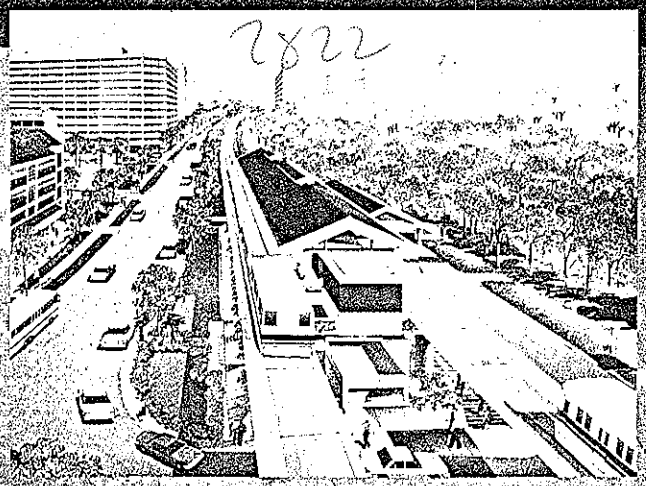
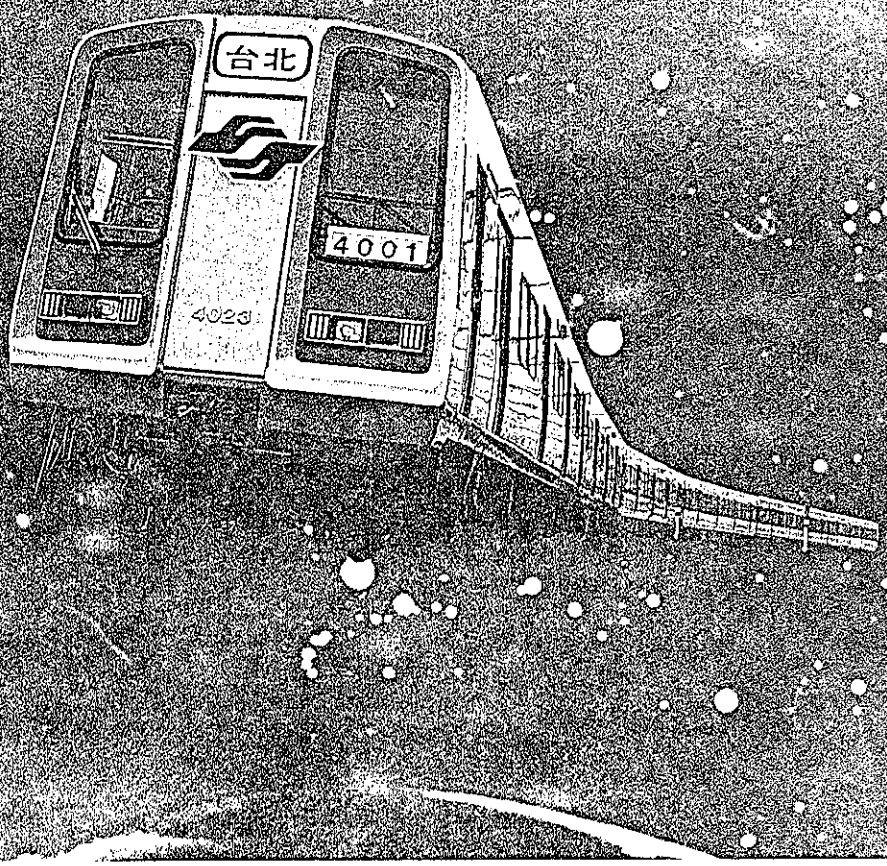
台北捷運

AN INTRODUCTION TO THE RAPID TRANSIT SYSTEMS OF THE TAIPEI METROPOLITAN AREA





Background

As a result of rapid economic growth and the related increased activity, significant rise in per capita income, and increasing use of private cars, street traffic congestion has increased sharply in the Taipei Metropolitan Area in recent years. Therefore, an alternative travel mode in the form of a fast, safe and comfortable mass transportation system will substantially aid in reducing the problem of insufficient road capacity that has become an issue of major concern to Taipei residents. It is an issue which needs an urgent solution.

Transportation development in a modern urban area must stress farsighted planning, integration of all travel modes, and system layout. Style and landscape of urban development as well as control of pollution and noise must be taken into consideration while solving traffic congestion problems in order to maintain a high quality living environment.

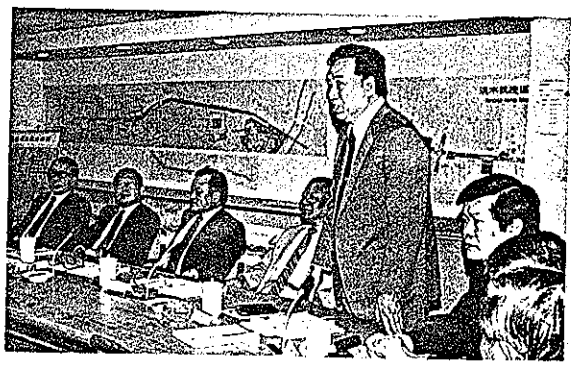
Taipei Rapid Transit System (TRTS) development has long been a concern of the central government. After years of study and careful evaluation of environmental conditions as well as economic costs and benefits, a study of an integrated system combining a high capacity rapid transit system and a medium capacity system was completed. In March 1986, the Executive Yuan approved an initial network of the Taipei metropolitan area mass rapid transit system and proposed to build four rapid transit lines, the first of which would be completed and begin revenue service operations in 1992.

