

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
THE REPUBLIC OF INDONESIA  
MINISTRY OF MANPOWER

No. 1

**BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT FOR THE REFRESHMENT OF  
VOCATIONAL TRAINING EQUIPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**MARCH 1994**

**UNICO INTERNATIONAL CORPORATION**

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THE PROJECT FOR THE REFRESHMENT OF  
VOCATIONAL TRAINING EQUIPMENT

MARCH 1994

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## PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for the Refreshment of Vocational Training Equipment and entrusted the study to the Japan International Cooperation Agency (JICA).

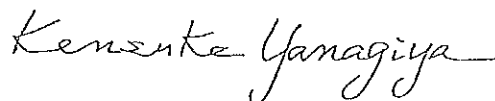
JICA sent to Indonesia a study team headed by Mr. Takashi Hatakeyama, Deputy Director, First Project Management Division, Grant Aid Project Management Department, JICA and constituted by members of UNICO INTERNATIONAL CORPORATION, from December 5 to December 29, 1993.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

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

March 1994



Kensuke Yanagiya  
President

Japan International Cooperation Agency





March 1994

Mr. Kensuke Yanagiya,  
President  
Japan International Cooperation Agency  
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Refreshment of Vocational Training Equipment in the Republic of Indonesia.

This study was conducted by UNICO INTERNATIONAL CORPORATION, under a contract to JICA, during the period December 1, 1993 to March 25, 1994. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs. We would also like to express our gratitude to the officials concerned of the Directorate General of Manpower Training and Productivity Development, Vocational Training Center concerned, the JICA Indonesia Office, the Embassy of Japan in Indonesia for their cooperation and assistance throughout our field survey.

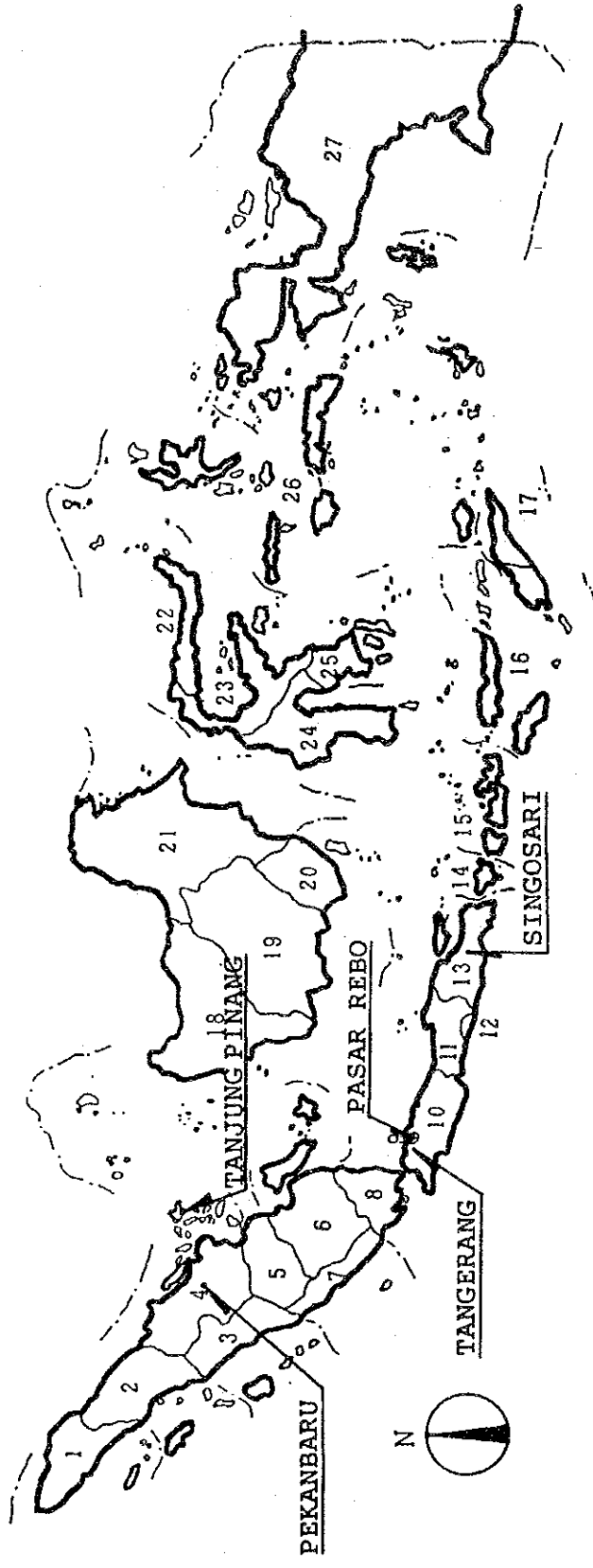
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



