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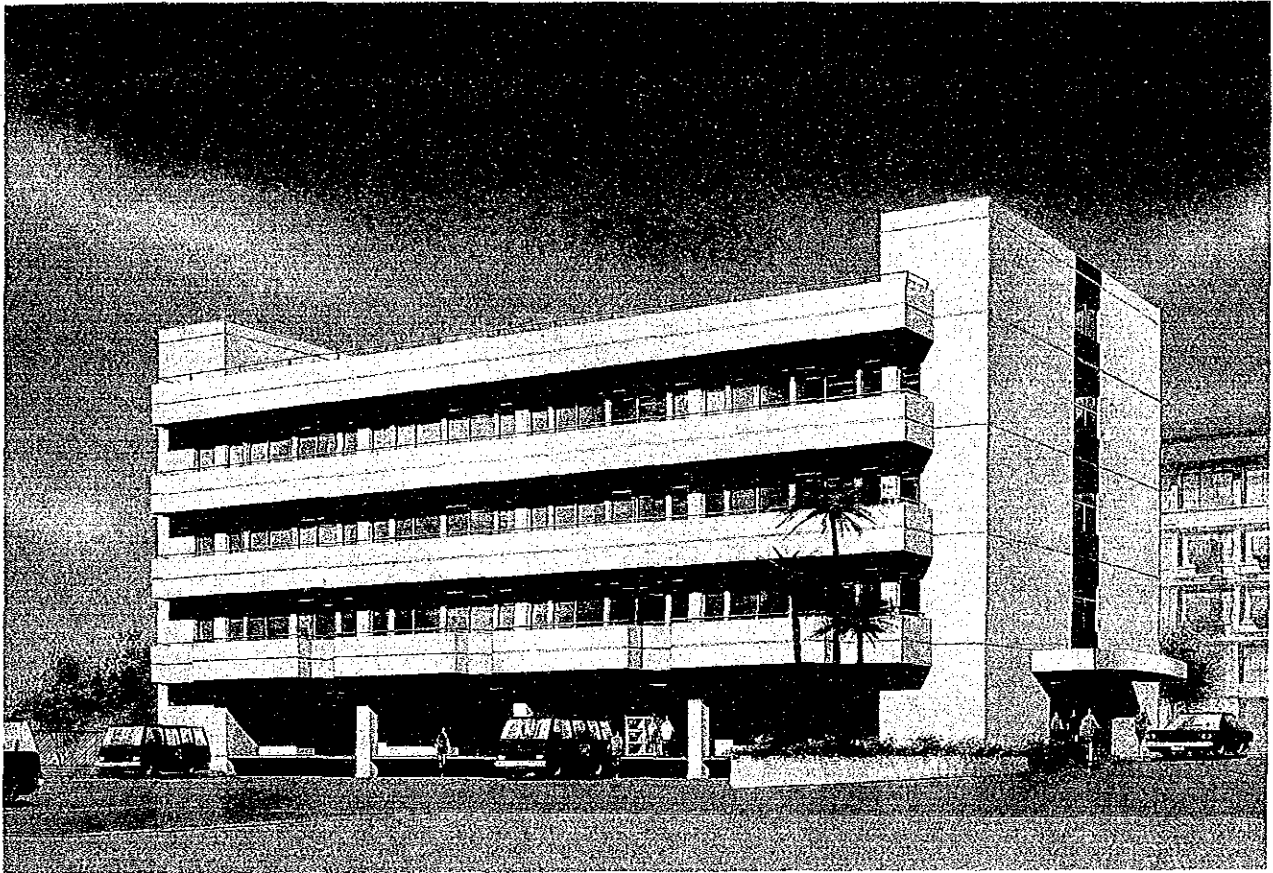
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BASIC DESIGN STUDY REPORT
ON
THE CONSTRUCTION PROJECT
OF
THE OUTSIDE PLANT MAINTENANCE MODEL CENTER
IN
THE REPUBLIC OF INDONESIA

MARCH 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Construction Project of the Outside Plant Maintenance Model Center and entrusted the survey to the Japan International Cooperation Agency. JICA sent a survey team to Indonesia headed by Mr. Toshizo Koizumi, International Cooperation Division, Ministry of Posts and Telecommunications, from 3rd to 22nd December, 1984.

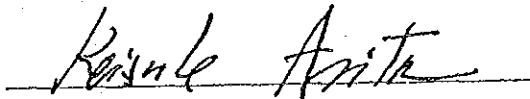
The team had discussions on the Project with the officials concerned of the Government of Indonesia and conducted a field survey.

After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

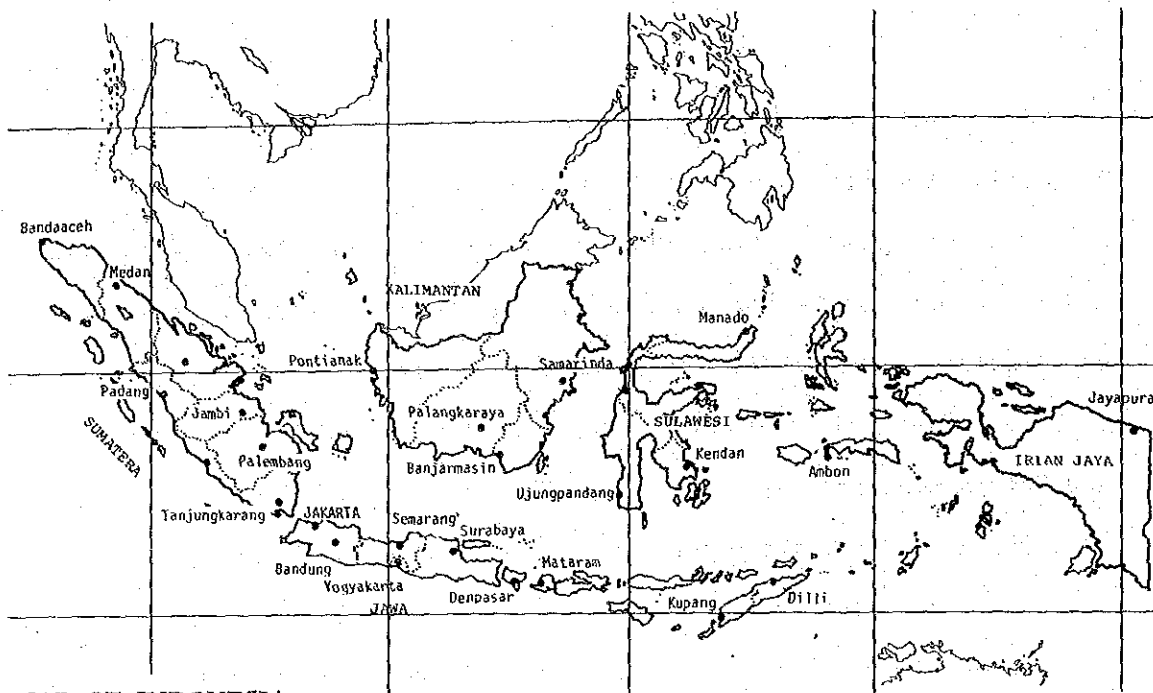
I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

March, 1985

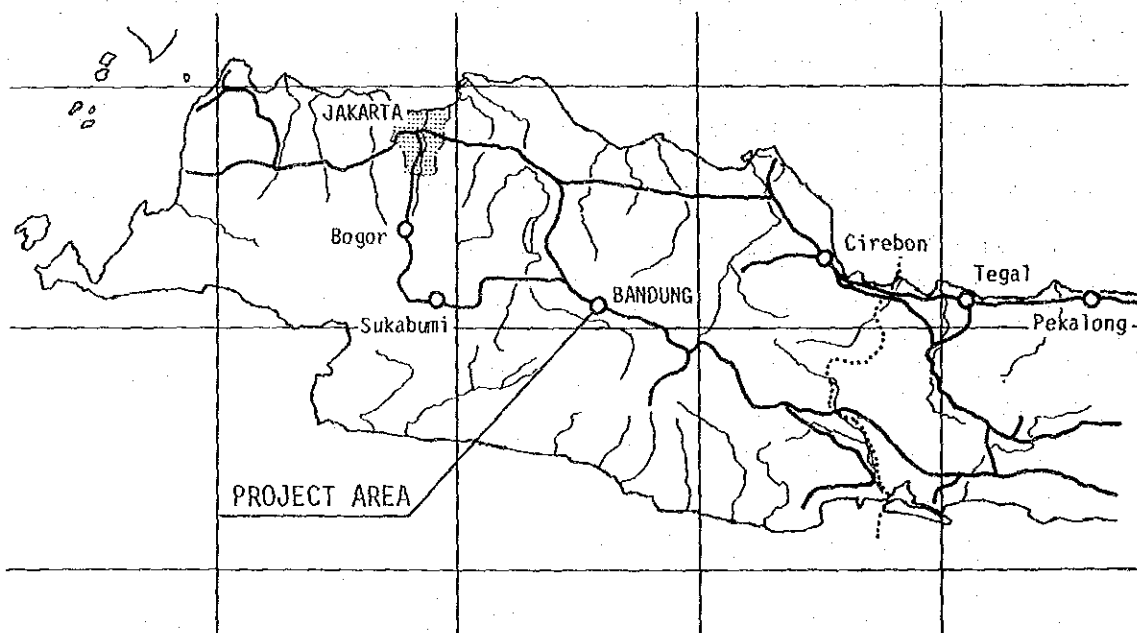


President

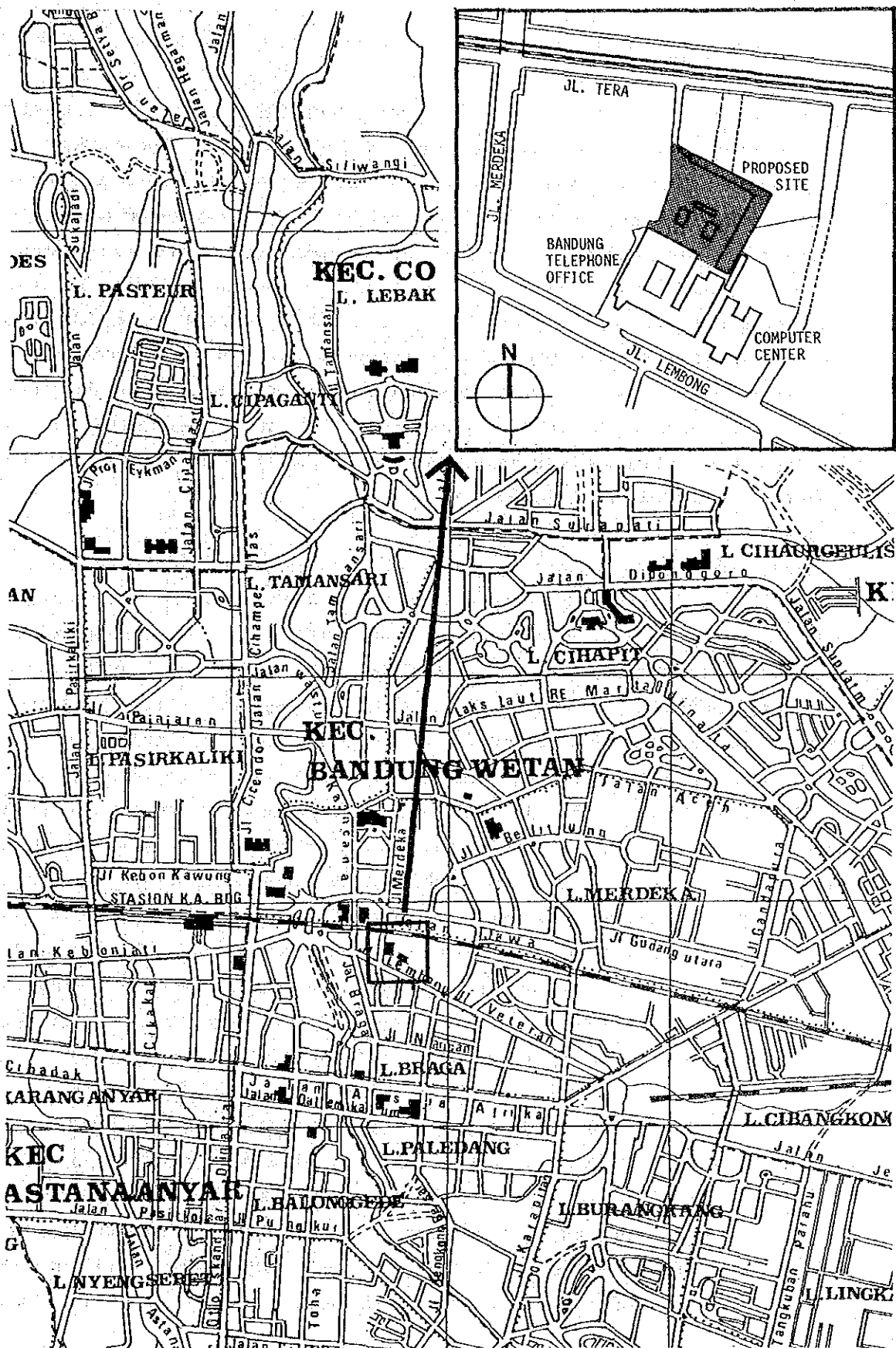
Japan International Cooperation Agency



MAP OF INDONESIA



MAP OF WEST JAWA



MAP OF PROPOSED SITE IN BANDUNG

SUMMARY

The Government of the Republic of Indonesia adopted the quality improvement of the telecommunication service as one of the targets of the Fourth National Development Plan in the Telecommunication Sub-sector. One of the qualitative problems lying in the telecommunication services results from the incomplete maintenance of the facilities. This is shown in the fault rate of the telecommunication facilities. It is much higher than that of Japan. Ninety percent of faults are caused by the telecommunications outside plants. This is because the maintenance of outside plants has especially been behind in development. Therefore, it is the most essential and urgent subject to develop the outside plant maintenance for quality improvement of the telecommunication services in Indonesia.

To meet this subject, PERUMTEL, the Telecommunications Public Corporation of Indonesia, has planned to construct outside maintenance centers in major cities throughout the country. These centers aim to improve maintenance activities to be implemented more efficiently through concentrated maintenance administration and staff training. For this purpose, the centers will integrate the facilities and the personnel of the concerned area at a place, and furnish necessary equipment. However, as PERUMTEL has no experience to construct such systematized facilities so far, it has planned to establish first a model center in Bandung where its headquarters is located. PERUMTEL will apply the experience of the Model Center to the other planned maintenance centers after evaluating the results of the Project. Therefore, the construction of the Model Center is the first step to improve the outside plant maintenance and the key to determine the future course of maintenance centers in Indonesia.

To realize the above scheme, the Government of Indonesia has requested the Government of Japan for a grant aid together with technical cooperation for the construction and operation of the Model Center. On the request of the Government of Indonesia, the Government of Japan decided to conduct a basic design study on the construction project of the Model Center. Japan International Cooperation Agency

sent a survey team to Indonesia in December 1984. The survey team had discussions with officials concerned of the Government of Indonesia and confirmed the details of the request.

The team also investigated the proposed site and collected necessary data and information. After analyzing the above data and information in Japan, the Team prepared a facility plan necessary for implementation of the Project as shown below:

Project Site:	Backyard of the Bandung Telephone Office, No. 11 Lembong Street, Bandung. Site Area: Approximately 2,880 sq.m.
Building:	4 storied reinforced concrete structure Total Floor Area: Approximately 2,020 sq.m. 1F Storage 2F Rooms for daily maintenance dept. 3F Rooms for daily maintenance dept. 4F Training dept.
Equipment:	For daily maintenance activities and for training
Accessory Facilities:	Garage for special vehicles, stockyard, parking lot, outdoor training facilities
Construction period:	12 months.

The organization and operation plan of the Model Center have already been studied. The technical cooperation of Japan will be implemented mainly for staff training in the Model Center.

The construction of the Model Center with Japan's Grant Aid will provide a base for the daily outside plant maintenance and training. The Model Center will provide know-how concerning telephone outside plant maintenance centers and to reduce the fault rate in Bandung. Therefore, the Model Center will contribute to development of the telecommunication services in Indonesia, especially to the improvement of the service quality. If the technical cooperation is implemented together with the Grant Aid, it will increase the effects of the Project and contribute to the development of the friendship between the countries of Indonesia and Japan.

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CHAPTER 1 INTRODUCTION

The Government of the Republic of Indonesia decided to improve the maintenance of the telecommunication facilities, particularly the maintenance of telephone outside plants to improve the quality of the telecommunication services. The improvement of the service quality is one of the targets of the Fourth National Development Plan (REPLITA-V). The Government of Indonesia decided to intensify the maintenance system and to train the personnel concerned. For this purpose, the Government of Indonesia has planned to establish maintenance centers in major cities throughout the country as bases for the telephone outside plant maintenance. However, since such systemized facilities have not been seen in Indonesia so far, PERUMTEL, the Telecommunications Public Corporation of Indonesia, has planned to establish first a model center in Bandung where its headquarters is located and to implement daily maintenance and staff training there. Then, PERUMTEL will evaluate the results of the Model Center and apply the optimum standard obtained through the evaluation to the other planned maintenance centers. Thus, the Government of Indonesia requested the Government of Japan for a grant aid together with technical cooperation for the construction and operation of the Model Center.

On the request of the Government of Indonesia, the Government of Japan decided to conduct a basic design study on the construction project of the Model Center (hereinafter referred to as the Project). Japan International Cooperation Agency (hereinafter referred to as JICA) sent a survey team headed by Mr. Toshio Koizumi, International Cooperation Division, Ministry of Posts and Telecommunications, from December 3 to December 22, 1984.

On the other hand, as for technical cooperation for the Model Center, a preliminary survey team and a long-term survey team were sent in June and in September, 1984.

Having examined the results of the above surveys, the survey team conducted a field survey in Indonesia for the following purposes:

- 1) To confirm the details of the request of the Government of Indonesia.
- 2) To investigate the proposed site.

- 3) To collect necessary data and information necessary for deciding the function and size of the Model Center and for examining the appropriateness of the project.

The survey team and the officials concerned of the Government of Indonesia had discussions on execution of the Project. The matters basically agreed through the discussions were summarized in the Minutes of Discussions which were signed between the representatives of the survey team and Indonesian officials. The survey team, after analyzing the collected data and information, prepared a facility plan for the Project. The team conducted a confirmation survey in Indonesia from February 20 to February 28, 1985.

This is a report compiling the results of the basic design study of the Construction Project of the Telephone Outside Plant Maintenance Model Center in Indonesia.

CHAPTER 2 BACKGROUND OF THE PROJECT

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CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Telecommunication Services in Indonesia

2-1-1 Operation Organization of the telecommunication Services

The telecommunication services in Indonesia are executed through the excellent cooperation of the authorities concerned under the jurisdiction of the Directorate General of Posts and Telecommunications (DIREKORATE JENDERAL POS DAN TELEKOMUNIKASI: POSTEL). PERUMTEL is in charge of the domestic telecommunication services and P.T. INDOSAT, the International Telecommunications Public Corporation, is in charge of the international and long distance telecommunication services. (The organization charts of the concerned government offices and PERUMTEL are shown in Appendix III).

PERUMTEL has its headquarters in Bandung City and undertakes the domestic telecommunication services. It has 12 jurisdictions of regional telecommunication bureaus (WITEL) which are control organizations of local telecommunication services as shown Figure 2-1. In regard to telephone networks, the jurisdiction area of each WITEL is divided into about 10 service areas of central telephone office.

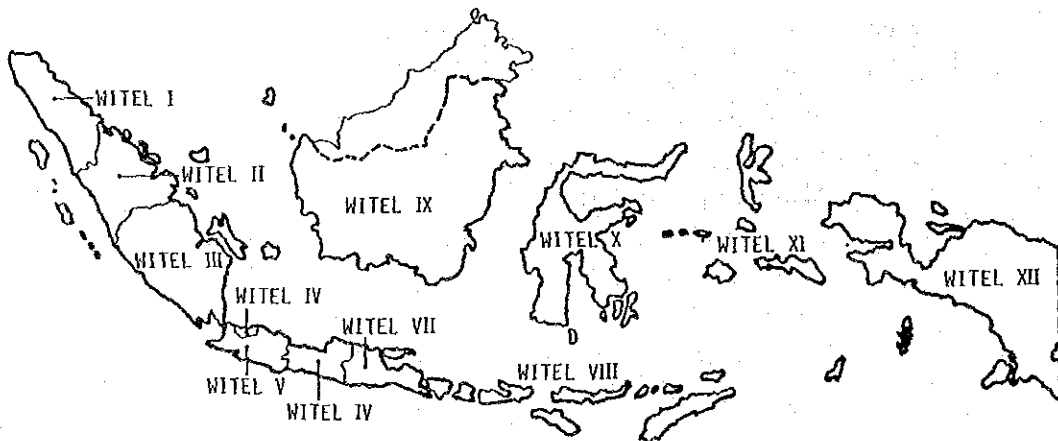


Fig. 2-1 Jurisdiction Area of Regional Telecommunication Bureau

2-1-2 Present Condition of the Telecommunication Services

Through a series of the National Development Five Year Plans (REPELITA), Indonesia has developed the telecommunication system. The Third Five Year Plan (1979 - 1983), nearly reached its goal. This Plan aimed at expansion of the networks for telephone, telegraph, telex and transmission, and improvement of the quality of services. With the completion of the Third Five Year Plan, the telecommunications would serve 2,326 of the 3,258 towns and villages in Indonesia. This would bring the convenience of telecommunications to the major cities of all provinces. It can be said that the national telecommunication service networks would be almost completed through the Five Year Plans. The major outcomes of the Third Five Year Plan are as follows:

(1) Telephone

The increase program of telephone switching equipment in the Third Five Year Plan was to install 374,000 terminals of automatic switching equipment in total. Out of this number, 232,000 were to be constructed as new project and 152,000 were carried over from the Second Five Year Plan (1974 - 1978). 276,000 terminals which corresponds to 72% of the planned increase had already been completed by the end of the 4th year of the Third Five Year Plan, in 1982. In result, the total capacity of telephone exchange was increased to 587,842 terminals at the end of 1982 as shown in Table 2-1. This was 65 percent increase compared with the total capacity at the end of the Second Five Year Plan. Among the increased capacity, 19,000 terminals had been converted from manual switchboards. This showed an example of the qualitative improvement of services. The capacity of manual switchboards was 81,827 terminals. Total capacity of automatic and manual telephone exchange amounted to 669,669 terminals.

(2) Telex

The telex services had been extended as a part of diversifications of telecommunication services. The increased capacity of telex exchange by the end of 1982 was 6,660 terminals including 3,910 carried over from the Second Five Year Plan. This was 71% increase compared with the capacity at the end of the Second Five Year Plan. The total capacity reached to 15,840 terminals in total.