Department of Rapid Transit Systems

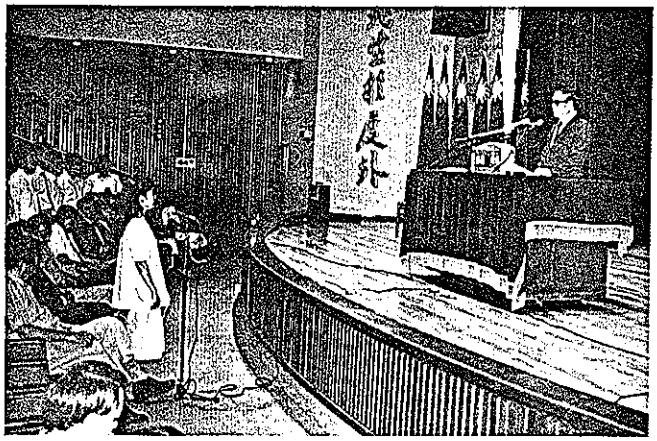
The Department of Rapid Transit Systems (DORTS) under the Taipei Municipal Government was officially founded on February 23, 1987. The DORTS purpose is to:

1). Complete the planning for locating TRTS facilities and determining system performance.
2). Prepare tender documents specifying the required facilities.
3). Prepare performance specifications to allow completion of design, furnishing and installing of system equipment.
4). Oversee the work of construction contractors.
5). Oversee the work and approve the design, fabrication and installation of equipment contractors.
6). Review and approve testing of individual system elements.
7). Manage the testing of the integrated system elements.
8). Conduct pre-revenue testing of the integrated system to assure revenue readiness.
9). Commission the system for revenue readiness. To accomplish this work, the Department has five divisions, six offices and a data processing center for technical and administrative affairs. There is also a Quality Assurance Task Group and a Consultant Coordination Task Group directly under the Chief Engineers Office. In addition, separate Noth, East and South District Project Offices were formed to oversee construction work by the contractors.

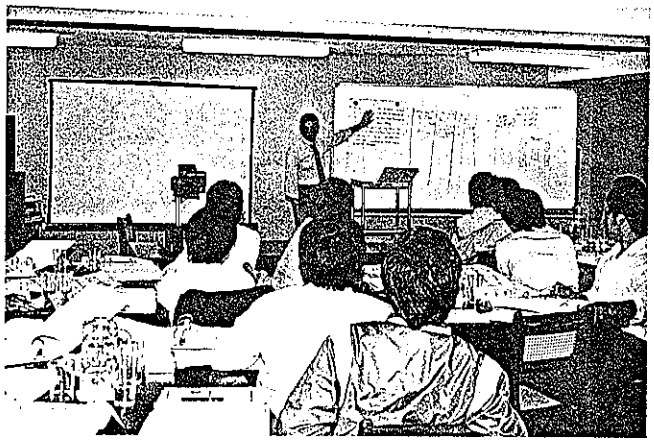
Public Service Center



Briefing presided by Director General, Mr. Chi



Training of our officials - 1

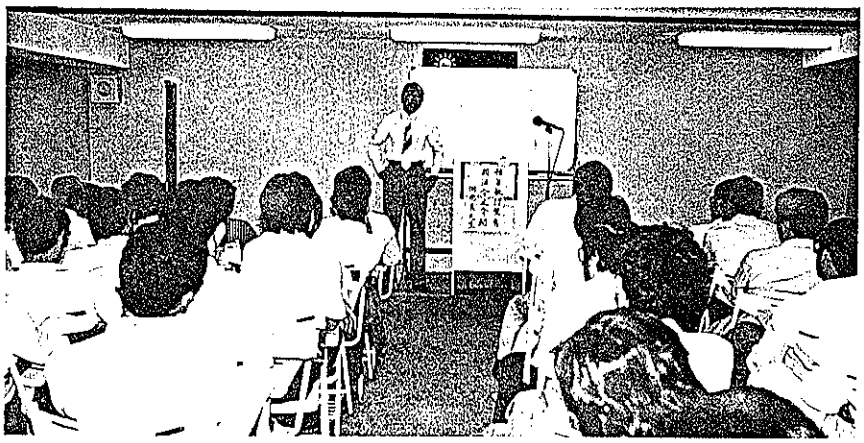


Training of our officials - 2

Staffing and Training. The Department has been recruiting staff since its formation in order to assure the availability of the necessary skills from many different disciplines. In addition to recruiting professional and experienced talent at home and abroad, the Department has a training program which has been implemented to upgrade staff capabilities in system planning, modern construction technology,quality assurance, and management/ administrative systems. Extensive training in many forms helps assure an integrated organization, enhances the capacity of all personnel and encourages effective teamwork. Training programs are basically in two categories described as follows:

(1)General Training-Strengthens recognition of targeted developments in Taipei by providing training on document disposition, operating procedures, knowledge of laws/regulations and administration.

(2)Professional Training - Training in engineering, operation, and technology is provided in several ways such as dispatching officials to study abroad, conducting in-house instruction by staff members who have studied abroad, technology transfer seminars and on-the-job instruction by contractors, instruction by domestic/foreign experts, participation in local/overseas professional conferences and seminars, project studies by officials (advisors), visiting other related organizations, etc.



Training of our officials - 3

Organization. The recruiting and training of personnel previously described is for the purpose of staffing the organization as shown in Figure 1. The office of the Director General has overall responsibility for executing the tasks necessary to achieve the DORTS purpose. Under the Director General, the organization is as shown and office responsibilities are briefly as described below:

Planning - 1

Office of Chief Engineer – In charge of engineering technology including all planning, design, construction, testing and commissioning for revenue service.

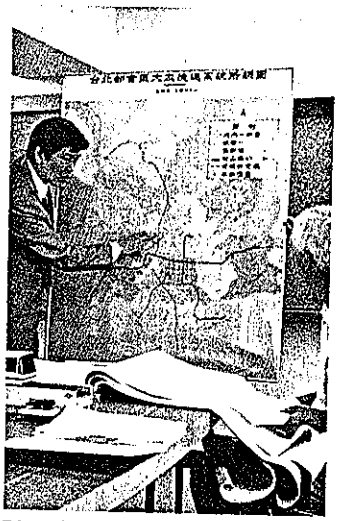
Office of Secretary General – In charge of administration, finance/accounting, data processing and personnel.

First Division – Responsible for rapid transit system networks planning, routing, coordination with other transportation systems, urban plan and public facilities, control, and evaluation.

Second Division – Responsible for facility design including engineering studies, survey, subsurface boring and investigation, civil engineering, planning and design for architecture and landscape, material specification, technical specification, performance specification and the like.

Third Division – Responsible for systems design including planning, preliminary design, procurement, installation, testing, operating, maintenance and repair, and budgeting of RTS vehicles, workshop facilities, power supply, signal and communication equipment.

Planning - 2



Planning - 3

Planning - 4

Fourth Division – Responsible for bid invitation, contracting, project management,material procurement,storage and transportation, construction management, etc.

Fifth Division – Responsible for planning and operation of the TRTS, vehicle management, scheduling control, station facilities, passenger services, etc.