Shinji Kufe  
Project manager,  
Basic design study team on the  
Project for the Refreshment of  
Vocational Training Equipment  
UNICO INTERNATIONAL CORPORATION





	PROVINCE	PROVINCE	PROVINCE	PROVINCE	PROVINCE	PROVINCE	
1	DI Aceh	8	Lampung	15	Nusa Tenggara Barat	22	Sulawesi Utara
2	Sumatera Utara	9	DKI Jakarta	16	Nusa Tenggara Timur	23	Sulawesi Tengah
3	Sumatera Barat	10	Jawa Barat	17	Timor Timur	24	Sulawesi Selatan
4	Riau	11	Jawa Tengah	18	Kalimantan Barat	25	Sulawesi Tenggara
5	Jambi	12	DI Yogyakarta	19	Kalimantan Tengah	26	Maluku
6	Sumatera Selatan	13	Jawa Timur	20	Kalimantan Selatan	27	Irian Jaya
7	Bengkulu	14	Bali	21	Kalimantan Timur		

THE REPUBLIC OF INDONESIA



## **SUMMARY**



## Summary

The Republic of Indonesia has implemented series of five-year national development plans since the late 1960s for the purpose of establishing self-sufficiency of food supply, promoting industrial development, and strengthening its political and economic foundation. However, its growth strategy has highly relied on petroleum resources that the country produced in abundance. During the 1970s, the country has achieved strong economic growth as driven by the surge in crude oil prices. Then, oil prices plummeted in the 1980s to adversely affect the balance of payments and government finance. The experience clearly shows vulnerability of the country's economic structure overly depending upon the oil sector.

The government addresses the issue more clearly under the current Fifth Five-Year Plan (1989 - 1993). Positioned as the final stage of the long-term (25 years) development plan initiated by the Indonesian government in 1969, the ongoing plan sets forth three basic guidelines, i.e.: fair distribution of benefits produced in the development process; sufficient economic growth; and the development of the country with stability and vitality.

Along this line, the government is now promoting economic development policy focusing on the reforms of industrial structure, in particular the decrease in the degree of dependency on the oil and gas sector by fostering new exporting industries, which would help create employment opportunities for increasing population and labor force.

As one of development objectives in the social sector, the plan envisages the improvement of vocational training to produce skilled workers at intermediate levels as part of efforts to nurture and upgrade human resources. Working population in the country is expected to increase by 11.9 million people during the ongoing five-year plan. To meet increasing labor demand from the industry, the Ministry of Manpower plans to provide vocational training for 600,000 people during the period at 153 public vocational training institutes.

The need for vocational training heightens as ever to foster export industries with international competitiveness. Human resources are essential in establishing the industrial structure with the ability to supply high grade products, instead of those relying on low wage, low price and poor quality. In particular, engineers and skilled workers are essential in improving the

productivity of the manufacturing sector. Despite the pressing need, however, aged training facilities and outdated training equipment and tools form a bottleneck to adequate education and training activity.

To encourage smooth implementation of the vocational training program, the Ministry of Manpower plans the renovation of existing vocational training centers as well as the modernization of training equipment and tools. Recently, the Ministry has requested the Government of Japan to supply training equipment and tools for key 5 vocational training centers as a grant aid project.

In response, the Government of Japan decided to conduct a survey on basic project design, and Japan International Cooperation Agency (JICA) sent a basic design study team to Indonesia between December 5 through 29, 1993.

The study team visited vocational training centers in Pekanbaru, Tanjung Pinang, Tangerang, Pasar Rebo, and Singosari, and The Directorate General of Training and Manpower Productivity Development (DGTMPD) of the Ministry of Manpower. It discussed with representatives of these organizations and identified a variety of issues, including the scope of the grant aid project, a proposed list of equipment and tools to be covered by the project, the project implementation organization in Indonesia, operation and maintenance plans, and the demarcation of responsibility between the two sides. Also, the study team visited The Center for Vocational and Extension Service Training (CEVEST), selected factories, and industrial parks under planning or development to collect relevant data and information. The result of the field study is summarized below.