(3) International Communications

International and long distance telecommunications operated by P.T. INDOSAT, had been dramatically developed in the Third Five Year Plan. Namely, P.T. INDOSAT completed the ASEAN Sea Cable between Indonesia and Singapore with capacity of 480 lines, replaced the satellites PALAPA A with more advanced satellites PALAPA B and constructed 75 earth relay stations. This contributed to the international telecommunications by automatic exchange system with 55 countries. Long distance telecommunications between Sumatra and Irian Jaya became also available by using PALAPA satellites.

(4) Telegraph

The telegraph system is being demanded less in large cities where telephone and telex services are available. However, telegraph is still important in farm villages and small islands. The number of telegraph offices had increased a little from 612 to 643 in these five years.

Table 2-1 The Number of Telecommunication Equipment (End of 1982)

Item	Capacity
Automatic switching equipment	587,843 terminals
Manual switchboard	81,827 terminals
Telegraph office	643 offices
Telex (domestic)	15,840 terminals
Earth relay station	122 stations
Cities with automatic telephone call	106 cities
ASEAN sea cable	480 lines
Earth station at JATILUHUR	33 lines
Micro wave (JATILUHUR-HAKARTA)	492 lines
International telephone call	4,096 lines
International telex	1,200 lines
International automatic telephone call	55 countries

2-1-3 Existing Problems in Telephone Services

In spite of the remarkable achievements of the Third Five Year Plan, the spread of telephone is still small against the people's demands. The number of telephones in use per 100 people is 0.57. This

figure is lower than those of other ASEAN countries. They are 4.4 in Malaysia, 1.1 in Thailand and the Philippines, while Japan's number of subscribers per 100 people is 35.8. The figures of ASEAN countries are the amounts of telephone sets including extension ones, while that of Japan is the amount of phone numbers. As mentioned above, the total exchange capacity reached 669,669 terminals at the end of 1982, and 82,000 terminals are still of manual switchboard. Some telephone facilities are forced to work to the limit of capacity due to the shortage of supply for increasing demands year by year. These facilities can neither answer to new demands nor secure standby lines for fault occurrence and urgent requirements.

To fill the gap between supply and demand, the quantity of telephone equipment has continuously been extended in the Fourth Five Year Plan. However, the present conditions of telephone services show that extension of services can not follow the increase of demand so far.

2-1-4 Telecommunication Policies of the Fourth Five Year Plan

The National Development Plan in Indonesia was first started in 1969. The Fourth Five Year Plan (REPELITA-IV) started in April 1984. The First, Second, and Third Plans were to prepare the development of the country. The Fourth and Fifth Plans are to frame the national economy for the following stage. The Sixth Plan will realize the economic take-off. In the year 2,000, an ideal nation with justice and prosperity based on the national principles PANCA SILA. (From speech of the President, January 9, 1984.)

The fundamental objectives of the Fourth Five Year Plan are as follows:

- 1) To improve more equitably and justly the living standard, intelligence and the welfare of the Indonesian people.
- 2) To lay a strong foundation for the next stage of development.

Along this line, the following concrete targets were set up for the Telecommunications Field of the Transportations and Communications Sector. These targets are succeeded from the Third Five Year Plan.

- 1) To enlarge the communication networks and exchange systems.
- 2) To increase the quality of telecommunication services.
- 3) To diversify the telecommunication services.

POSTEL, as the policy making authority, has prepared the following development plans to realize the above three targets.

- 1) To increase the capacity of telephone approximately 750 thousand terminals. This will increase the availability of services to 0.9 telephone sets per 100 people. For this purpose domestic telecommunication industries will be established to provide digital switching equipment of 100 thousand terminals capacity per annum.
- 2) To increase the number of public telephones to 2% of the total capacity of the switching equipment.
- 3) To establish a new electric wave monitoring system which will provide a wide selection of frequencies and increase the monitoring capabilities.
- 4) To install two more international sea cables. One is Medan-Middle East-West Europe sea cable. The other is Indonesia-Australia-Singapore cable. To provide a wider spread of international telecommunications, new technologies are being utilized.
- 5) To spread new types of services such as new cable communication system, television meeting system for local and long distance, data transmission system, etc. This will be realized also by introduction of new technologies.
- 6) To complete the carried over project from the Third Five Year Plan (190,390 terminals of telephone switching equipment).

PERUMTEL, one of the execution organizations of POSTEL, is now planning detailed construction plans through which the communication networks and the exchange system will be developed. At the same time intensification of maintenance activities to decrease the fault rate and speed up fault repairs is also emphasized for the qualitative improvement of the services.

2-2 Future Plan for Maintenance Activities

2-2-1 Present Conditions of Maintenance

PERUMTEL has developed the quantity of telecommunication facilities together with diversification of the services. The quality of services, however, has not been sufficiently developed compared with

Table 2-2 Construction Targets of the Fourth Five Year Plan

	Construction Items	Number
Domestic	Telephone	750,000 ss
	Telex	16,450 ss
	Radio Monitor Agency	32
	Telecommunication Industries	
	A. Digital Switching Equipment	100,000 ss/year
	B. PABX	5,000
	C. PCM Transmission	6,000 ch
	D. Telephone Set	100,000
	E. Public Telephone	1,000
	F. Secondary Relay Station	100
International	Sea Cable	2
	Automatic telephone system	
	A. Domestic Station	25
	B. International	110 countries

the quantity. The importance and role of maintenance for securing the quality of services have not always been recognized.

As a result, faults in telecommunication facilities often occur as shown in the fault rate in Indonesia. This is 8 faults per 100 telephone sets a month while in Japan it is about 0.5. In addition, required fault repairs are often delayed and some are obliged to be left without repairs. For this reason, standardization of maintenance activities and establishment of an appropriate maintenance system are matters of urgency. Ninety percent of faults occur in telephone outside plants according to the PERUMTEL's statistics. This rate indicates that the improvement of outside plant maintenance is the most urgent and important subject of the qualitative improvement of telecommunication services in Indonesia.

2-2-2 Present Conditions and Problems of Outside Plant Maintenance

(1) Present Conditions

Telephone outside plants include premises plants such as telephone set and wires, aerial and underground cables, poles and guys, manholes,

ducts, etc.. The actual maintenance activities of PERUMTEL are mainly to repair faults occurred in telephone sets and cables, and to replace and transfer the subscribers' telephone sets according to the procedures as mentioned hereinafter.

Daily outside plant maintenance is carried out by concerned divisions of outside plant maintenance, supply and materials, and inside plant maintenance at each telephone office throughout the country. The outside plant maintenance division actually repairs faults, install and remove telephone sets. The supply and materials division administrates vehicles and materials. The inside plant maintenance division is also involved in outside plant maintenance to receive fault claims from subscribers and inform them to the outside plant maintenance division. Maintenance personnel are dispersedly located at local and district substations of each telephone office.

Faults repairs are conducted according to repair plan prepared by each maintenance section based on the information from the inside plant maintenance division.

As maintenance personnel have a few training opportunity, they can not provide good services to fault repairs nor service order works. They usually wait outdoors for job assignment and work order from section chief.

(2) Problems

Under these circumstances of daily maintenance activities as mentioned above, it is difficult to secure the functions of facilities as they should be. Thus, the fault rate is so high as mentioned in the previous paragraph. Speaking about the repairing capability of personnel, a repair takes 6 days and only 1.17 faults can be repaired by a person per day on an average. The following can be suggested to improve these circumstances.

- 1) To reduce the fault rate.
- 2) To speed up fault repairs through establishing a system to detect faults and to grasp the present conditions of plants.
- 3) To intensify the mobility and to improve the equipment necessary for maintenance activities.
- 4) To improve knowledge and skills of personnel.

2-2-3 Future Plan of Outside Plant Maintenance

As it is too difficult to realize the above mentioned improvement through alteration of the existing facilities, PERUMTEL has considered that it is more appropriate to establish new facilities and it has concluded to establish telephone outside plant maintenance centers for this purpose. These maintenance centers will have comprehensive functions of daily outside plant maintenance activities after being added some new functions to the present functions. These new functions will include these of preventive maintenance, fault administration, material administration and personnel training as well.

PERUMTEL has planned to begin the construction of the maintenance centers in the major areas and cities in which telephone services are more required. These include five areas of Jakarta and the cities of Medan, Surabaya, Palembang, Semarang, Ujung Pandang, and Bandung, as shown in Figure 2-2. PERUMTEL has a plan to construct such centers also in other cities in accordance with the result of these centers.

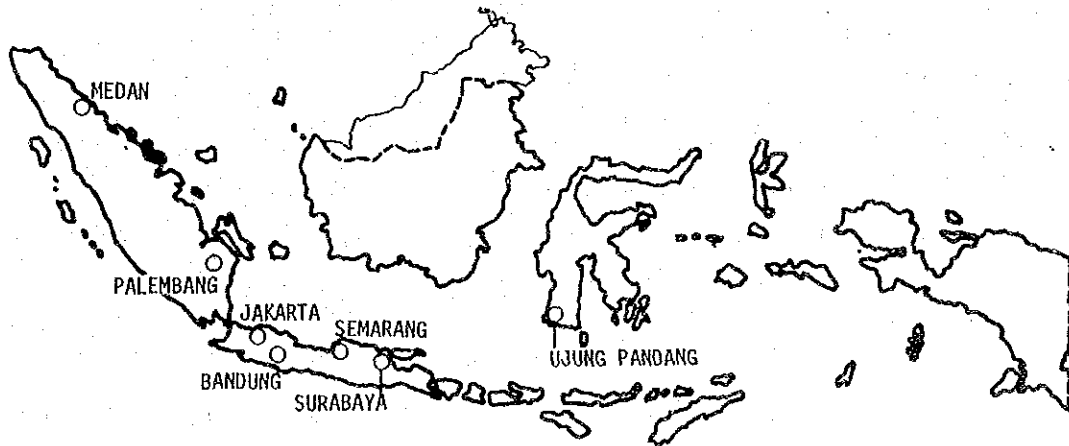


Fig. 2-2 Proposed Cities for Maintenance Centers

2-2-4 Model Center

As PERUMTEL has been interested in the system of Japanese lineman centers through the current technical cooperation, it has decided to introduce this system to Indonesia to construct the above mentioned maintenance centers. PERUMTEL has decided to construct a model center for the first step of this construction project.

The Model Center will have a training function as well as the same function of a daily maintenance activities as the Japanese lineman centers.

Japanese linemen centers are facilities to accommodate only the outside plant maintenance divisions from a telephone office organization. They have been established to realize more efficient maintenance activities and to function as a base for this purpose. Beforehand, office room for indoor duty personnel and waiting room for outdoor duty personnel were separated. However, it became clear that it would be more adequate for efficiency increase to combine the two rooms and provide the outdoor duty personnel with desks so as to participate to some clerical works and study by themselves there. Lineman center buildings have been designed so as to ensure a functionally smooth work procedure from the start in the morning to the close in the evening. Especially storages have been laid out to facilitate taking in and out of materials and equipment from the storages to vehicles and viceversa. Thus working flow in the linemen center has been well organized. This has also realized labor and time saving in the linemen centers.

The main tasks of Japanese linemen centers are daily maintenance activities. Personnel training is scarcely conducted there except occasional introduction of new technique. Therefore, when the system of Japanese linemen centers is introduced to Indonesia, it is required to add a training function to it and to modify it taking into account the local conditions of telephone facilities and maintenance activities.

PERUMTEL selected Bandung City where its headquarters is located for the project area of the Model Center. The present conditions of telephone services in Bandung are described in the following clause.

2-3 Telephone Services in Bandung

2-3-1 Jurisdiction of the Bandung Telephone Office

The Bandung Telephone Office is one of the nine central telephone offices under the jurisdiction of the Fifth Regional Telecommunication Bureau (WITEL-V) as shown in Figure 2-3.

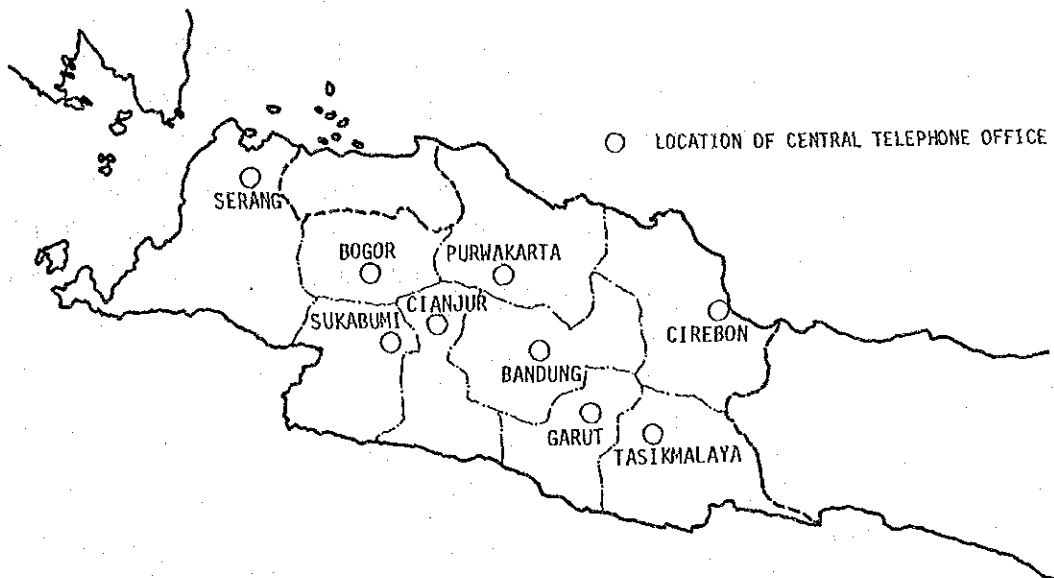


Fig. 2-3 Jurisdiction Area of Witel-V

The jurisdiction of the Bandung Telephone Office consists of the inside and outside areas of Bandung City. Inside Bandung City, a central office and 4 local substations offer services by automatic exchange system to approximately 20,000 subscribers.

On the other hand, outside the city, 16 district substations offer services to approximately 2,000 subscribers. Services are of manual switchboard system except the district substations of Chimahi, Lembong, and Sumedaung. The organizations of these district substations differ according to the number of subscribers and kind of equipment. Some district substations consist of technical section for plant maintenance and administrative section for switching and window services. Many others have no organization but a few operators and maintenance personnel. Figure 2-4 shows the jurisdiction are of the Bandung Telephone Office.

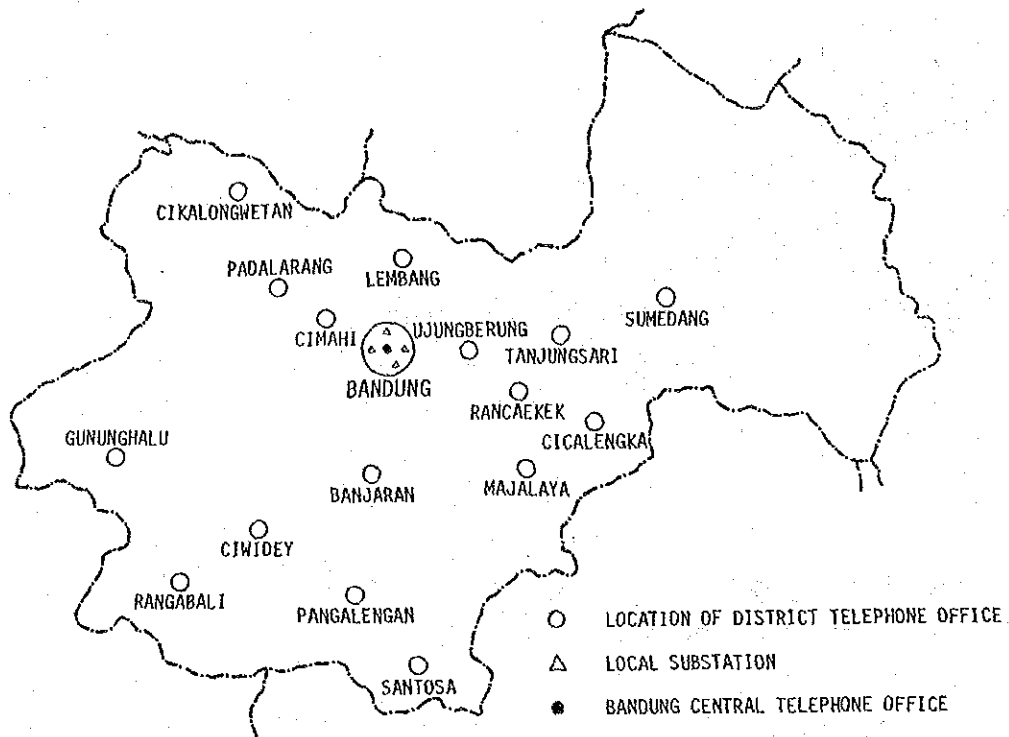


Fig. 2-4 Jurisdiction Area of Bandung Telephone Office

2-3-2 Organization of the Bandung Telephone Office and its Services

The Bandung Telephone Office consists of six divisions and 16 district substations. The six divisions are Inside Plant Maintenance Division, Local Outside Plant Maintenance Division, Fare Account Division, Personnel Division, District Outside Plant Maintenance Division, and Supply and Materials Division. The organization chart of the Bandung Telephone Office is shown in Appendix III-4. The services of each division are as follows:

(1) Inside Plant Maintenance Division

This division is in charge of control and maintenance of the all inside plants of the Bandung Telephone Office. Inside plants include switching equipment, MDF (Main Distribution Frame), PBX (Private Branch Exchange), and other related facilities. This division also takes part in outside plant maintenance by receiving fault claims from subscribers and preparing fault statistics. The personnel are dispersedly located at the central station, the local and district substations.

(2) Local Outside Plant Maintenance Division

This division is in charge of control and maintenance of the telephone outside plants inside the city. Service order works and supervision of new plant construction are also included in the tasks. The personnel are dispersedly stationed at the central and the local substations.

(3) Fare Account Division

This division is in charge of fare accounting, subscriber administration, etc.

(4) Personnel Division

This division is in charge of salary accounting, payment, personnel administration, etc.

(5) District Outside Plant Maintenance Division

This division is in charge of maintenance of the outside plants outside the city and toll lines between the Bandung Toll Exchange and each district substation. The administrative staff and toll line maintenance staff are stationed at the central station. However the maintenance personnel dispersedly located at some district substations.

(6) Supply and Materials Division

This division is in charge of control of all materials needed for the Bandung Telephone Office, vehicles management and building maintenance.

2-3-3 Present Conditions of Telephone Equipment

According to the statistics of the Bandung Telephone Office (Table 2-3), the capacity of switching equipment in Bandung City is 28,500 terminals in November, 1984. The number of subscribers is 19,518 which occupies 68.5 percent of the exchange capacity. The ratio of the capacity to the number of subscribers is appropriate to balance the demand and the supply so far as new constructions are executed in accordance with an adequate program. The number of subscribers of the central station, however, reaches to 90 percent of the exchange capacity. Thus, new switching equipment is being installed.

The number of telephone sets surpasses the capacity of switching equipment at almost all stations in Bandung City except the Barat Substation. This is because extension telephone sets are included in the number of telephone sets.

Table 2-3 Telephone Facilities

November 1984

Location	Exchange Capacity	Number of Telephone	Cable Capacity	Number of Subscribers
Turangga	2000	2036	6700	1215
Centrum	7000	13940	10236	6344
Barat	8000	7359	8000	4792
Timur	5500	6272	6520	3325
Utara	6000	6092	6384	3842
TOTAL	28500	35699	37840	19518

2-3-4 Present Condition of Fault Occurrence

As for fault occurrence situation, 99.8 percent of faults outbreak in the outside plants as calculated from Table 2-4. This figure is higher than the national average of 90 percent. This is considered because, in Bandung City, the exchange systems are all automatic, the telephone equipment is relatively new, and maintenance has been done comparatively well by manufactures. The fault rate per 100 telephone sets is calculated 5.17 in November, 1984 from Tables 2-3 and 2-4, while that per 100 subscribers is 9.5.

Table 2-4 Fault Occurrence in Bandung

November 1984

Location	Faults occurred at				Total
	Inside Plant	Outside Plant			
		U/G Cable	Aerial Cable	Premise Plant	
Turangga	1	1	31	31	64
Centrum	-	220	360	236	816
Barat	-	27	149	96	272
Timur	1	34	234	118	397
Utara	2	63	122	110	297
Total	4	345	896	591	1,846

2-3-5 Plan for Equipment Increase of the Bandung Telephone Office

Increase plan of the telephone equipment in the Bandung Telephone Office has been made based on the results of demand research and budget condition of PERUMTEL. The demand research has been referred to the waiting subscriber list.

The increase plan from 1985 to 1989 is shown in Table 2-5. According to this table, the capacity of switching equipment will be 96,500 terminals in 1989 and increased 68,000 terminals in the five years. Consequently, the number of local substations will also increase from 4 to 9. Some of these new local substations have already been begun to be constructed.

In accordance with this increase, the Outside Plant Maintenance Department will have such new services as supervision of new construction works, installation and replacement of telephone sets as well as maintenance of these new facilities.

Table 2-5 Exchange Capacity Increase in Bandung City

No. Location	Year						Total (1989)
	1984	1985	1986	1987	1988	1989	
1. Bd. Centrum	7,000	500	11,000	—	—	—	18,500
2. Bd. Timur	5,500	3,000	—	7,000	—	—	16,500
3. Bd. Barat	8,000	—	2,000	4,000	1,000	—	15,000
4. Bd. Utara	6,000	—	—	13,500	—	—	19,500
5. Turangga	2,000	3,000	—	—	6,000	—	11,000
6. Tegallega	—	3,000	—	3,000	—	3,000	9,000
7. Kopo	—	2,000	—	—	—	—	2,000
8. Cijawura	—	2,000	—	—	—	—	2,000
9. Gegarkalong	—	—	—	2,000	—	—	2,000
10. Ujung Berung	—	—	1,000	—	—	1,000	2,000
Total	28,500	13,500	14,000	29,000	7,000	4,000	96,500

2-3-6 Present Conditions of Outside Plant Maintenance Activities

The outside plant maintenance in the Bandung Telephone Office is carried out by the Local Outside Plant Maintenance Division and District Outside Plant Maintenance Division, as mentioned in 2-3-2. The Local Outside Plant Maintenance Division consists of 8 sections of Planning, Administration, Maintenance I - V, and Junction. The Planning Section, Administration Section, Maintenance Section III, and Junction Section are located in the central station and the other 4 maintenance sections are located in each local substations in Bandung City. The total number of personnel is 153 including chief of the division. Figure 2-5 shows organization and services of the Local Outside Plant Maintenance Division. Plant record administration actually carried out by the Planning Section is still incomplete to fulfill the purpose of plant record.

