) to Kano while at the same time, the governor of Southern Nigeria was instructed to extend Lagos Railway to effect a link with the Baro-Kano line at Zungeru. work started on this line in January 1908 and was completed and opened to public in 1912.

The Bauchi light railway, which was authorized to be constructed in 1911, was completed as far as Bukuru in 1914, thus serving the tin-mining area of Northern Nigeria. The discovery of coal at Enugu in 1909 encouraged the government to investigate the possibility of an Eastern railway line.

The Eastern segment of the Nigerian railway was originally intended to be a line merely linking Port-Harcourt with coal mines in Enugu and work commenced towards the end of 1913 and was subsequently extended to Abia in 1915. The Eastern railway joined the Western line at Kaduna in 1926 and the railway bridge over the River Benue was completed in 1932.

2.5 THE DEVELOPMENT OF THE NIGERIAN RAILWAY CORPORATION.(NRC)

The Nigerian Railway corp. (NRC) was established in 1955 by an act of parliament in "Nigeria Railway corp. Acts 1955" following the recommendations of the international Bank Mission (IBDR) to Nigeria in 1953. Until 1955, the administration of the railway was carried out by a General Manger with the highest authority vested in the Directorate of Railways and works, subject to the Governor-Generals control.

The first announcement of the Federal Government to establish an autonomous statutory corporation to take over the duties of the Nigeria Government Department was made by the late Chief Bode Thomas, the Federal Minster for transport in the House of representatives in August 1952 who stated. "It is the Government view that a public utility of this kind is better operated on quasi-commercial lines by a statutory corporation than by a Government department. The rigidity of control and establishment formalism which are proper and necessary in the operation of a Government department are not suited to a public utility which should not only provide the service required by the public but should do so on sound financial lines.

The railway thus became a corporate body with perpetual succession and a common seal with power to sue and be sued in it's corporate name and to acquire, hold and dispose of moveable and immovable property.

From its inception, the Nigerian Railway Corporation was designed to serve the exploitation nature of colonial administration yet it enjoyed a real monopoly in the transport sector (1960's) despite its inherent defects. Established to over see all railway services within the nation, it combines both administrative and technological capabilities among its functions. The Railway construction was partly administrative to maintain links between Lagos and other parts of the country. It was also intended to facilitate the exploitation and evacuation of agricultural and mineral resources for export mainly to the U.K. from an economic point of view, the unit cost goods were drastically reduced when carried by rail system .

The Nigerian Railway Corporation made a number of improvements to the system although one of the most significant was not appreciated by the coal corporation workers ; the introduction of diesel locomotives in 1955. Railways and electricity corporation were the highest consumers of coal, but with the sudden introduction of diesel, the coal market fell, causing coal corporation workers concern in Enugu.

2.6 STATE OF NIGERIA RAIL TRANSPORT

After the National independence of October 1st 1960, the important role of the Nigerian Railway Corporation started to decline. Due to defects in management, operation, equipment, staffing, rate policy, investigation decision, neglect and most importantly, completion from the automobile, the Nigerian Railway corporation has declined in popularity and functionality.

A program to modernize the railway system of transport was embarked upon during the civilian administration of 1979-1983 when the idea of a standard gauge railway was pursued; this program was later suspended due to the ailing economy. In fact, the Nigerian Railway system came to a virtual stand still. The Nigerian Railway Corporation, which had the longest fleet of trains in sub- Saharan Africa, was not running any trains for months on end before the intervention of the F.G in 1995.

Presently, the Nigeria Railway system is experiencing massive rejuvenating/revival efforts with rail lines being serviced and some stations earmarked for renovation for example the one at Iddo and for construction Onne and Abuja railway terminus.

CHAPTER THREE

3.0 CIRCULATION

The Dictionary of Architectural and construction terms defines circulation in the following ways;

i. Traffic pattern through an area or building.

ii. Scheme providing for smooth, economical and functional flow of traffic.

iii. Means of travel through a building such as doors, elevators, stairs and corridors.

iv. Continuous flow of liquid or gas within a closed circuit.

For the purpose of this study, the researcher defines effective circulation as a means of movement of people, goods and services from one place to another with minimum delay.

From the definition above, one can see the importance of effective circulation in our everyday lifes. The free flow of people, goods and services is essential for the economic development of any people. If people could get to their predetermined destinations safely with a minimum of discomfort and delay, if goods could be transported long/short haul safely and promptly, then the chances of economic development will be much brighter.

While working on the community as a whole, one has to check out a reliable and economical means of transport (mass transit), thus the idea of railway and thus the need for a railway station.

3.1.0 CIRCULATION IN RAILWAY STATIONS

Railways are roads on which trains or freight and passenger cars, drawn by locomotives, travel on tracks formed by parallel metals rails.

3.1.1 DEFINITION OF TERMS

The railroad glossary of terms gives the following definitions :

TERMINUS: A place where all train operations originates, terminate and trains destinations are determined. It offers inter state and intra -state services.

STATION: A place designated in the railway timetable station column by name. It offers only inter state services and is found in big communities.

SUB-STATION : Usually located in small communities where rail roads pass and is used as a feeder station for bigger stations.

YARD: This is a system of tracks other than main tracks or sidings used for making up trains, storing of coaches, cabs and other purposes related to railways.

CAB: Drivers carriage or engine van (also called locomotive)

COACH/CAR: One of several passenger vans which when joined coupled to cab make a train.

TERMINAL: A terminal is an area where individual cars perhaps arriving from various points are sorted according to their destinations and assembled in train. Freight and passenger terminals necessarily include not only stations with offices and various facilities but also yards with more or less elaborate systems

of tracks and switches. Usually, repair shops are provided and passenger terminals usually include shops, yards and sheds where cars are cleaned and supplies put aboard sleeping cars diners. An incoming locomotive, after its train is uncoupled in a receiving yard and drawn away by a switch engine proceeds to the engine terminal for inspection, repairs and servicing or storage.

The oxford learners dictionary defines " Station" as "a place , building etc where a service is organized and provided". A railway station will thus be extended to include the cars and locomotives (rolling stock); the land, building and equipment owned or operated in conjunction with the railway lines.

A railway station is like a total city denoted to dynamic movement. It comprises varied structures that facilitate passenger and cargo movement, train maintenance and control and other structures that provide for auxiliary support functions.

This sub-chapter will show primarily, the major points and causes of poor circulation (congestion), and how these can be overcome to achieve "effective circulation within railway station complexes".

From the information gathered by the researcher, the following are the major points and causes of poor circulation.

i **Boarding and deboarding** : due to inadequate boarding and unboarding areas (platforms), when trains come into stations, there is usually a rush for seats and coaches (when tickets do not indicate commuters seat in a coach number) and because there is no ample space, people rush onto the tracks even before the train stops. This has led to loss of lives and property and is most

common at peak periods.

ii **Baggage check/claims**: In the haste to check in or claim baggage before boarding or deboarding as the case may be, property can be misplaced or stolen thus causing further delay in station proceedings

iii **Tickets** : Poor positioning and inadequate tickets booths in stations is another cause of congestion. It is very common to see long queues at ticket booths or to see people patronize touts for tickets since there are not enough officials to attend to them.

iv **Passengers flow pattern**: Poor information on station proceedings causes commuters distress, especially the elderly and new comers. When not properly informed on how to move around, commuters tend to stray about the complex (even to private offices). There is the need to mark out clearly public and private pedestrian flow pattern.

v **Train parking and track arrangement**: Due to poor track arrangement, when more than one train comes into the station at a time, they do not have ample space to park and allow passengers to deboard , in the ensuing confusion, commuters and public may cross tracks and get run over by another train. The differing views on passenger safety at station is another cause of congestion.

vi **Car park arrangement** : Unchecked ingress and egress of vehicular traffic to the station complex is another cause of poor circulation. Some people use the station premises as a safe parking spot for their cars (for days) and deprive visitors of parking space.

vii **Concession**: Concession here refers to commercial activities. Unlicensed or unorganized commercial activities cause unnecessary inflow of people, while simultaneously creating a haven for touts, pickpocket's and other illegal activities to thrive.

viii **Waiting Areas (lounge)** : Inadequate waiting areas for passengers especially at peak hours is a cause of congestion. People tend to mill about and get in each others way thereby causing hindrance of movement.

ix **Entrance and exit**: Inadequate number and size of entrance and exit points to the station can lead to overcrowding under normal and emergency situation.

x **Traffic Control**: Poor traffic planning patterns can cause delays. If there is a train short at any location because it was left at the depot, a trip or two may be cancelled

xi **Maintenance**: Trains may require cleaning and/ or reprovisioning (fueling) while in a terminal platform. It is common practice and can cause delay if not done efficiently.

xii **Routes signals**:. Poor understanding of necessary railway signals can also cause delays. Inefficient signaling methods have been seen to cause delay when the train driver is (mis)led to an occupied or wrong platform.

3.1.2 PROFERRED SOLUTIONS TO CAUSES OF POOR CIRCULATION

From the research conducted, the researcher recommends the following as possible solutions to the major factors to be considered for proper circulation:

i **Platform:** The platform is an important feature in the station design concerning circulation. It must be sufficient to accommodate the largest number of passengers expected but not wasteful of space. It should be designed to give free visual areas along it's length so that passengers and staff alike can ensure safety while dispatching trains. Platform edges should be straight, to assist operations by allowing clear sight lines. The platform height should also be considered with regards to train/station interface as higher platform permits quicker loading or unloading of trains.

Plate 1. A metro station (Shanghai, China) where there are columns to support the structures over the underground station. The station is bright and columns do not seriously obstruct the platform

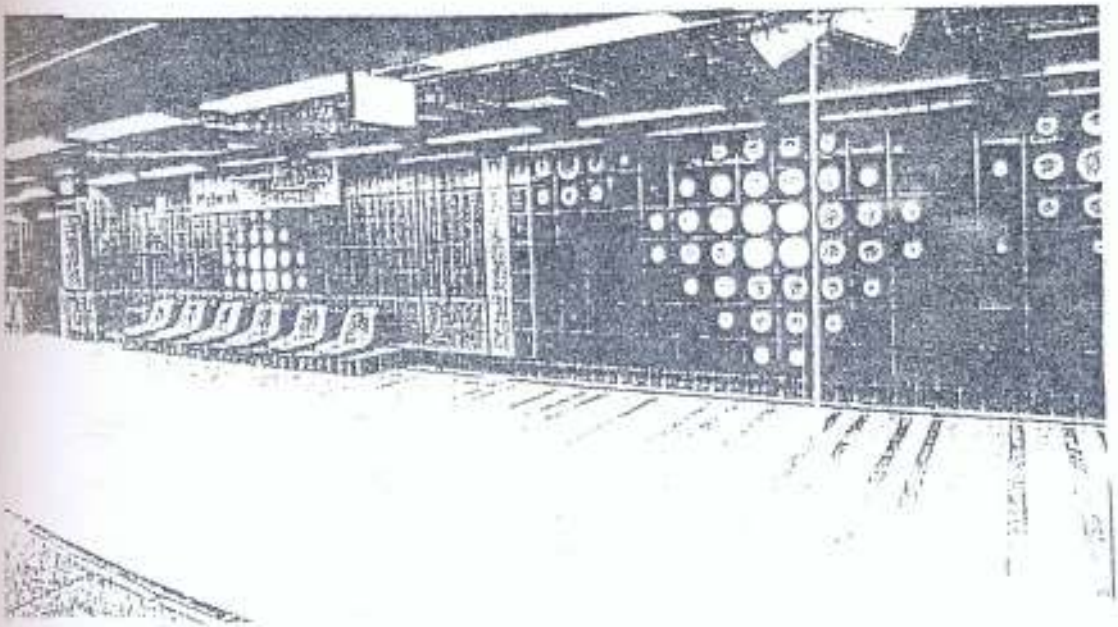


Plate 2. An example of a wide station platform (Cairo Metro, Egypt) designed to accommodate large numbers of passengers boarding and alighting at the same time. Note that there are no supporting columns to limit circulation or visibility on the platform. There are a few seats for waiting passengers but these are arranged to prevent a person lying down on down. Vagrant sheltering in stations in a serious problem in some cities and has to be discouraged.

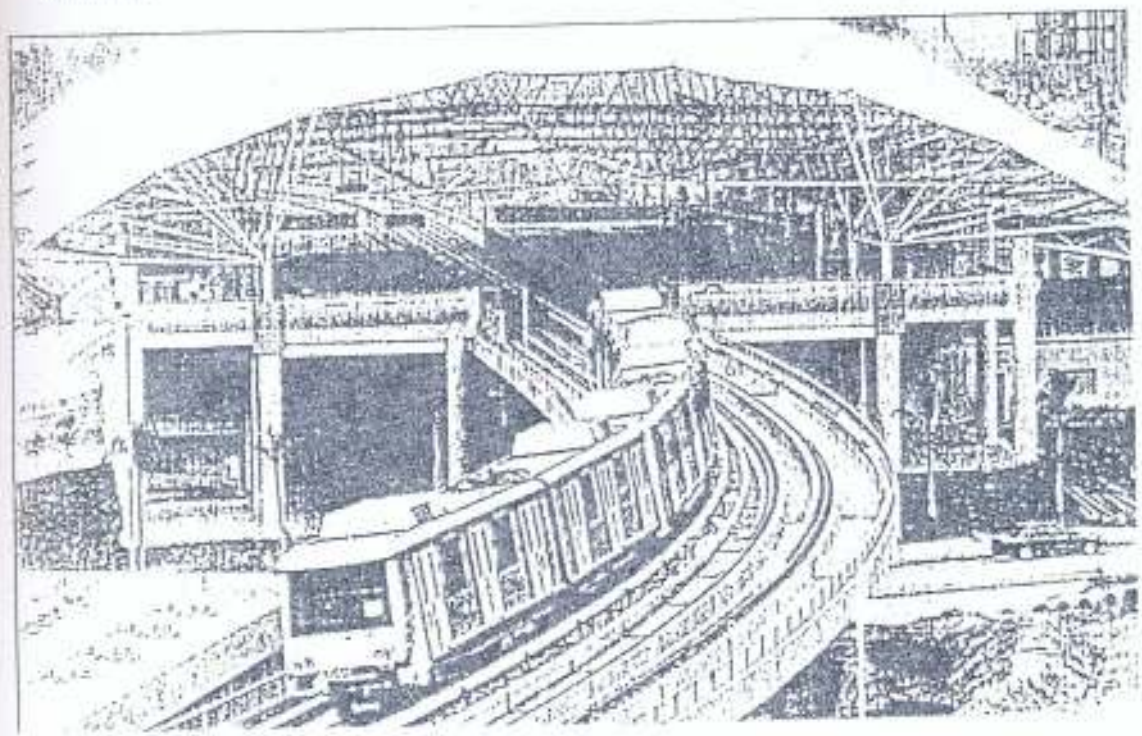


Plate 3. This photo shows the station at Sultan Negara in Kuala Lumpur, Malaysia, built for access to the commonwealth games complex. It was designed to handle large numbers of passengers, hence the wide platform. Note that there are no columns to obstruct the platform near the edges, the platform are straight and the whole station is protected by a large overall roof, essential in a country with a tropical climate. All utility rooms, staff amenities and ticket facilities are at ground level.

ii **Tickets**: An adequate number of tickets booths and operators should be managed to suit the patronage offering and placed strategically in view.

iii **Passenger flow pattern**: This can be aided with the following ;

Passenger information system (PIS) or passenger information display is reliable way of dispersing passenger information. For example time now, destination, expected time of arrival/ departure, number of stops and where, position of coach of travelling on reserved space, platform of boarding etc. A very common compliant by passengers is lack of information which may lead to loitering around station premises, thus latest information must be assecible. Information display should be mounted in public areas and should be clearly visible and regularly updated with accurate information. Some information system appear with some form of advertising but it must not be allowed to detract from the main aim of providing train service information.

Screens and Doors: Screen and doors should be placed as a means of controlling direction of passenger flow. They should be of see-through material for public use and clearly marked out where for staff only. Consideration must be paid to issues like direction in which doors opens.

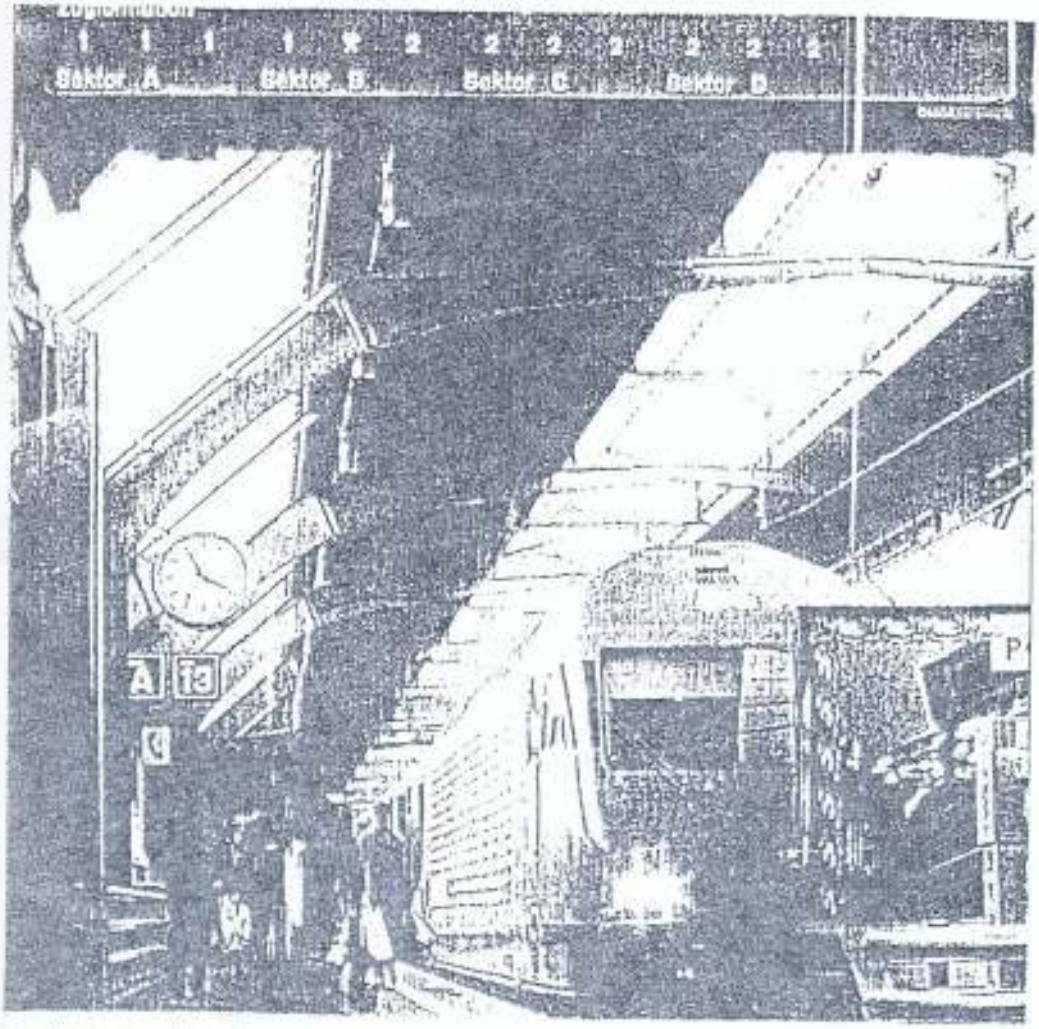


Plate 4 A station designed to assist passengers with good "instant information". The display over the platform entrance shows the location of first and second class coaches and the train is divided in sections A,B,C and D. The sections are marked by signs on the platform. The train restaurant facilities are shown between first and second class. The platform is clean and signs are not confused with too much advertising

iv **Entrance and Exit**: Station entrance and exits must be designed to allow for the number of passengers passing through then both under normal and emergency situation as part of circulation and safety conditions. Entrance must be welcoming to the prospective passengers. Station design must also have sufficient entrance to cater for the different sides of the railway route while taking into account the effectiveness of each entrance.