Finance Office – Responsible for study and preparation of financial programs, inventory management, cost analysis, tariff study, study and preparation of related development plans, etc.

Land Acquisition Office – Responsible acquisition of land, coordination for removal, disbursement of compensation, management of land, etc.

Data Processing Center – Responsible for data processing, preparation of reports and statements, filing, file management and document/information retrieval.

Public Relation Office – Responsible for publicity, news release, public services, public coordination, etc.

Administration Office – Responsible for legal affairs, documents, official seals, cashiers, and other general administrative services.

Accounting Office – Responsible for accounting and statistics.

Personnel Office – Responsible for personnel management and security.

Consultant Coordination Group – Responsible for management of general consultant services, price evaluation, control of contract changes, computerized control on documents and assistance and consultation on significant matters.

Quality Assurance Group – Responsible for quality control and quality assurance during design, construction and procurement, including supervision of site work, safety surveillance and the maintenance of hygienic conditions.

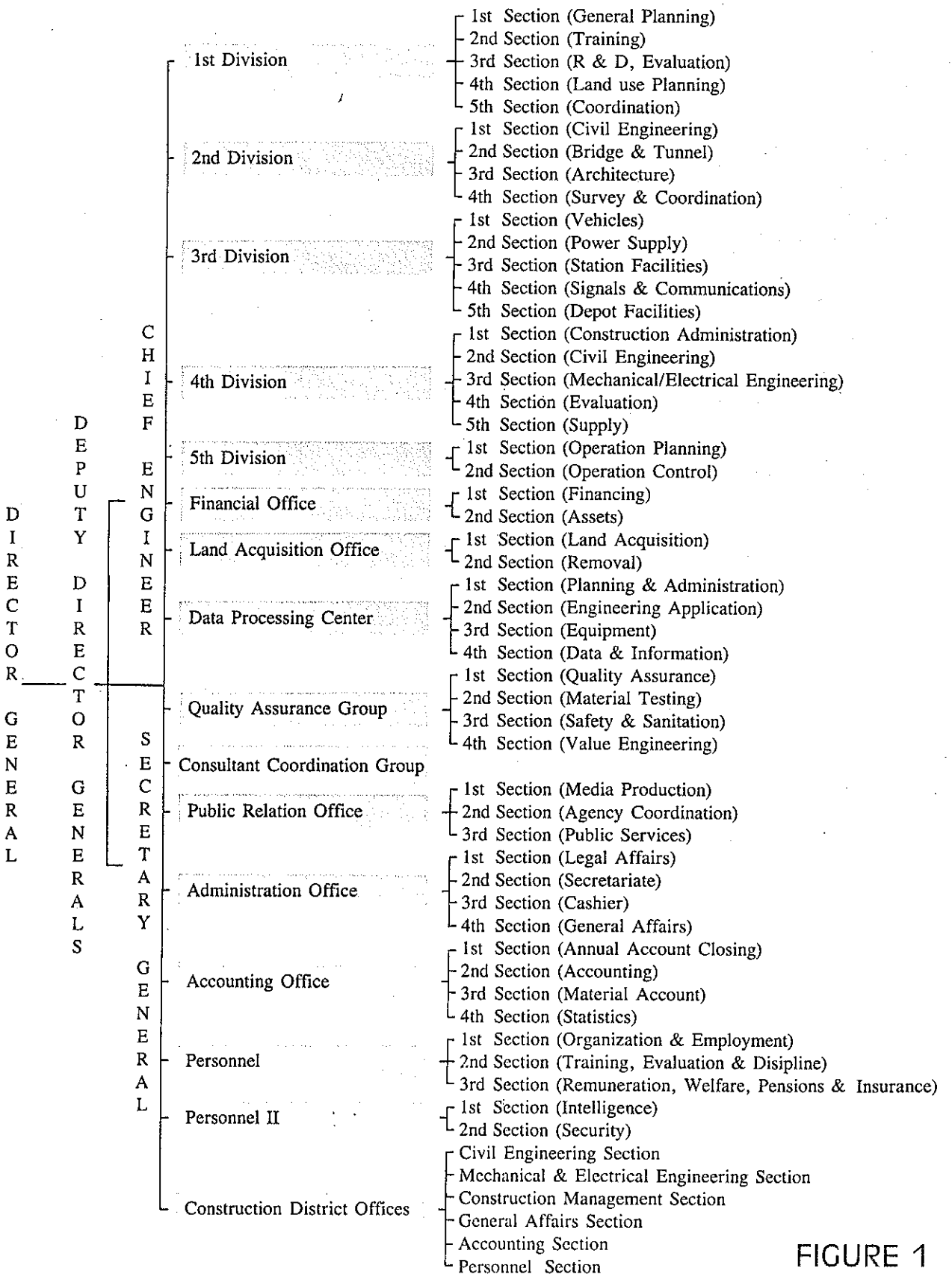

DIRECTOR GENERAL
DEPUTY DIRECTOR GENERALS
CHIEF ENGINEER
SECRETARY GENERAL
1st Division
1st Section (General Planning)
2nd Section (Training)
3rd Section (R & D, Evaluation)
4th Section (Land use Planning)
5th Section (Coordination)
2nd Division
1st Section (Civil Engineering)
2nd Section (Bridge & Tunnel)
3rd Section (Architecture)
4th Section (Survey & Coordination)
3rd Division
1st Section (Vehicles)
2nd Section (Power Supply)
3rd Section (Station Facilities)
4th Section (Signals & Communications)
5th Section (Depot Facilities)
4th Division
1st Section (Construction Administration)
2nd Section (Civil Engineering)
3rd Section (Mechanical/Electrical Engineering)
4th Section (Evaluation)
5th Section (Supply)
5th Division
1st Section (Operation Planning)
2nd Section (Operation Control)
Financial Office
1st Section (Financing)
2nd Section (Assets)
Land Acquisition Office
1st Section (Land Acquisition)
2nd Section (Removal)
Data Processing Center
1st Section (Planning & Administration)
2nd Section (Engineering Application)
3rd Section (Equipment)
4th Section (Data & Information)
Quality Assurance Group
1st Section (Quality Assurance)
2nd Section (Material Testing)
3rd Section (Safety & Sanitation)
4th Section (Value Engineering)
Consultant Coordination Group
Public Relation Office
1st Section (Media Production)
2nd Section (Agency Coordination)
3rd Section (Public Services)
Administration Office
1st Section (Legal Affairs)
2nd Section (Secretariate)
3rd Section (Cashier)
4th Section (General Affairs)
Accounting Office
1st Section (Annual Account Closing)
2nd Section (Accounting)
3rd Section (Material Account)
4th Section (Statistics)
Personnel
1st Section (Organization & Employment)
2nd Section (Training, Evaluation & Disipline)
3rd Section (Remuneration, Welfare, Pensions & Insurance)
Personnel II
1st Section (Intelligence)
2nd Section (Security)
Construction District Offices
Civil Engineering Section
Mechanical & Electrical Engineering Section
Construction Management Section
General Affairs Section
Accounting Section
Personnel Section