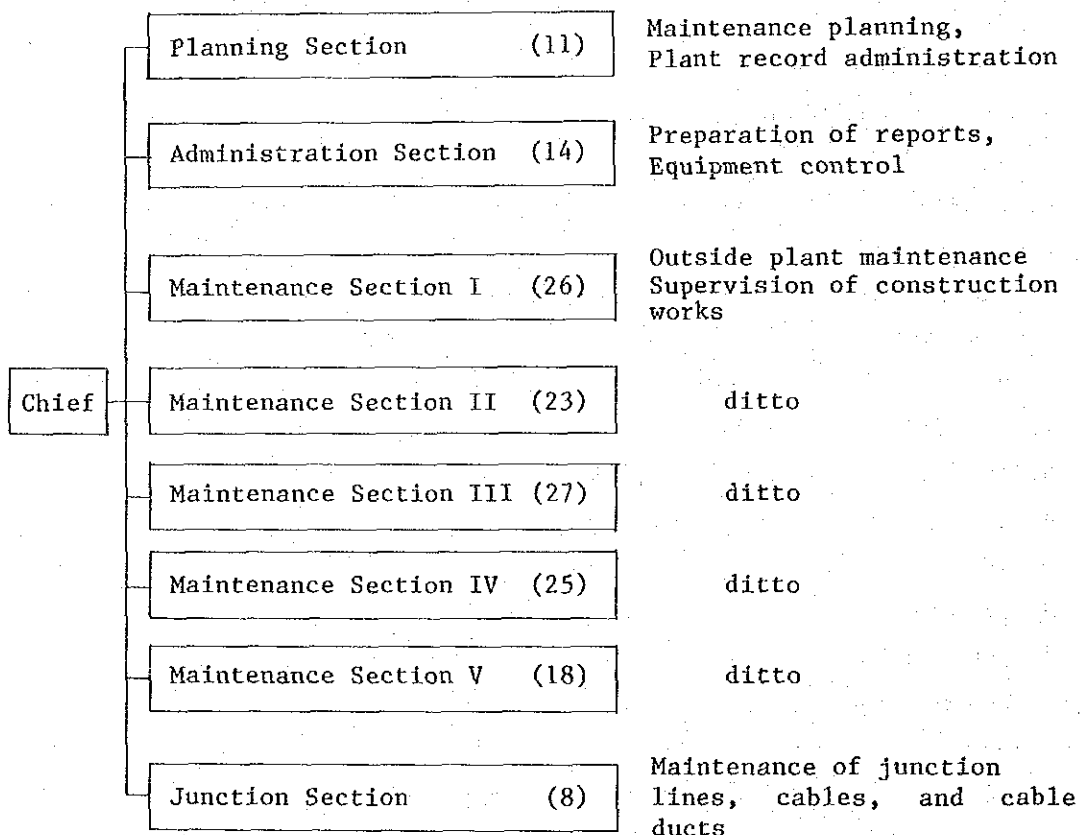


Figure 2-5 Organization of Local Outside Plant Maintenance Division

The District Outside Plant Maintenance Division consists of 5 sections of Administration, Toll Line, Western area maintenance, Eastern area maintenance, and Northern area maintenance. The Administration and the Toll Line Sections, and the chiefs of each Maintenance Sections as well as the division chief are stationed at the central station. The Maintenance Personnel are dispersedly located at some of district substations. The total number of personnel is 50 among which 20 are placed at the central station.

As for the maintenance activities of the central station, the maintenance personnel have to wait for job assignment from the section chiefs outside the room of the Maintenance Section III. They are mainly engaged in fault repairs and service order works. The office room is only equipped with a few desks, chairs, and a telephone set. The personnel dispatch procedures for fault repairs are almost the same as mentioned in 2-2-2. Only 3 vehicles are allocated for maintenance activities to the Maintenance Section III including a wagon used for fault repair kit transportation. Therefore, bicycles and motorbikes are major mobile power.

Materials and vehicles necessary for maintenance activities are controlled by the Supply and Materials Division. Therefore, daily use of materials, equipment, vehicles, etc. calls for procedures extended over two divisions. This system also disturbs to implement efficient daily maintenance.

CHAPTER 3 PROJECT DESCRIPTION

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CHAPTER 3 PROJECT DESCRIPTION

3-1 Purposes and Functions of the Model Center

3-1-1 Purposes of the Project

As mentioned before, PERUMTEL has a plan to establish 11 maintenance centers throughout the country for the purpose of improving the telephone outside plant maintenance. To ensure efficient daily maintenance activities, these maintenance centers are required to function as a base of daily maintenance such as Japanese lineman centers. These are also required to be a training facility for improving the knowledge and technique of maintenance personnel.

The role of the Model Center, which is also mentioned in the previous chapter, is being a model for these maintenance centers. The purposes of the Model Center are to realize efficient outside plant maintenance activities in Bandung, to train personnel concerned for this purpose and to train instructors for the other maintenance centers.

3-1-2 Functions of the Model Center

The Model Center is required to fulfill the following functions for the purposes clarified in the above paragraph:

- 1) To implement daily maintenance through a centralized management system.
- 2) To train personnel's knowledge and technique of telephone outside plant maintenance.
- 3) To develop methods and system of the above training.

3-2 Activities of the Model Center

3-2-1 Daily Maintenance Activities

The daily outside plant maintenance activities of the Model Center are to offer services mainly to subscribers and includes: repair of faults; removal and relocation of cables, wires, telephone sets, etc; installation of new telephone sets; plant inspection; supervision of

outside-ordered construction project; plant record management; material and other related administrations. These activities consists of the whole tasks of the Local Outside Plant Maintenance Division, partial tasks of the District Outside Plant Maintenance Division and Supply and Material Division of the Bandung Telephone Office. The Model Center will not include personnel who are in charge of maintenance at district substations. This is based on the consideration that easy personnel centralization would result in decrease of efficiency, because the service area of the District Outside Plant Maintenance extends 60 kilometers. The Model Center will exclude such sections of the Supply and Material Division as are in charge of management of other materials, building maintenance, etc. which are not directly concerned with telephone outside plant maintenance.

The actual outside plant maintenance activities of the Bandung Telephone Office are mainly repair of faults according to subscriber's claim and service order works for subscriber's as mentioned in 2-3-6. The Model Center will realize efficient maintenance activities and reduction of fault rate in Bandung through the following improvement: providing necessary equipment which includes intensification of mobility; preparing plant records and statistic data to be utilized effectively; intensification of maintenance administration; implementation of preventive maintenance.

For the improvement of maintenance efficiency, all of the outdoor maintenance personnel will be also engaged in a small clerical works such as reporting activities and filling necessary forms. For this purpose, common use desks and chairs will be provided for the outdoor service staff as well as a personnel lounge to be used for waiting while job assignment.

This large improvement of system and working condition from the present condition will also extend the scope of responsibility of each personnel. It will also give each personnel opportunities to understand the services conducted by others. Through this improvement, it is expected to improve awareness of responsibility of each personnel. This improved awareness will further promote efficient maintenance activities.

The contribution targets of the Model Center at the end of the Fourth Five Year Plan are planned as listed in Table 3-1, concerning the efficiency improvement of maintenance activities.

Table 3-1 Planned Achievement of the Model Center

Item	Targets	
	Current	Future
Fault rate (100 telephone sets)	8 sets/month	→ 5 sets/month
Efficiency (number of repairs/pers.)	1.7/day	→ 3/day
Days necessary for a repair	6 days average	→ less than 1 day = 70% less than 3 days = 20% more than 7 days = 0%

3-2-2 Training in the Model Center

The training in the Model Center will include the following, necessary knowledge for daily outside plant maintenance, necessary skill for fault repair, inspection and testing; necessary technique for implementation of fault management and maintenance administration. Training will consist of lectures, indoor practice, outdoor practice and on-the-job training. The planned training items are as follows:

1) Outline of the outside plant:

- Line plant,
- Underground plant,
- Premises plant,
- Basis of telecommunication system

2) Installation techniques:

- Basis of telephone,
- Telephone sets,
- Inside wire,
- Outdoor wire,
- Local cable,
- Pole and guy,
- Cross-connecting and terminal box,
- Local cable jointing

3) Maintenance techniques:

Fault locating method & acceptance test,
Local cable maintenance,
Underground plant maintenance,
Premises plant maintenance

4) Maintenance management:

Fault administration,
Inferior plant administration,
Material administration,
Plant record administration,
Preventive measures from other work

The trainees of the Model Center will be the personnel of the Bandung Telephone Office who are engaged in outside plant maintenance, the chiefs of outside plant maintenance division in the other eight telephone offices of WITEL-V, the candidates for instructor and chief of outside plant maintenance division in the other ten maintenance centers.

The trainees will be classified into Grade I and Grade II in accordance with the PERUMTEL's classification for technical staff. Table 3-2 shows the planned numbers and classifications of the trainees.

Table 3-2 Trainees

No.	Trainee	Number & Classification	
		Grade I	Grade II
1	Staff of L.OPM. Div.	126	26
2	Staff of D.OPM. Div.	47	3
3	Staff of IPM. Div.	32	7
4	Chief of OPM., WITEL-V	0	8
5	Candidate for Chief in the other M.C.	0	10
6	Instructor for the other M.C.	0	20

Note) L.OPM.Div. : Local Outside Plant Maintenance Division
D.OPM.Div. : District Outside Plant Maintenance Division
IPM.Div. : Inside Plant Maintenance Division
M.C. : Maintenance Centers

Grade I and Grade II mean personnel ranked Jrtk I or below and Pamtk or above respectively in the PERUMTEL's classification for technical staff shown in Table 3-3.

Table 3-3 Classification of Technical Staff

Classification		Qualification
Grade I	TPP	Highschool + 1 month training
	Jrmtk	Junior Highschool + 1 year training or More than 1 year as TPP
	Jrmtk I	More than 4 years as Jrmtk
	Jrtk	More than 4 years as Jrmtk I
	Jrtk I	More than 4 years as Jrtk
Grade II	Pamtk	Highschool + 2 years training or More than 4 years as Jrtk I
	Pamtk I	More than 4 years as Pamtk
	Patk	Postel Academy or More than 4 years as Pamtk I
	Patk I	More than 4 years as Patk
	Pnmtk	University + 1 year training or More than 4 years as Patk I
	Pnmtk I	More than 4 years as Pnmtk

The following four training courses will be prepared according to the classification and task of trainee.

- 1) Basic Course : Grade I personnel of the Bandung Telephone Office
- 2) Advanced Course : Grade II Personnel of the Bandung Telephone Office
- 3) Comprehensive Course : Chiefs of outside plant maintenance division
- 4) Instructors Course : Instructors

Details of training are shown in Table 3-4.

Table 3-4 Training Courses

Courses	Trainees	Targets and Contents
Basic Course	Grade I personnel of the Bandung Telephone Office	<p>To understand the outside plants. To have basic skills and knowledge of the maintenance. This includes:</p> <ol style="list-style-type: none"> 1) To understand each element and function of the outside plants. 2) To be able to install and repair telephone sets, wires, cables, poles guys, terminal box, etc. 3) To be able to inspect the outside plants. 4) To understand the basis of the fault administration material control and plant record management.
Advanced Course	Grade II personnel of Bandung Telephone Office	<p>To acquire skill and knowledge of maintenance sufficient enough to train assistants. This includes:</p> <ol style="list-style-type: none"> 1) To be able to install and repair telephone sets, wires cables, poles guys, terminal boxes, etc. 2) To be able to connect cables. 3) To be able to conduct fault detection and final cable tests. 4) To be able to inspect the outside plants. 5) To be able to provide maintenance administration.

Courses	Trainees	Targets and Contents
Comprehensive Course	Chiefs of outside plant maintenance division	<p>To have sufficient knowledge of maintenance administration and to improve capability of leader.</p> <p>This includes:</p> <ol style="list-style-type: none"> 1) To be able to provide maintenance administration. 2) To be able to direct the staff with construction, maintenance and supervision. 3) To be able to conduct fault detection and final cable tests.
Instructors Course	Candidates of instructors for the other planned maintenance centers.	<p>To have sufficient technique and knowledge as an instructor of outside plant maintenance. This includes:</p> <ol style="list-style-type: none"> 1) To be able to train installing and repairing of telephone sets, outside and inside cables, poles, guys, terminal boxes, etc. 2) To be able to train cable connecting. 3) To be able to train outside plant inspecting. 4) To be able to train fault repairing and final cable testing. 5) To be able to teach maintenance administration. 6) To be able to prepare instruction manuals and curriculum.

Training for the personnel of the Bandung Telephone Office will last four years and training for the other trainees will be implemented in the fifth year.

The number of trainees in one training unit will be 15 - 20. Training will be given to one unit only at the same period. One training period for Bandung Telephone Office staff will be 2 weeks. It is difficult for the staff of the Bandung Telephone Office to spare time for continuous intensive training due to the tasks of daily maintenance. Training will be divided into 4 - 6 periods. For example, maintenance personnel of Grade I will have a total of eight weeks training divided into four periods in the four years. Training for trainees other than the Bandung Telephone Office staff will be conducted continuously during 3 to 4 months.

3-3 Organization of the Model Center

3-3-1 Operational Organization

The Model Center will be operated under the direction of the chief of Bandung Telephone Office by two departments of daily maintenance and training. The former will consist of the present Local Outside Plant Maintenance Division and parts of the present District Outside Plant Maintenance Division and the Supply and Material Division as mentioned in paragraph 3-1-1. The latter will be newly established.

3-3-2 Personnel Planning

The number of personnel of the Model Center is decided to be 214 in total through studies and discussions with Indonesian side. This consists of 192 in the Daily Maintenance Department, 16 in the Training Department and planned five experts of technical cooperation, as well as a director.

3-4 Proposed Site

The Model Center will be constructed in Bandung as mentioned in Chapter 2. The following four lands were taken into study as candidate sites for the Model Center.

- 1) A land to be newly purchased
- 2) Backyard of the Bandung Telephone Office
- 3) A land inside the site of Dayeuh Kolt
- 4) A land inside the site of PERUMTEL Education, Research and Development Center (PERDC)

The following conditions were taken into consideration to propose the site:

- 1) The minimum area of land should be about 3,000 sq.m to meet the functional requirement of the Model Center.
- 2) For efficient maintenance activities, land should be located in the center of the service area as much as possible.
- 3) Infrastructures of land such as access road, drainage, water supply, etc. shall be in good condition.
- 4) Site purchase and/or renovation should not disturb the progress of the Project implementation.

The above four lands respectively correspond to the above conditions as follows:

- 1) A new land has little possibility to be timely purchased.
- 2) A new land in Dayeuh Kolot is 9 kilometers far from the center of Bandung and located in one-side. The access road is narrow and requires a widening.
- 3) A land in PERDC has an area of 1,500 sq.m and is too small.

As a result, the backyard of the Bandung Telephone Office was proposed to be the site of the Model Center. Actually it is used for parking area, stockyard and the site of existing buildings. It will provide an area of around 2,880 sq.m after demolition of the existing building and renovation of the land.

3-5 Facilities

3-5-1 Building

The required rooms for the satisfaction of the functions of the Model Center are mentioned below.

(1) Daily Maintenance Department

Offices for daily maintenance activities and storage of equipment and materials should be functionally laid out for the centralized management of personnel, equipment and materials. Rooms for division chiefs which should be adjacent to these office rooms are also required. The chief's rooms will be used also as meeting room.

Outdoor duty personnel will wait job assignment inside the Model Center and be engaged also in small clerical work. For these purposes a personnel lounge and clerical space equipped with common use desks are necessary.

A room is necessary for lockers to store tools, helmets, shoes etc. loaned to and controlled by each personnel.

The Supply and Material Division is in charge of small repairs of telephone sets, tools and measuring equipment as well as material administration. Therefore, a workshop is required to be provided adjoining the office room of the Supply and Material Division.

Other rooms are a meeting room, a resting room and a detached garage for the pole installing vehicle and the bucket equipped vehicle.

(2) Training Department

A lecture room, practice rooms for measuring training, a preparation room and a training material room are necessary for training. A instructors' room and an administrative staff room are also indispensable. Being adjacent to the instructors' room, an experts' room and a director's room are also required. The meeting room mentioned above will be commonly used by the two departments.

(3) Common Use Space

As common use spaces, entrance halls, staircases, corridors, storage rooms, kitchenette, etc. are also necessary for the building.

3-5-2 Equipment

It is required to equip the Model Center with necessary equipment for daily maintenance activities based on the standard of Japanese lineman centers. The planned equipment includes, measuring instruments, tools, vehicles and so on. Office cabinets and shelves are necessary for custody of records, documents, data and so forth. Common use desks and chairs mentioned in paragraph 3-5-1 (1) are required to

be equipped in the offices of the Daily Maintenance Department for outdoor service personnel. Lockers for tools, helmets, etc. are also required for them. In the Training Department, white boards, a slide projector, a lecture table and chair, classroom desks and chairs, tables for measuring practice and so on are necessary for training.

3-5-3 Other Facilities

The following facilities other than the building and equipment are necessary for the Daily Maintenance Department and the Training Department respectively:

(1) Daily Maintenance Department

1) Parking lots for vehicles

Parking area should be decided based on the planned number of vehicles. The number of vehicles required for maintenance activities must increase in the future in accordance with demand of efficiency increase. To meet this requirement, it is required to secure a space for parking as large as possible.

2) Parking lots for bicycles

Bicycles and motorbikes will be still useful as mobility for maintenance activities in the Model Center. Parking lots for bicycles and motorbikes are necessary.

3) Stockyard

Stockyards are required for poles and cable drums which cannot be stored in the storage of the Model Center.

(2) Training Department

The practical training in the Model Center will consist of outdoor training and indoor training. The outdoor training will include installation practice of pole and guy, wiring and terminating practice, installation of aerial and underground cables, connecting practice of cables, and so on. Therefore, it is required to provide the Model Center with a training ground which is equipped with training poles, manholes, ducts and terminal boxes.

CHAPTER 4 OUTLINE OF THE PROJECT AREA

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CHAPTER 4 OUTLINE OF THE PROJECT AREA

4-1 Outline of Bandung City

4-1-1 General

Bandung, the capital of West Java Province, is located 115 km from Jakarta and is on the highlands at 700 - 1,000 meters. Bandung city is the third largest city in Indonesia. It covers an area of about 8,100 hectares and has a population of 1.45 million (1980). It is the center of commerce and industry in Western Java as well as the center of education, science and culture, as symbolized by Bandung Polytechnique.

4-1-2 Natural Conditions

(1) Geography

Bandung is located in a basin surrounded by volcanos of the central highlands of WEST Java. Although the altitude difference between the north and the south of the city is large, the central part is rather flat. The northern area is higher. About ten small rivers run through the city from north to south. The river beds are relatively deep with adequate space for drainage.

(2) Climate

The climate of Java Island is tropical monsoon. The weather is moderate in Bandung due to the high altitude. The climatic data of Bandung is listed in Table 4-1.

(3) Natural Disasters

Serious disasters, such as storms and floods, have not occurred in Bandung due to the moderate climate and high altitude. Although the frequency of lightning is less than in Jakarta, lightning protection must be furnished for all buildings in Bandung. No earthquake disasters have been recorded, although light earthquakes are felt occasionally.

Table 4-1 Climate in Bandung

CLIMATE IN BANDUNG													
Location	06° 54' LS	107° 35' BT		Altitude 743									
Item	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Temperature	°C	22.8	22.6	22.6	22.7	23.1	22.3	22.0	22.5	22.9	23.3	23.0	--
Maximum Average Temperature	°C	27.7	28.1	28.1	28.9	28.8	28.5	28.8	28.6	29.3	29.8	28.9	--
Minimum Average Temperature	°C	18.9	18.9	18.5	18.8	18.3	16.6	15.2	16.0	17.1	16.5	17.8	--
Total Rainfall	mm	187	155	190	384	135	37	05	98	171	223	381	--
Clear Days Rate	%	49	--	--	--	--	--	--	70	60	69	50	--
Average Air Pressure	mm bars	14.2	13.3	13.3	13.1	13.3	13.6	15.3	14.1	14.3	15.3	13.2	--
Average Humidity	%	82	85	83	87	84	76	71	73	74	72	82	--
Average Wind Speed	knots	05	05	05	04	04	05	05	06	06	05	04	--
Maximum Wind Speed	knots	18	15	26	20	12	12	15	15	18	22	14	--
Maximum Wind Direction	knots	NW	NW	NW	NW	NW	E	E	E	SE	SE	NW	--

4-1-3 Infrastructure

Bandung city, the third most populated city, is equipped with acceptable infrastructures such as roads, electricity and other public utilities, as follows.

(1) Roads

Most of the roads in urban areas, except alleys, are paved with asphalt. Road edges and connections with sidewalks are roughly finished.

(2) Drainage

The drainage system is separated into rain drainage and sewer according to jurisdiction. Rain drainage is controlled by the Municipality and sewerage is controlled by PAM (PERUSAHAAN AIR MINIM), the Water Public Corporation. The two separated systems have been constructed. However, since no treatment plant is yet completed, sewage is still percolated underground or discharged directly into rivers with rain water.

(3) Water Supply

PAM provides water for the whole city. However, since the facilities cannot meet the water demand, wells are still essential. Water from wells is not potable in general due to drainage facilities located closeby.

(4) Electrical Power

Power supply is controlled by PLN (PERUSAHAAN UMUM LISTRIK NEGARA), the Electric Public Corporation. The total capacity of supply seems to be short compared to the needs considering that streets are rather dark at night and power failures sometimes occur. Buildings for public use are generally equipped with emergency generators.

Electric power is of 3 phase 4 wire, 380/220 volts, 50 hertz. According to PLN comments, the voltage and frequency remain constant without regulation.

4-1-4 Construction Conditions

(1) Materials

Basic construction materials which are generally used in Indonesia, are produced domestically. This includes cement, steel bar, aluminum sash, metals, lumber, stones, roofing tile, asbestos slates, paint, glass, etc. Materials and machinery for building equipment are mainly imported or manufactured by domestic manufacturers with license from foreign companies. Most of the above materials are available in Bandung. Therefore, most materials can be acquired in Bandung for this Project.

(2) Contractors and Labor

Detailed information about the capability of contractors in Bandung is not clear. However, large hotels, office buildings, and shopping centers are being constructed in Jakarta by INDONESIAN contractors. With the visible quality and size of these projects, it is very clear that the construction business in Indonesia is prospering. These services are being offered throughout the country. Accordingly, there will be no problem in securing sub-contractors in Bandung.