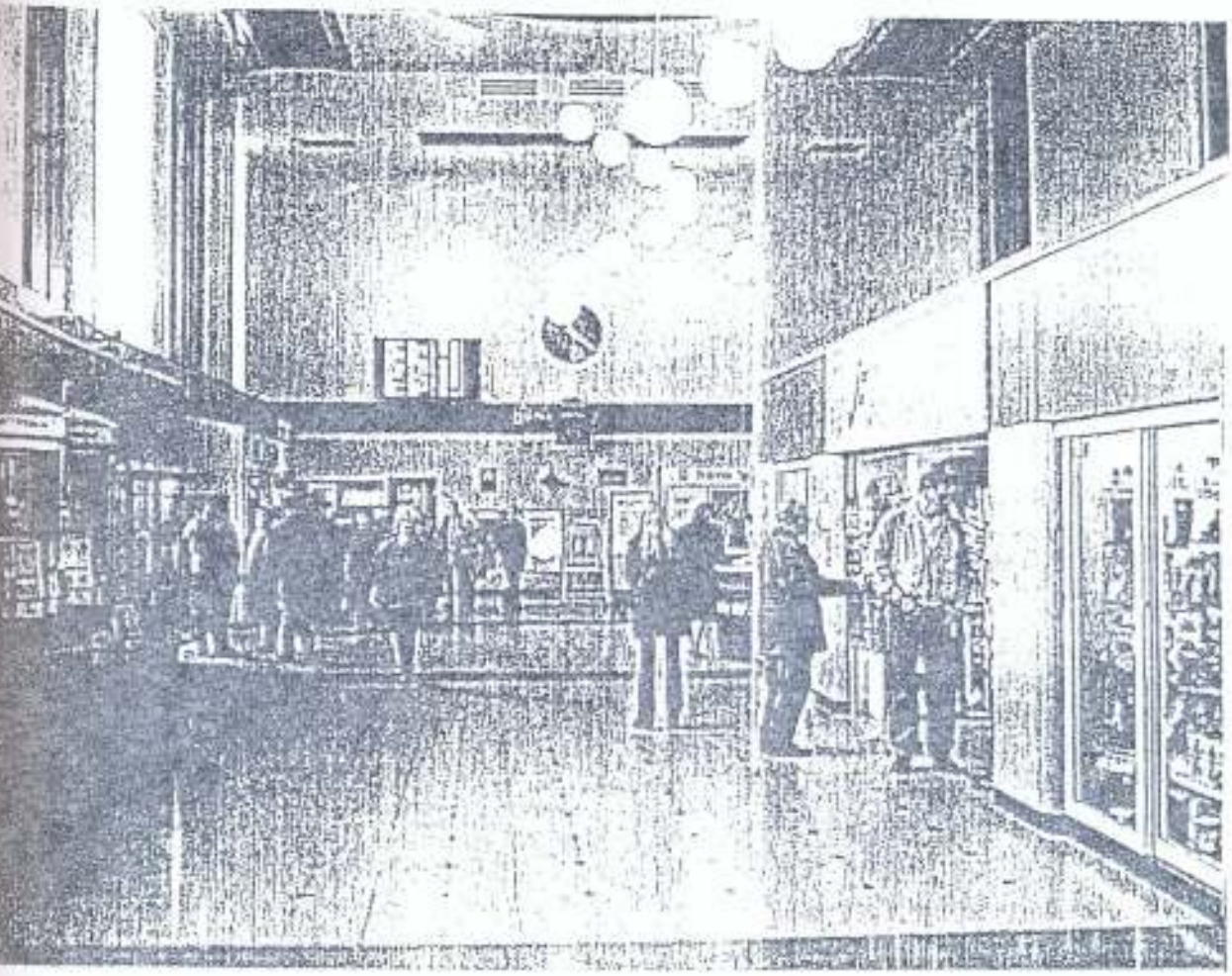


Plate 5. The entrance hall of Doncaster station, UK. The ticket office is immediately behind the camera position. The hall has a shop, car rental office and public telephones. A train information display is mounted high on the wall and a TV screen duplicates the information below it. There is an information counter next to the shop, this begin an additional service now often seen in large stations. Flooring is designed to be easy to keep clean.

v **Concessions**: These should be clearly defined. Concession on railway premises can be a lucrative source of income and the opportunity to provide for then should be taken wherever possible. The normal type of concession include :- refreshment counters, coffee /tea shop, lunch room, pharmacies, lettable office spaces, newspaper or literature shops among others. This is good for the railway as it attract customers and provides a sense of community which would

otherwise be lacking there should however be limits to what can continue unhindered and with safety. Food outlets should not be allowed to generate a rubbish or vermin problem. Operators must prevent shops from allowing passages to become obstructed with sales equipment and key must ensure that they conform with railway safety requirements in cooking and similar activities. Leases for shops/stalls should detail all exclusive required and layout clearly the safety, evacuation and training required for shop staff.

vi **Waiting areas (lounge)** : A careful evaluation of the average peak hour so as to ascertain size of halls, simple, direct and logical routes for passengers, the luggage and vehicular transportation should be made.

vii **Car park Arrangement:** Another inevitable problem directly related to the station building is the provision of automobile parking spaces. Weary commuters will not fancy a further delay with the station premises. A system of tariffs, applying to do long and short term parking to determine the accrual rate of vehicle parking. This accrual rate will be the determing factor of the number of parking spaces required. As on additional factor, employee parking should be considered to relieve congestion during shift changes. Care should also be exercised in developing access for employees to the station building.

viii **Train parking and track arrangement**: In terms of crossing safety, it has been assumed in some places that passengers (and members of the public) will take care of their safety when walking on or near a railway, thus it is not necessary to segregate passengers from the trains. This can cause confusion and rowdiness at different points on railway. In some places (UK) railways are

fenced and passengers and public kept away from the tracks as far as possible such that people not concerned with the going on are kept out. Terminals date from an era when land was cheaper than it is now. Opportunities for expansion are limited so efficiency of operations is very important. It is important that trains do not occupy a plat form for any longer than is necessary. Track layout at, many terminals are complex and compact due to shortage of space. Flexibility of operations require careful design of the layout and short run-in and run-out times.

ix **Baggage check/claims** : An area to which checked and tagged baggage belonging to originating passengers is delivered for sorting prior to being dispatched to the train for loading is necessary. This is called out-bound baggage room in Airports while a method under which passengers have direct access to terminating baggage in a controlled area (self claim baggage) is employed for terminating passengers /baggage's. As passengers leave the area, an attendant retrieves baggage claim checks and matches them with baggage tags to ensure that passengers have selected only baggage to which they are entitled. A baggage diverter can be used if necessary.

x **Traffic Control**: Proper planning of train routes and arrival time is essential for the smooth and on time running of rail services. This can be accomplished with the use of timetable. The time table must be designed such that crew duties are arranged in a way that people (crew members) are available to start up the trains each day. The time table is a detailed one for staff only and will show all details of all train movements in and out of stations. It should

show each train or trip identity and intermediate times for all stations.

xi **Route Signal**: Train should be shown which route and speed a train will take when approaching station or diverging junctions. The speed of the train will be a matter for the driver observing separate rules or fixed speed limit signs along the trackside. Interlocking signals at junctions ensure that the speed aspect shown are in accordance with the route set.

xii **Maintenance**: The provision of special facilities for maintenance is the only way to ensure quick and efficient cleaning and restocking for a later trip. Also, the introduction of many train can help reduce the stress and stain (breakdown) as compared to the toll exerted on just a few trains.

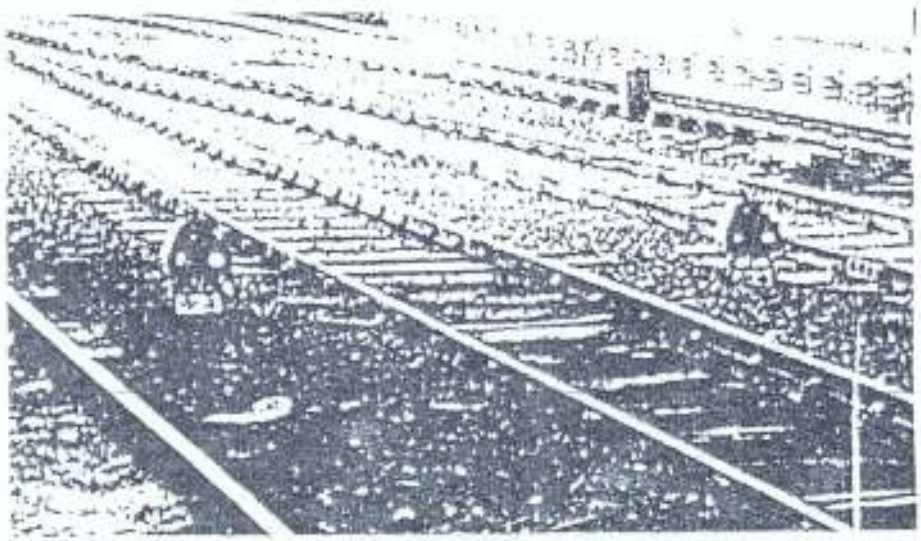


Plate 6 Standard UK shunt signals protecting the exists from stabling tracks at Sheffield, shown in the OFF position with a red white light

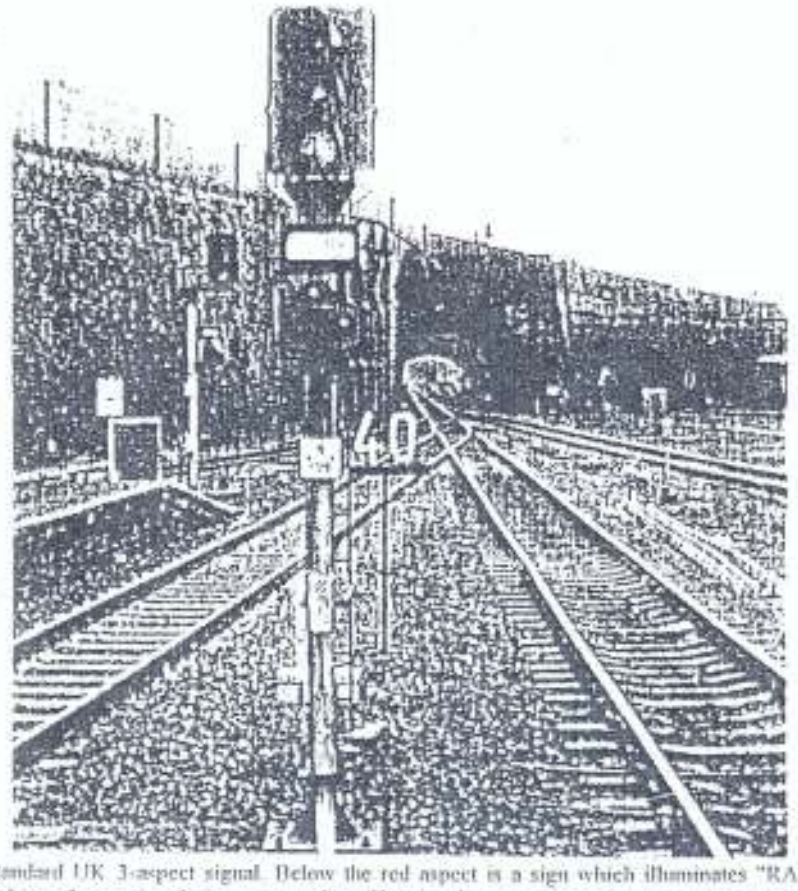


Plate 7. Standard UK 3-aspect signal. Below the red aspect is a sign which illuminates "RA" (Right Away) to inform the driver that station duties are complete. The signal post carries a shunt signal which has no red light. The stop indication is provided by the main signal. Nearer ground level is the signal post telephone. Note also the 40 mph permanent speed limit sign.

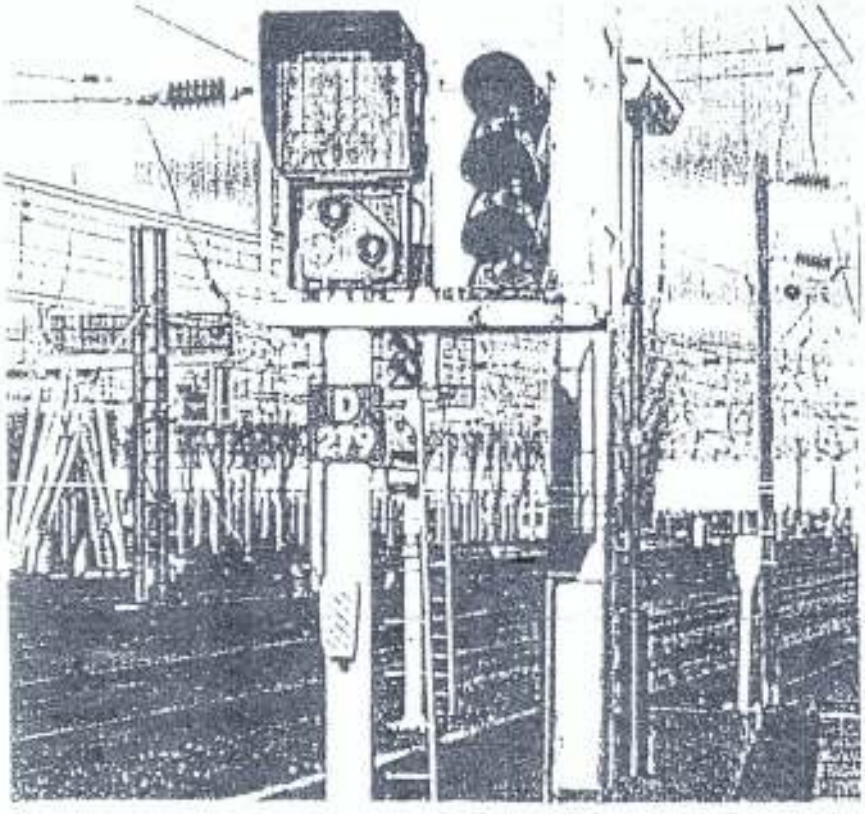


Plate 8. 3-aspect junction signal with a "theatre type" route indicator. The route is indicated by displaying small lamps in a pattern to show letters for example, UL = Up local.

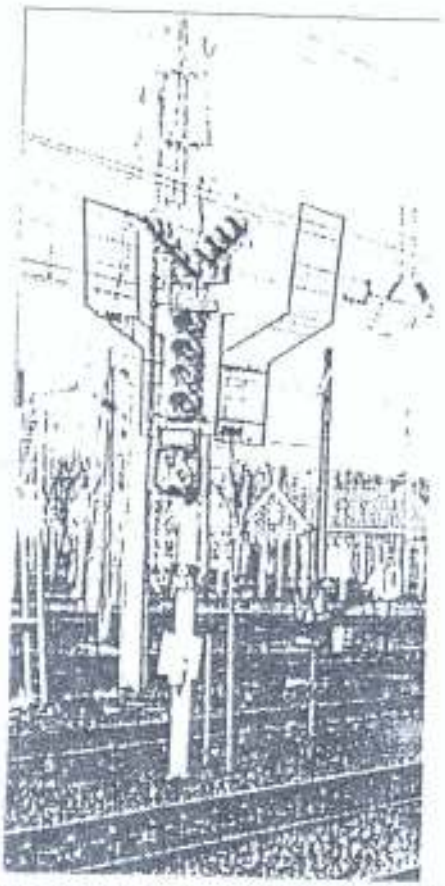


Plate 9 Standard UK 4 aspect junction signal. The signal can show three routes Ahead, Diverging left and Diverging right. The rows of five white lights are located in the angled arms above the main signal head. Note the wire screens to protect staff from contact with the electrified overhead lines

VARIOUS TYPES OF SIGNALS

This is a stop signal placed at the entrance to a block and, when showing "stop", the train is forbidden to enter the block. When a signal shows a stop or other restrictive indication, it is said to be "on". A signal showing a proceed indication is said to be "off".

This is a stop signal showing a proceed indication - it is "off". The train may enter the block at normal speed. In effect, this means the maximum speed applicable to this section of line and the type of train.

To give advanced warning of the indication of a stop signal, a "distant" signal is sometimes provided. This operates in the same way as the stop signal but gives either a "caution" indication (it is said to be "on"), shown here, or a proceed indication, shown below. If the distant is "on", a yellow light shows at night.

Here the distant is "off". The driver is being told that the next signal - a stop signal - is also "off" and he may continue at normal speed. The signal shows a green light at night.

Where blocks were short or stations close together, the distant signal was often placed on the same post at the previous stop signal. The driver now has two indications, one from the stop signal protecting the entrance to the block, the other from the distant for the next stop signal. To avoid confusion, if the stop signal is "on", the distant will also be "on", even if the next stop signal happens to be "off". This is achieved by linking the two signals mechanically - a system known as "slotting".

At night, the driver will see two lights, a red over a yellow. The red always takes precedence.

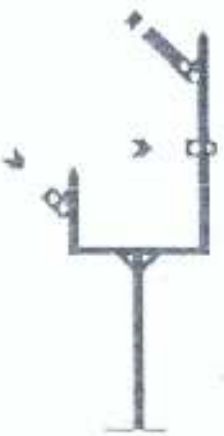
At a signal post with home and distant together, there will be occasions when the block immediately ahead is free and the train may enter but the next block may be occupied. In this case the driver will see the stop signal "off" and the distant "on" as shown here. At night, he will see green over yellow. This shows him he may proceed into the block but that the next stop signal is "on" and he must stop there.

The third indication for a stop and distant signal is where both are "off". The driver is being told both this block and the next are free and he may proceed at normal speed. At night he will see green over green.

In some very restricted locations, a repeating signal is provided, often referred to as a "banner" signal. It is a black band on a white disc which repeats the position of the semaphore arm.

This pair of signals protects a pair of diverging routes. The lower signal is "off", indicating that the route to the left of the two is set and the train may proceed.

Junction signals also have an equivalent distant set up. These are always referred to as "splitting distants". They provide advance warning of the position of the junction signals and they operate in the same way as regular distants.



There are also combined versions of the splitting distant where a stop signal is placed over the distant for the main route. Either of the distants can only show "off" if the stop signal is also "off".

3.2 PLANNING GUIDE LINES:

Railway stations are the place where trains stop to collect and deboard passengers, and since it is the first point of contact, it should be regarded as the "shop window" for the services provided. It should therefore be well designed, pleasing to the eye, comfortable and convenient for the visitor or commuter as well as efficient in layout and operation. The station should be properly managed, maintained and operated safely.

The nature of a railway stations complexity makes it necessary to isolate it's segments for design purposes. In order to arrive at a good design proposal, one must first have an understanding of railway proceedings. First of all, movement and function of passengers, cargo and staff to and from the station are regulated by a schedule that is, the action that each discipline will follow is began on this schedule and passengers action are based on a pointed time table people and cargo movement to and from the community are based on normal working hours of the community. This working schedule may be in conflict with rail service schedule and this requires special correlation by rail service. Another factor to be considered in the design program is on-time record of rail services as related to pointed schedule. Actual arrival and departure time are subject to ✗ mechanical difficulties etc therefore consideration should be directed towards capability of handling peak periods and an overload factor for deviation from schedule. Caution must be exercised here to control the amount of structure designed so as to provide an economical correct solution.

The understanding of the operation of railway station would be incomplete without the knowledge of a series of system that must be correlated to it's activities. The activity is divided into public and non public factors. Another important element to be noted is flexibility so that all element of the system may grow as required. Baggage claim areas, check in areas, lounge, train position any or all of these elements should offer capability of independent growth to meet changing demands of the future. This is because independence and flexibility relates to the fact that pre-established schedules can change and as a result, congestion may become a problem at almost any point in the system (future expansion).

Ideal parking space and arrangement should also be considered. This will include employee parking and visitors parking area – public and private. Any passenger terminal system will rely heavily on the ability of the two public to secure information. It is therefore necessary to give consideration as early as possible to nature and type of information system to be made available to the public so as to guide them to their desired locations.Adequate planning must take into account for safety and access to the structure as well as train terminal operation and maintenance.