FIGURE 1

The Taipei Rapid Transit System (TRTS) Summary

The initial system that is currently scheduled for design, construction and revenue service is shown in Figure 2. Named sections and their color correspondence is as follows:

Red Line: Phase 1, Tamshui to Taipei main station. Phase 2, Hsintien to Taipei main station.

Brown Line: Mucha-Phase 1, Mucha Zoo to Chung Hsiao E. Rd.Mucha-Phase 2, Chung Hsiao E. Rd. to Shungsang Domestic Airport.

Blue Line: Nankang-Phase 2, Nankang to Westgate.

Panchiao-Phase 3, Panchiao to Westgate.

Orange Line: Chungho-Phase 3.

Green Line: Phase 2, Maintenance Link.

The Phase identification indicates the general sequence of completion. Also see the implementation discussion at the end of this section.

A description of the alignments follows Figure 2. Guidelines being used in completing the planning and proceeding with the design are contained in the following sections.

The Red Line-A line from Tamshui, along the existing Taipei-Tamshui Railway owned by Taiwan Railway Administration (TRA), via the east side of Taipei Railway Main Station, Kungyuan Road, Roosevelt Road, Pei Hsin Road to Hsintien. The total length is 33.1km. The line from Tamshui to Taipei Railway Station is also called "Tamshui Line" and that from Taipei Railway Station to Hsintien as the "Hsintien Line".

The Blue Line - A line from the existing TRA Line Nankang Station, parallelling the TRA Line, and then following Chung Hsiao E. Road, Chung Hsiao W. Road, Chung Hua Road, Ho Ping W. Road, Wen Hua Road to Panchiao Railway Station and final extending to the west riverbank of Ta Han Creek.

The Orange Line - A line from Lien Cheng Road in Chung Ho, along Ching Ping Road and Chung Ho Road, passing Hsintien Creek at the east side of Chung Cheng Bridge, via the east side of Hsia Men Street, Roosevelt Road, Ho Ping W. Road, and then connecting with the Red Line (Taipei-Hsintien Line). The overall length is 6.5km. It is also known as the Chung Ho/Yung Ho Line.

The Brown Line - A line beginning from Mucha Zoo, along Hsin Kuang Road, Wan Fang Road, Hsin Long Road, Hsin Hai Road, connecting with Ho Ping E. Road through a tunnel, and then along Fu Hsin S. Road, Fu Hsin N. Road, and Min Chuan E. Road to the Sungsan Airport. The entire length is 11.6km. It is also called "Mucha Line".

The Green Line - A 1.6km underground maintenance link between the Blue Line at the West Gate Station and the Red Line at CKS Memorial Hall for trains from the Blue Line to connect via the Red Line to the Peitou Main Workshop for maintenance purposes. It is called the Maintenance Line.