Securing the necessary number of laborers is no problem, since sixty percent of the population (150 million people in Indonesia) live on Java Island. But skilled workers are short in supply. The labor wages are reportedly less than in Jakarta, as shown below.

Unskilled laborer	2,000 Rp/day
Skilled laborer	3,000 - 4,000 Rp/day.

(3) Transportation of Building Materials

Imported goods from Japan are unloaded at the port of Tanjung Priok. Sea transportation from Japan takes about two weeks, custom clearance takes about four weeks, and transportation to Bandung takes about five hours.

Jakarta and Bandung are connected by a trunk road about 180 km long. The transportation trucks keep the road very busy.

(4) Building Codes

More than ten regulations and codes are enforced for building in Indonesia, such as The National Building Regulation, The Indonesian Load Regulation for Buildings, etc. The Bandung Building/Construction Regulation also is imposed on buildings in Bandung. Some of the restrictions to be imposed on the Model Center were pointed out by the Municipality of Bandung as listed below.

- 1) Land Use: Public Building
- 2) Building coverage: 40%
- 3) Skyline Restriction: Less than 45° from the center of the road.
- 4) Building Alignment Line: 10 meters minimum from the plot boundary line
- 5) Parking Capacity: 1 car per 60 square meters of floor area
- 6) Structural Calculation: MUTOH METHOD,
Indonesia Load Regulation for Buildings and Others,
Soil investigation shall be done.
- 7) Fire Protection: Fire extinguisher, fire hydrant shall be provided.

However, details are subject to discussion prior to application of the building permit with officials of the Municipality. In addition, details of the contract are subject to prequalification prior to signing by SECRETARIAT NEGARA. This is imposed for all governmental building exceeding 500 million Rp in construction price.

4-2 Proposed Site

4-2-1 Conditions of the Site

(1) Location and Size of the Site

The proposed site is located at the center of Bandung city. It is in the backyard of the Bandung Telephone Office, addressed No. 11 Lembong Street (JL.LEMBONG). The site area is approximately 2,880 square meters. A four meter wide alley leads to Tera Street (JL. Tera).

(2) Environment of the Site

The four-story Bandung Telephone Office stands adjacent to the south side of the site. The west side adjoins the site of the ten-story Panhegar Hotel. Most of the north side and a part of the east side adjoin residential sites. The rest of the east side adjoins a vacant site owned by PERUMTEL. The computer center of PERUMTEL is located in the south of the vacant site which is east of the Bandung Telephone Office.

Lembong Street is eighteen meters wide and busy in traffic. Tera Street, however, is only 6 meters wide and it has light traffic. Several hotels and many houses are located near the site. A shopping area is also close to the site.

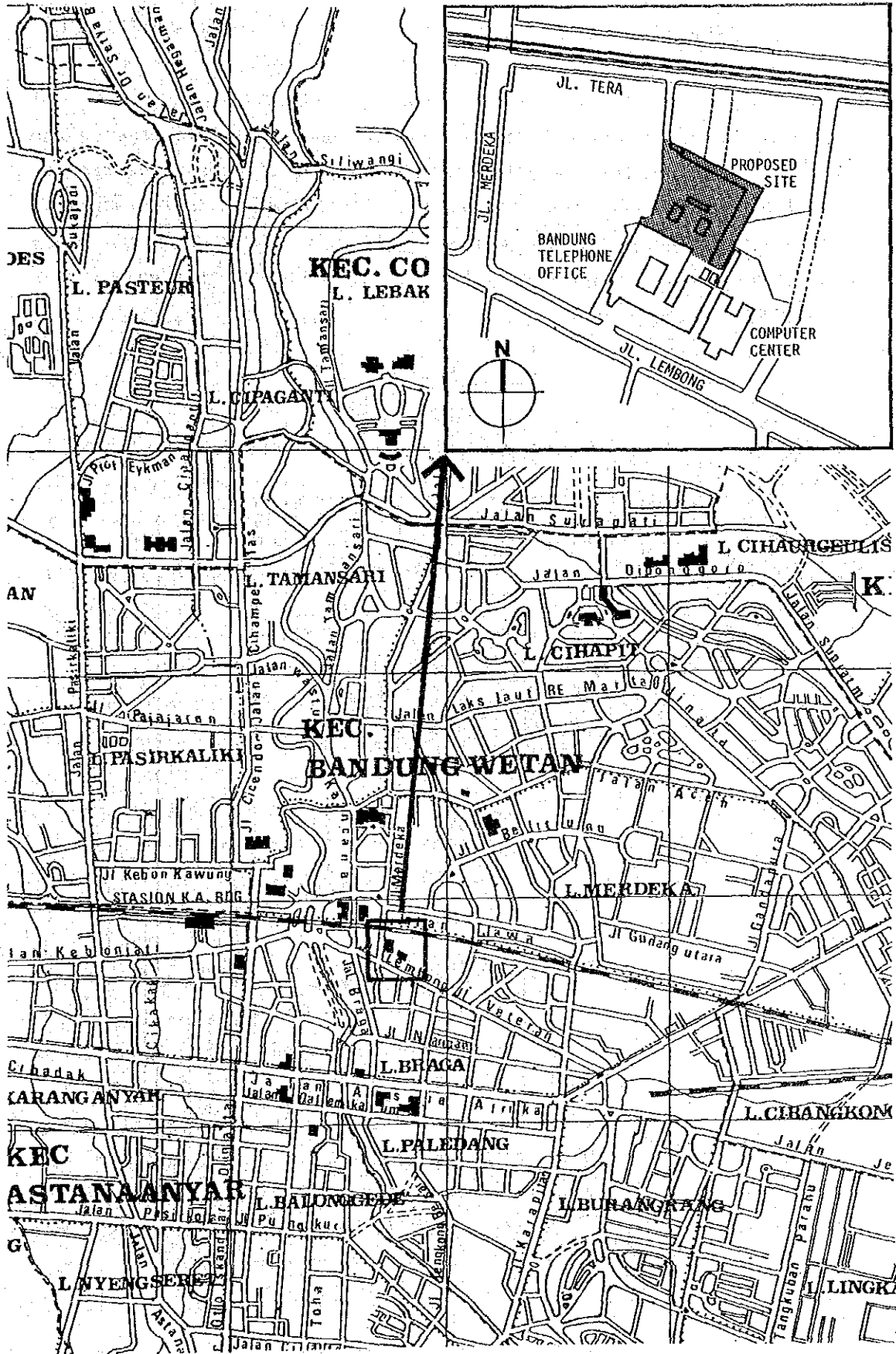


Fig. 4-1 Location Map

4-2-2 Actual Use of the Site

(1) Land Use

As shown in Figure 4-2, there are five one-story buildings on the site. These are mainly used for storehouses and offices. The rest of the site is used as stockyard for cables and steel poles and for parking cars. Wells, drainage pipes, electric cables from the emergency generator and telephone cables are installed underground. (Refer to Figures 4-3, 4-4, 4-5).

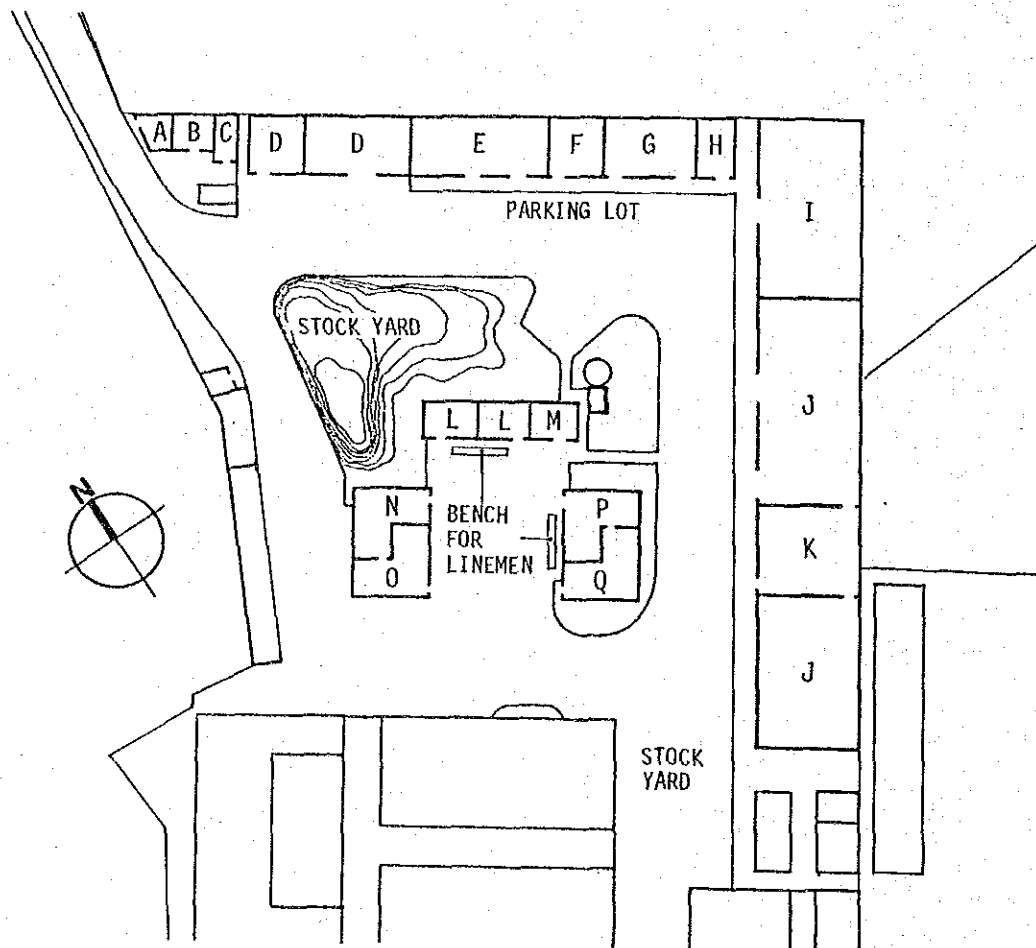


Fig. 4-2 Present Site Utilization

(2) Utilization of the Existing Buildings

The five buildings are occupied not only by the Bandung Telephone Office, but also by the Microwave Radio Station and the Interlocal Station. The table below indicates the building utilization.

Table 4-2 Existing Buildings in the Site

	Occupant	Utilization	Area(m ²)	No. of personnel
A.	--	Guard House	7.5	2
B.	--	Mosque	10.5	--
C.	--	Toilet	8.0	--
D.	Supply and Materials Div.	Electric Room	70.0	--
E.	Microwave Radio Sta.	Office	47.5	15
F.	Building Maintenance Sec, Supply and Materials Div.	Office	55.0	20
G.	Dist Outside PlantMnt Div.	Office	32.5	Unknown
H.	Vehicle Section, Supply and Materials Sec	Office	22.5	2
I.	Interlocal Station	Office	108.0	Unknown
J.	Supply and Materials Div	Storehouse	282.0	--
K.	Materials and Supply Div.	Office	54.0	11
L.	Machinery Div	Office	40.0	5
M.	Supply and Materials Div.	Workshop	14.0	5
N.	Supply and Materials Div.	Director's Room	27.0	1
O.	Supply and Materials Div.	Office	27.0	5
P.	Section III, City Cable Div.	Office	27.0	4
Q.	Personnel Div.	Office	27.0	6

4-2-3 Infrastructure of the Site

(1) Water Supply

City water has been supplied neither to the site nor to the Bandung Telephone Office. The city water mains, however, run under the Merdeka Street (JL.MERDEKA) (800 ϕ pipe) and the Tera Street (150 ϕ pipe), as shown in Figure 4-3.

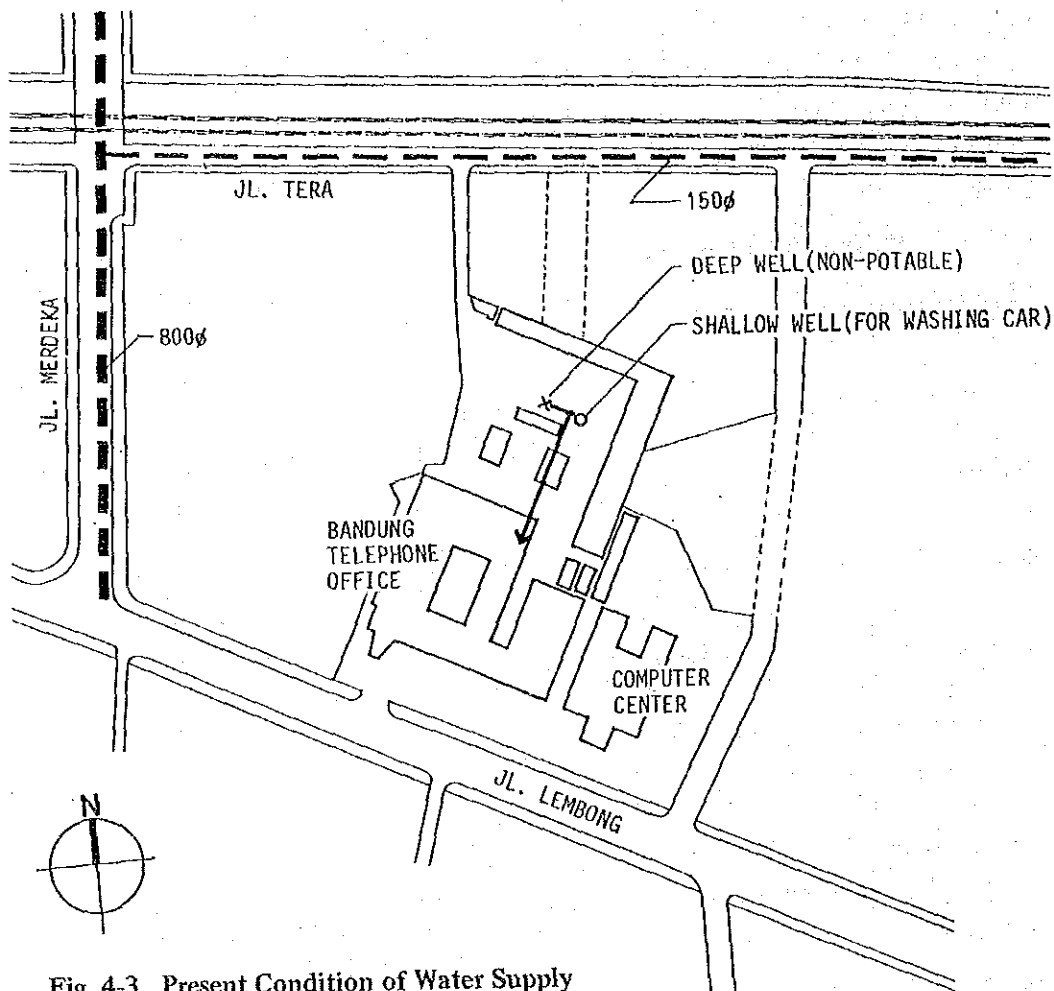


Fig. 4-3 Present Condition of Water Supply

From the city main under the Tera Street are intake pipes of 50 ϕ which have very recently been installed and supply city water to the existing buildings. At the time of the field survey, water was supplied to the buildings from the deep well existing on the proposed site. This deep well supplied non-potable water. Potable water is brought dailt to the existing buildings in polyethylene tanks by truck. The shallow well existing on the proposed site still supplies unclean water for car washing.

(2) Drainage

Rain water and sewage from the site and the Bandung Telephone Office together drain through the drainage pipe which exists within the proposed site. (Refer to Figure 4-4). This pipe is connected to an

open drainage (one meter wide, one meter deep) that borders the site. The drainage is connected to the city sewer, which runs under the road. Drained water flows rather smoothly in the open drainage.

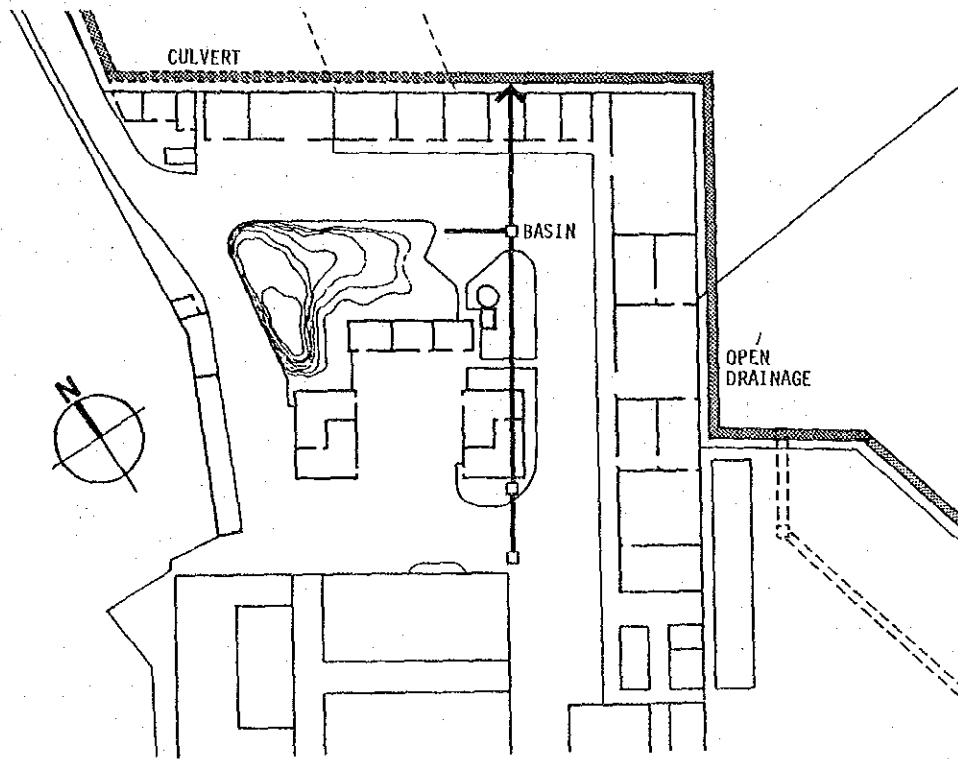


Fig. 4-4 Present Condition of Drainage

(3) Electricity

Electricity is supplied from aerial cables in Lembon Street to the PLN room. It is transformed from 20KV to 127/220V, 3 ϕ 4W in the transformer room and supplied to the electric room of the Bandung Telephone Office. The capacity of the supplied power is 210 KVA. A generator for emergency use is installed in the electric room located in the proposed site. The capacity is 175 KVA, 105/220V. Inside the proposed site, underground and aerial telephone cables and underground power cable from the generator are also installed.

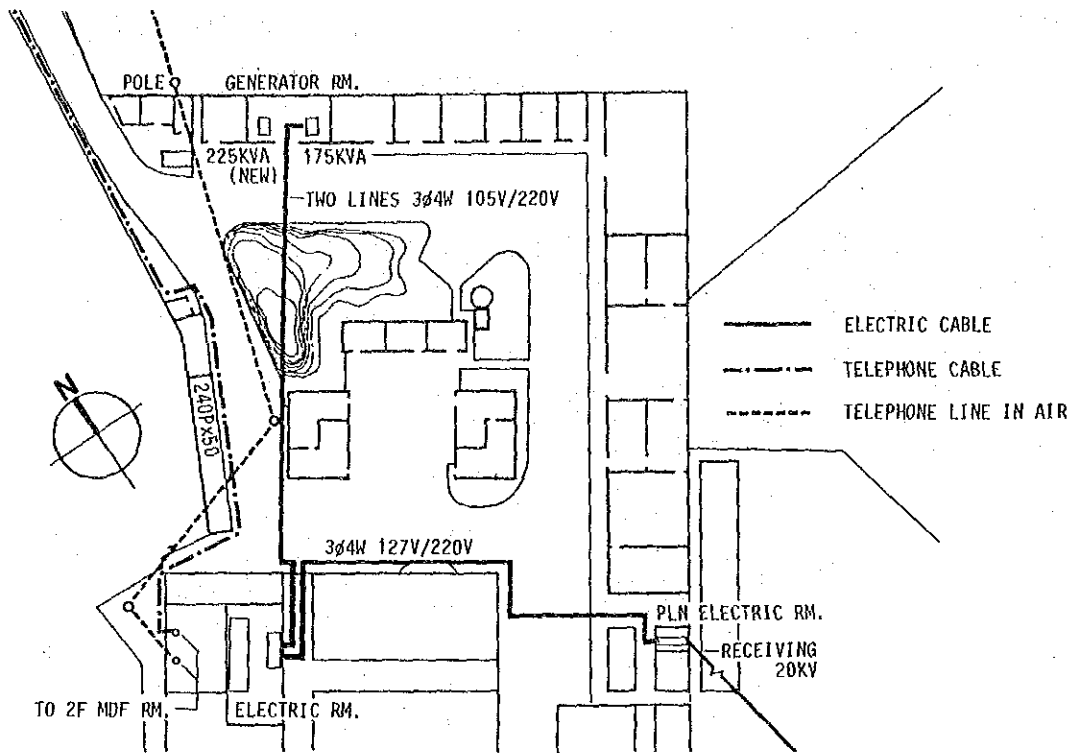


Fig. 4-5 Present Condition of Electric Facilities

4-2-4 Soil Condition

The ground level of the proposed site is not flat. It slopes down towards the north-east side. The maximum difference in altitude is about 1.2 meters between the road surfaces and about 2.0 meters between the lowest and highest parts of the proposed site. The condition of soil is rather good. A supportive layer of earth is found at 7 - 10 meters below the surface.