TERMINAL OPERATIONS

PASSENGER AND CARGO FLOW PATTERN

(CARGO/FREIGHT)

Fig. 1 Passenger And Cargo Flow Pattern

PASSENGER FLOW PATTERN

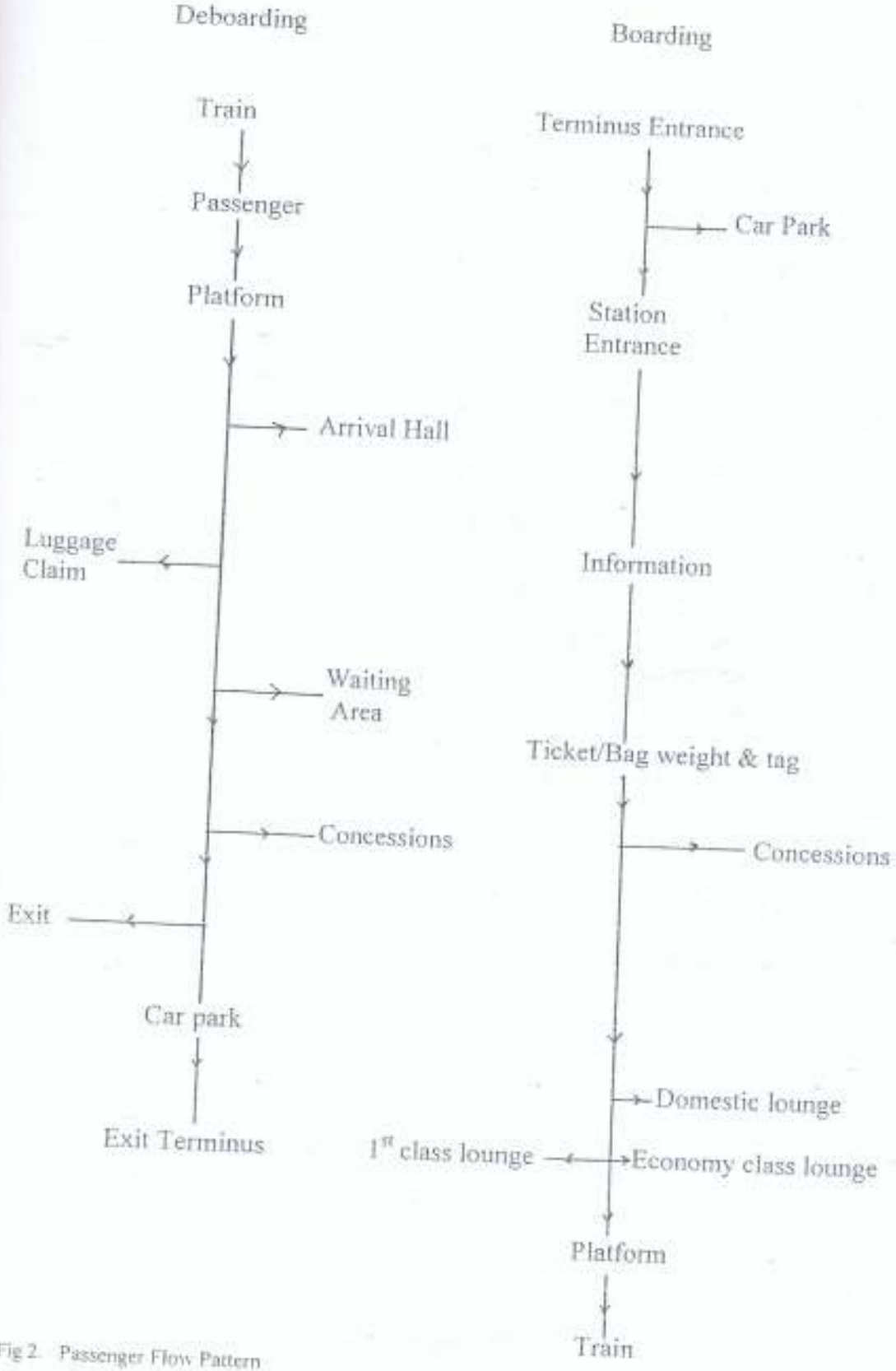


Fig 2. Passenger Flow Pattern

3.3 TRAIN OPERATIONS AND MAINTENANCE

This sub-chapter will discuss the planning movement and control of trains based on modern practice world wide. A train is defined here as one or more railway vehicles capable of being moved. It may consist of a locomotive (sometimes more than one) to provide power with various unpowered vehicles attached to it. A train may be only a locomotive running light (dead heading) to a point elsewhere on the railway. A train may be passenger carrying, freight or nowadays, mixed.

In Nigeria, locomotive hauled trains are used. The traditional train comprises a collection of coaches (freight wagons) with suitable motion power attached in form of a locomotive. The train is made up of sufficient vehicles to carry the traffic offering and provided with enough power for the job. An advantage of locomotive haulage is it's flexibility. As long as the train weight remains within the capacity of the locomotive(s) any number of vehicles can be attached although limits will be imposed platform or siding lengths.

Terminal operation: When a train arrives at a dead end terminal, the locomotive is trapped behind the train and buffer stop. The only way to release the locomotive is to remove the train and to do that, another locomotive is required. This second locomotive is attached to the other end and will be used to provide power on the return trip. When the train has been removed, the first locomotive is released and moved from platform to "low siding" and stored until used for return trip for another train. This problem can be solved if

adequate space is available the train stops a distance from the buffer stop and a cross over to a run-around track is provided. This is referred to as a "locomotive escape" as shown in Fig 3.

Terminals, lays and turnbacks: There are three ways of turning a train required to reverse it's direction at the end of a trip.

A simple change of direction when a locomotive is placed at the other end of the train or when driving cabs are available at both ends of the train (or facing both ends) can be achieved in a train on a single terminal platform with a track on either side as shown in Fig 4.

Trains can also be driven round a loop track beyond the terminal station provided there is space to build the loop. See Fig.5

Finally, a reversing or turn back track can be provided. The train deposits arriving passengers in one platform and goes forward to the siding where it changes direction and then proceeds onto a departure platform. The diagram below shows a single reversing track on the left and while a double set are shown on the right hand.(Fig. 6)

The latter is the usual option and can be seen in such places as Paris and Tokyo.

The first option in a simple reversed procedure is the most popular since it uses less space and is reasonable quick. The second option is favoured by train or light rail operations while the third is a reversing or turnback track as shown but often used also when turning at a location mid-route. The siding is provided

beyond the station between the main running lines and is connected to both as shown in Fig.7 below .

An alternative layout is where a two-track terminus has it's tracks extended beyond the station. See Fig.8

This arrangement allows the train to be stored between the peak hours or at night. A defective train can be stored there untill it can be repaired or sent back to depot. On maintenance, trains require special facilities for storage and maintenance. The layout of a maintenance facility or depot will consist of a storage yard, car/coach cleaning area, washing, inspection and light maintenance shed, heavy maintenance shop and if possible, separate locomotive shed. All this can be made easy by proper track arrangement

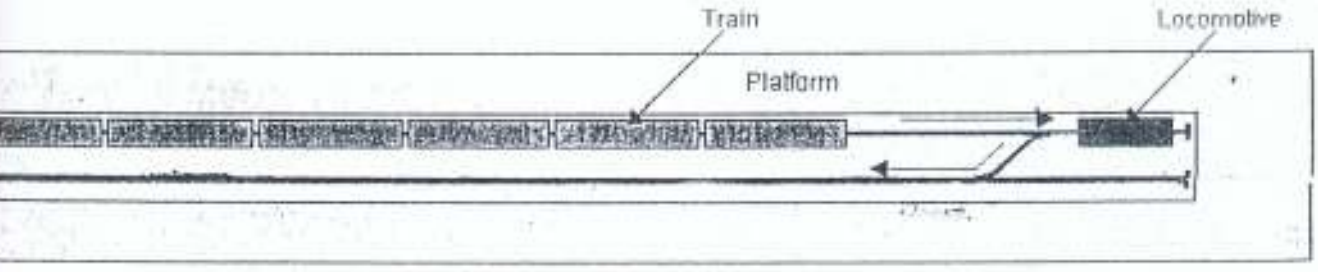


Fig 3. Diagram of terminal station showing how locomotive escape crossover is used. The train stops of the crossover and the locomotive is uncoupled. The locomotive will draw forward to the other side of the crossover and then reverse direction over the crossover to escape.

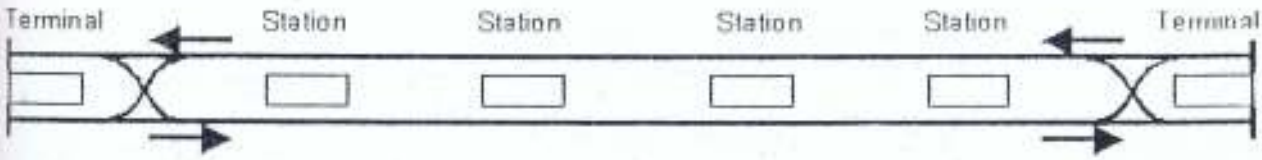


Fig 4. Diagram showing a simple end to end metro line with two platform terminals at each end.

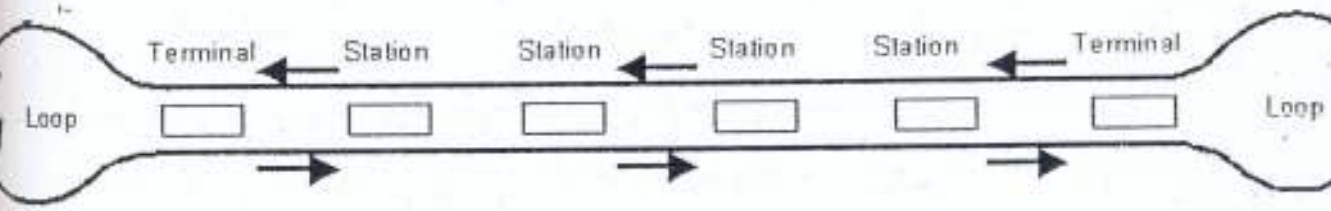


Fig 5. Diagram showing a simple metro line with terminal loops at each end

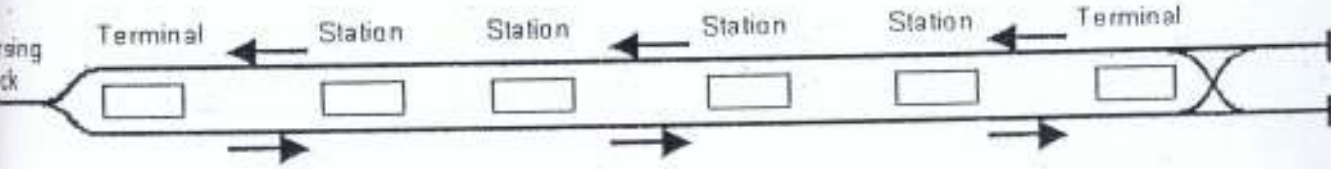


Fig 6. Diagram showing a simple metro line with a single reversing siding at one end. In the US this arrangement is referred to as a pinched loop. The other end has two reversing tracks beyond the terminus.

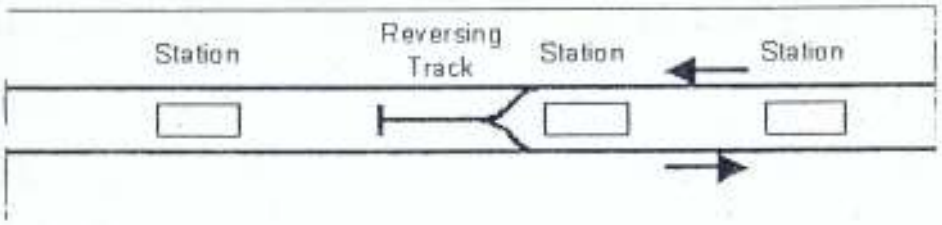


Fig 7. Diagram showing a reversing track between two running tracks. This is variously known as a centre siding, pocket track or turnback.

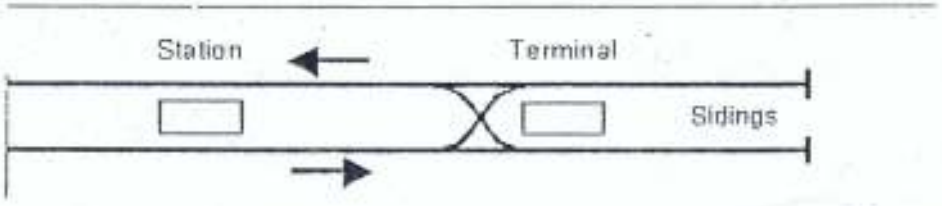


Fig 8. Diagram showing a terminal with the crossover in front of the platform and sidings behind. The sidings can be used to store trains between peak hours or at night.

3.4 TRACK AND TRACK ARRANGEMENT

Track is the base upon which the railway runs. Track design and construction is a complex and multi disciplinary engineering service involving earth works, steel work, timber and suspension system. Many different system exist throughout the world and there are many variations in their performance and maintenance. The track is a fundamental part of the railway infrastructure and represents the primary distribution between this form of kind transportation and all others in that it provides a fixed guidance system. The track is the steering base for the train and was evolved from an ancient design of vehicle guidance with origins dating from the Sumerian culture of 2000BC.

The modern version is based on the steel wheel running on a steel rail. The usual track form consists of two rails secured on sleepers so as to keep the rails at the correct distance apart(the gauge) and capable of supporting the weight of the train.

There are various types of sleepers and methods of securing rails to them. Sleepers are spaced depending on the particular railways standard requirements. Traditionally, sleepers are made of wood and are impregnated with preservative and under good conditions will last up to 25 years. Nowadays, they have been replaced by concrete and steel.

The standard form of rail used is the "flat bottom" rail. It has a wide base or "foot" and narrower top or "head". The U.K introduced a type of rail known as the "Bull head" rail which was designed with reuse in mind. It was intended that it would be turned over when the top had worn but this proved impossible because the underside also wore when it had been secured to the sleeper.

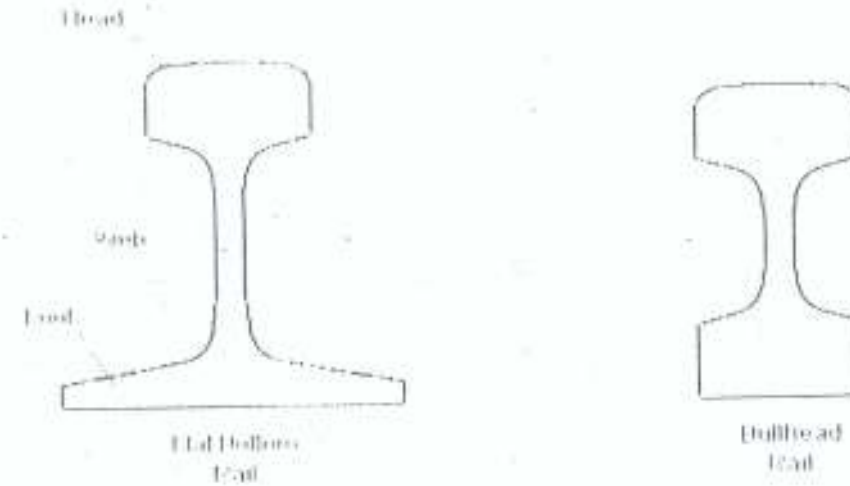


Fig 9. Two type of Rail in cross section bullhead rail is now obsolete

Tracks can be straight or curved. Curves in tracks are almost a science on their own. Careful calculations are required to ensure that curves are designed and maintained properly and that train speeds are allowed to reach a reasonable level without causing too much lateral stress on the track or inducing a derailment.

Turnouts: The word turnout is used to describe the junctions in track work where lines diverge or converge so as to avoid "points". In the railway trade, turnouts are referred to as "switch and crossing work". A turnout consist of a number of parts as follows:

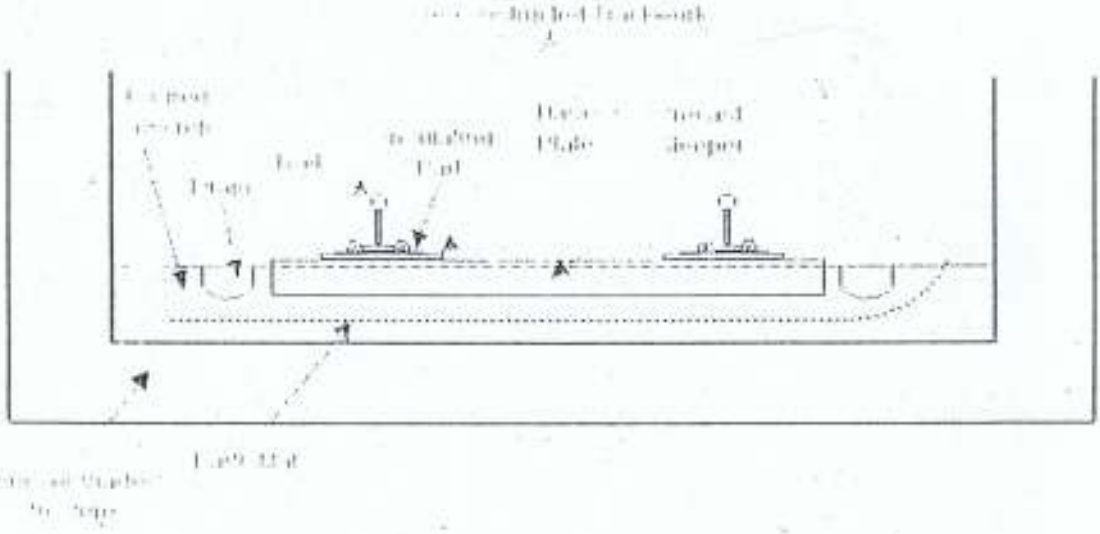


Fig 10. Diagram of modern slab track system, showing the pre-constructed track which is suspended in the tunnel (or viaduct structure) while concrete is poured around it. The earth mat is used to reduce stray current corrosion.