The five vocational training centers proposed to receive training equipment and tools under the proposed grant aid project are located in the following 3 areas:

- Riau Province (Pekanbaru and Tanjung Pinang vocational training centers)
- Special District of Jakarta (D.K.I. Jakarta) and West Java Province (Pasar Rebo and Tangerang vocational training centers)
- East Java Province (Singosari vocational training center)

Rapid economic development progresses in these three areas which industrial



production accounts for two-third of the total output in the country. Nationwide efforts are being made to promote industrial projects and construct infrastructure in these areas. Thus, the project to upgrade the vocational training centers is believed to be justifiable in consideration to their impacts on these areas and their development.

These vocational training centers are established in 1952 for the oldest and in 1983 for the newest. Most of the equipment and tools the centers possess are 10 to 40 years old as they have not been replaced since their initial installation. Therefore, they are mostly outdated and timeworn. Some of them are left as they are out of order, only because the parts are hard to procure. These hinder the smooth vocational training activity of the country.

Major issues related to training equipment and tools requested are that the proposed list includes equipment which has undue advanced functions compared to expected levels of students, some has too large capacity or performance for training purposes, and no curriculum has been developed for the new courses.

In consideration to the above, the study team has prepared a plan to supply training equipment and tools required by the five vocational training centers.

The project implementation body will be DGTMPD and the objective of the project is to provide vocational training for unskilled workers by using training equipment and tools to be furnished under the project, with the aim to increase employment opportunities and reduce the unemployment rate in the country, thereby contributing to economic growth, better standards of living of people, and national stability.

Equipment and tools to be supplied under the proposed project should be suitable for ongoing vocational training activity and should enable students to learn operating principles and techniques with ease. In the selection process, priority has been given to the renewal of existing equipment at the training centers that is outdated or deteriorated due to aging. Newly installed equipment and tools have been selected in consideration to usability for wide applications and offer the ease of operation and maintenance in order to ensure the effective use for a variety of courses at each center, including general tools and measuring instruments.

Major equipment and tools to be supplied to each type of course are shown

below:

**Major Equipment and Tools Proposed by Course**

(1) Machine shop	Center lathe, Drilling machine, Milling machine, Shaping machine, Copying lathe, Grinding machine, Power hacksaw, Cut off grinding machine, Hand tools, Measuring instruments, Educational video tape
(2) Arc welding	Welding machine, Tig welding set, Mig welding set, Plasma welding machine, Gas welding kit, Shearing machine, Grinding machine, Drilling machine, Universal testing machine, X - ray radiographic equipment, Ultrasonic tester, Hand tools, Measuring instruments, Work bench, Overhead projector, Educational video tape
(3) Refrigeration repair and service	Refrigerator, Freezer, Air compressor, Vacuum pump, Charging hose, Pipe cutter, Refrigerator trainer
(4) Pipe fitting	Welding machine, Gas pipe cutting set, Drilling machine, Hand grinder, Pipe cutter, Pipe threading machine, Pipe wrench, Square, Gate valve, Tees, Flange, Elbow, Educational video tape
(5) Automotive repair and service	Engine Trainer, Brake tester, Electrical component tester, Auto lift, Hydraulic press, Battery quick charger, Educational video tape
(6) Furniture	Wood lathe, Surface planer, Automatic round-end tenoner, Disk sander, Circular saw, Electric jig saw, Hammer, Chisel, Plane, Hand drill, Clamp
(7) Industrial electronics/ instrumentation	Air control trainer, DC servo unit, Logic circuit trainer, DC ampere meter, Personal computer, Logic analyzer
(8) Language laboratory	Language training equipment, Language training tape

The costs of the work (construction of buildings etc.) to be borne by the Indonesian side are estimated to be about 942 million rupiah when the project is implemented through a Grant Aid of the Japanese Government. The project period is estimated at 4 months for project design and 8 months for procurement and installation of equipment and tools.

If the project is implemented under grant aid by the Japanese government, the following benefits are expected:

Education and training of basic knowledge and skills in a variety of fields will help meet increasing demand for skilled workers by the industry. Training the productive work force will lead to the increase in employment opportunity and the decrease in unemployment rate, which will in turn contribute to overall economic growth, better standards of living, and national stability.

And, the use of latest equipment and tools urges students as well as instructors to learn their operation and maintenance, together with related technologies. It will give a great stimulus to educational activities at the vocational training centers and will improve levels of training. The ability

to supply highly trained workers who can operate a variety of equipment will improve reputation of the public vocational training centers in the industrial community. In turn, the vocational training centers will be able to attract more students. Overall, the centers will effectively serve as the core of fostering the growth of local industries that is conducive to the development of the entire Indonesian economy.