4-2-5 Existing Construction Plans Related to the Proposed Site

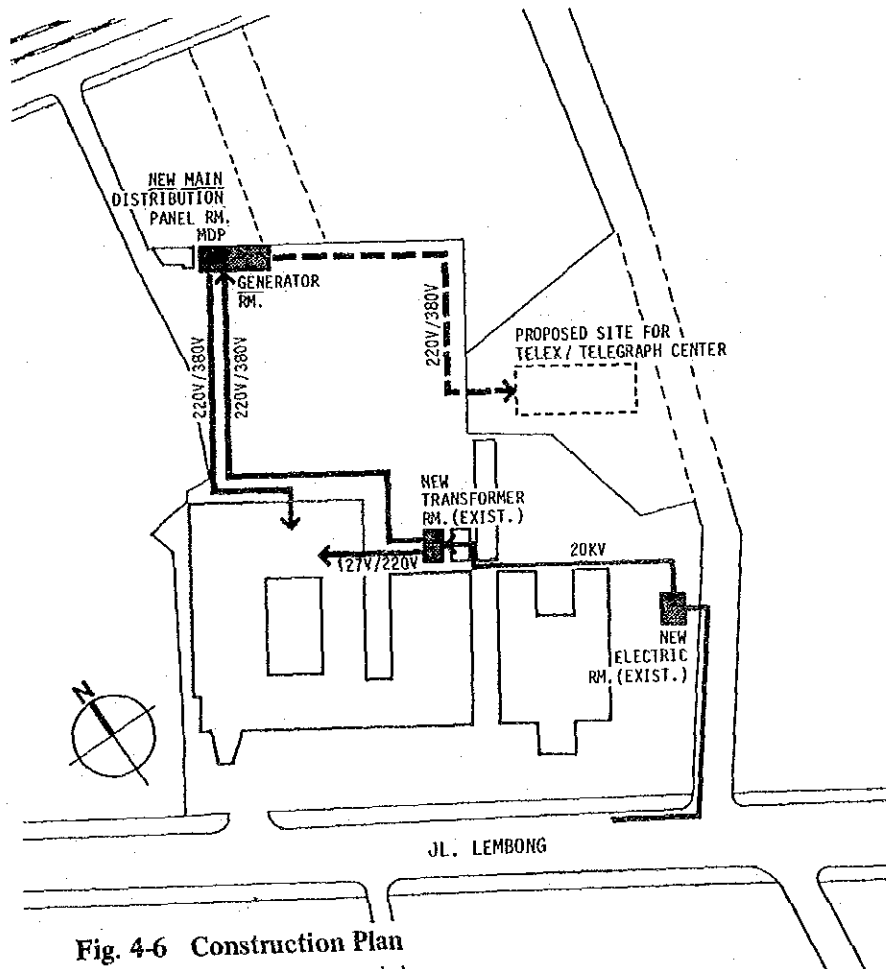
(1) Telegraph/Telex Center

This Center will be built in response to increasing demands for telegraph and telex in Bandung. The building will be of reinforced concrete of five-stories with a height of 21 meters. The building will be built on the vacant site adjacent to the east side of the proposed site. The design and tender for construction were already completed.

Construction will be started as soon as the government grants permission.

(2) Increase of Power Supply

PERUMTEL decided to increase the power supply capacity for this area from 210 KVA to 1,100 KVA. This is to meet the increased demands required by the planned Telegraph/Telex: a center and installation of new digital switchboards. For this purpose, construction of new electric rooms for PLN and alteration of the existing distribution system are needed (as shown in Figure 4-6). The PLN room have already been completed. Installation of new cables inside the proposed site have not yet been started, although the design and tender were already finished. A part of the design is subject to modification to coordinate with the Model Center Project. PERUMTEL is ready to do it according to the results of this basic design study.



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CHAPTER 5 PRELIMINARY DESIGN

5-1 Basic Policies of the Design

5-1-1 Design as a Model

As mentioned in Chapter 3, paragraph 3-3-1, this Model Center will function as a model for the maintenance centers, which will be built in other cities. Therefore, the facility plan and design should proceed so as to apply what the Model Center includes to the construction of the other maintenance centers with or without minimum modifications.

5-1-2 Utilization of the Proposed Site

The proposed site area is approximately 2,880 sq.m, which is barely large enough compared with the required activities of the Model Center. The outside plant maintenance center usually requires a lot of parking space. A future increase of vehicles should also be considered for the Model Center as mentioned in Chapter 3, paragraph 3-5-3. Besides, the Model Center needs a training ground for outdoor practice. To fulfil these requirements, it is necessary to lower the building coverage on the site as much as possible and to use the land as efficiently as possible.

As for the layout of the facilities, it is required to use the site most appropriately taking its particular conditions into consideration. At the same time, taking the nature of a model imposed on the Model Center into account, layout planning for this facility should be adaptable to any standard-type site.

5-1-3 Basic Concept of Building Design

When the nature of a model is seriously considered, the shape of the building should be most universal and standard. Thus, the following are adopted as the principles for designing:

- 1) To differentiate spaces according to the function as much as possible.

- 2) The structure should be simple and structurally uniform.
- 3) Much technical attention should be paid to the detail design of building, so that the building will be guaranteed in durability and safety.
- 4) The materials should be selected from those which are easy to obtain in Indonesia. Also, common construction methods in Indonesia should be utilized.
- 5) The building design should show an example to solve technical problems which have been observed in similar facilities in Indonesia. This will have the effect to transfer the rightful designing technology of maintenance centers.

The climate of Bandung is mild, so air-conditioning is almost unnecessary in the Model Center, but other cities are not the same condition as Bandung. Therefore, the building should have the capability to install air-conditioning with ease.

5-1-4 Basic Concept of Equipment Plan

The nature of a model emphasized in the equipment plan is to furnish the Model Center with necessary and sufficient equipment which can effectively be utilized. The equipment to be furnished in the Model Center is used for daily maintenance activities and training. Some equipment can immediately be utilized without any training. Some requires training. The former should be procured at the opening of the Model Center. However, the latter should be procured according to the training schedule, because if they are procured at the opening, they must be left until the related training is finished. A responsible custody is also required. It is not efficient.

The equipment should, therefore, be procured timely. So the selection of equipment will be planned according to the training schedule.

5-2 Facility Layout Design

5-2-1 Site Utilization

This Model Center consists of a center building and outdoor spaces surrounding it. The outdoor spaces consist of an area used for daily maintenance activities such as vehicle parking, loading and unloading of the material and equipment, etc. and an area used for outdoor training. These two outdoor spaces have different purposes and characteristics. It is appropriate and universal to layout separately the two independent outdoor spaces by placing the building as shown in Figure 5-1.

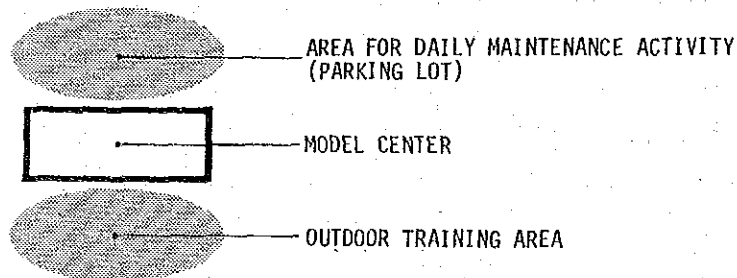


Fig. 5-1 Concept of Zoning

As for orientation of the building, two ways are possible as shown in Figure 5-2.

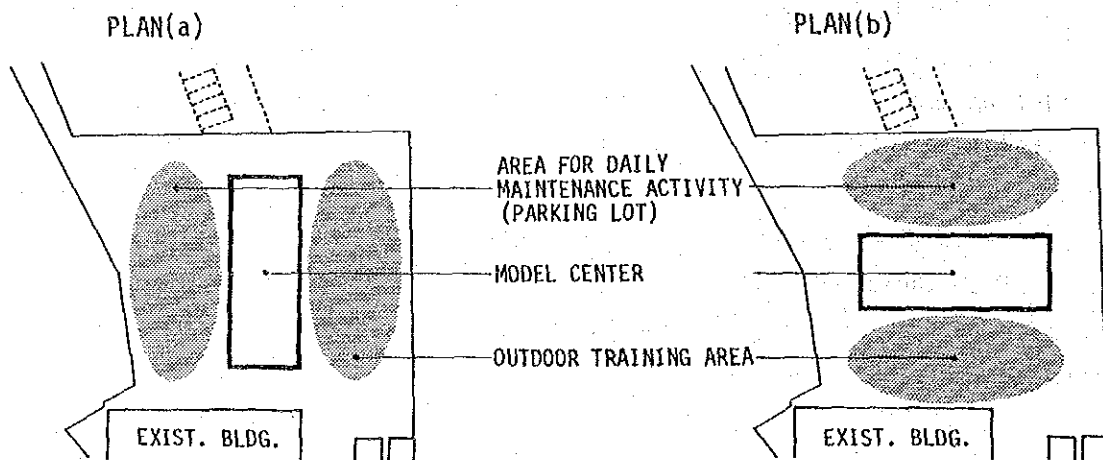


Fig. 5-2 Layout of Building

In the above figure, the location of the site at 18 Tera Street is indicated by dotted lines. The landlord of this site has made an offer to sell the land to PERUMTEL. At present, the only access road is four meters in width. However, if PERUMTEL purchases this property, the present site would be able to have two access roads. At the same time, this ensures a space for the parking of fifteen vehicles. Thus, in the plan of site utilization, it would be appropriate to consider the possibility of the land purchase and utilization.

The comparative study of the alternative plans (a) and (b) above is as follows.

(1) Effectiveness of Land Use

The effectiveness of land use becomes low when such a big facility as parking area occupies an irregularly outlined part of the site. Thus, plan (a), compared with plan (b), holds a smaller number of vehicles. Following the primary concept of zoning shown in Figure 5-1, the outdoor space on the end side of the building would be used mainly for subordinate purposes, such as passage, stockyard, etc. In plan (a), the side space of the existing facility functions only as a passageway or buffer space, while in plan (b), this is used also as an outdoor training space. Therefore, the function of (b) will be more complex. Thus, the site can be utilized more efficiently in the case of plan (b).

(2) Independence of Outdoor Training Space

As stated above, in plan (b), the outdoor space combines the functions. So the independence of the outdoor training space in plan (b) is a little smaller than in plan (a).

(3) Topographical Correspondance

Loading and unloading between the storage and vehicles are important at the Model Center. For these activities, it is desirable to put a difference of level which is approximately 70 cm between the floor level of storage and the ground level. On the other hand, less difference is more desirable between the floor level and the outdoor training space.

As shown in Figure 5-3, there are elevation differences on the site. Therefore, in case of plan (a), cutting is necessary to reduce the elevation of the daily maintenance space or a large filling is required on the outdoor training space. Both cause an elevation difference between the proposed level and the present ground level of the Bandung Telephone Office building. On the other hand, a small filling on the daily maintenance activity space would be sufficient for the purpose in plan (b).

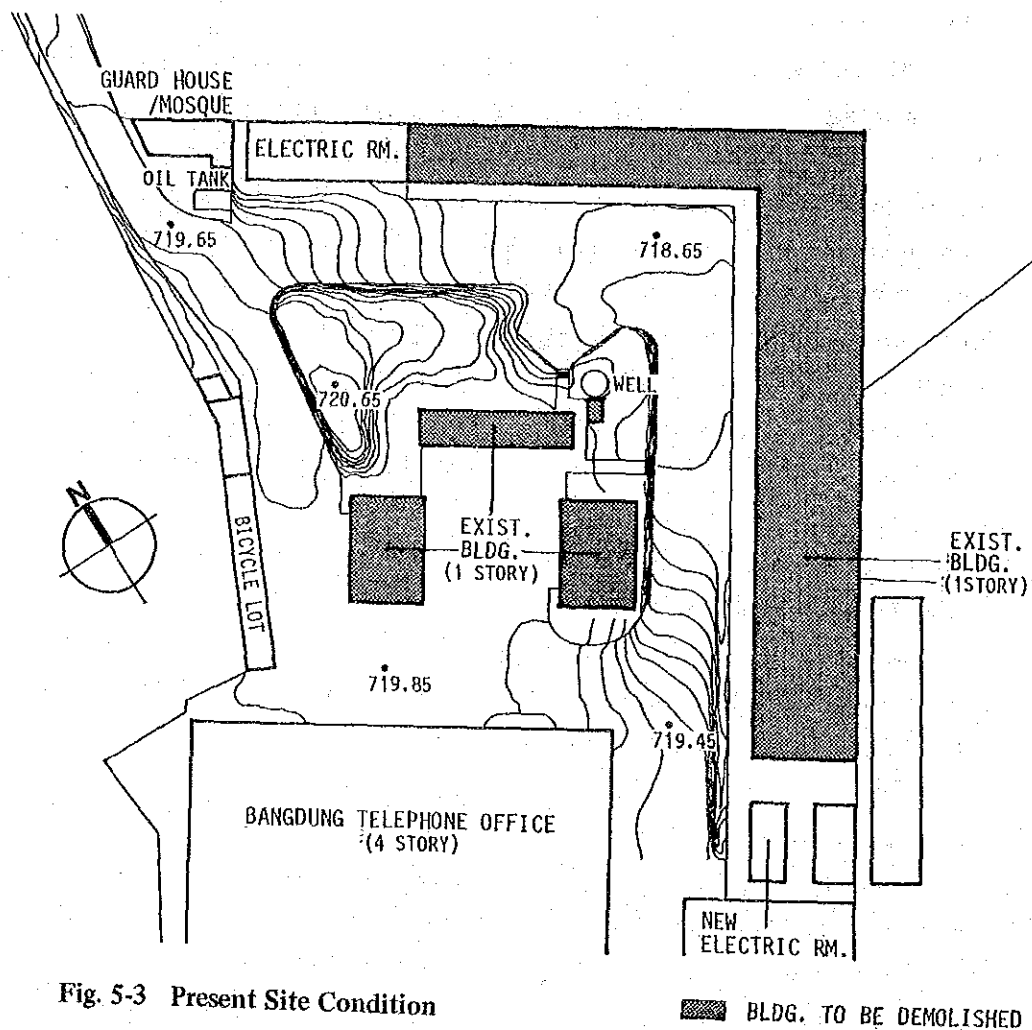


Fig. 5-3 Present Site Condition

(4) Future Correspondance

If the property at 18 Tera Street can be used as an additional access road and parking lot for daily maintenance activities, the access road would be directed at the training ground in plan (a). This would disturb the independence. On the other hand, in plan (b), the function of the space and the traffic line would be effectively improved.

As a result, the orientation of the Model Center building should be based on plan (b) considering the particular features of the proposed site.

5-2-2 Site Preparation

(1) Relocation of Infrastructure

As mentioned in paragraph 4-2-3, there are installations for water supply, drainage and others on the site. For the site clearance, these installations need to be relocated. As for water supply, two ways can be considered. One is to draw city water from the 150 ϕ city water main on Tera Street, and another is to dig a new deep well.

In the case of drainage, relocation is needed. These works have to be carried out according to the basic design study report prior to demolishing the existing buildings. A recommendable route for drainage relocation is shown in the drawing of this basic design study report. A recommendable route for power cable which will be installed for power increase is also shown in the drawing.

(2) Demolition of the Existing Buildings

The buildings to be demolished for site preparation are shown in Figure 5-4. In this figure, the parking lot for bicycles, the guard house, mosque, and the electric room will be maintained and used also after the completion of the Model Center.

(3) Grade Preparation

After demolition, necessary filling work shall be carried out. The rubbles brought by demolition work has to be removed from the site. For land fill, the soil of the site and filling sand from off-site shall be used. The finish ground elevation is shown in the basic design study report.

5-2-3 Layout of Facility

The Model Center building and other facilities necessary for daily maintenance activities and training are laid out as shown in Figure 5-4, in accordance with the site utilization plan.

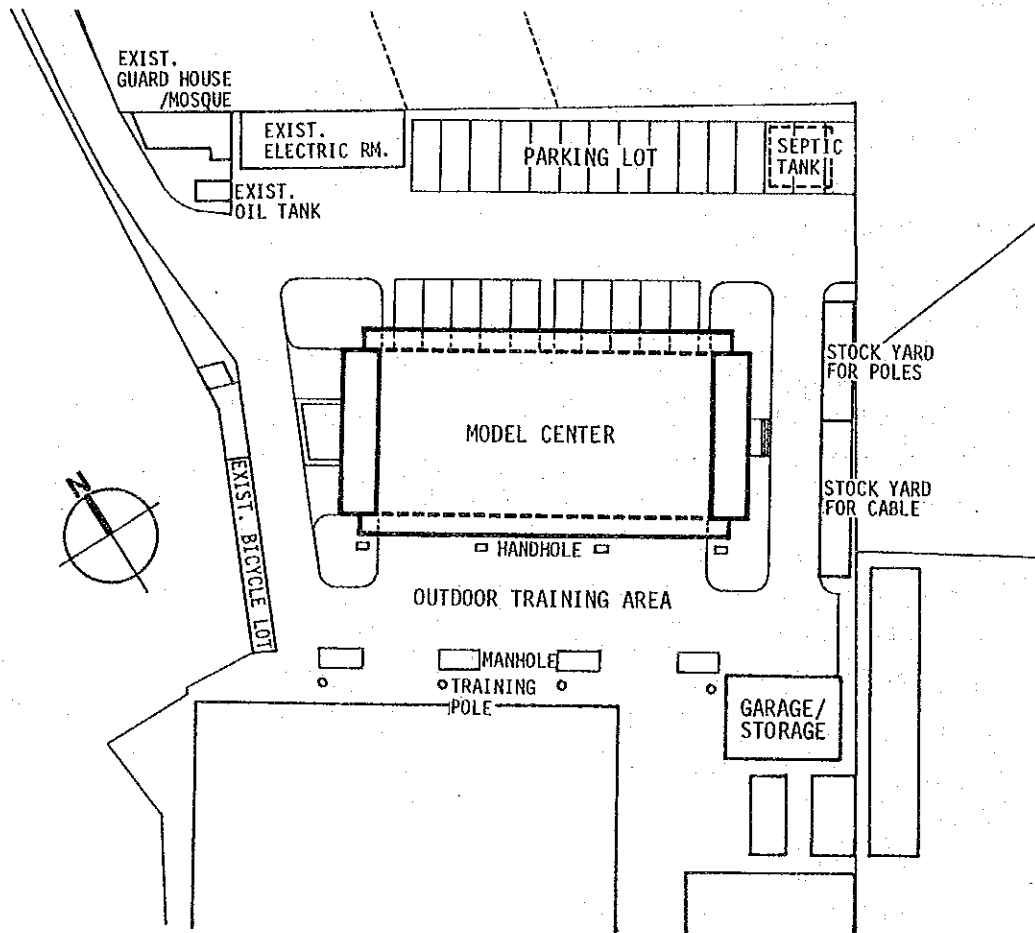


Fig. 5-4 Site Plan

Site area	Approximately	2,880	m ²
Building area	Main building	480.20	m ²
	Garage	66.50	m ²
Stockyard for cable		33	m ²
Stockyard for poles		25	m ²
Parking lot		25	cars

Outdoor Training Facilities

Manhole	4	
Handhole	4	
Pole	4	
Duct (PVC 100 ϕ , 60 ϕ , 30 ϕ)	68	m
Cable connection box	4	
Wiring board	1	

5-3 Building Design

5-3-1 Size of Building

(1) Premise of calculation

The size of the building should be minimum after assuring the functions of the building required for the Project. This is based on the following conditions.

- 1) As studied in paragraph 5-1-2, the site is not sufficiently large in size.
- 2) When the purpose of the Model Center is achieved, the number of personnel would be decreased in accordance with the fault rate decrease and efficiency increase of maintenance activities.

(2) Means of Calculation

Calculation of floor areas takes the following procedures:

- 1) To assume the kind and number of necessary office equipment from the activities and the planned number of personnel of each of the main rooms mentioned in paragraph 3-5-1.
- 2) To layout the office equipment with necessary clearances on a drawing for the above room, thus an example of room layout can be prepared.
- 3) To calculate the floor areas of the above.
- 4) To sum up 3) above and get a total floor area of main rooms. Staircases/corridor and water closets occupy generally 20

Table 5-1 Calculated Floor Space

Room	Floor area (m ²)
(Daily Maintenance Department)	
Storage	444.0
Office for Local OPM Div.	164.4
Maintenance personnel lounge	43.8
Locker room	62.4
Shower room	21.0
Office for Supply and Material Div.	20.4
Workshop	21.0
Office for Administration Section	52.8
Chief's room of Local OPM Div.	20.7
Room for Planning Section.	84.0
Office for District OPM Div.	63.0
Chief's room of District OPM Div.	20.7
Meeting room	39.96
Resting room	21.0
Subtotal	1079.16 m ²
(Training Department)	
Directors room	42.0
Experts room	42.0
Instructors room	63.0
Office machine room	8.4
Lecture room	42.0
Practice room A	45.24
Preparation room	10.53
Training material room	10.5
Practice room B	66.0
Kitchenette	3.78
Lavatory for women	7.8
Subtotal	341.25 m ²
(Common Space)	
Corridor, staircase (20%)	373.0
Lavatory for men (4%)	75.0
Subtotal	448.0 m ²
Total	1,868.41 m ²

In building design, the error should be with $\pm 5\%$.

percent and 4 percent respectively of total floor area of similar facilities in Japan. From these ratios and the total floor area of main rooms, the total floor area of the whole building and the areas of staircase/corridor and water closets can be calculated respectively. The calculated floor area of each room is listed in Table 5-1.

(3) Propriety of Calculation

The subtotal area of the Daily Maintenance Department is 1,079.16 sq.m net as shown above. The corresponding area of common space is calculated by a weighted average method. Therefore, the gross total area (S) of this department is calculated as follows:

$$S = 1079.16 + 448 \times 1079.16/1865.41 = 1338.33 \text{ sq.m}$$

As the number of personnel of the Daily Maintenance Department is 192, the floor area per each person is about 7.0 square meters.

According to Table 5-2, the floor area per person of Japanese similar facilities is calculated about 9.0 sq.m in high density type facilities, such as the Chiba Lineman Center or the Izumi Lineman Center. Japanese linemen centers include laundry room, dining room, saloon, etc. which are not included in the Model Center. These rooms provide more than 2.0 sq.m per person.

Table 5-2 Size and Scale of Japanese Lineman Centers

Location	No. of Staff	Site Area	Total floor area	Vehicle No.
Chiba	132	4,270 m ²	1,170 m ²	-
Tokushima	-	5,530 m ²	2,300 m ²	-
Asahikawa	123	5,430 m ²	1,080 m ²	45
Niigata	-	3,910 m ²	2,120 m ²	-
Sendai	120	5,220 m ²	1,830 m ²	51
Izumi	125	7,000 m ²	1,160 m ²	32
Kano	135	4,930 m ²	1,430 m ²	-
Amagasaki	60	1,960 m ²	470 m ²	15
Kugayama	80	-	780 m ²	22
Kofu	101	-	1,140 m ²	-
Furukawa	-	4,280 m ²	1,430 m ²	-

After excluding this figure, the floor area per person of Japanese lenemen center becomes 7.0 sq.m, that is the same as the Model Center. Therefore, this calculated floor space fulfills the premise of calculation mentioned in (a) above. That is, the space should be minimum in size. At the same time, this calculation is made from case example, so each room satisfies the required function.

5-3-2 Quality of Building

The quality of the building should be decided so as to accord with the basic policies of the design mentioned in paragraph 5-1-1. From this viewpoint, the selected materials and construction method for the building should be easily applied to the construction of the other maintenance centers.