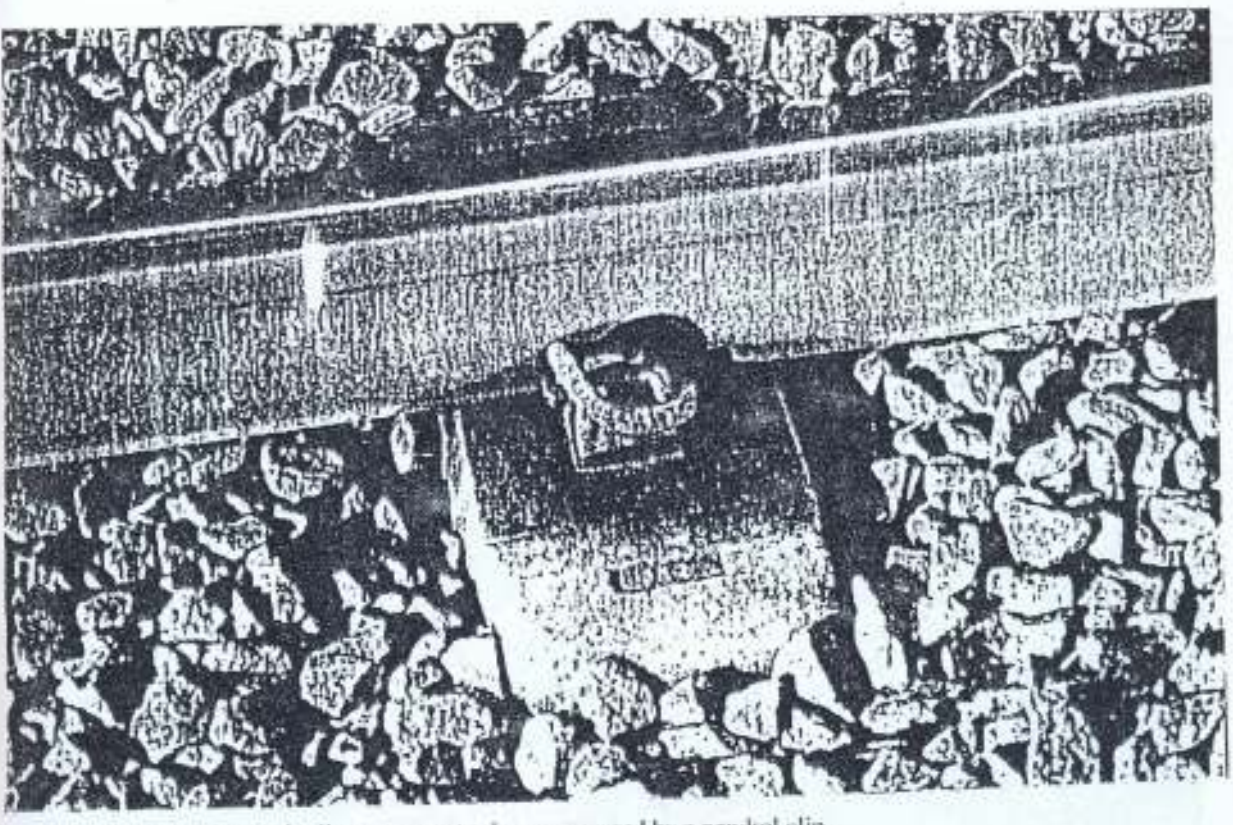


Plate 10. Flat bottomed rail on a concrete sleeper, secured by a pandrol clip

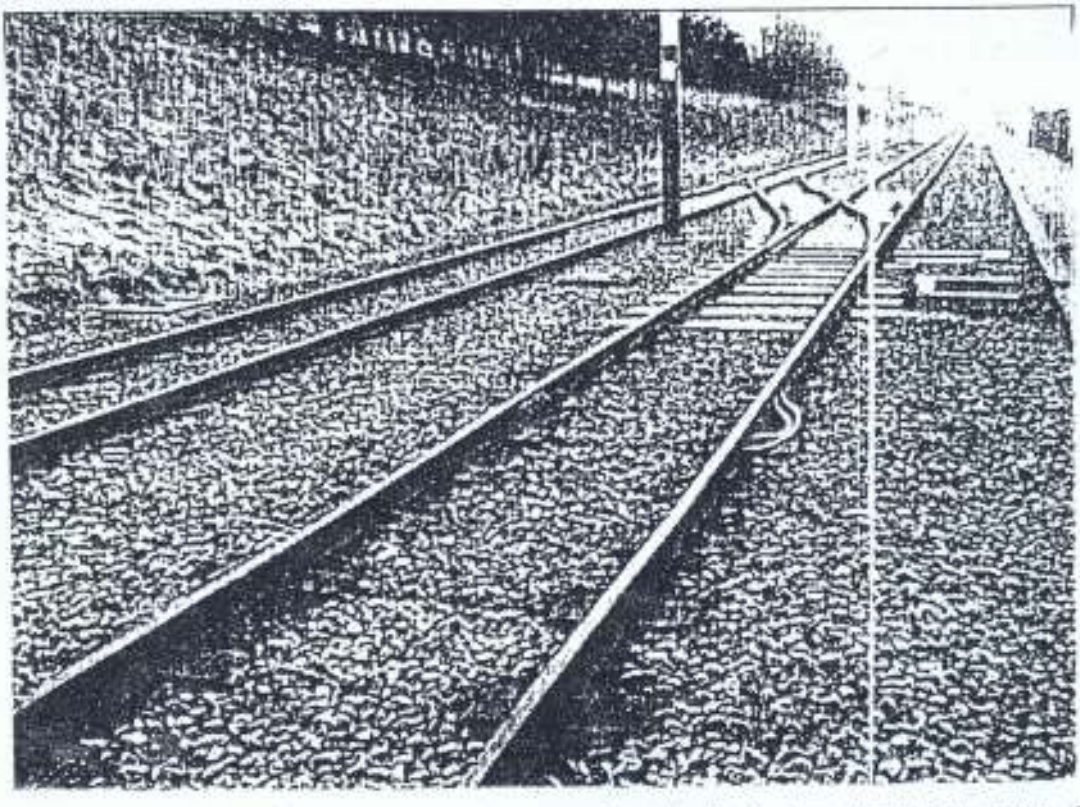


Plate 11. Mixed concrete and wooden sleepers used on the Sheffied supertram LRT system. The concrete sleepers are of the twin block type. Note that the steel bar connecting the two blocks is normally covered by the ballast. Wooden sleepers are used for the crossover because the timber is easy to cut to the required size.

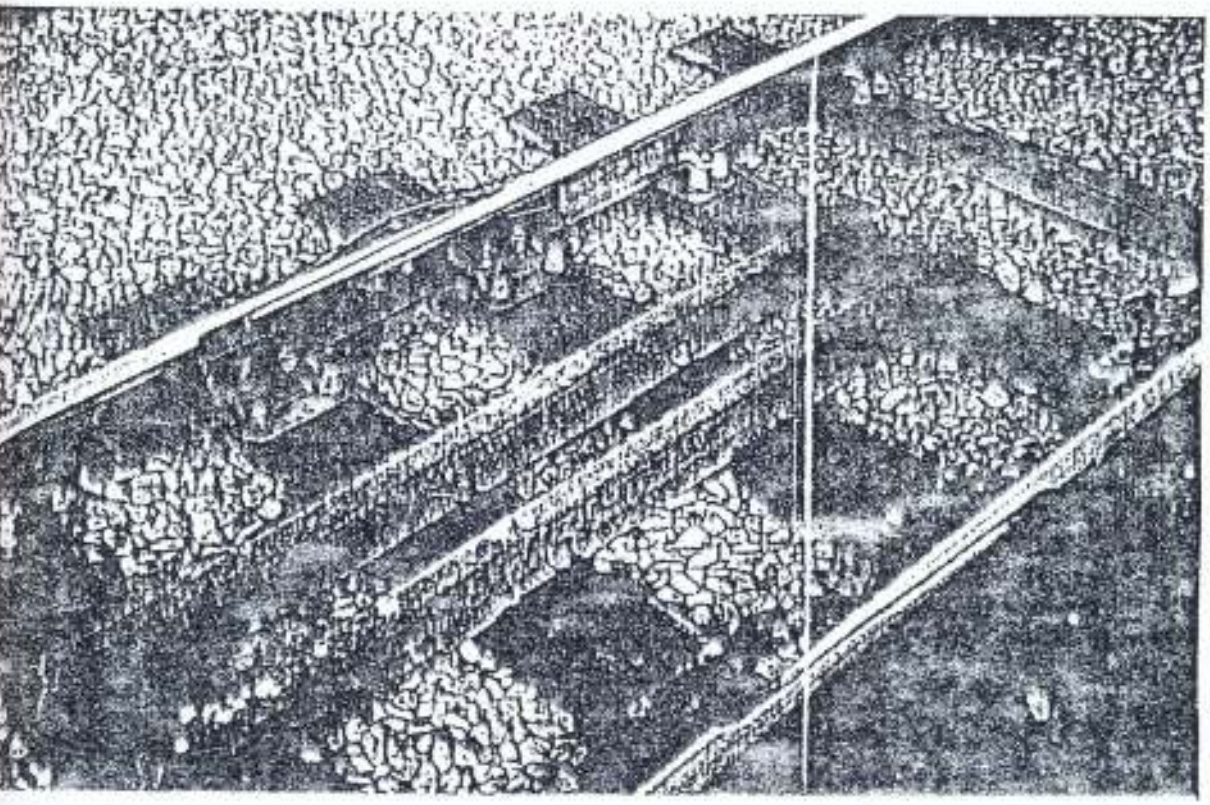


Plate 12. Expansion joints are provided in running rails to allow for temperature changes. The additional rails in the centre of the track are bolted to the sleepers to prevent the sleepers being shifted by rail expansion.

The moving part of the turnout is the switch "blade" or "point", one for each route. The two blades are fixed to each other by a tie bar to ensure that when one is against its stock rail, the other is fully clear and will provide room for the wheel flange to pass through cleanly. Either side of the crossing area, wing and checkrails are provided to assist the guidance of the wheelsets through the crossing. The crossing can be cast or fabricated. A crossing is sometimes referred to as a "frog"

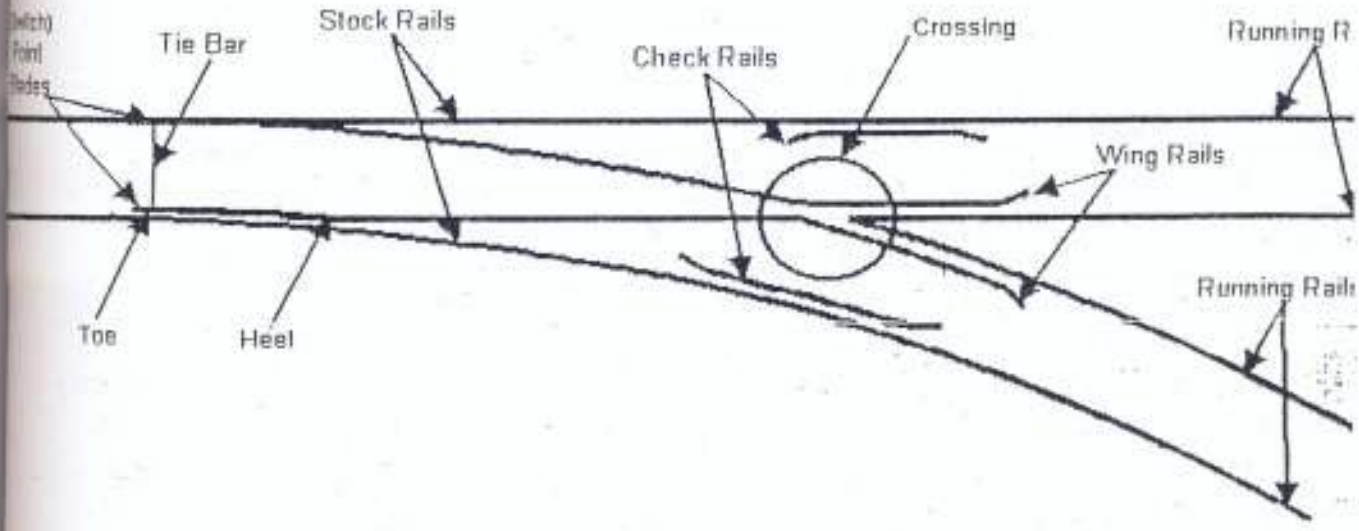


Fig 11. Diagram of simple turnout showing the names of the principal parts.

Types of turnouts

Fig 12. Left Hand Turnout

Fig 13. Y Turnout

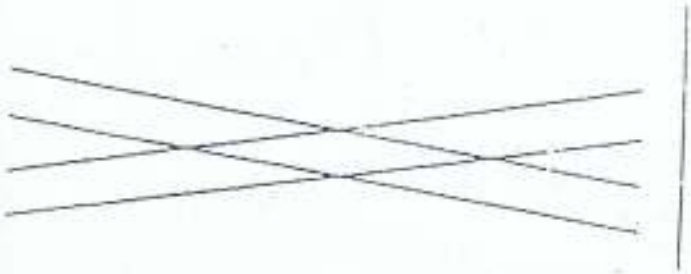


Fig 14. Diamond Crossing

Fig 15. 3-Way Turnout.

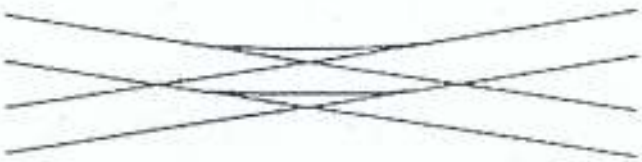


Fig 16. Single slip

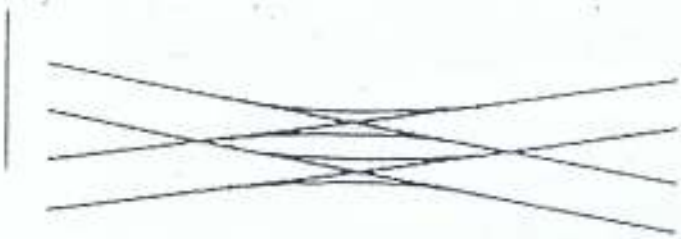


Fig 17. Double slip

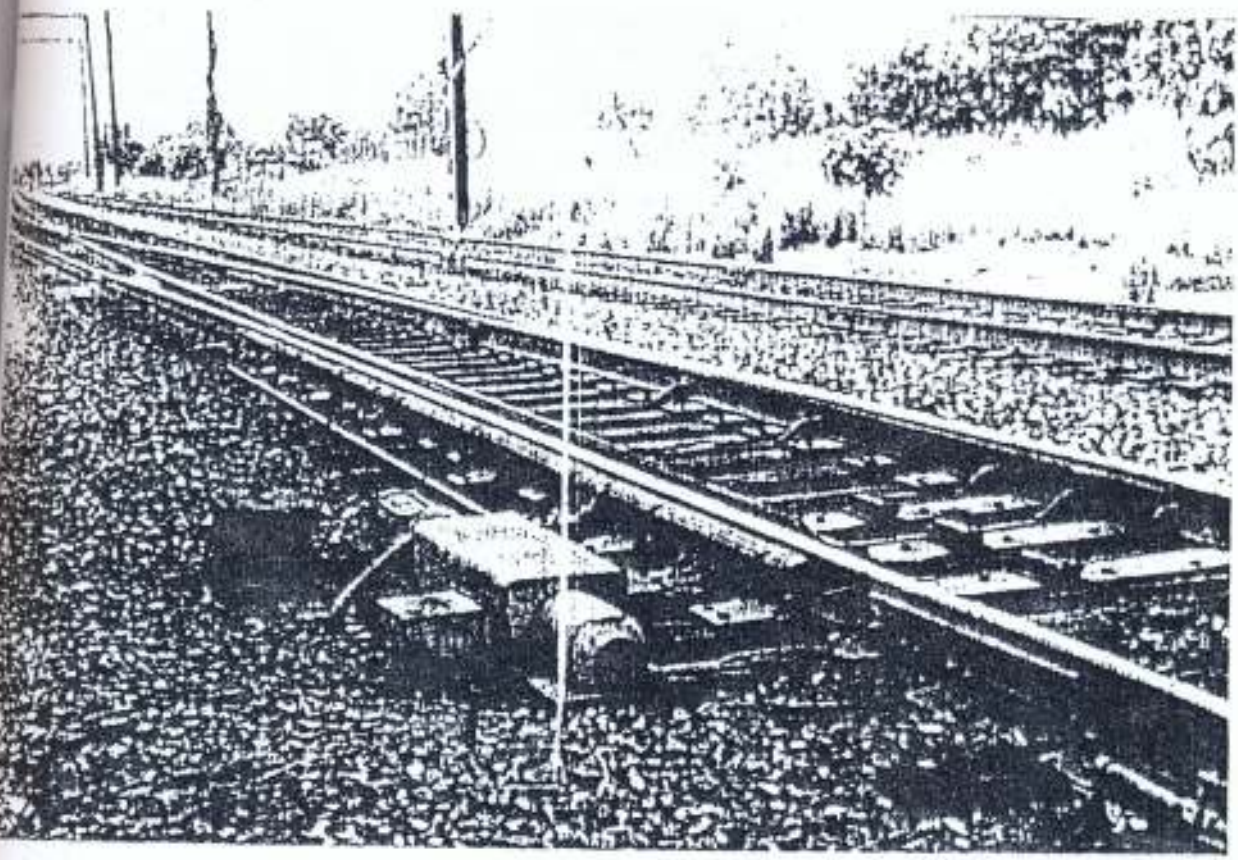


Plate 13. UIS turnout showing the electro-pneumatic motor to operate the switch blades and the point heater tube alongside the stock rail. Heaters are invaluable in cold weather condition and are widely used. Turnout motors are usually electric but electro-pneumatic motors are seen in the UIS are standard equipment for London Underground

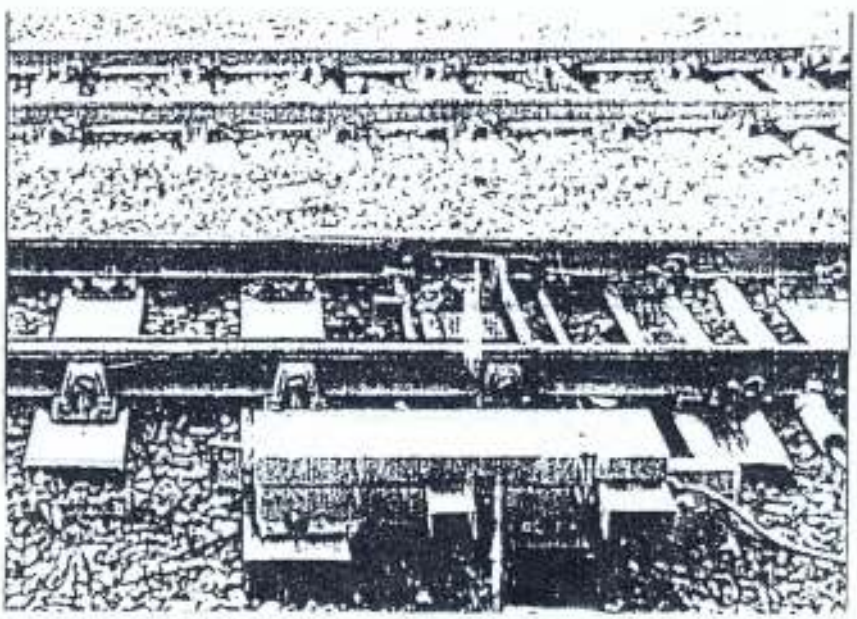


Plate 14. A point machine located adjacent to the switch blades it operates most point machines are electrically operated but London underground has a large number of air operated machine

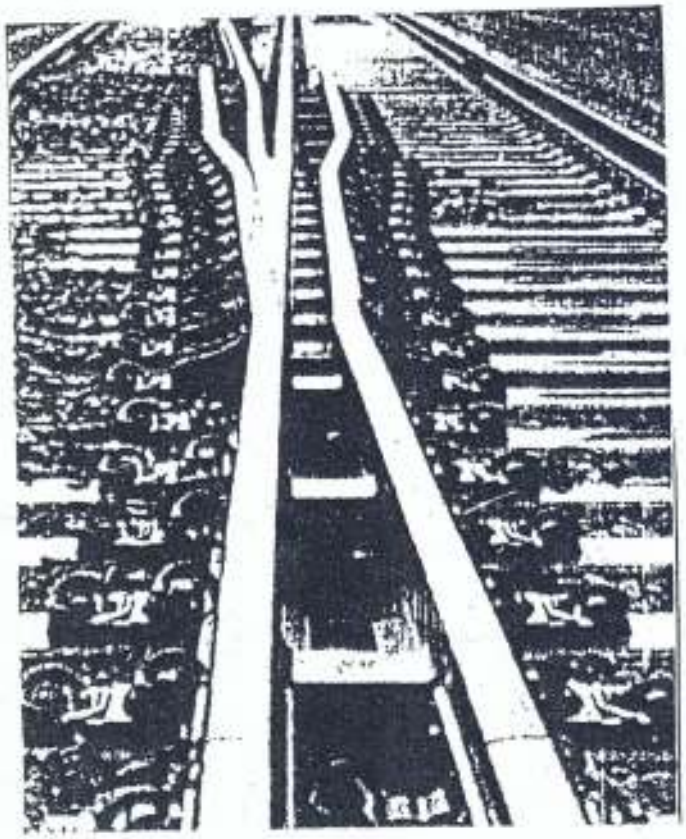


Plate 15. A switched crossing

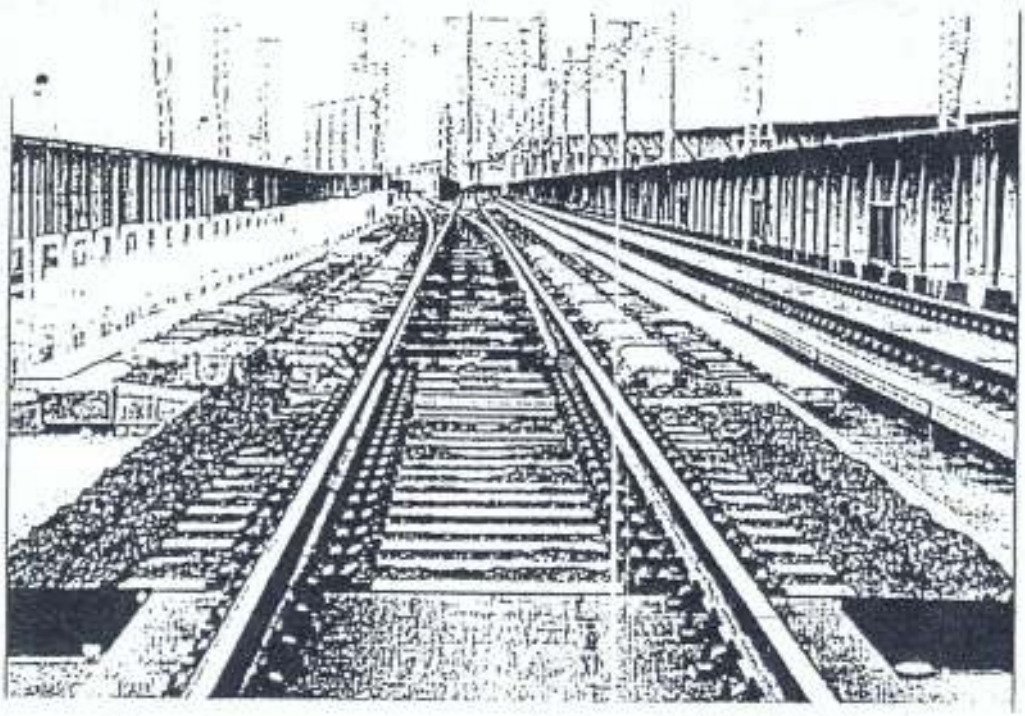


Plate 16. High speed turnout as used on Japanese Shinkasen " Bullet Trains" lines. There are seven point machines to move the blade rails. The turnout is designed for 160 km/h running.