SAFE

CONVENIENT

COMFORTABLE

NICE-LOOKING

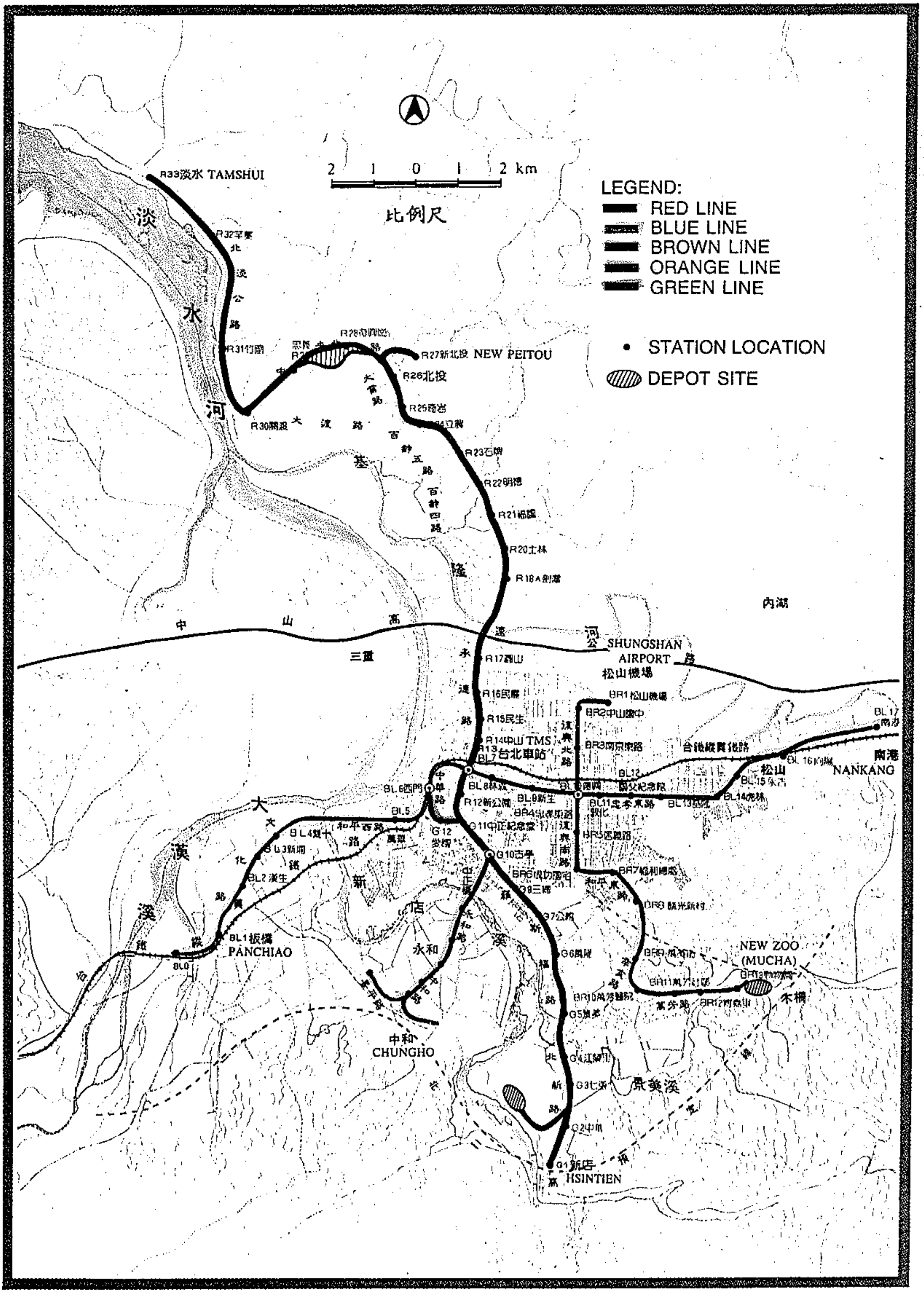

R33淡水 TAMSHUI
2 1 0 1 2 km
比例尺
LEGEND:
RED LINE
BLUE LINE
BROWN LINE
ORANGE LINE
GREEN LINE
STATION LOCATION
DEPOT SITE
R27新北投 NEW PEITOU
R26北投
SHUNGSHAN
AIRPORT
松山機場
NANKANG
BL1板橋
PANCHIAO
NEW ZOO
(MUCHA)
中和
CHUNGHO
G1新店
HSINTIEN

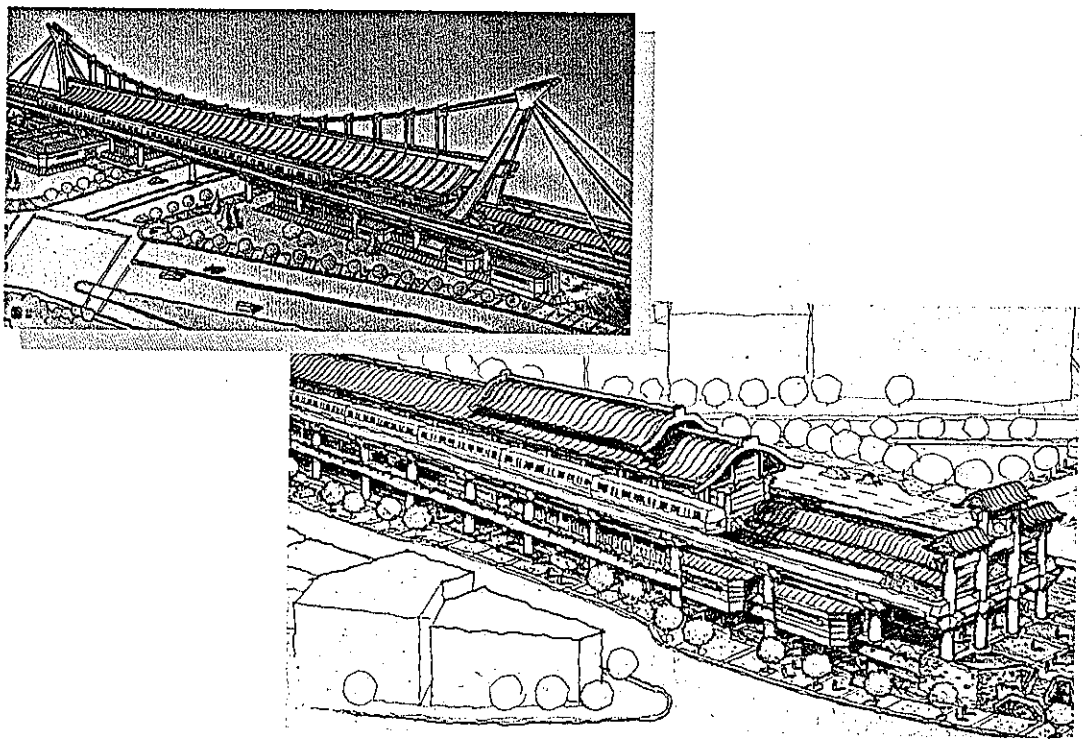
FIGURE 2

Station Planning

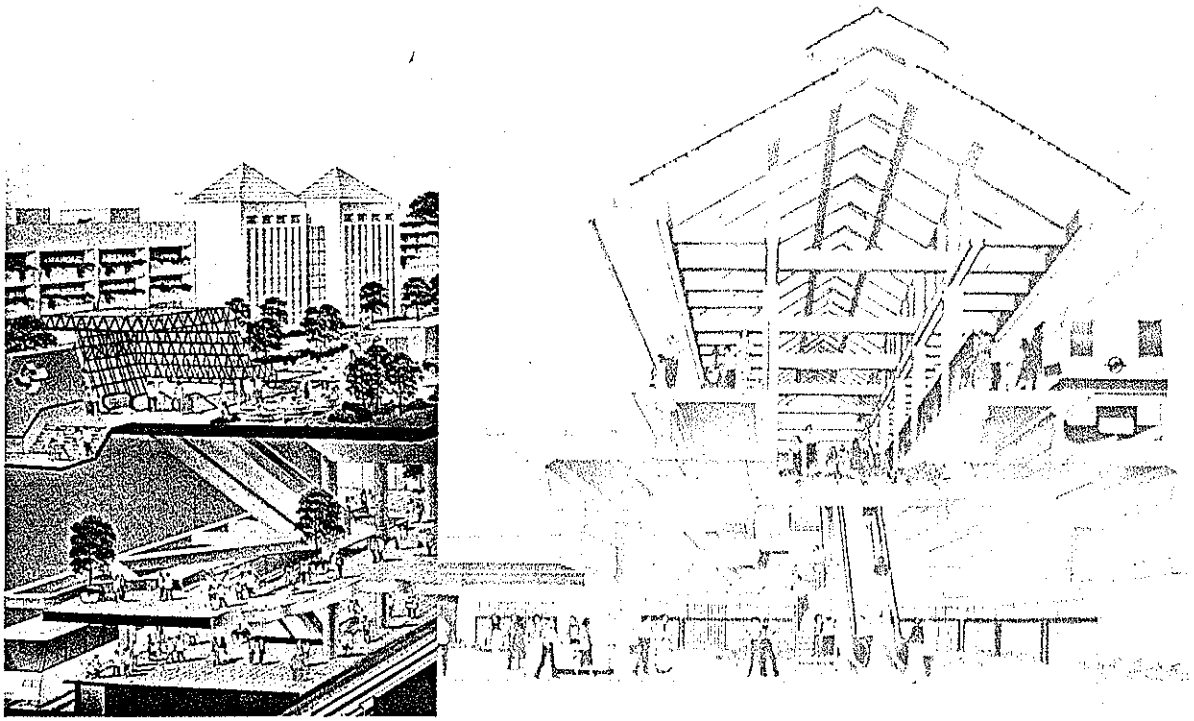
A. Location: The following main factors are taken into consideration for selection of station locations:

1. Capacity Forecast - Areas where population density is high, commercial activities are concentrated and large-scale public facilities are available with the resulting high traffic volume will be selected as stations to serve the maximum population.
2. Station Separation Distance - Distance between two consecutive stations will be about 600 - 1,000 meters in downtown areas and about 800 - 1,500 meters in suburbs in order to attract maximum passenger patronage and achieve operating efficiency.
3. Site Condition - Places of favorable adjacent track profile and geological conditions to allow a platform gradient at less than 0.25% with minimum special construction will be selected.
4. Routing - To facilitate boarding and disembarking of passengers, stations are to be built at places where the radius of curvature is greater than 1,000 meters.
5. Urban Development - Stations will be built where present urban development conditions are compatible and where there is a potential for further development.
6. Land Acquisition - Places where public land can be acquired easily will be given priority.
7. Environment - Stations will be built where the natural landscape or historical/cultural character will not be adversely impacted.
8. Other Factors - Places for stations will be selected only after coordination with other related agencies for consideration of transfer service cost, future public development, and other factors.

RTS Jiann-Tarn Station - conception



RTS Shin-Peitou Station - conception



RTS underground station - conception

B. Design Features

1. Design Requirements
   (1)Basic functional requirements will be emphasized while maintaining simplicity.
   (2)Compatibility with environmental and landscape characteristics of the surrounding community will be considered.
   (3)Design will consider not only the present, but will readily adapt to changes in economic, social and cultural conditions for the next 50 years.
   (4)Modern techniques with Chinese architectural characteristics will be employed.
   (5)Within the other guidelines, each station will represent a landmark or focal point for neighborhood pride.
2. Station Classification
   (1)Underground stations have underground concourses and platforms. All will be equipped with escalators and stairs and include necessary handicap facilities. They will be air conditioned, well lighted, contain direction and identification signs, and a public address system for routine and emergency announcements. Passenger safety and security will be aided by closed circuit television, additional emergency exits where necessary and appropriate fire protection and fire suppression systems.
   (2)Elevated station have a concourse at ground level and overhead platforms. They will also be equipped with escalators and stairs, and include necessary handicap facilities. There will be no enclosed public areas requiring forced ventilation or air conditioning. Passenger access to trains will be from either side or center platform. Center platforms are favored for convenience of new passengers who may board trains travelling in either direction from the center platform.
   (3)At-Grade Station have the concourse and platforms at ground level. Both elevated and at-grade stations will contain certain minimum features such as described for underground locations. These include signage, public address, fire protection and the like.

3. Interior Features

The interior of a station is divided into public areas and non-public areas.

The public areas include:

(1)Entrances. Entrance points may be integrated with neighboring structures or designed to stand alone. In some stations, entry will be directly to the concourse. In others, access to the concourse will be by elevators, stairs, or escalators.

(2)Concourse. Each concourse will be divided into a "free" and "paid" zone. In the "free" zone will be automatic ticketing machines, public telephones, and signs instructing patrons on system use. The fare collection gates separate the "free" and "paid" zones. After passing through the fare gate, patrons proceed to the platform. The platform may be at the same elevation or require travel by stair, escalator or elevator.

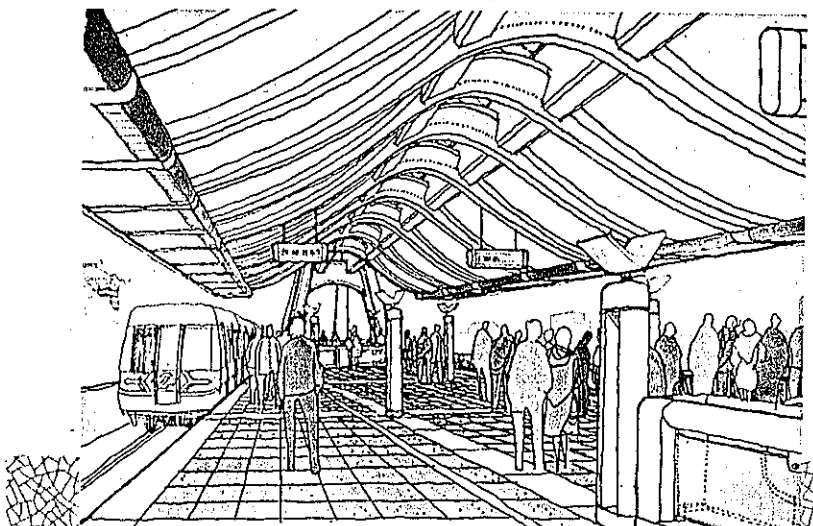
(3)Platforms. Places where passengers wait to board or depart trains are the platforms.

The non-public areas include offices, control and communication rooms, machine rooms, and the like.

The stations will have advertising, signage, minimal commercial shops, benches, telephones, trash receptacles and the like for convenience to the passengers.

Stations are to be identified as major or standard. All major stations will be equipped with public address systems, electronic displays, escalators, ramps, toilets, benches and facilities for handicap persons.

Jiann -Tarn Station — platform conception



Mechanical and Electrical Equipment

Escalator in rapid transit system

(1)Electric rolling stock. The rolling stock to be used by Taipei Rapid Transit Systems will be electrically propelled. Vibration and noise mitigation measures will be incorporated so that noise and vibration will be much lower than the of conventional railway systems. Reliable control systems, aesthetically designed interior features, air-conditioning and large capacity coaches will provide safe, comfortable and convenient service.