Building structure, materials, and finishing are, in principle, selected from those used in general in similar facilities in Indonesia. The Model Center will be constructed with Japan's Grant Aid. This requires that the quality of building shall guarantee safety, durability and solidness. Therefore, in case the quality of some materials is not enough to ensure this requirement, the materials shall be imported from Japan. The quality of building installations should be decided considering the safety of the personnel in the building.

5-3-3 Formation of Functions

The indoor and outdoor activities are closely connected in the Model Center. The building, therefore, has to fulfill the following requirements.

- 1) Parking vehicles alongside of the storage shall be possible to ensure easy taking in and out of materials and equipment from the storage.
- 2) The outside plant maintenance personnel will take part in outdoor work, therefore their entrance and exit have to be convenient.

- 3) The practical training is done both indoors and outdoors, therefore traffic flow from the training department to outdoors should be short and clear.
- 4) The indoors of the building gets dirty due to the frequent entrance and exit of the staff, therefore the flows of inside and outside personnel can be separated from each other.

Based on the above requirements, the building is desired to be low-rise. However, building coverage has to be kept as small as possible, as already mentioned in the basic policies of the design. This requires that the building is high-rise; Considering these contradictory conditions, it is appropriate that the building of the Model Center should be four storied.

According to the basic concept of building design in paragraph 5-1-3, spaces for different purposes shall be clearly separated in accordance with the functions. To ensure this concept, the function of each floor is planned as shown in Figure 5-5.

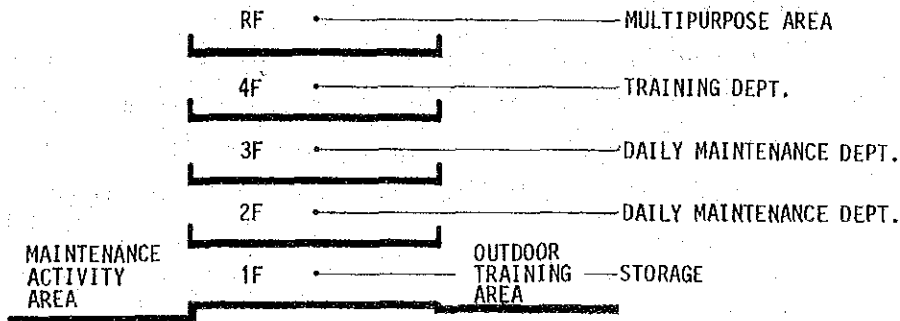


Fig. 5-5 Sectional Function

As shown in Figure 5-5, departments which require much mobility in the Model Center are installed on the lower floors, and those which require less mobility are installed on the upper floors.

For the separation of traffic flow, staircases are installed on both sides of the building, so that the personnel of indoor duties and those of outdoor duties are able to use them separately as shown in Figure 5-6.

5-3-4 Floor Planning

On both sides of the building, core space which consists of stair cases, lavatories, and small storage rooms are laid out. The space between the cores is used for offices with a corridor provided in the middle. As a result, the common use space is H-shaped and the floor plan is simple and clear.

(1) First Floor

The main rooms provided on the first floor are the entrance and storage. The formation of the storage space and the material control system are planned as follows.

1) Maintenance Storage

The Local and District Outside Plant Maintenance Divisions will control this storage. Equipment and necessary materials for one to two weeks maintenance will be stored. The control system is closed-shelf type. Loans and return of materials will be checked by staff every morning.

2) Material Storage

The Supply and Materials Division will control this storage which stores all the materials necessary for daily maintenance activities in the Model Center. Loans and returns to the Maintenance Storage will be made by submitting a request form in advance.

3) Training Storage

Instructors will control this storage. The control system is open-shelf type.

(2) Second Floor

This floor holds the Supply and Material Division, the Maintenance Sections of No. 1 to No. 5 and Junction Maintenance Sections from the Local Outside Plant Maintenance Division. The rooms laid out on the second floor are open-type office rooms for the local outside plant maintenance sections, an office room for the Supply and Material Division, a lounge for the maintenance personnel, a locker room, a shower room, and others.

(3) Third Floor

This floor provides spaces for the Administration and Planning Sections of the Local Outside Plant Maintenance Division and the District Outside Plant Maintenance Division. The provided rooms on the third floor are an open-type office, two rooms for the division chiefs, a meeting room and others. The meeting room is for common use with the Training Department.

(4) Fourth Floor

This floor is used for training. The floor is separated by a corridor into two parts. One is for trainees and provided with a lecture room, practice rooms, and so forth. The other is for instructors and management with layout of an instructor's room, an expert's room, a director's room and others.

Practice Room A will be used mainly for measuring practice, so that fixed tables for measuring are provided. For Practice Room B a flat floor is required for various training purposes.

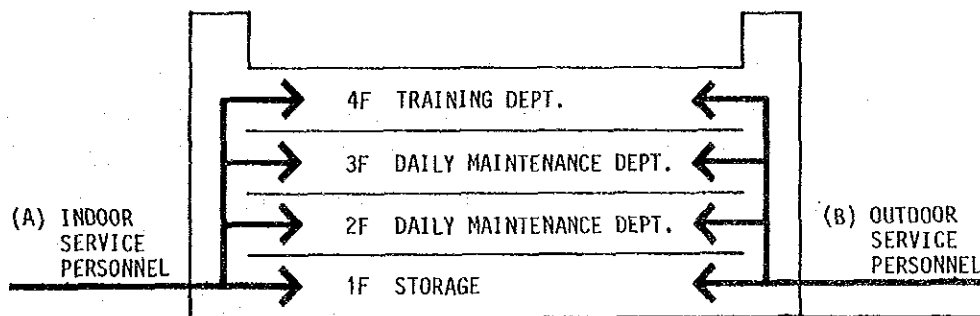


Fig. 5-6 Access Flow

5-3-5 Structural Design

(1) The Primary Policy of Structural Design

Following the basic concept of building design, the structural design is proceeded with the following policies.

- 1) The structure should be highly safe, solid and structurally uniform.
- 2) Adopting a popular construction method in Indonesia, the building should be formed of reinforced concrete structure.

3) As for the foundation, pier foundation should be adopted. This is to avoid the vibration of pilework due to the construction taking place close to the working exchanges.

(2) Basis of Structural Design

1) Design Load

The calculation of the design load and external force will be based upon "Indonesian Load Regulations for Buildings 1981 (NI-18)" (PERATURAN PEMBEBANAN INDONESIA UNTAK DEDUNG 1981 (NI-18)) and "Indonesian Seismic Structural Design Standard for Buildings 1981 (PERATURAN PERENCANAAN TAHAN GEMPA INDONESIA UNTUK GEDUNG 1981).

a) Dead Load

Unit weights for major materials are as follows:

Reinforced concrete	2400 kg/m ³
Plain concrete	2200 kg/m ³
Brickwall	double - 450 kg/m ² single - 250 kg/m ²

b) Live load are shown in Table 5-3

As for concentrated load of the tower water tank and others, the consideration is given case by case.

Table 5-3 Live Loads

Room	Kind of Calculations				
	Calculated Member			Seismic Load	
	Slab and Beam	Column and Girder		Reduction Coefficient	Load
Reduction Coefficient		Load			
Roof (1)	100	0.60	60	0.3	30
Roof (2)	300	0.60	180	0.3	90
Office	300	0.60	180	0.3	90
Storage	500	0.80	400	0.5	250
Stairs	300	0.75	225	0.5	150
Lavatory	250	0.60	150	0.3	75
Balcony	250	0.60	150	0.3	75

Note: Roof (1) is accessible and used for activities
Roof (2) is not accessible

c) Wind Loads.

The building is built of reinforced concrete. On the assumption that seismic load is a horizontal external force, it is generally larger than the wind load in a reinforced concrete building. Therefore, wind loads are not necessary to be taken into consideration in structural design except for windows.

d) Seismic Load

The seismic load will be calculated based upon the "Indonesian Seismic Structure Design Standard for Buildings 1981." The height of the building is below 40 meters and the shape of the building is well regulated. So, it fulfills the requirements to apply the Equivalent Static Load Analysis Method from the above standard.

2) Materials and Allowable Stress Intensity

The standard and allowable stress intensity of materials, applied in Indonesia are indicated in the "Indonesian Reinforced Concrete Structure Design Standard 1971 (NI-2)" (PERATURAN BETON BERTULANG INDONESIA 1971 (NI-2), as shown in Table 5-4 and Table 5-5.

Table 5-4 Allowable Tensile/Compressive Stress Intensity

CLASSIFICATION	ALLOWABLE TENSILE/COMPRESSIVE STRESS INTENSITY $\bar{\sigma}_a = \bar{\sigma}'_a$ (kg/cm ²)	
	FOR LONG TIME LOADING	FOR SHORT TIME LOADING
U 22	1.250	1.800
U 24	1.400	2.000
U 32	1.850	2.650
U 39	2.250	3.200
U 48	2.750	4.000
GENERAL	0,58 σ_{au} 0,58 $\sigma_{0,2}$	0,83 σ_{au} 0,83 $\sigma_{0,2}$

Table 5-5 Allowable Stress Intensity (kg/cm²)

KIND OF FORCE	SYMBOL	ALLOWABLE STRESS INTENSITY (Kg/cm ²)									
		FOR LONG TIME LOADING					FOR SHORT TIME LOADING				
		B ₁ 100	K 125 125	K 175 175	K 225 225	Umum σ' _{bk}	B ₁ 100	K 125 125	K 175 175	K 225 225	Umum σ' _{bk}
COMPRESSIVE STRENGTH OF CONCRETE	σ' _{bk}										
BENDING MOMENT											
COMPRESSIVE	σ' _b	35	40	60	75	0,33 σ' _{bk}	55	70	100	125	0,56 σ' _{bk}
TENSIL	σ _b	5	5,5	6,5	7	0,48 √σ' _{bk}	7	7,5	9	10	0,63 √σ' _{bk}
AXIAL FORCE											
COMPRESSIVE	σ' _{bs}	35	40	60	75	0,33 σ' _{bk}	55	70	100	125	0,56 σ' _{bk}
TENSIL	σ _{bs}	4	4	5	5,5	0,36 √σ' _{bk}	5	5,5	6,5	7,5	0,51 √σ' _{bk}
SHEARING FORCE BY BENDING OR TORQUE MOMENT											
WITHOUT REINFORCING BARS	τ _b	4,5	5	5,5	6,5	0,43 σ' _{bk}	7	7,5	9	10	0,68 σ' _{bk}
WITH " "	τ _{bm}	11	12	14	16	1,08 √σ' _{bk}	17	19	22	25	1,70 √σ' _{bk}
SHEARING FORCE BY BENDING											
WITHOUT REINFORCING BARS	τ _b	5,5	6	7	8	0,54 σ' _{bk}	8,5	9,5	11	13	0,85 σ' _{bk}
WITH " "	τ _{bm}	14	15	18	20	1,35 √σ' _{bk}	21	24	28	32	2,12 √σ' _{bk}
PUNCHING SHEAR FORCE											
WITHOUT REINFORCING BARS	τ _{bp}	6,5	7,5	8,5	10	0,65 √σ' _{bk}	10	11	13	15	1,02 √σ' _{bk}
WITH " "	τ _{bpm}	13	15	17	20	1,30 √σ' _{bk}	20	22	26	30	2,04 √σ' _{bk}

(3) Structure of Foundations

According to the result of the soil investigation, the bearing layer for a four storied building of reinforced concrete structure should be sandstone layer or sand gravel layer, which is found from seven to ten meters below the surface. The pier foundation is adopted and the bottom of the pier should be on the bearing layer of which N-value is more than 50. Known from the results of the soil investigation, the depth of bearing layers differ, thus the bearing layer should be confirmed for each pier at the time of construction.

(4) Method of structure

The means of structural calculation will be on the basis of the "Indonesian Reinforced Concrete Structure Design Standard (NI-2)." In case of necessity, the "A.I.J. (Architectural Institute of Japan) Standard for the Structural Calculation of Reinforced Concrete Structure," and "A.I.J. Standard for Structural Design of Building Foundations" will be referred to for confirming safety. The following means

should be taken to calculate stress analysis:

The analysis of stress by vertical load will be by the Moment Distribution Method.

For the stress by horizontal load, the simplified analysis method called the Muto Method will be applied. This method is popularly used in Indonesia.

5-3-6 Electric Installations

(1) Receiving Power

The electric power for the building will be supplied from the main distribution panel (MDP) to be installed according to the PERUMTEL power increase plan in the existing electric room located on the north end of the proposed site. The supply line will be connected to the receiving switchboard installed in the building. The voltage is 380/220V 3 ϕ 3W, and the frequency is 50 hertz. The total load of this building is estimated to be about 35 KVA.

(2) Trunk Line

A receiving switch, a power control board, and piping and wiring to the panel board installed in each staircase will be provided.

(3) Power Distribution

Piping and wiring for providing power to ventilation fans, cooling system and pumps will be provided. Voltage for small capacity devices is single-phase 220 V, and that of other power loads is three-phase 380 V. For power-factor regulations a low voltage condenser will be equipped to each equipment.

(4) Light and Receptacles

For light, fluorescent lamps will be used mainly, and incandescent lights and mercury arc lamps will be installed according to necessity. The average illumination in main rooms is as follows:

Office	200 - 300 lux
Practice room	300 - 400 lux
Meeting room	150 - 200 lux
Corridor, stair, lavatory	50 - 100 lux
Storage	30 - 100 lux

Receptacles for practice room and other rooms with humidity should be grounding type.

(5) Telephone

Piping and wiring will be installed to connect the lines from the receiving terminal board on the first floor to the devices and telephone sets. The exchange will have the capacity of 30 lines.

(6) Inner Broadcasting Installation

An amplifier and a microphone will be installed in the Local Outside Plant Maintenance Division on the third floor, and speakers will be installed in each corridor and outdoors of the building.

(7) Intercom Installation

Intercoms are installed for liaison purposes in the following places:

- 1) The liaison between the platform on the first floor and the Local Outside Plant Maintenance Division on the second floor.
- 2) The liaison between the material storage on the first floor and the Supply and Material Division on the second floor.

(8) Fire Alarm

Heat detectors will be installed for rooms, corridors, and storage to warn when fire breaks out. Fire-alarms will be installed in the staircases on each floor. The warning signals will appear on the receiver installed on the third floor.

(9) Lightning Arrester

For the protection of the building from lightning, lightning rods will be installed on the rooftop and an earth plate will be laid in the ground.

5-3-7 Plumbing and Sanitary Installations

(1) Water Supply

A supply pipe shall be constructed from the intake pipe of 50φ which has been already installed and connected to the city main of 150

ø laid in the Tera Street. A water meter and a stopcock shall also be installed. This construction is subject to the responsibility of the Indonesian side. From this point, the water will be led to the underground water tank. Then the water will be pumped up to the elevated water tank. Thus water will be supplied to the required parts of the building by gravity.

(2) Draining

The drainage system is a separate system for sewage, waste water and rain water inside the building. Sewage will be treated in the simplex purification tank (BOD, 90 ppm). It is discharged to the existing open drainage surrounding the site after combined with the waste and the rain water from the building.

(3) Fire Extinguishing Fixture

Fire hydrant and fire extinguishers shall be installed according to the Indonesian regulations.

(4) Sanitary Fixtures

Required sanitary wares and sanitary metal wares will be installed. Mainly, Indonesian closet bowls and some Western-style will be installed.

(5) Cooling and Air Ventilation

Considering the climate of Bandung, air-conditioning is hardly necessary in the Model Center. Therefore, a central air-conditioning system is not adopted. Coolers of a separate system will be installed in main rooms. Ceiling fans may be installed in other rooms. Air ventilation is of natural convection type as a rule. However, for places which require only forced ventilation such as the lavatory, practice room, and kitchenette, a mechanical ventilation system is adopted. Ceiling fan and ventilation fan will be used for the purpose.

5-3-8 Construction Materials

Most construction materials will be procured in Indonesia but some are imported from Japan considering durability and safety of the building. Following the building quality set in paragraph 5-3-2, the

materials which are required to be imported from Japan will be Japanese products. Imported materials in Indonesia will be also imported from Japan. The procurement of main materials is planned as follows.

Table 5-6 Procurement of Materials

Kind	Japanese Material	Indonesian Material
Building Material	Waterproof material Steel sash Metalwork material Cast iron material Hardware	Concrete aggregate Cement Reinforcing steel Aluminum sash Glass Paint Terrazza tile Ceramic tile Wood, plywood Wooden fittings
Electric Installation	Boards Conduit tube Intercom Lighting fixtures Automatic fire alarm	Wire Wiring instrument Lamps
Air-conditioning and sanitary installations	Separated type air-conditioning fixtures Outlet, Inlet Pump Inner equipment of septic tank Pipe coupling, valves PVC lined steel pipes Western-style lavatory Fire hydrant box	Ventilation fan Sanitary fixtures Fume pipes Fire extinguishers

5-4 Equipment Plan

5-4-1 Scale of Procurement

The decision of scale of equipment procurement means to decide the kinds and amount of equipment required for the Model Center. The equipment of the Model Center is selected based on the equipment standard of Japanese lineman centers.

However, the scale of equipment procurement is decided considering the actual maintenance activities in Indonesia, the training effect and planned maintenance activities in the Model Center.

5-4-2 Selected Equipment

The equipment to be provided to the Model Center is listed in Table 7 to Table 11.

Table 5-7 Measuring Instrument

Item	Use	No.
Insulation resistance measuring set	Measuring faults, final test	9
Cable fault locator	Measuring faults	9
Power set for cable fault locator	"	9
Artificial telephone cable	"	4
Pulse echo tester	"	9
Buried cable locator	"	9
Harmful gas detector	Detection of harmful gas in manhole	4
Gas manometer	Gas pressure measuring	6
Voltage current meter	Measuring faults	17
Portable communication set	Communication at measuring faults	38
Portable test telephone set	"	38

Item	Use	No.
Cable conductor identifier	Measuring faults	9
Electrostatic induction conductor identifier	"	9
Oscillator	"	9
Amplifier for sounding	"	9
SD wire fault locating antenna	"	9
Buried cable locating coil	"	9
Direct reading impedance measuring set	Final test	4
Oscillator for impedance and attenuator measuring	"	4
Amplifier for impedance measuring	"	4
Impedance compensator	"	19
Voice band crosstalk measuring	"	4
Variable resistor	Final test	16
Oscillator for crosstalk measuring	"	4
Amplifier for crosstalk measuring	"	4
Level meter	"	4
Variable attenuator	"	4
Matching transformer	"	8
Repeating coil	"	8

Table 5-8 Installation

Item	Use	No.
Work control desk	Communication	1
Tele-writer or Facsimile	"	10

Table 5-9 Tools

Item	Use	No.
Tool set (A)	Service order works	12
Tool set (B)	"	12
Safety belt	Work on pole	46
Aerial cable tool set	Cable installation	11
Underground cable tool set	"	9
Cable jointing tool set	Cable jointing	27
Pole installation tool set	Pole installation	11
Guy installation tool set	Guy installation	11
Portable generator	Civil works of line	9
Portable generator sound-proofing cover	"	9
Manhole ventilator	Working inside manhole	7
Drain pump	Manhole works	12
Flexible ladder	Aerial cable wire works	26
Helmet	Work safety	46

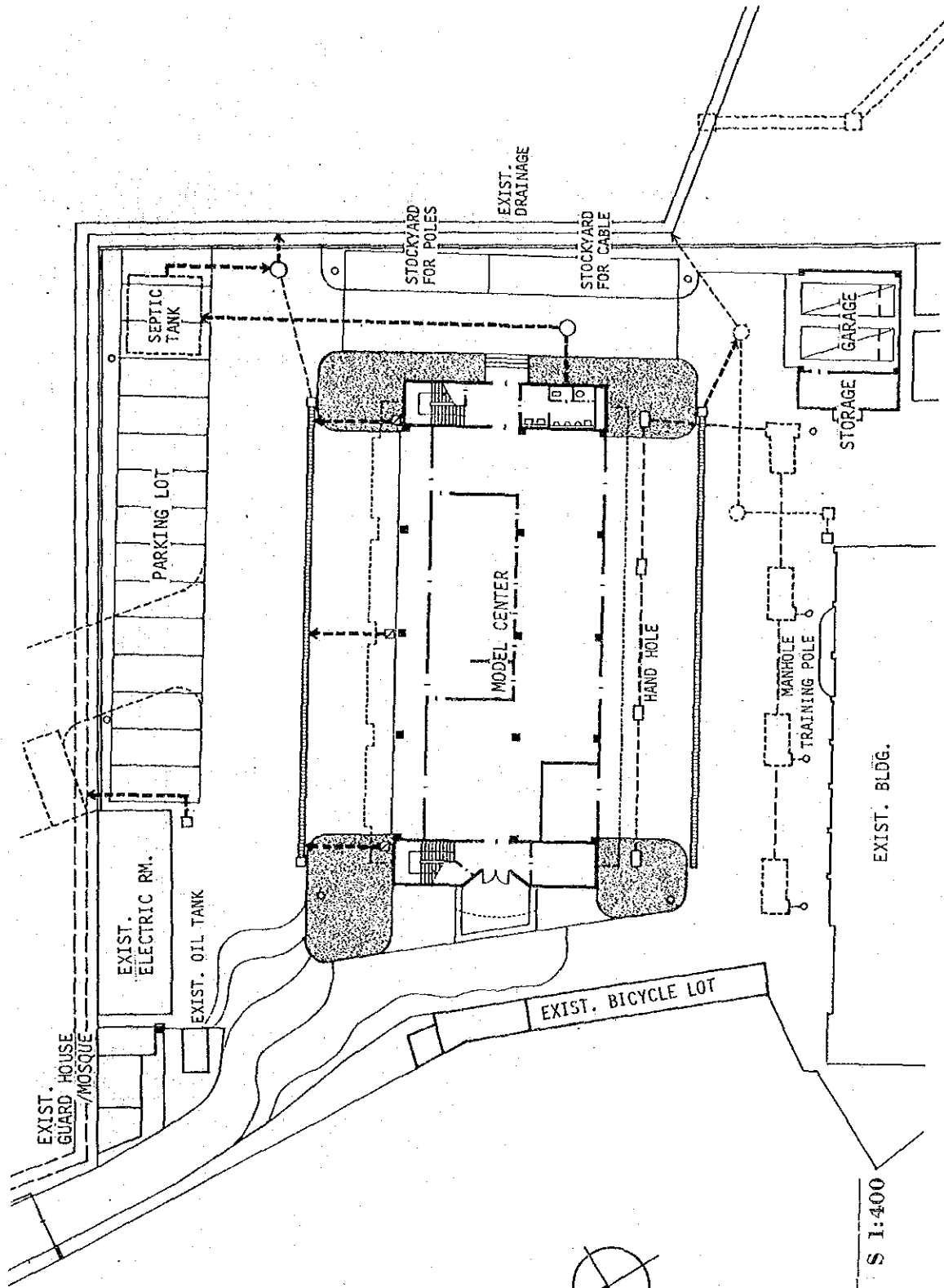
Table 5-10 Vehicles

Item	Use	No.
Pole installing vehicle	Pole installations	1
Bucket equipped vehicle	Work at pole top	1
Ladder equipped working vehicle	Service order work	5
Van type vehicle	Repairing faults, investigation	13
Four-wheel drive jeep		1