The standard track gauge distance between two rails is 4ft 8in or 1435(mm) but many others are used worldwide. The gauge is often intentionally widened slightly on curved tracks.

Table1. Railway gauge Around the World

Broad gauge (Spain):	1674mm	5' 5 9 / 10 th "
Broad gauge(Portugal):	1665mm	5' 5 11/20th"
Broad gauge (Ireland):	1600mm	5' 3"
Broad gauge (Finland):	1524mm	5" exactly
Broad gauge (Former USSR):	1520mm	5'
Standard gauge:	1435mm	4' 8 1/2"
Narrow gauge (Cape gauge) :	1067mm	3' 6"
Narrow gauge (meter gauge):	1000mm	3' 3 37/100"
Narrow gauge (US narrow):	914mm	3' 0"

3.5 TRAIN MAINTENANCE.

An essential ingredient in the successful running of a railway is a well maintained system. Railways are made up of complex mechanical system and there are hundreds of moving parts. Good maintenance ensures a reliable railway service. A railway will not survive for long as a viable operation if it is allowed to deteriorate because of lack of maintenance. Although maintenance is expensive, it will become more expensive to replace failing equipment because maintenance has been neglected.

3.5.1 MAINTENANCE FACILITIES.

Trains require special facilities for storage and maintenance. The layout of a maintenance facility will consist of a storage yard, a car cleaning area, an inspection and light maintenance shed, a heavy maintenance shed, and washing area. Access to the underneath of the train is essential and so design must allow reasonable working conditions and safety. To achieve this, pits should be provided between the rails of the maintenance track or on either side of the track. Another common method was to lift the car body by use of an overhead crane. Each vehicle to be lifted has to be separated from the train and dealt with separately.

The use of maintenance programs can also help ensure smooth running of a railway system. Rolling stock maintenance can be programmed one of the following three ways; by mileage, by time or by condition monitoring.

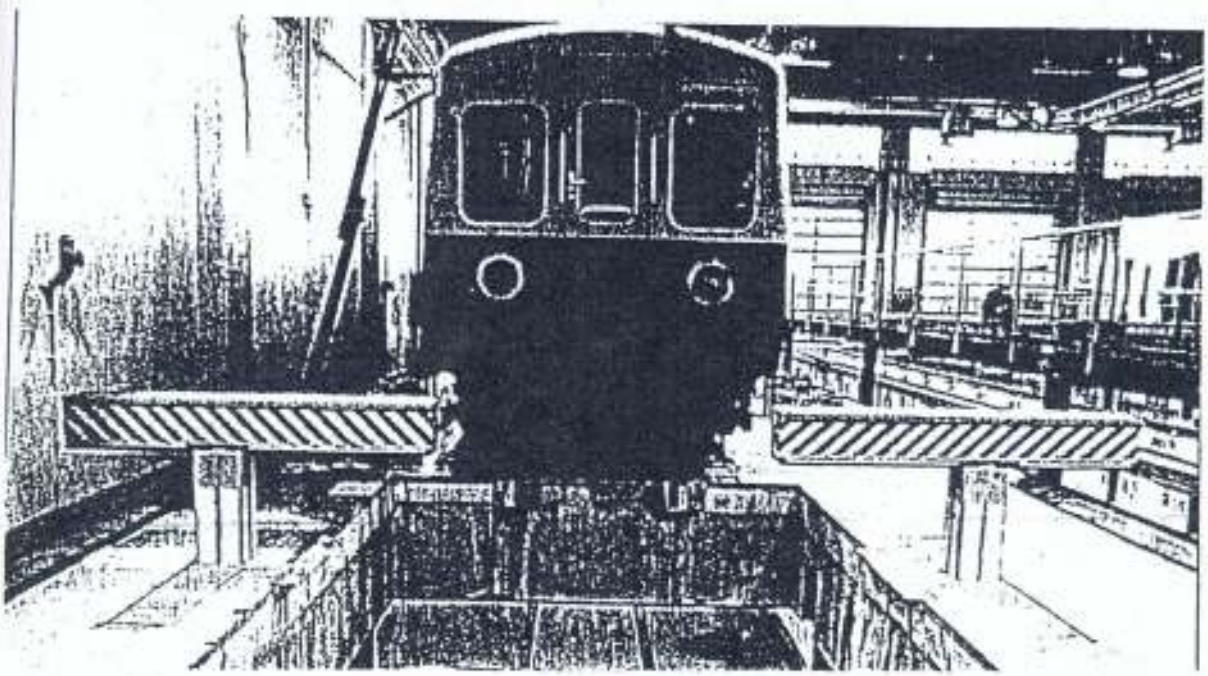


Plate 17 A bogie drop table being lowered in a train maintenance depot. The bogie workshop is in a basement area below the main floor of the depot.

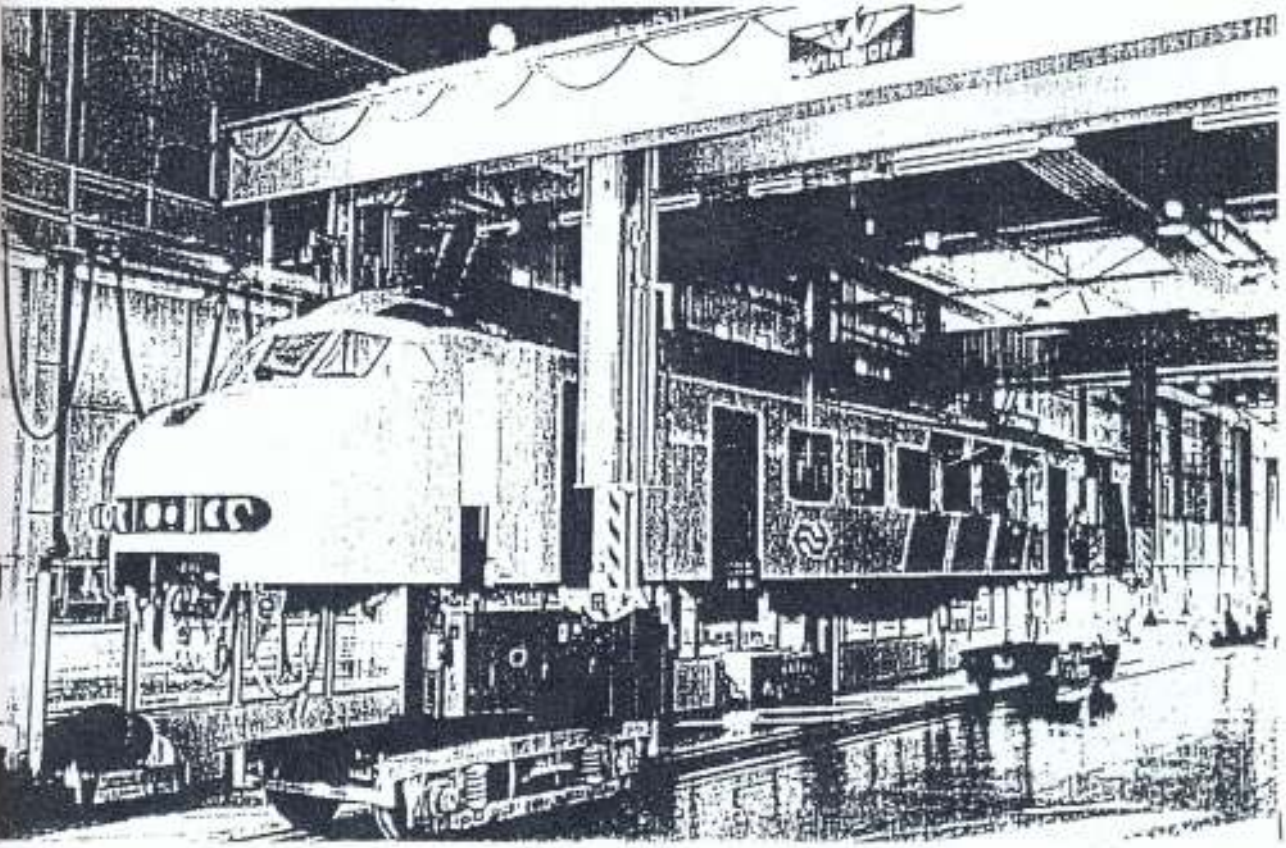


Plate 18. A traditional method where the car body is raised by a pair of overhead cranes and then lowered onto stands. The body can be removed to other places in the workshop or stands provided where it is lifted.

Plate 19. London underground train (1995 Tube stock) raised on lifting jacks in Golders Green Depot. The pit below (an old design dating from 1906) is not deep enough to allow a comfortable working position. The jacks raise the train as a set (a 7-car unit) to give more clearance. Four jacks are required for each car and they are synchronised to operate from one control position.

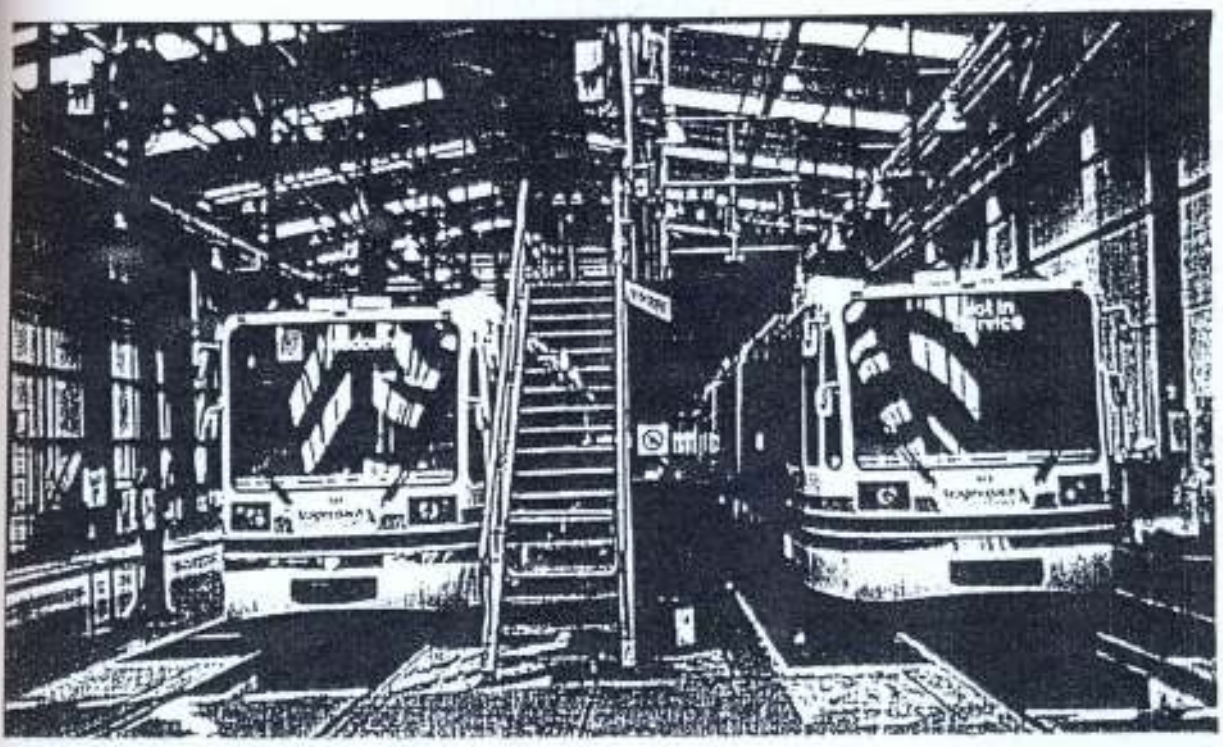


Plate 20. Interior of maintenance depot of the Sheffield (UK) Supertram. Note that overhead walkways are provided to give access to the electrical equipment mounted on the roof. Pits are also provided for under car access.

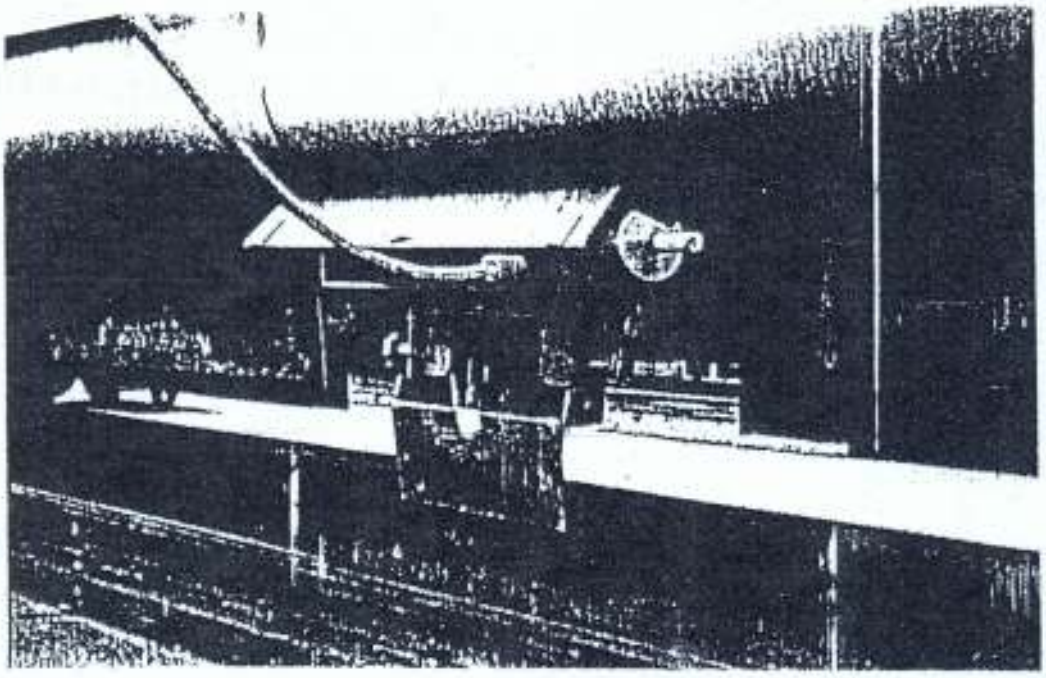


Plate 21. Trains require a shore supply when inside an inspection shop. This allows auxiliary equipment to function and batteries to be kept charged. A shore supply can be through a roof suspended trolley or " stinger" which is plugged into the side of the train as shown here. A knife switch is provided to isolate the shore supply from the third rail collector shoes.

CHAPTER FOUR

4.0 CASE STUDIES

This research will focus on both domestic and international railway stations to ascertain existing problems and prefer solutions for varying problems in varying situations. These case studies will help to ensure that design flaws and shortcoming are avoided and possible solutions incorporated in the design.

4.1 IDDO TERMINUS, LAGOS, NIGERIA.

The Iddo terminus is sited in the hub of the city, along Carter Bridge and Oyingbo road, directly opposite Iddo motor park. It was commissioned in 1901. It has perforated blocks and flower pots engraved with the number 1955 which is the year the Nigerian Railway Cooperation was officially established.

4.11 FACILITIES

The station serves the surface rail (passengers and freight) with provisions made for goods with warehouses and off-loading bays. Other facilities include covered platforms 1st class waiting lounge and numbered exists to direct human traffic.

4.12 STRUCTURE

The station has a large entrance hall with a centralized ticket booking area, as well as staff offices on the ground and first floors with baggage check area.

4.13 MERIT

Easy access to other modes of transport.

Adequate circulation around the building.

Clearly defined ingress/egress situation.

Adequate parking space for public and staff.

4.14 DEMERIT

No waiting lounge for economy class.

Inadequate concessions.

Outdated and poorly maintained facilities.

Unorganised commercial activities within premises.

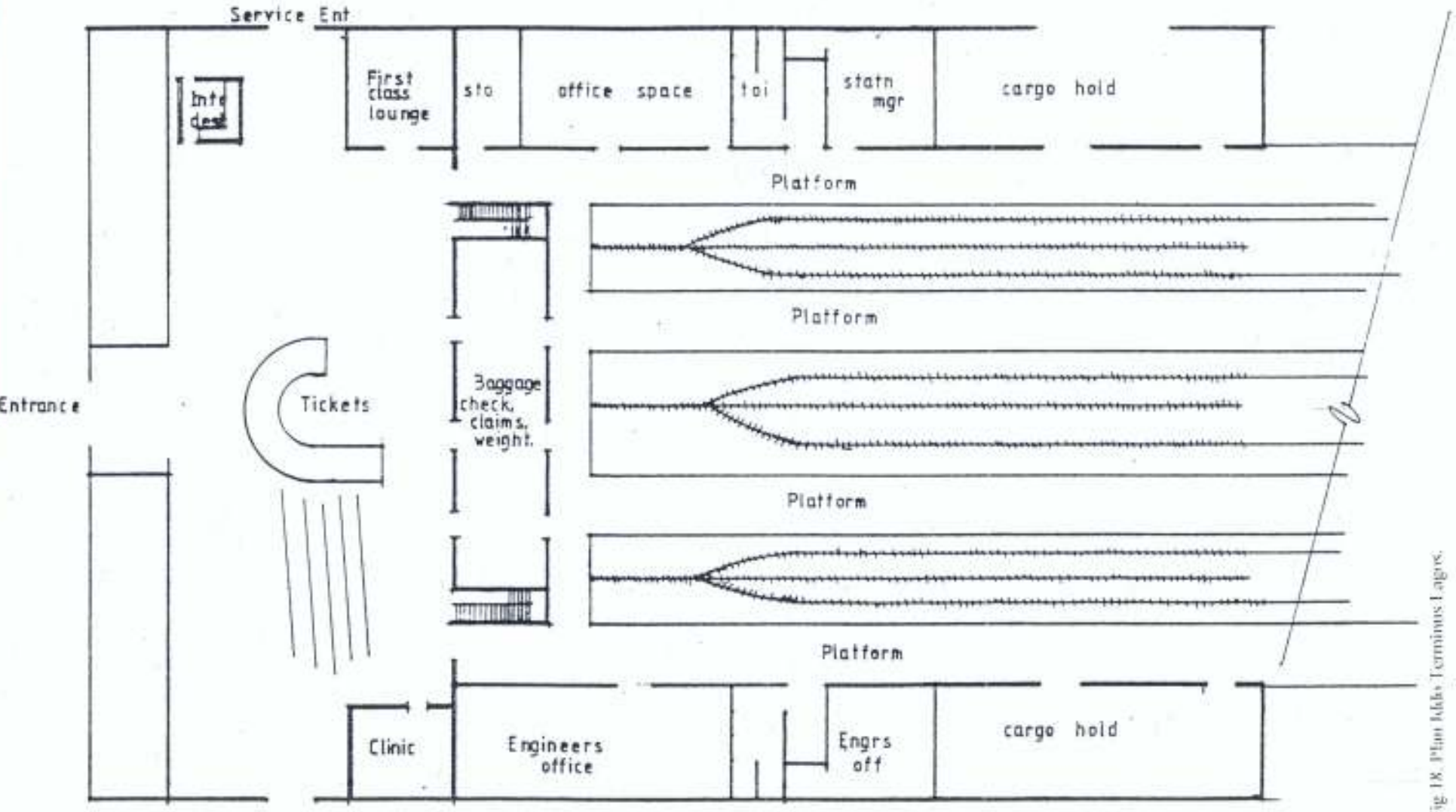


Fig 18 Plan Addis Terminus Lagos.