(2)Automatic Train Control System. Close headway and high performance operation require a modern train control system. A modern train control center will oversee all operations. Wayside and car borne equipment will provide the following. All routing is automatically set and monitored in a control center. Limiting speeds are transmitted from the wayside to the trains which automatically accelerate or decelerate. This provides for the comfort of passengers and the saving of energy. An Automatic Train Protection (ATP) system assures controlled speed and stopping. The Automatic Train Operation (ATO) also provides accurate station stopping along platforms to facilitate boarding and discharge of passengers. Train operators manually open or close doors in a timely fashion for the safety of passengers.

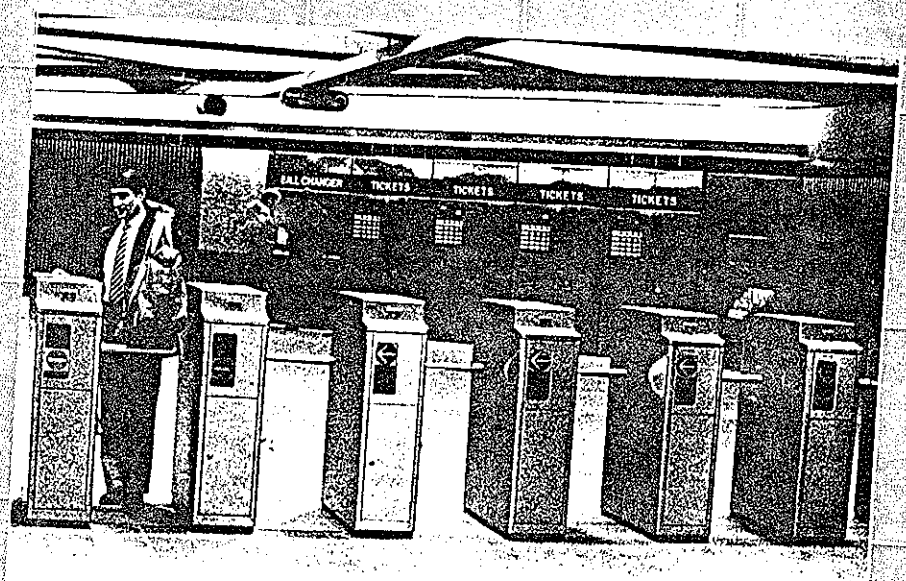
(3)Automatic Ticketing System. Computerized and easy-to-operate ticketing machines are used in automatic ticketing machines are used in automatic ticketing systems. Multiple-trip tickets are used to facilitate passengers who travel frequently. Automatic gates and magnetic card type tickets eliminate the need for manual ticket inspection and entry control.

(4)Escalator System. Heavy duty reversible type escalators are used for mass transmission of passengers. They operate at least 20 hours per day, seven days per week to provide passengers with the best service. Elevators are designated for the disabled or orderly persons, or for small children.

(5)Environmental Control System. The environmental control system in the rapid transit system is mainly to provide comfortable air conditioning and tunnel ventilation. Passengers who enter underground stations through escalators from outdoor summer weather will be cooled gradually and the same feeling will be experienced while walking from concourse to platform. The tunnel ventilation system will discharge smoke or excess heat from tunnels upon occurrence of fire.

(6)Other mechanical and electrical equipment includes workshop facilities, electric lighting, fire protection lightning arrester, grounding and corrosion control, drainage and other systems in stations and tunnels.

Control center in rapid transit system



Automatic ticketing system for rapid transit system

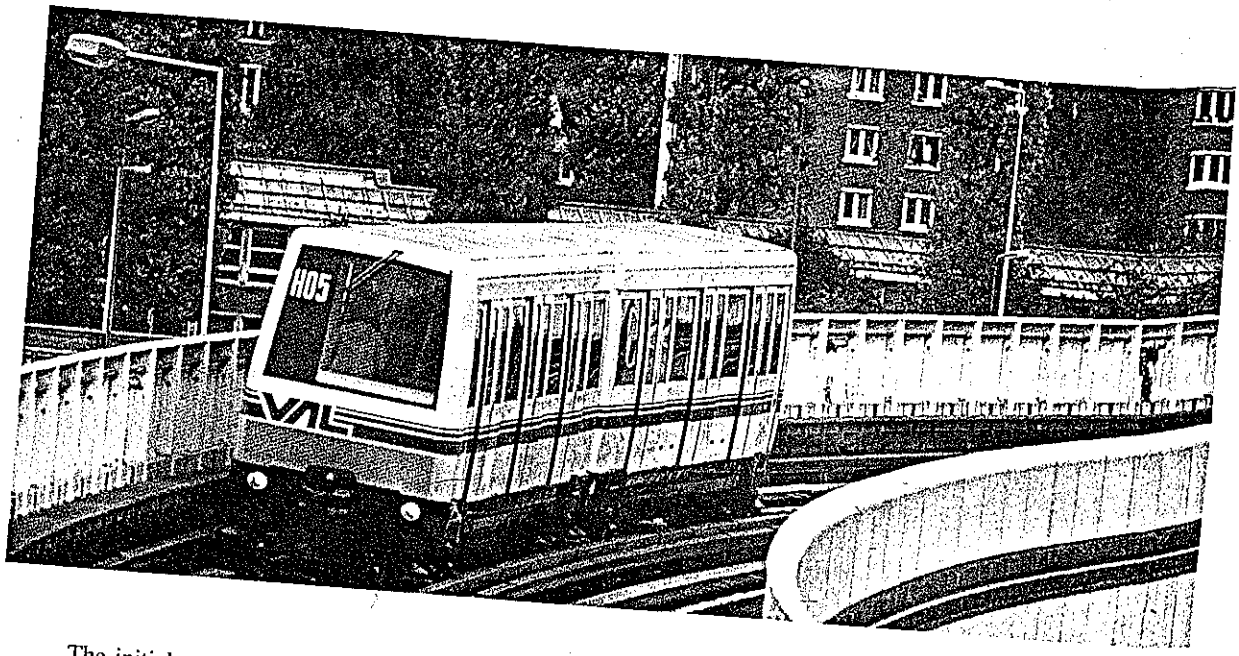
Preliminary Operating Concept

Comfort, safety, convenience, speed and pleasing aesthetics are the goals of TRTS operation. A train will be dispatched approximately every two minutes at peak hours. In addition to joint operation with city buses and railways, a common ticketing system is proposed to facilitate passenger transfer and to enhance communications in the metropolis.