Table 5-11 Office Equipment

Item	Use	No.
Copying machine	Plant record reproduction	1
White board (turning type)	Training and communication	8
Drafting board and instruments	Plant record making	1
Document cabinet	Keeping plant record	18
Desk plate	"	5
File cabinet	"	10
Drawing cabinet	Keeping plant record drawing	6
Desk for common use	Outdoor duty personnel	12
Double pedestal desk	Indoor duty personnel	18
Single pedestal desk	"	80
Arm chair	"	18
Armless chair	Four outdoor duty personnel	152
Classroom desk	Lecture	20
Classroom chair	"	20
Teacher's desk	"	1
Teacher's chair	"	1
Business machine desk	Business machine	3
Business chair	Typing and others	3
Meeting table (2 persons)	Meeting	12
Meeting chair	"	24
Table for measuring	Measuring practice	5
Instructor's material table	Preparation of materials	1
Chair for above	"	6
Locker (for 4 persons)	Housing tools and uniform	34
Cabinet	Keeping training materials	15
Rack for measuring instruments	Keeping measuring instruments	4
Shelf for storage	Keeping materials & equip.	140

Drawings



SITE PLAN S 1:400

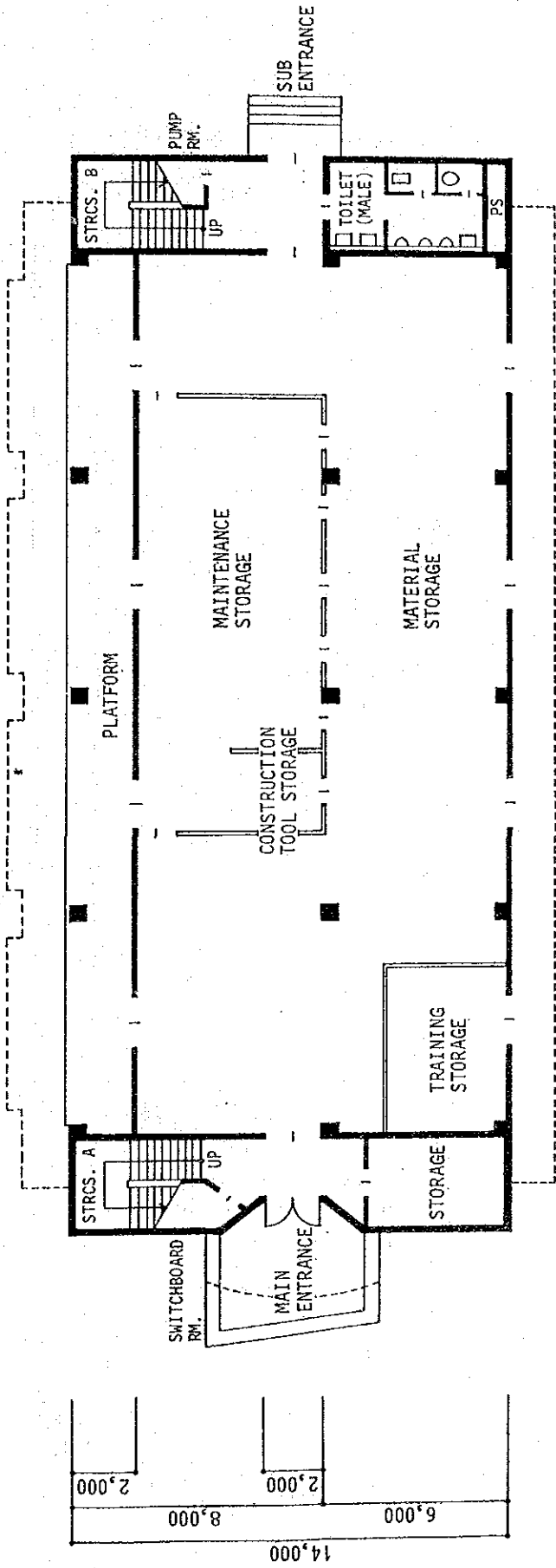


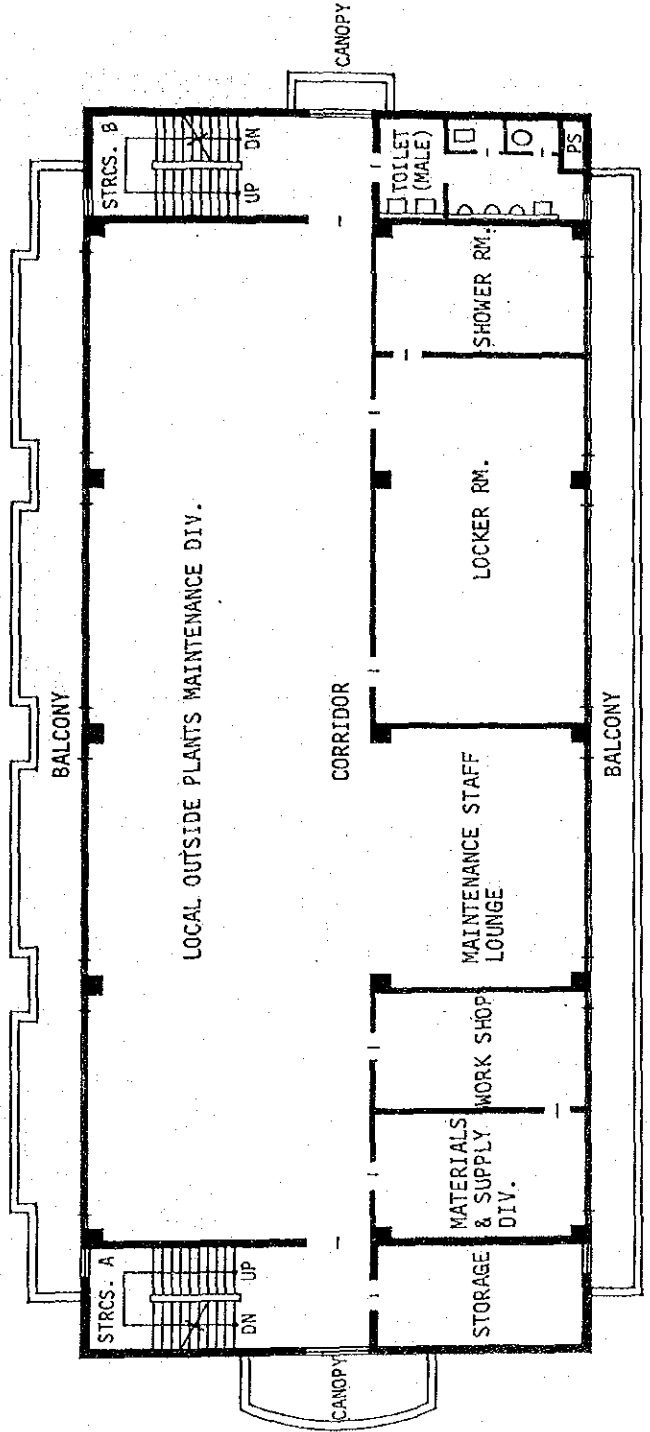
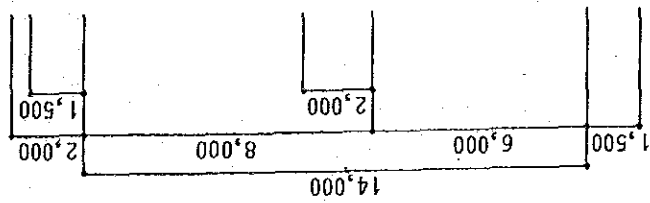
TABLE OF FLOOR AREA

1F	420.20
2F	480.20
3F	480.20
4F	480.20
RF	92.40
TOTAL	1953.20 m ²

3,150	7,000	7,000	7,000	7,000	3,150
150					150
34,300					



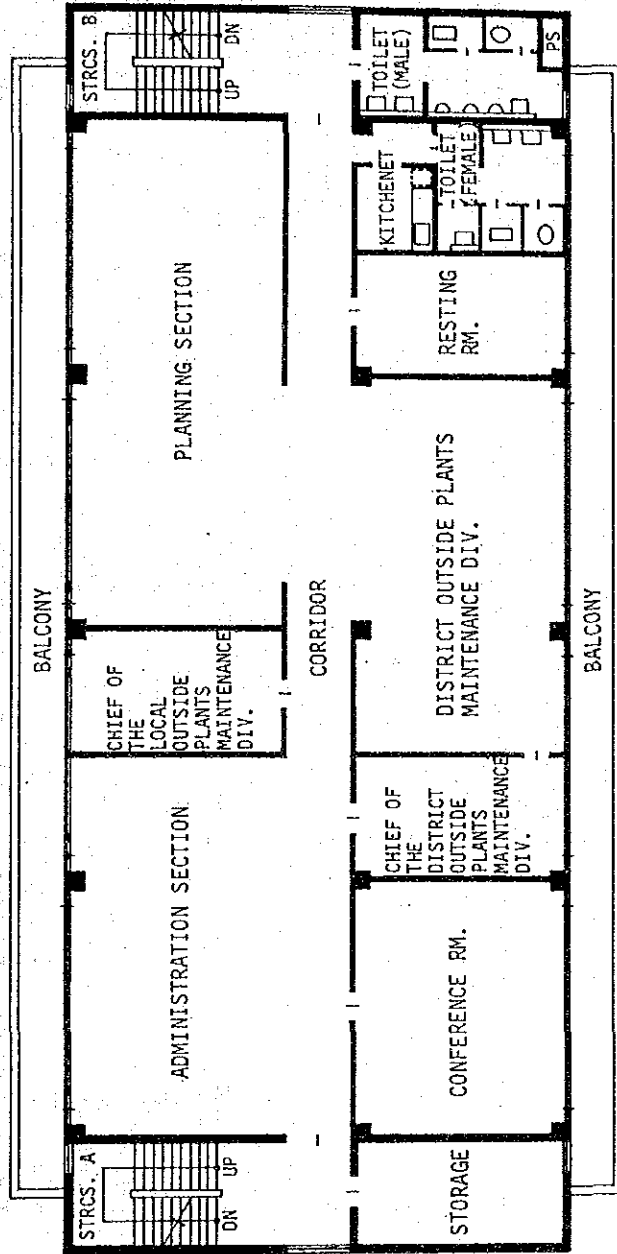
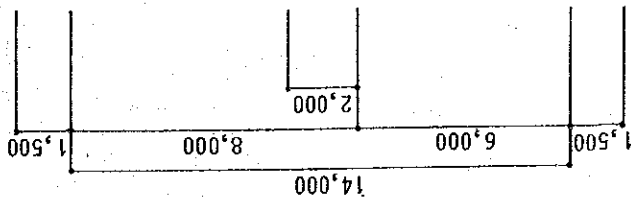
1st FLOOR PLAN S 1:200



150	7,000	7,000	7,000	150
3,150	7,000	7,000	7,000	3,150
34,300				



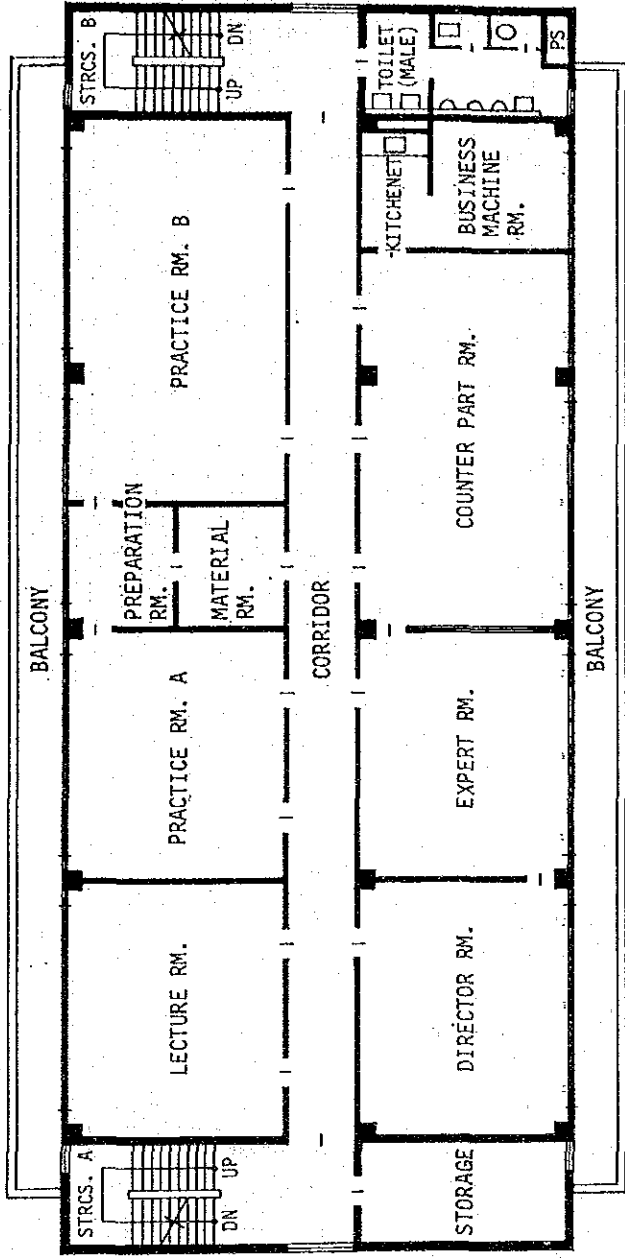
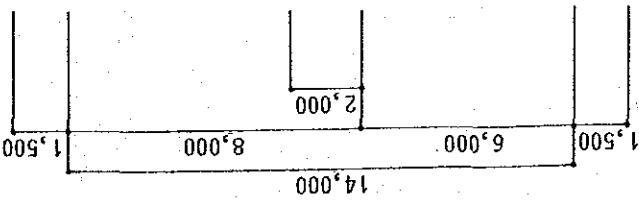
2nd FLOOR PLAN S 1:200



150					150
3,150	7,000	7,000	7,000	7,000	3,150
34,300					



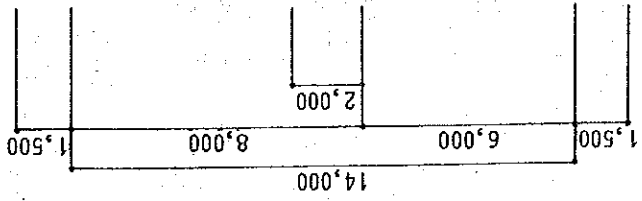
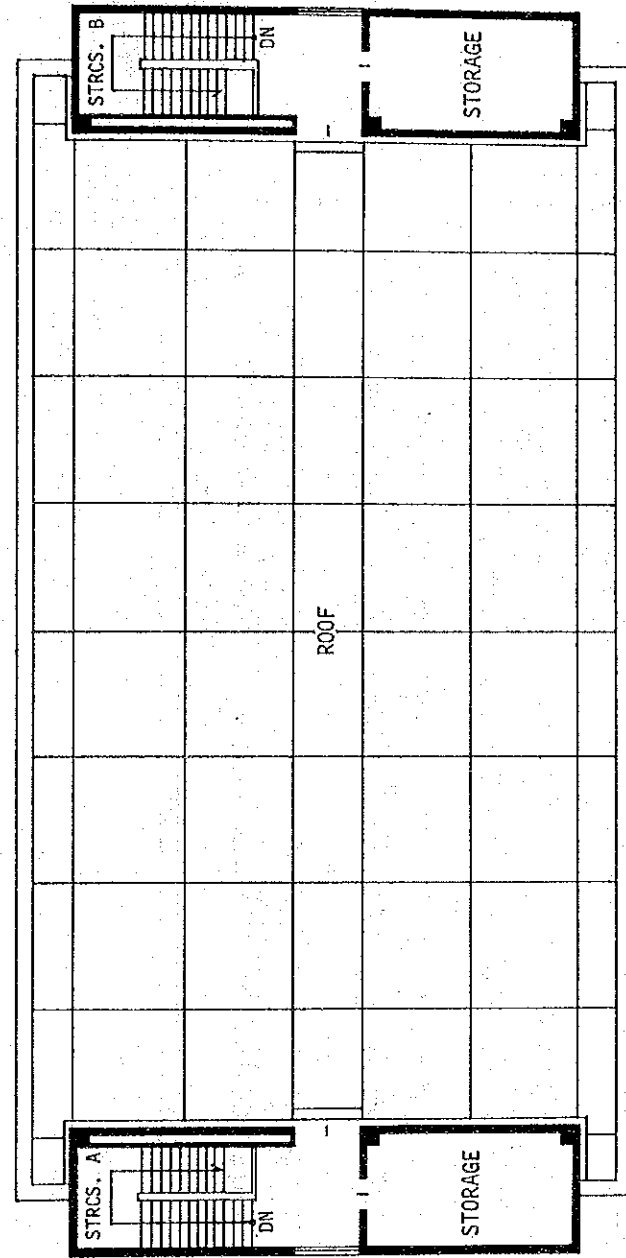
3rd FLOOR PLAN S 1:200