4.2 HAUPT BAHN HOFF, FRANKFURT, GERMANY.

The Haupt Bahn Hoff is sited in the central of Frankfurt city and is the main or central station. It was built in the mid 1911 when the railways were first developed in Germany.

4.21 FACILITIES

The station serves both the surface and underground railway system in Frankfurt. Consisting of platform extending into the building, thereby proving shelter for commuters and concessions like shops have also been provided.

4.22 STRUCTURE

The structure is made up of 5vaults, a 25-meter high concourse spanning a length of about 200 meter.

The underground consist of high walls spanning the width of the basement floor. The station has undergone a number of renovations over the years.

4.23 MERIT

Easy access for pedestrian arriving or departing.

Fully incorporates facilities for buses, the main form of transport.

Fully modernized with state of the art facilities.

Adequate provision of passenger facilities.

Adequate circulation with the station.

4.24 DEMERIT

Inadequate public parking space.

Inadequate provision for luggage storage.

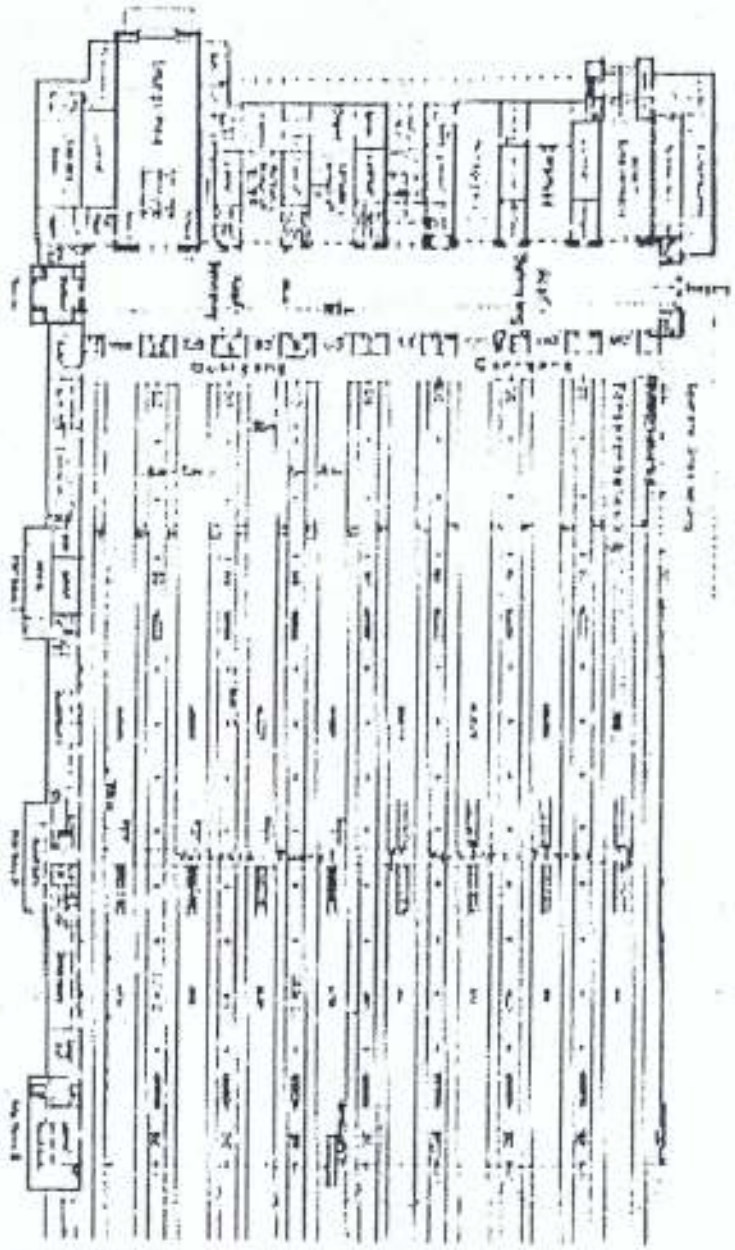


Fig 19. Haupt Bahnhoff (Plan)

4.3 TGV LYON RAILWAY TERMINUS (FRANCE)

The station was built in 1989 to contribute to the movement of a unified Europe and the challenges of the new millenium. The station, an epitome of the 3rd age of railways which Europe is carrying the banner for, uses high velocity (alto velocita) and tilting body trains (Pendolito).

4.31 FACILITIES

The station serves both the surface and underground rail system and is fully modernized.

4.32 STRUCTURE

The structure comprises of the train level, mezzaine floor, bus/car park and link to airport.

4.33 MERIT

Easy access to other modes of transport.

Adequate provision for concessions.

Airy and spacious environment for commuters and staff.

4.34 DEMERIT

Poorly defined ingress/egress situation.

Inaccessible to pedestrian traffic.

Commuters have to cross tracks to get from waiting lounge to platforms.

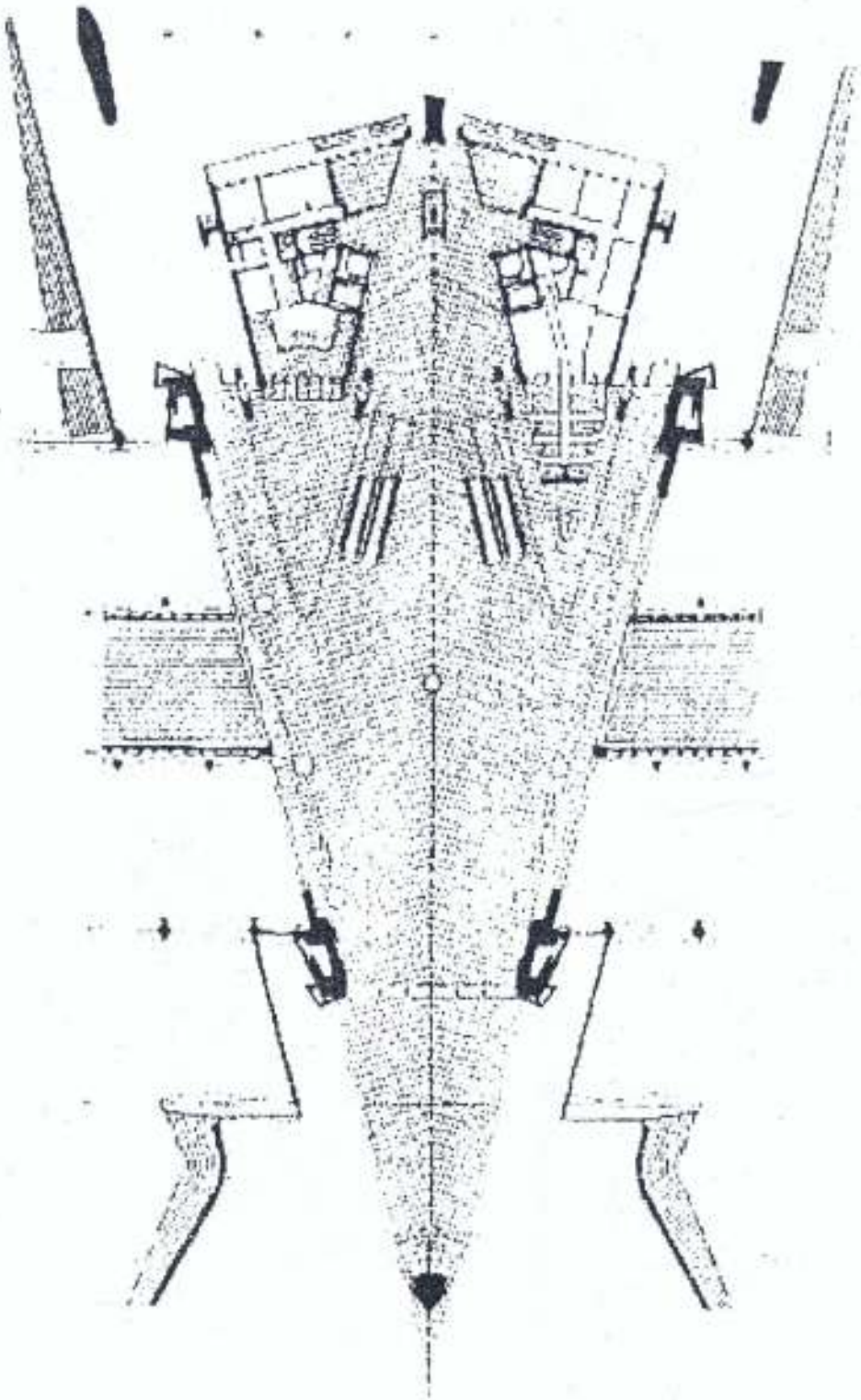


Fig 21. TGV (Plan)

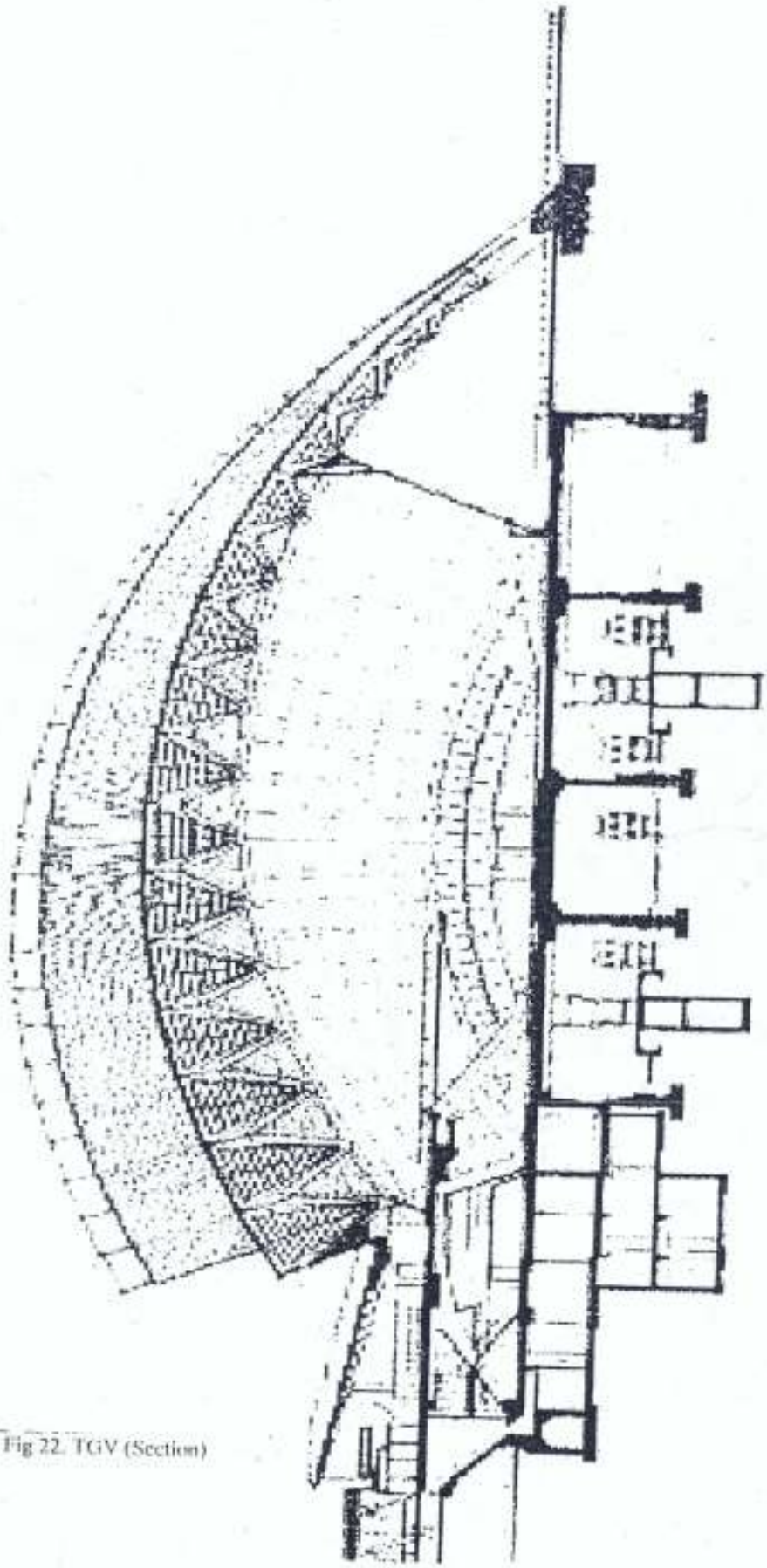


Fig 22. TGV (Section)

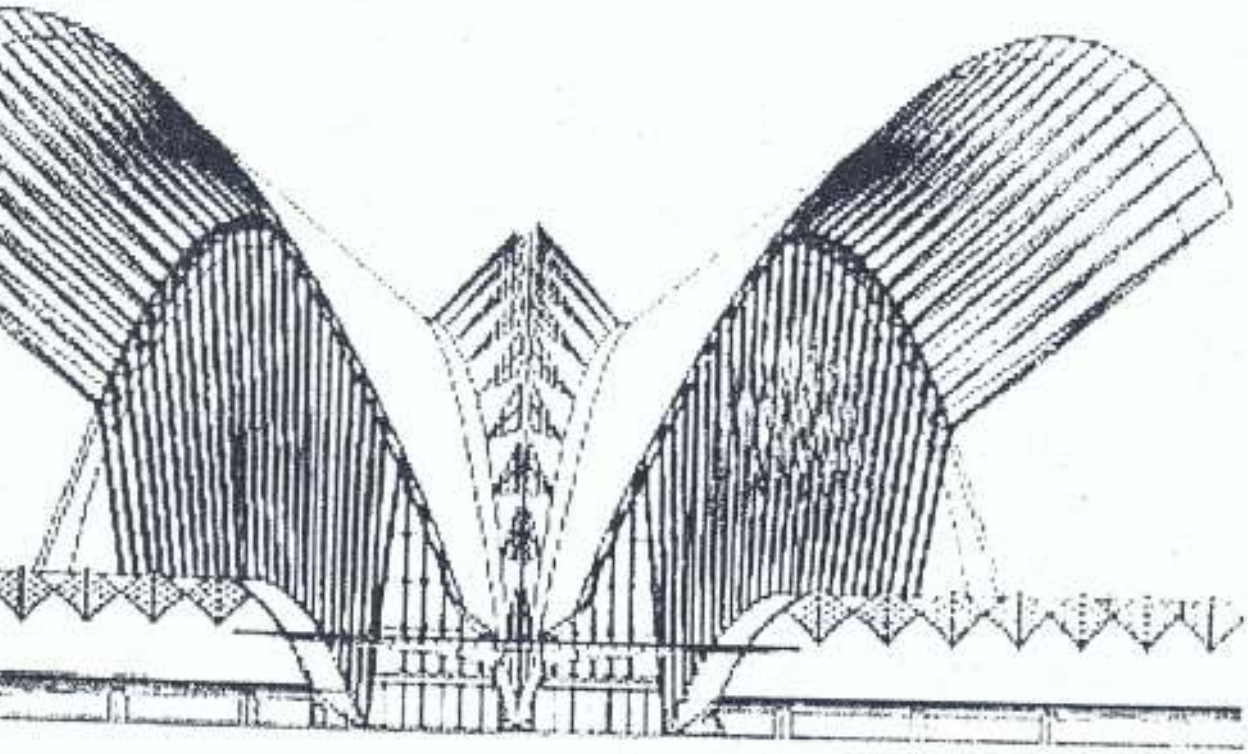


Fig 23. TGV (Approach)

CHAPTER FIVE

5.1 THE PROJECT TOWN

Rivers state was created in January 1976 by General Muritala Mohammed the head of state and the capital is P.Hc.

Onne River state is located on latitude 04 ^{0}46'N of the equator and longitude 07^{0}10'E of the Greenwich meridian with an altitude of 10m above sea level. It is a humid zone and is located in the south-southern part of Nigeria.

5.2 CLIMATIC CONDITIONS: Onne is located in the humid zone with an annual rainfall of 2400mm during the months of March to November. The average temperature ranges from 27^{0}C in (February – April) and 25^{0}C (July – August).

Onne has a relative humidity of 78% with 6hrs sunshine in February and 89% with 2 hrs sunshine from July – August where it is most humid.

5.3 SOILS: Onne has loamy soil with P.H value of 4.0 – 4.6 acidic, low in Nitrogen and high in phosphorous. The top soil is 65% sand, 15% silt, 18% clay, 1.04% organic carbon, a porosity of 49%, bulk density of 1.32g/cm^{3} with total Nitrogen content of 0.11% and an effective cat ion capacity of 2.0m equivalent 100g, Calcium – 0.26m equivalent 100g, Magnesium –0.9, Phosphorous –0.02, Manganese – 0.02 , Aluminium – 1.83 and Potassium 26mg/kg.

5.4 THE PEOPLE: 60% of the population consist of rural dwellers, mostly small scale farmers engaged in crop production. They practice shifting cultivation which involves a fallow system of 2-6 years. The major crops are yam, cassava, maize, telfaria , melon and pepper. Majority of the rest 40% (urban dwellers) work with the oil industry.

5.5 THE SITE : The project site is shaped like a trapezium with a total square area of 205344m^2. The site is located between the lighter berth terminal and PRODECO residential estate and easily accessible to or from the ports.

5.6 DRAINAGE / TOPOGRAPHY: From the site analysis carried out, it was observed that the site slopes gently in the west ward axis of the site, thus drainage is towards that direction.

5.7 EXISTING SERVICES : The project town is connected to the National Electric Power Authority (NEPA) grid hence connection to the site will not be a problem.

Water mains are not connected to the site presently but the ambient sites are, therefore connection to the site will not be a problem.

CHAPTER SIX

THE PROPOSED DESIGN

The aim of this project is to revive and encourage the use of rail roads as a ior link between the coastal region and the hinterland and encourage the ective circulation of goods, people and services from place to place in an ort to promote development.

DESIGN PROCESS.

e planning and execution of a building project puts into consideration a nber of factors which form the basis for the successful execution of the ject. These include ;

(1) Brief and brief development.

(2) Space analysis or schedule of accommodation.

(3) Access and parking.

(4) The site and site inventory.

(5) Landscaping.

(6) Building materials and design.

BRIEF AND BRIEF DEVELOPMENT

e researcher employed the following methods in order to arrive at a brief.

a. CASE STUDIES: Use of existing railway terminuses as a yardstick.

b. LITERATURE: From books and journals on the railway.

c. INTERVIEWS: Discussions with officials and staff of Nigerian Railway Corporation.

2.1 THE BRIEF : An ideal railway terminus can be broken down into the following;

1. Public section.
2. Administrative section.
3. Concessions.
4. Security post.
5. Maintenance.

2.2 BRIEF DEVELOPMENT

) Public serves:

i. Entrance hall - Telephone
Tickets booths
Baggage weight/check
Information desk
Lost but found
Valuable check in desk

ii. Arrivals - Arrival hall
Baggage claim
Visitors lounge

iii. Platform

iv. Departure lounges – Intra states – First class lounge

Economy class lounge

Inter states

v. Conveniences

vi. Cargo hold

(b) Concessions:- Health centre /clinic

Restaurants

Fast foods

Publication vendors

Conveniences

Let able spaces (office and commercial)

) Administrative section:

i. Senior officers - P.R.O

Station manager

Stationmaster

Station yard supervisor

Procurement / stores office

Accountant

ii. Offices Accounts , Reception, Traffic/signal.

Corporate. Affairs, Conference room.

Secretaries

Clerks

Staff common room.

Personnel.

iii. Staff canteen - Kitchen, Dinning, Store, Delivery, cloakroom.

Maintenance:

i. Engineers Office

ii. Workshop - Washing area

Light Maintenance

Heavy Maintenance

Storage facilities

iii. Cloak room

iv. Conveniences

ORGANIZATION OF ACCOMODATION

A schedule of accommodation will be required to calculate the/an proximate flow area for individual spaces to be allocated out. This will be iewed in relationship to existing conditions or parallel conditions in similar anisations.

ecial Accommodations:

e need to establish special requirements may arise. These are requirements t were overlooked in other designs by design default but which the ent/researcher thinks necessary.

nveniences:

e decision on what type of system to adopt will depend on circulation of h public and staff. This will also determine the character of the building.

king spaces:

e need to provide accommodation for cars of visitors and staff cannot be r-emphasized. Although management and local conditions will also ermine parking space allocation.