Coach for RTS - 1

Coach for RTS - 2

Initial System Definition and Implementation Schedule



The initial networks will be built in three phases as described below. The activity leading to this construction in shown graphically in Figure 3.

Phase One:

Tamshui Line From Taishui to New Park (excluding New Park Station), which will be completed and ready for revenue service by early 1993.

Mucha Line From Mucha Zoo to Chung Hsiao E. Road, which will be completed and ready for revenue service by early 1992.

Phase Two:

Mucha Line From Chung Hsiao E. Road to Sungsan Airport.

Hsintien Line From New Park to Hsintien.

Nankang Line From Nankang to West Gate.

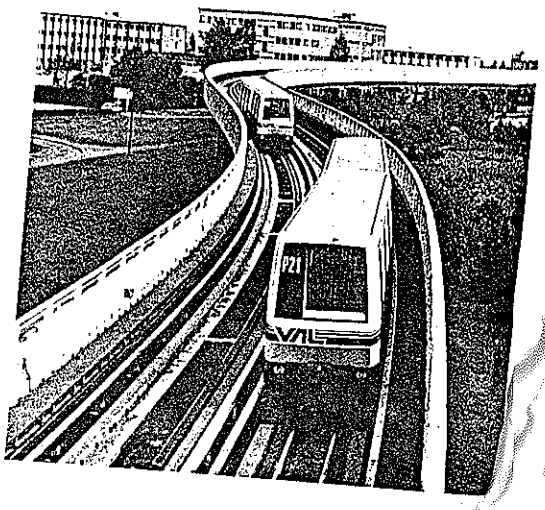
Maintenance Line From West Gate to CKS Memorial Hall.

Phase Three:

Panchiao Line From West Gate to Panchiao (excluding West Gate Station).

Chungho/Yungho Line From Kuting market to Chungho (excluding Kuting Station).

Medium Capacity Transit System



Implementation Program for Initial Line-TRTS

PROPOSED CONSTRUCTION SCHEDULE FOR THE APPROVED NETWORK OF TAIPEI RAPID TRANSIT SYSTEMS

LINE	ACTIVITY DESCRIPTION	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAMSHUI	PRELIMINARY DESIGN	••••••	••••												
	DETAILED DESIGN		••••	••••••	••••										
	CONSTRUCTION			••••••	••••••	••••••	••••••	••••••	•						
	INTEG. & OPER. TESTING						•	••••••	•••6/93						
MUCHA	PRELIMINARY DESIGN	••••••	••••••	•••											
	DETAILED DESIGN			•••	••••										
	CONSTRUCTION			•••	••••••	••••••	•••								
	INTEG. & OPER. TESTING						••••	12/91							
HSINTIEN	PRELIMINARY DESIGN		•••	•••											
	DETAILED DESIGN			•••	••••••	•••									
	CONSTRUCTION				••	••••••	••••••	••••••	••••••	•					
	INTEG. & OPER. TESTING									••••••	12/94				
NANKANG	PRELIMINARY DESIGN			•••••											
	DETAILED DESIGN			•	••••••	••••									
	CONSTRUCTION				•	••••••	••••••	••••••	••••••	•••					
	INTEG. & OPER. TESTING									•••	12/94				
PANCHIAO	PRELIMINARY DESIGN				•••••										
	DETAILED DESIGN					••••••	••••••	••••••							
	CONSTRUCTION							••••	••••••	••••••	••••••	••••••	••••••	•••	
	INTEG. & OPER. TESTING													••••	12/98
CHUNGHO	PRELIMINARY DESIGN				•••••	•									
	DETAILED DESIGN					••••••	••••••	••••••	•••						
	CONSTRUCTION								•••••	••••••	••••••	••••••	••••••	••••••	•••
	INTEG.& OPER. TESTING														••••

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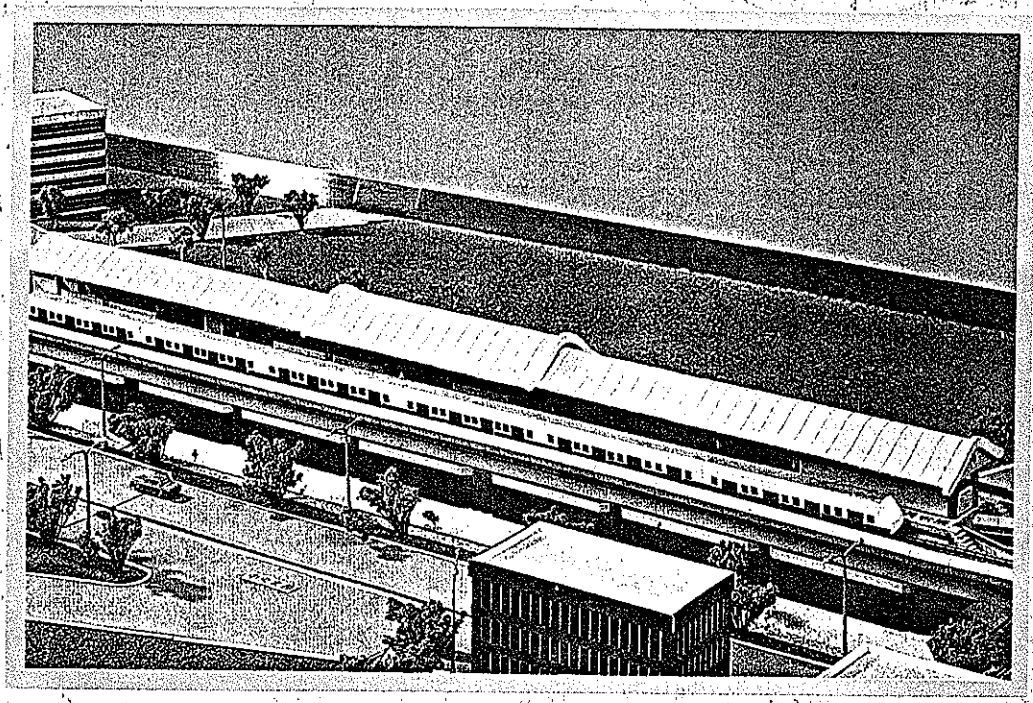

台北市政府捷運工程局

DEPARTMENT OF RAPID TRANSIT SYSTEMS TMG
10F, 746, Min-Sheng East
Taipei R.O.C.
TEL/713-7786•713-7710 Ex. 731