150					150
3,150	7,000	7,000	7,000	7,000	3,150
34,300					

4th FLOOR PLAN S 1:200

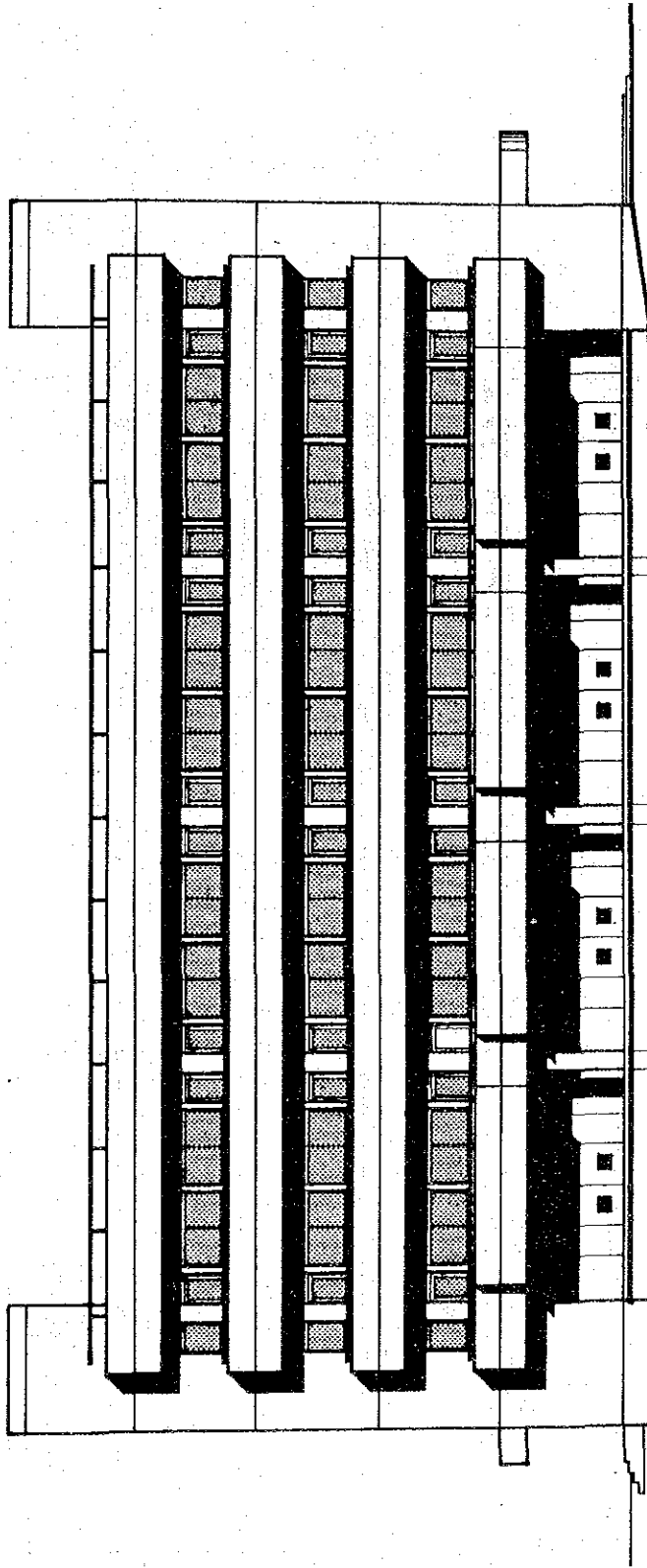




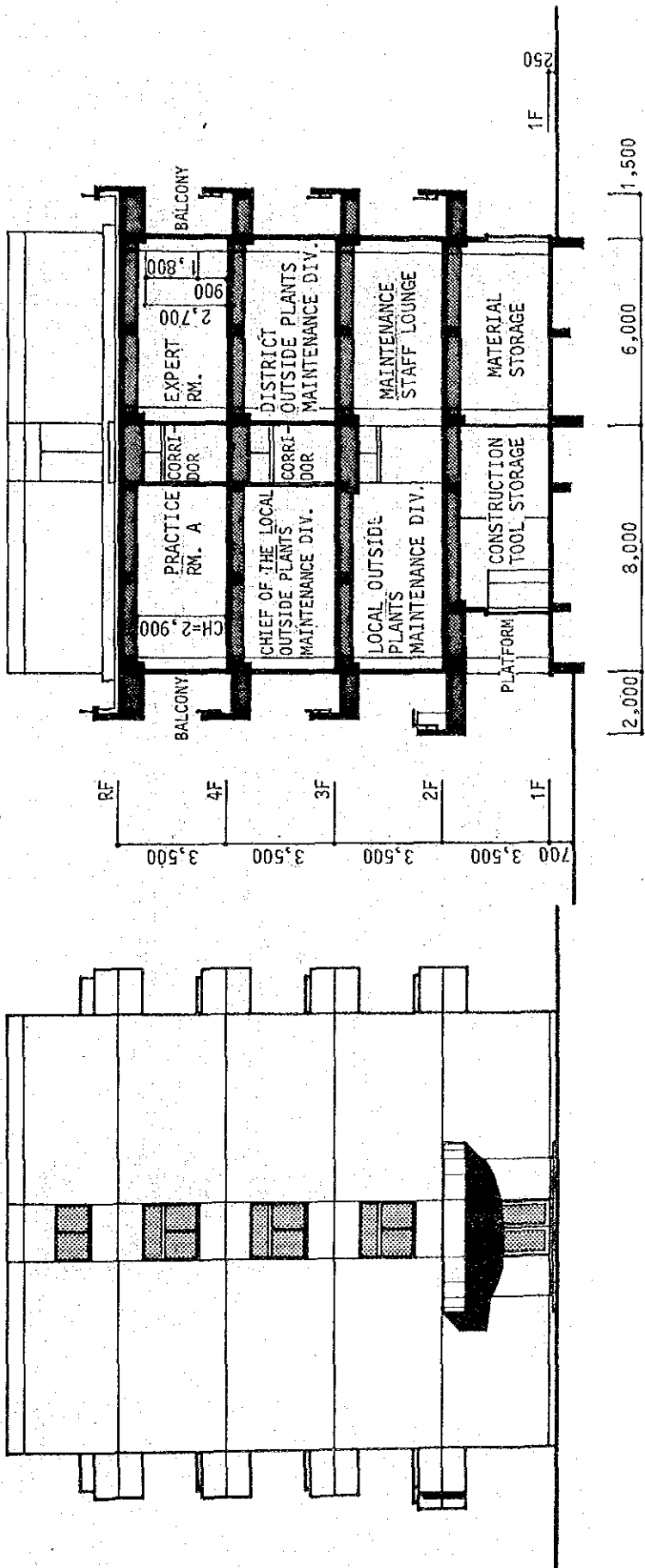
150	28,000
3,150	34,300

ROOF PLAN S 1:200



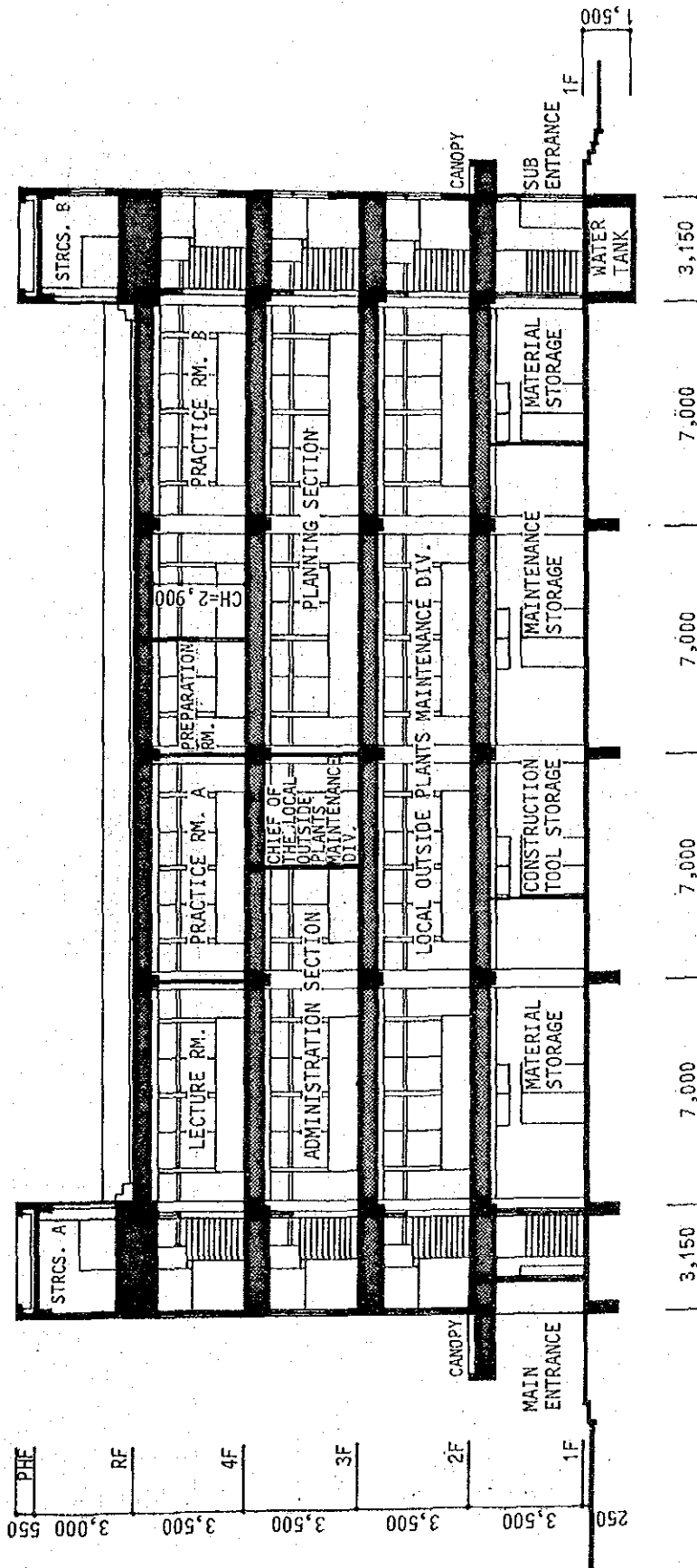


NORTH ELEVATION S 1:200

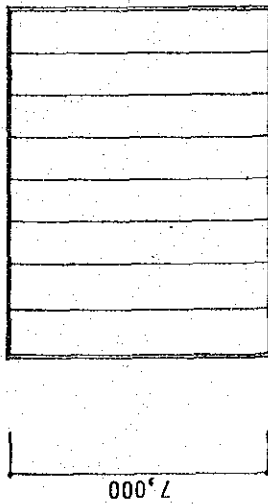


WEST ELEVATION S 1:200

SECTION S 1:200



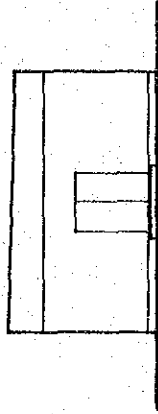
SECTION S I:200



ROOF PLAN

9,500

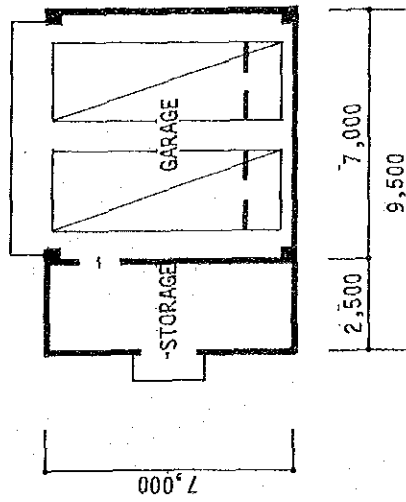
7,000



WEST ELEVATION



NORTH ELEVATION



PLAN

FLOOR AREA
66.50 m²

2,500

7,000

9,500

7,000

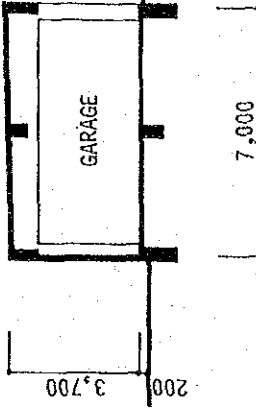
STORAGE

GARAGE

GARAGE



GARAGE/STORAGE S 1:200



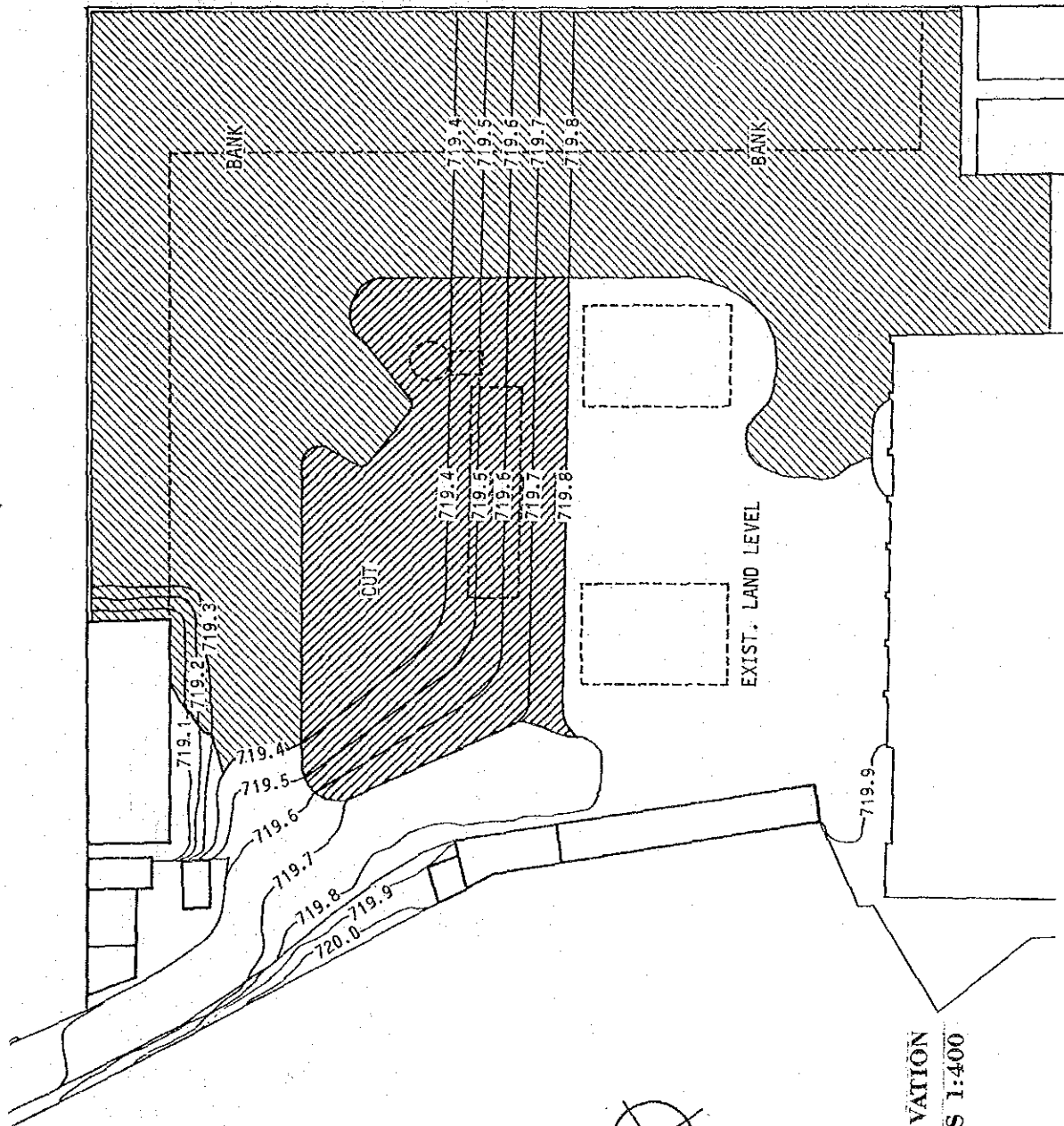
SECTION

3,700

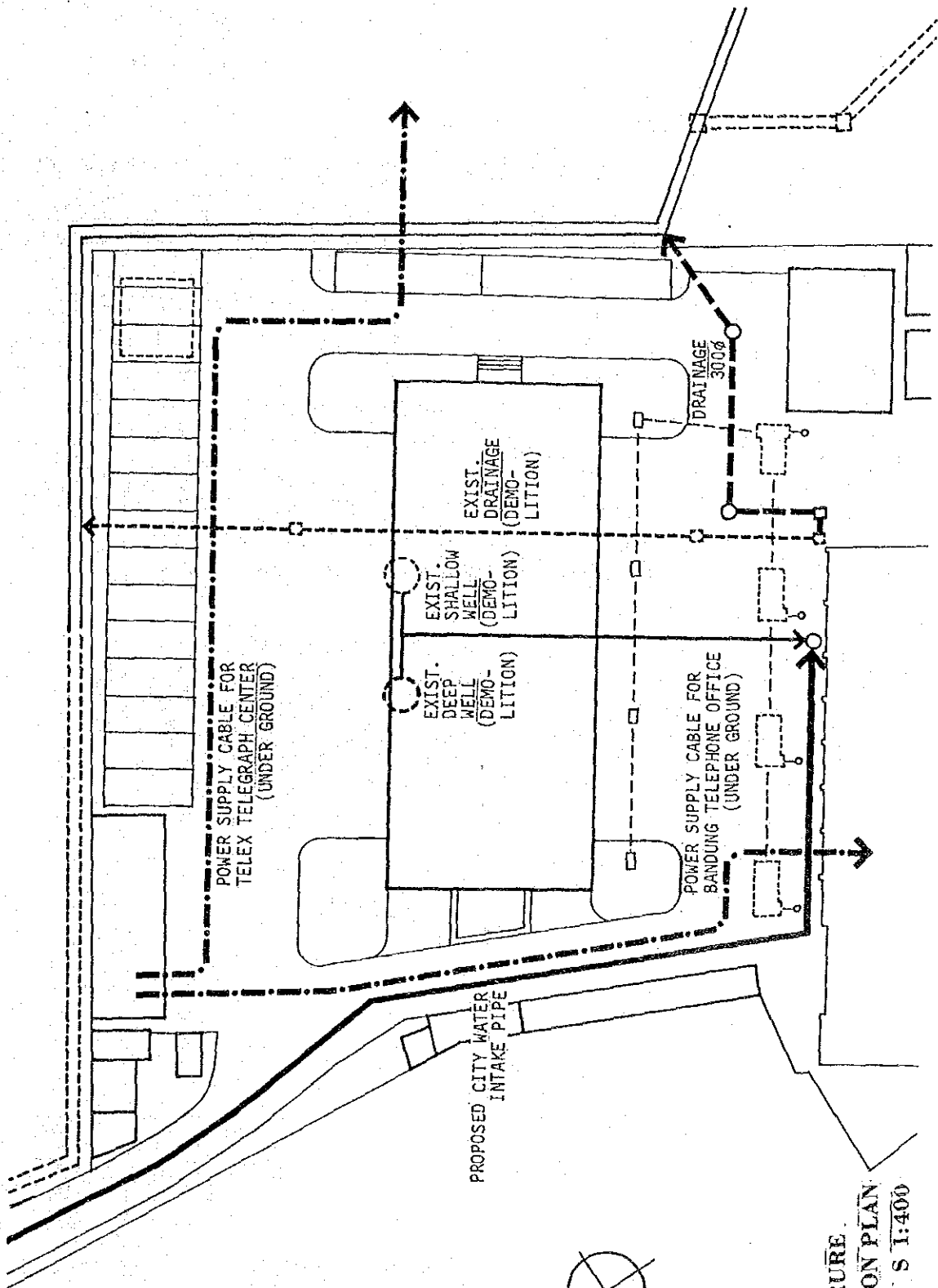
200

7,000

GARAGE



**SITE RENOVATION
PLAN S 1:400**



**INFRASTRUCTURE
RENOVATION PLAN
S 1:400**

CHAPTER 6 PROJECT IMPLEMENTATION PLAN

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CHAPTER 6 PROJECT IMPLEMENTATION PLAN

6-1 Implementation Organizations

Indonesian organizations, required for implementation of the Project, have not yet been established. These organizations will be in charge of the Project promotion, deciding and executing basic matters concerning the detailed design, construction and procurement.

The following organizations have been officially proposed as the implementation organizations by the Indonesian side.

- | | |
|--|---|
| 1) Signing of contracts | POSTEL |
| 2) Supervision of building construction | General Facility Division,
Directorate of Supply,
PERUMTEL |
| 3) Supervision of equipment installation | Cable Network Division, Directorate
of and Technique, PERUMTEL |

The Indonesian Government is requested to give the highest priority to the establishment of the necessary organizations including assignment of an official authorized for signing necessary documents and a project director.

6-2 Scheme of Execution

6-2-1 Execution Summary

(1) Summary of Construction Works

- | | |
|--------------|---|
| 1) Site: | Address: JL. LEMBONG 11, Bandung |
| | Area: Approximately 2,880 sq.m |
| 2) Building: | Building: Structure: Reinforced concrete
4 story |
| | Building area: 480.2 sq.m (The main
building) |
| | 66.5 sq.m (Garage) |
| | Total floow are: $1953.2+66.5=2019.70$
sq.m |

- 3) Installations: Electrical installations
 Plumbing and sanitary Installations
 Air-conditioning system
 Septic tank
- 4) Exterior Facilities: Parking lot
 Stockyard
 Training facilities (Training ground,
 practice manholes, etc.)
- 5) Site Preparation: Relocation of existing water supply/
 drainage systems.
 Demolition and removal of the existing
 buildings.
 Grade preparation
- 6) Utilities: Cable work for the amended power in-
 crease plan

(2) Summary of Execution and Necessary Considerations

The entrance to the proposed site is bordered by the Bandung Telephone Office and residential housing. The width of the access road is 4 meters and narrow. So, the construction work shall be executed carefully not to disturb the neighbors. To keep the present environment as safe as possible, temporary fences shall enclose the construction site, as shown in Figure 6-1.

The construction period is estimated to be twelve months, taking into consideration that it takes one month for the concrete work of each floor and seven months are required to complete framework including the preparation and foundation works, with allowance for the rainy season.

Buried objects in the site are telephone cables and electrical supply cables between the emergency generator room and the transformer room of the Bandung Telephone Office. These cables must be protected during the site preparation, grade preparation, outside plumbing and other exterior works.

As the construction site is very close to the Bandung Telephone Office, vibration by construction shall be reduced as much as possible so as to give no damage to the operating exchanges.

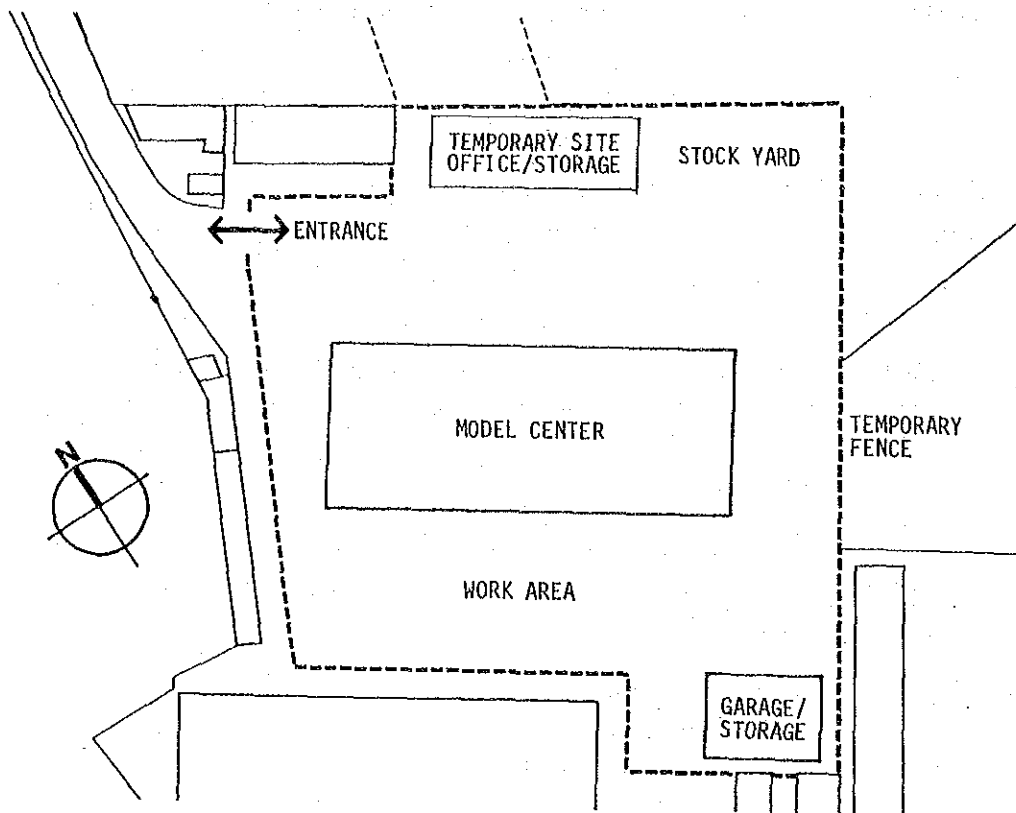


Fig. 6-1 Construction Site Plan

6-2-2 Contract

The client of the Project is the Government of Indonesia. Construction contract and procurement contract for equipment will be separately signed between the client and a Japanese contractor respectively. The Japanese contractors will be chosen by general competitive bidding. The signed contracts will be effective after verified by the Government of Japan.

6-2-3 Quality of Contractor

Tenderers will be selected by a prequalification which examines experiences of overseas projects and similar facilities as well as the managing stability. This assures the quality of tenderers.

The construction work may require to be executed by a resident chief engineer with more than twenty years experience and two other resident engineers with at least ten years experience.

6-2-4 Supervision of Construction

Instead of a permanent supervision system, periodical inspections will be made. The consultant will dispatch necessary engineers according to the necessity and construction schedule.

6-3 Scopes of Responsibilities

This project is implemented by a cooperative effort between Indonesia and Japan. The scopes of responsibilities for each side are shown below. This defines the scopes of the project responsibilities which will be born by Japan's Grant Aid and which shall be implemented by the Indonesian side.

6-3-1 Scope of Japanese Side

- (1) Detailed design, preparation of tender documents, assistance for tenders and contracts and construction supervision.
- (2) Construction of building
 - 1) Main building and garage for special vehicles.
 - 2) Installation works related to the building construction.
 - 3) Exterior works related to the building construction.
- (3) Procurement of the machinery and equipment included in the project.

6-3-2 Scope of Indonesian Side

- (1) Preparation of infrastructure for the existing building of the Bandung Telephone Office.
 - 1) Construction of intake pipe of water supply (Completed).
 - 2) Relocation of the existing drainage.
- (2) Demolition and Removal of the existing buildings, well and drainage.

- (3) Grade preparation
- (4) Cable work for the amended power increase plan.
- (5) Procurement of carpets, curtains and ordinary furniture (such as sofas and tables for reception room).
- (6) Telephone cable installation to switching equipment of the Model Center.

6-4 Execution Schedule

This project will be implemented by Japan's Grant Aid. The execution schedule is as follows:

Table 6-1 Tentative Implementation Schedule

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Exchange of Notes	□																
Design & Supervision Contract		□															
Detail Design			□	□													
Tender & Contract					□	□											
Supervision						□	□	□	□	□	□	□	□	□	□	□	□
Construction Works						□	□	□	□	□	□	□	□	□	□	□	□
Building Construction						□	□	□	□	□	□	□	□	□	□	□	□
Drainage Relocation, etc.		□															
Demolition			□														
Grade Preparation				□													
Intake of Water, Elec. Work					□												