THE BUILDING

Railway stations are the place where trains stop to collect and deboard sengers, and since it is the first point of contact, it should be regarded as the op window" for the services provided. It should therefore be well designed, asing to the eye, comfortable and convenient for the visitor or commuter as ll as efficient in layout and operation. The station should be properly naged, maintained and operated safely.

.1 EXTERIOR DESIGN PHILOSOPHY

Every public building should reflect an atmosphere of restrained dignity, urity, permanence , beauty and strength. It should have a friendly yet iness like appearance.

The structure should be constructed of non - combustible materials such as nforced masonry to improve resistance to man made or natural disaster. s will also help resist heavy vibrations to an extent while other inputs to rease building safety and security can be provided at little additional cost.

.2 INTERIOR DESIGN

The basic requirements for a functional floor plan in any public building is ulation and circulation control. For efficiency and safety, outbound and in nd commuters will enter the building through separate entrances into a trolled lobby (Hall).

.3 SPACE ALLOCATION

Public facilities should be as flexible as possible. This means it should be ptable to a variety of occupancies while it should also be able to ommodate the need for future expansion.

DESIGN CONCEPT

Concepts are ideas that integrate various elements into whole. The ncept of this design can be said to be ideal that is, looking at universal lues. This suggests that the architect looks into the problem or a similar oblem to discover appropriate concept. These are concepts that the chitect brings to the problem.

.4 EXTERNAL ARCHITECTURAL CHARACTERISTICS

Landscape: The structure should be easily accessible with proper dscaping taken into consideration; site drainage, tree and shrub planting for nd break and shade, noise absorption and prevent erosion as well as for thetics.

.5 INTERNAL ARCHITECTURAL CHARACTERISTICS

The design of any space should have human comfort as its priority. Thus the rmal comfort of the buildings occupants must be considered. This has to do h ventilation which can be natural or artificial. Due to the inconsistency of ctric power in Nigeria emphasis was on natural ventilation with the use of rtyards and large openings in the walls.

CHAPTER SEVEN

7.0 RECOMMENDATION AND CONCLUSION

A village is the habitat of a crowd that has to buy food by selling something else in exchange for it, the crowd having a corporate social life". Says Toynbee. " It was the division of class not work that separated the city from the village" countered Blumenfeld.

Cities are made up essentially of building and transport, mass and space, where the form or shape depends on the points, lines or planes of contact between mass and space. City structures may be of mono centric, multi-centric or homogenous nature and land use types are central area, industrial area, residential area, open and public areas.

There is often a separation of residence from workplace. The central area is characterized by tertiary industries (offices). The economics of location is largely identical with economics of transport.says Kelvin

Merlin maintains that while transport systems determine the urban structure, they also determine the way of life, which was the reason for building cities. The public should be made aware of the environmental standards for any city and transport network.

7.1 :EXPECTED CONTRIBUTIONS

Advantages of rail transport over motor vehicles in city transport environment.

Accidents: The number of persons killed or injured in road has been on the increase over the years especially in urban areas. Smeed and Jacobs found that

fatalities (F) were a function of the number of vehicles (MV) registered per 1000 inhabitants(P)[3]

$F = K (MV)^{1/3} P^{2/3}$

Accident rate should be used as a city transport safety measure (i.e Accident/inhabitants) says Beeker

Noise: Increase in noise level from streets motor vehicles has caused an increase in noise level. Thus motor vehicles traffic volume would mean a reduction in motor vehicles, and parking capacity.

Air pollution: Carbon monoxide (CO_2) concentration increase with traffic volume and meteorological conditions (wind) while railway air pollution is negligible says Intercity transport.

Road capacity: There is a connection between traffic volume (N)- vehicles /hour and speed(V) km/h multiplied by traffic density (T) vehicle/km says Intercity transport. Hence factors such as wearing areas, ideal geometrical conditions (lane width) queue conditions make it necessary to reduce number of motor ways.

7.12 OTHER EXPECTED CONTRIBUTION TO THE SOCIETY.

One of the major problems in Nigeria today is the high rate of unemployment. With improved rail transport system more jobs opportunities can be created. There are numerous areas in the railway system where job openings are guaranteed. Such job opportunity may also be visible in the informal sector of the economy. The central concern of the railway system is to ensure availability of cargo to lift or distribute over space and the principal source of cargo is the area of cargo, commence and manufacturing . The railway system can assist government in the generation and realization of revenue which accumulate to large sums.

7.2 CONCLUSION

Public transport allows everyone to travel or move to work, shops , health service centers, school, leisure and other social facilities at an affordable price. It is an economical means of transport and its importance to natural well being and environmental protection cannot be over emphasized. An effective and efficient transport system will also encourage economic expansion which otherwise may not be possible to achieve in Onne. It will provide access to remote areas and encourage the development of key institution away from the city center.

Policies for the future development of public transport service must take full account of this over all perspective and be sensitive to the wide economic and

social needs of the local community. It should take into account the benefits of various types of public transport system, thus an integrated approach is needed. There is a need to provide adequate interchange between the public transport systems.

The most favored transport system must be planned within the context of a coherent transportation strategy taking account of traffic patterns, passenger demands, land use pattern as well as environmental and economic factors. The availability of public transport is not an end in itself but a means to an end: economic growth and stability.

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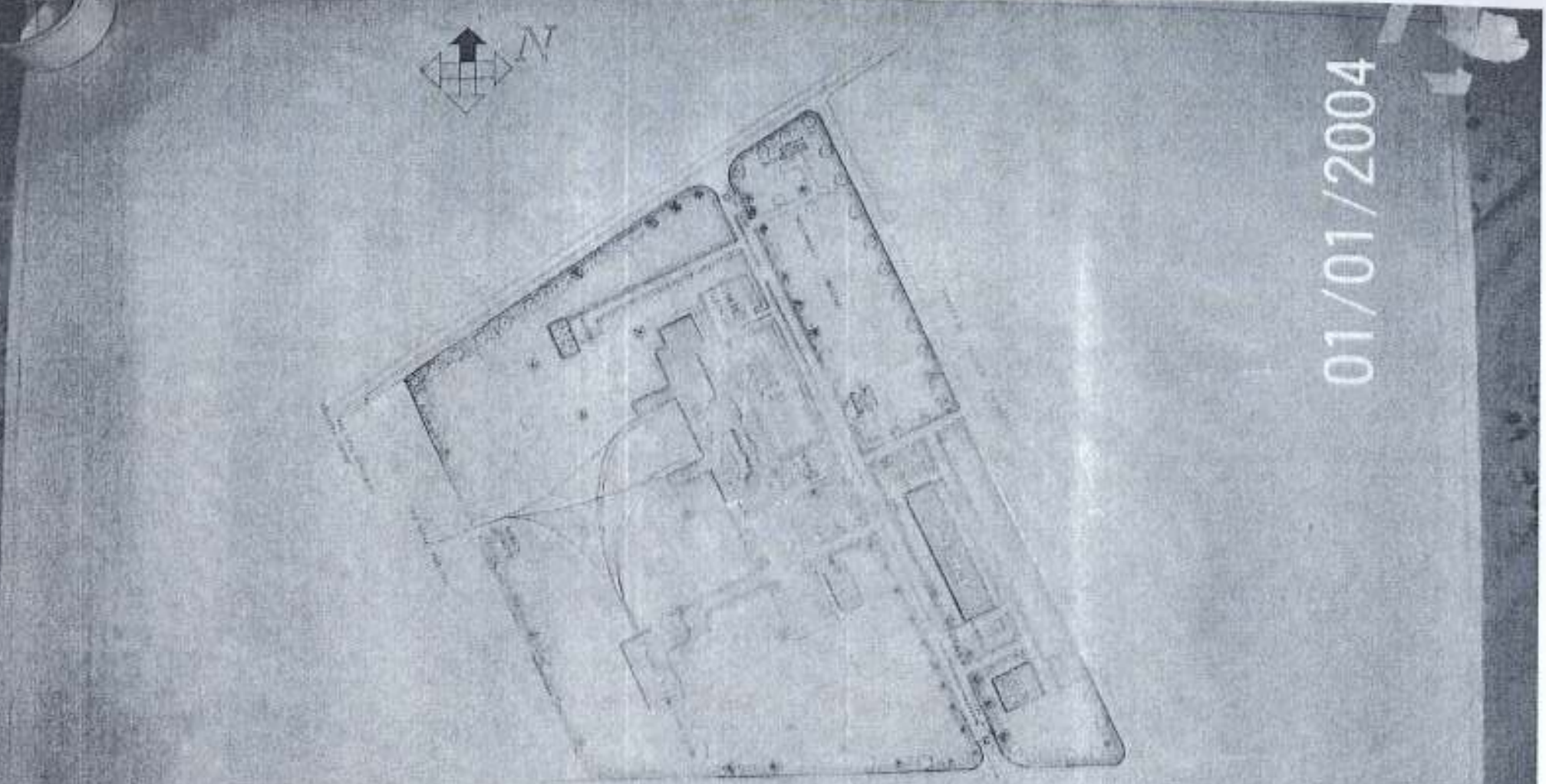
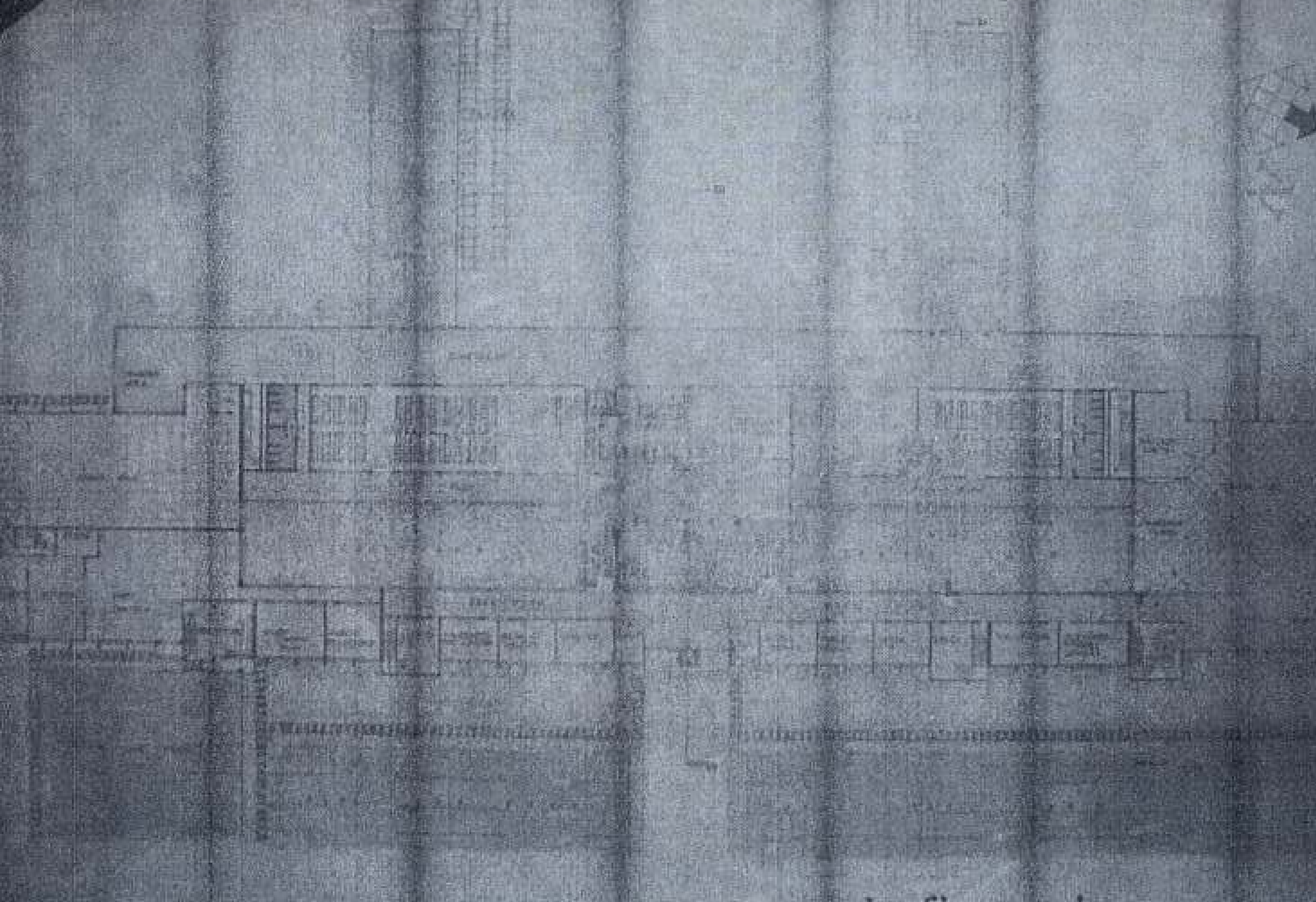


site plan

RAILWAY TERMINUS ONNE,RIVERS STATE

Effective circulation in railway terminuses



ground floor plan

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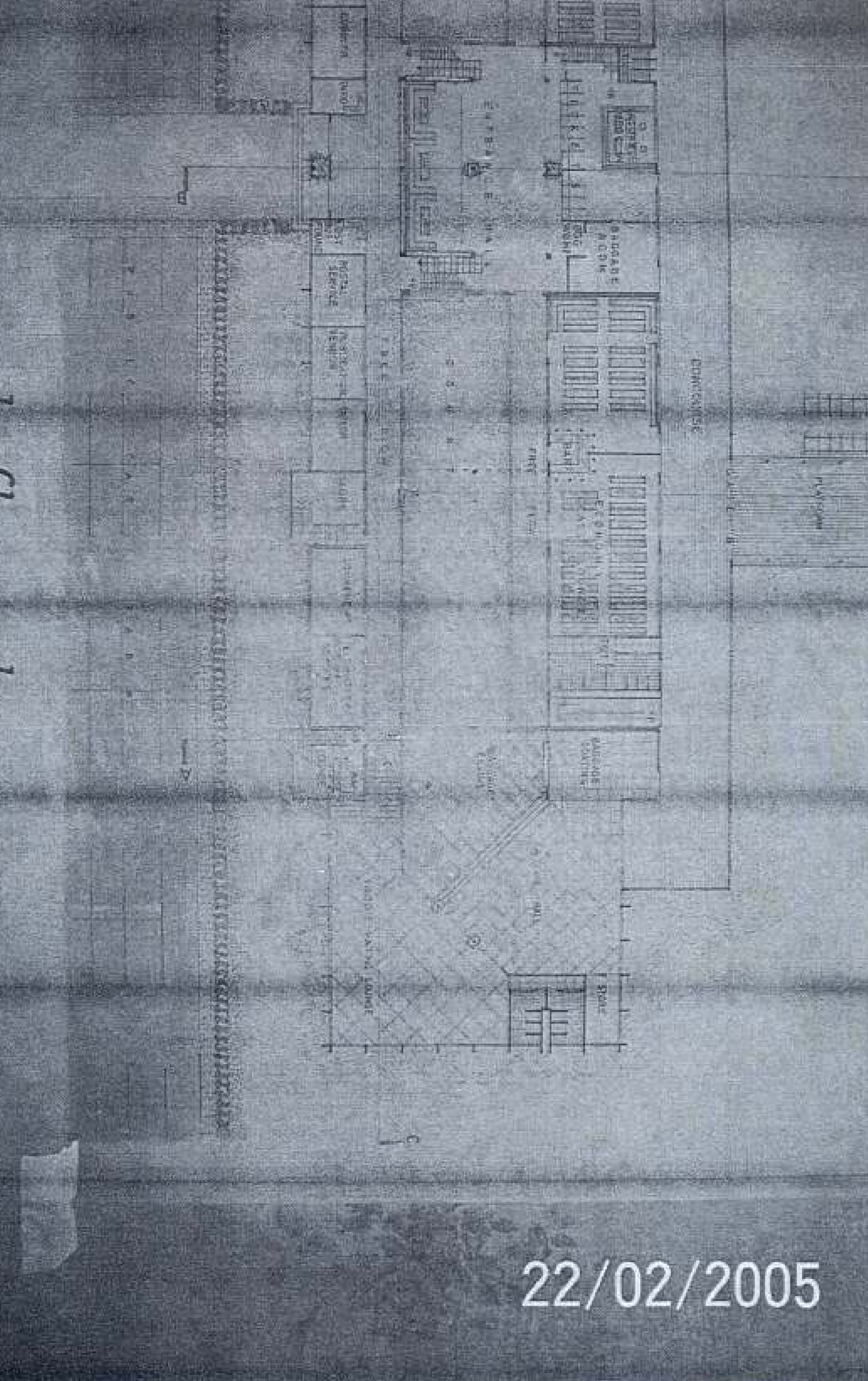
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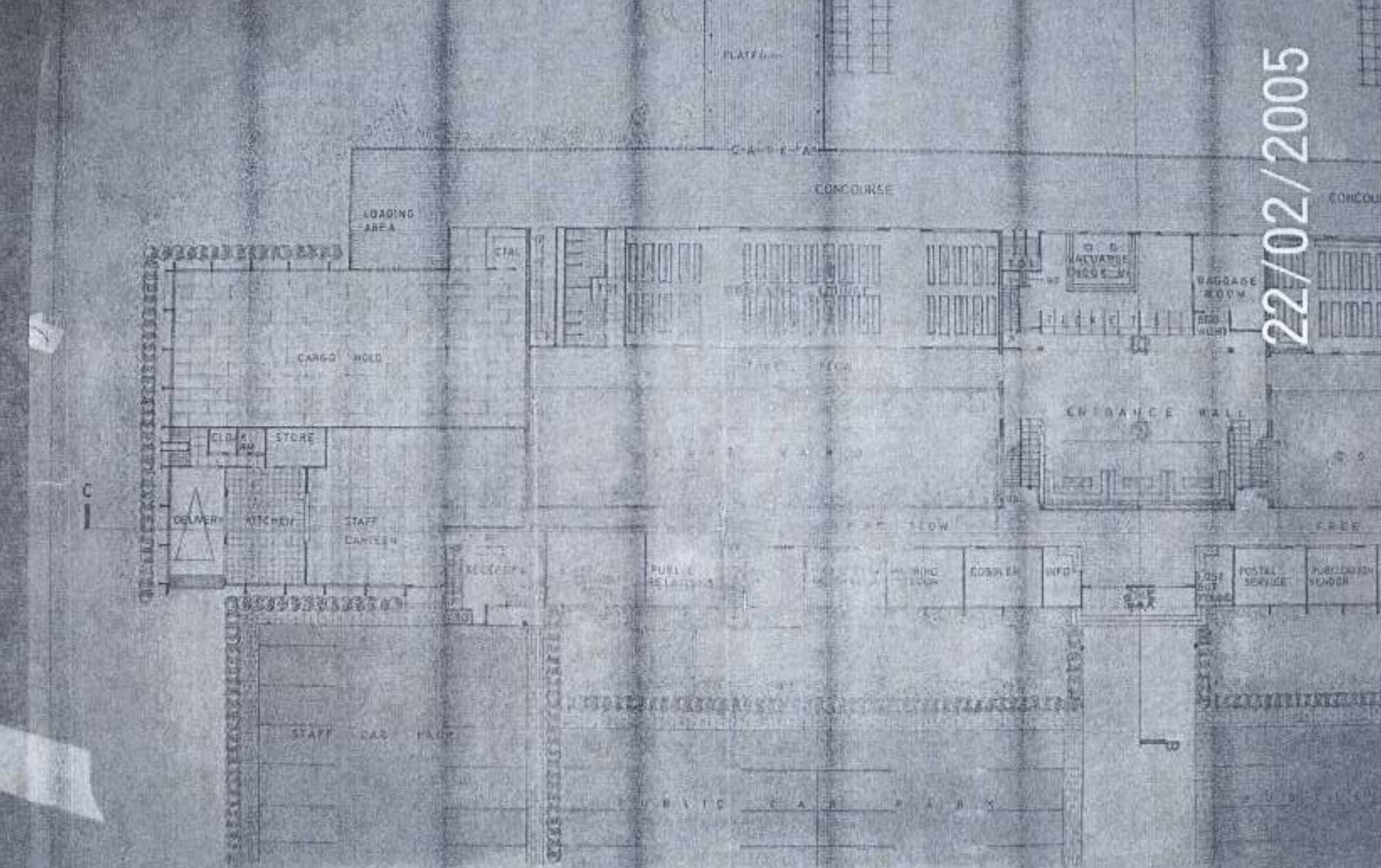
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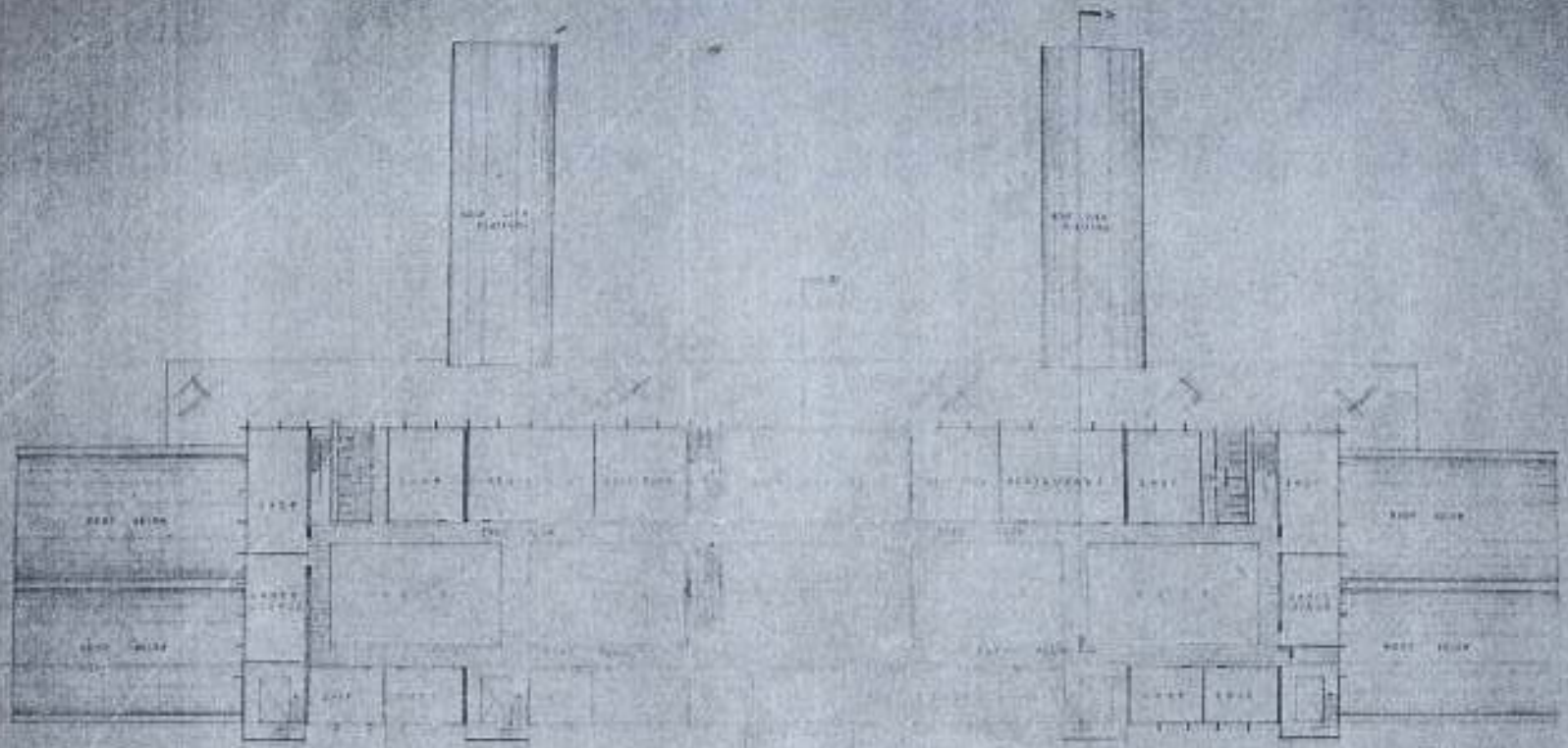
CONCOURSE
LOADING AREA
CARGO HOLD
STORE
DELIVERY
KITCHEN
STAFF CANTEEN
STAFF CAR PARK
PUBLIC CAR PARK
BAGGAGE ROOM
ENTRANCE HALL
POSTAL SERVICE

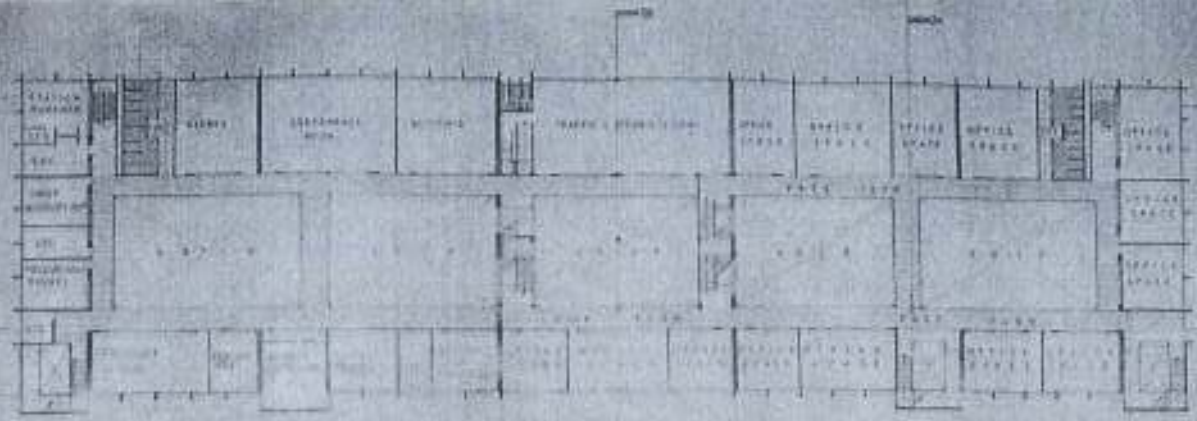


first floor plan

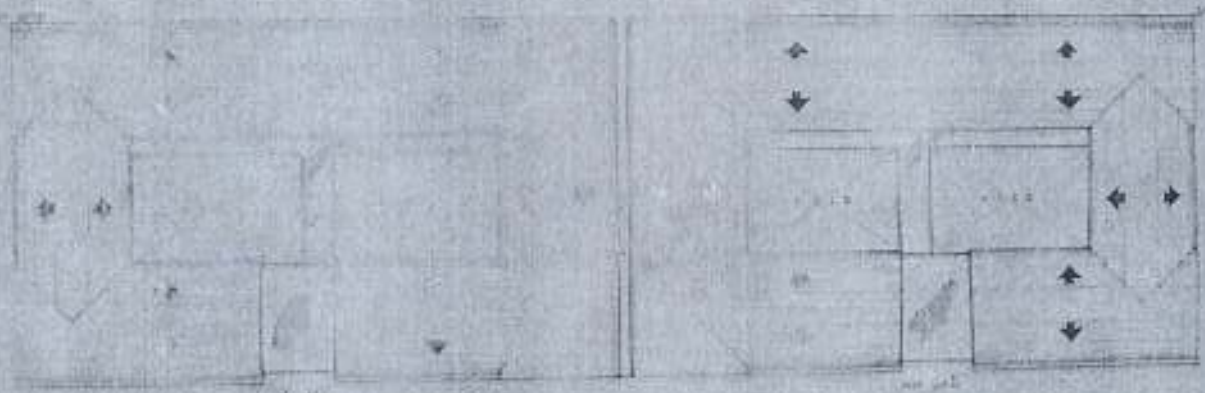
RAILWAY TERMINUS
ONNE, RIVERS STATE

Effective circulation
in railway terminuses

01/01/2004



second floor plan



roof plan

RAILWAY TERMINUS
ONNE RIVERS STATE

Effective circulation
in railway terminuses

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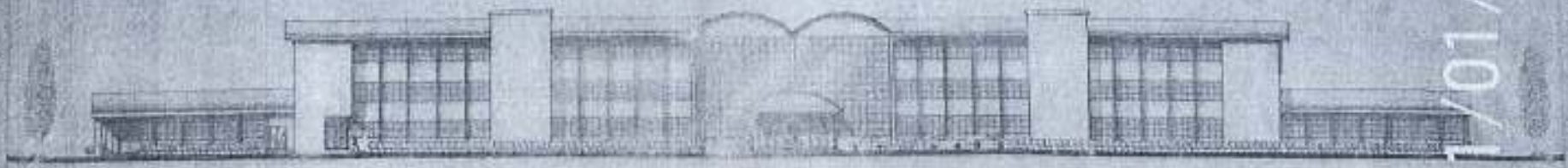

front elevation

left side elevation

RAILWAY TERMINUS ONNE,RIVERS STATE

Effective circulation in railway terminuses

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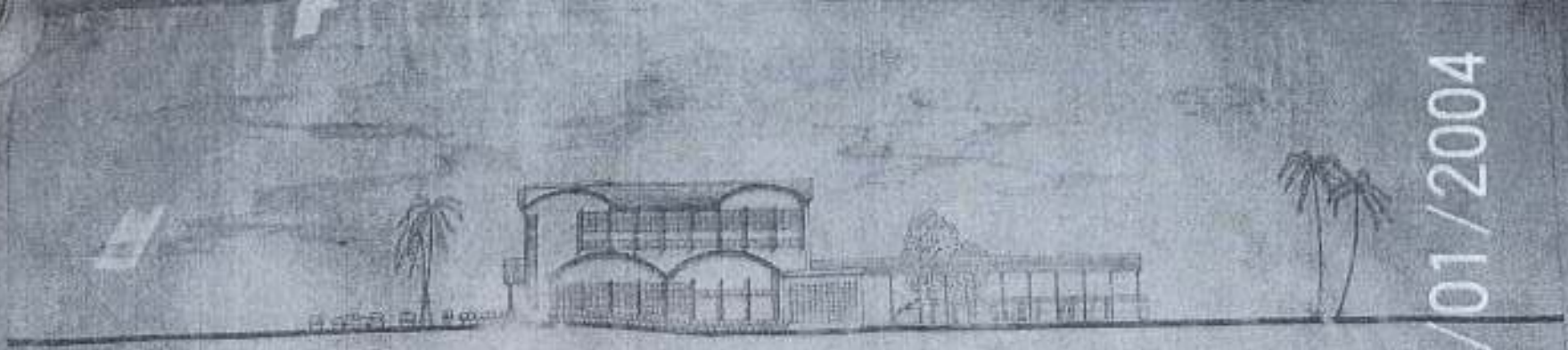

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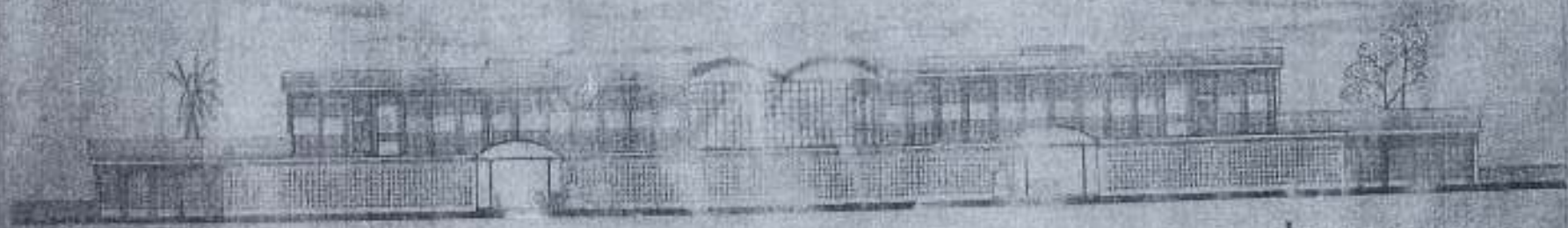
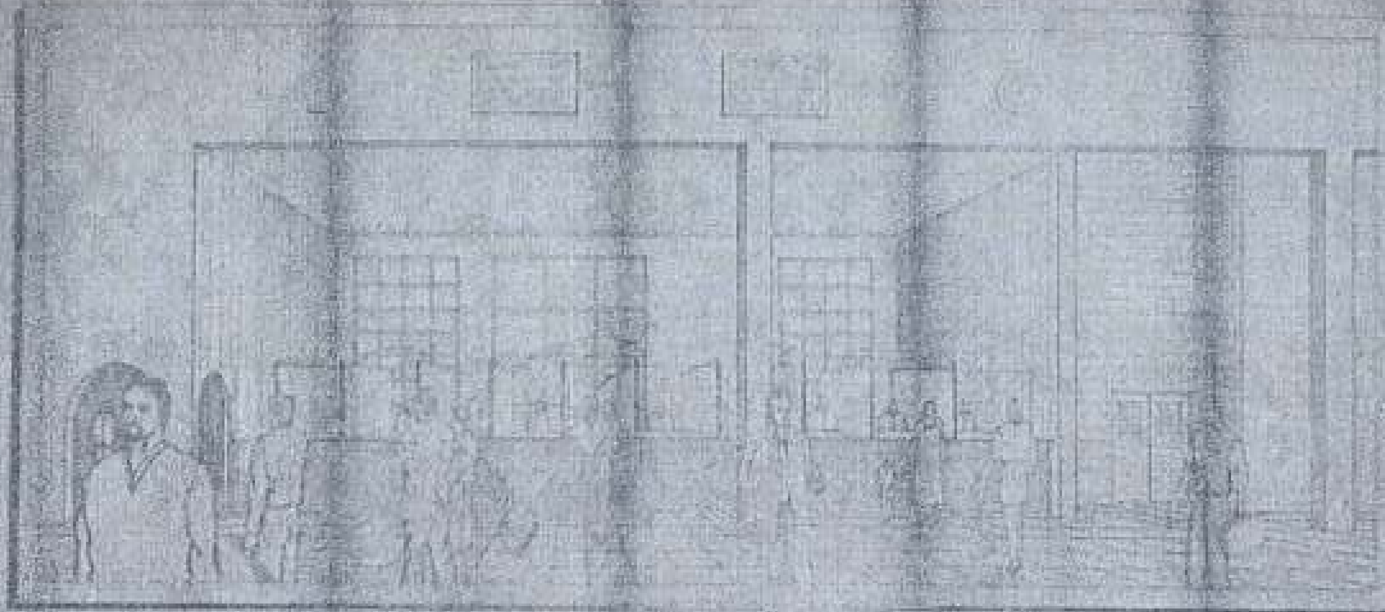
right side elevation

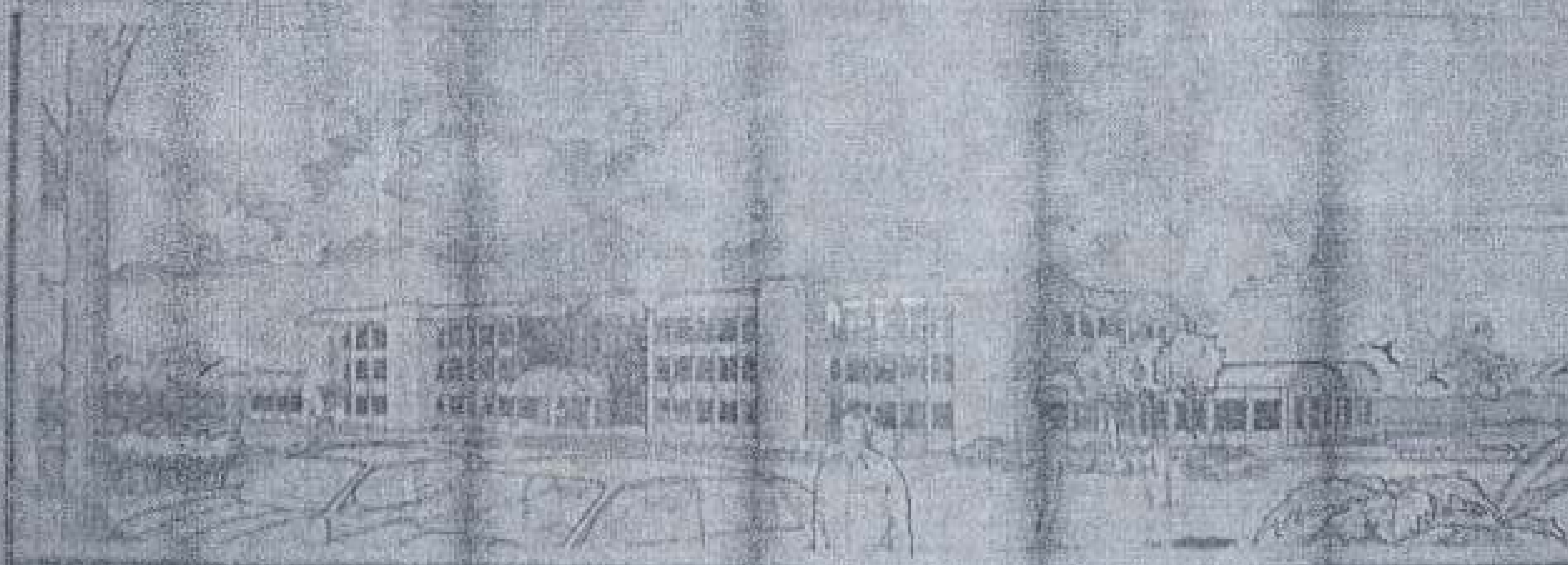


rear elevation

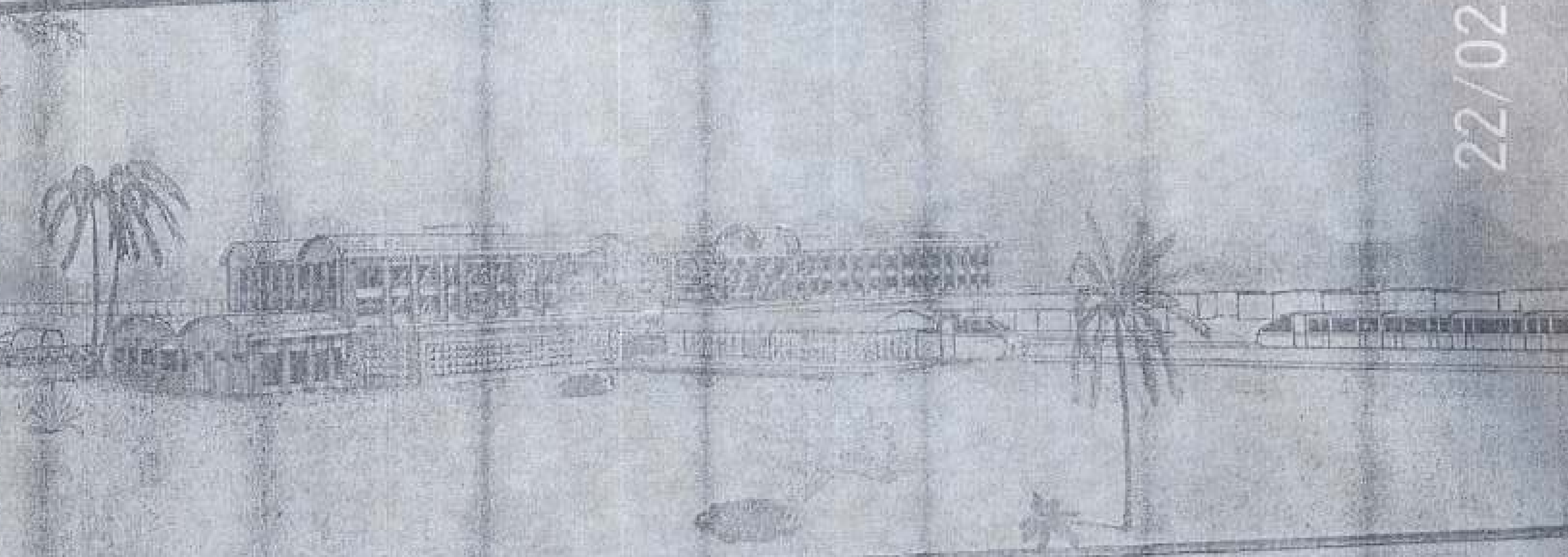
RAILWAY TERMINUS ONNE,RIVERS STATE

Effective circulation in railway terminuses





perspectives



perspective