Further, the use of latest equipment and tools that meet industrial needs will win the confidence of the industrial community in the vocational training centers. As a result, local industries will increasingly use the centers to train their own work force. Obtaining higher levels of production techniques will serve as a powerful source of improving product quality and international competitiveness of local manufacturers, and the development of the Indonesian economy in the long run.

On the other hand, organizational arrangement and setup proposed for the project is evaluated as follows:

The project implementation body is each vocational training center of the project which is active and well managed under DGMPD of Ministry of Manpower. They are capable of managing and supporting the project.

The administrative division (or section) of each vocational training center will be responsible for the maintenance of training equipment and tools to be supplied under the project, including budgeting and financial matters. The chief instructor of each course will be responsible for daily operation and maintenance of individual equipment, under the assistance of course instructors and their assistants. Thus, proper maintenance is expected so far as instructors are trained in advance.

In addition, operation and maintenance costs for new equipment and tools will be financed by the annual budget of each training center, and its major source of revenue - government subsidy - will be increased by 20% after the initial installation. It is thus expected to meet financial requirements for new training equipment and tools.

Thus, overall consideration of the above factors indicates that the project will bring about various benefits that will directly contribute to vocational training in the country, then leading to the decrease in unemployment rate,

growth of the local and entire economies, the improvement of standards of living, and the country's stability and development. These benefits are considered to justify the implementation of the project by grant aid of the Japanese government.

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## **CHAPTER 1 INTRODUCTION**





## Chapter 1 Introduction

The Ministry of Manpower of Indonesia has been operating 153 vocational training centers throughout the country to provide skilled workers for industries. However, training equipment and tools used at these centers are outdated and deteriorated due to aging and make it difficult to provide adequate education to meet rapidly advancing industrial needs in diverse fields of technology. As part of its efforts to improve the situation, the Ministry decided to modernize equipment at 5 key vocational training centers and requested the Government of Japan to provide grant aid for acquiring diverse types of equipment and tools.

In response, the Japanese government decided to conduct a preliminary study required for basic project design. To verify the background of the project and the request for grant aid, and details of the request, and to investigate local conditions related to the project, JICA sent a study team led by Takashi Hatakeyama, Deputy Director, First Project Management Division, Grant Aid Project management Department, Japan International Cooperation Agency to Indonesia from December 5 to December 29, 1993.

During the period, the study team visited vocational training centers in Pekanbaru, Tanjung Pinang, Tangerang, Pasar Rebo, and Singosari, and The Directorate General of Manpower Training and Productivity Development (DGMTPD) of the Ministry of Manpower. Through discussion with representatives of these organizations, a general picture of the project and related issues were confirmed and addressed, including the scope of the grant aid project, a proposed list of equipment and tools to be supplied under the project, the organizational arrangement and setup in Indonesia to support the project, operation and maintenance plans, and the division of responsibility between the two sides. In addition, the study team visited the Center for Vocational and Extension Service Training (CEVEST), selected factories, and industrial parks under planning or development in order to collect relevant data and information.

After returning to Japan, the study team consulted with related authorities and organizations to evaluate propriety of the project, the project size, the proposed operation and maintenance system, and the effect and value as the official grant aid project. Having found preliminary propriety of the project, it selected equipment and tools, estimated the project cost, and

developed the implementation plan.

Based on the above evaluation, this report discusses the selection of training equipment and tools that are considered the most suitable for implementation of the project, basic project design, project implementation and maintenance plans, followed by project evaluation and recommendations. Note that the organization of the study team, the study schedule, the list of officers and representatives of government authorities and related organizations interviewed, the minutes of discussions with counterparts are listed in appendices (Appendices 1 - 4) attached to this report.

## **CHAPTER 2 BACKGROUND OF THE PROJECT**



## Chapter 2 Background of the Project

### 2.1 Economic Background

Indonesia is made up of approximately 13,000 islands in varying sizes, which are distributed within a vast area extending 1,900km in a north-south direction and 5,100km in an east-west direction. Its total land area is 1.9 million km<sup>2</sup> (5.1 times that of Japan) and population is over 180 million as of 1993.

The country's vast territory is rich in mineral resources, including petroleum, natural gas, coal, tin, nickel, copper, and bauxite, and natural resources such as wood and prawns. Among these resources, the country heavily depends upon petroleum and natural gas as its principal economic base, accounting for approximately 40% of total exports and 30% of government revenues. The high degree of dependency on the oil and gas sector makes the country's economy directly exposed to volatility in the international market. Steering the country's economic structure away from the excess dependency on the limited resources has become a major challenge for the government, which has initiated its policy to promote exports of non-oil/gas products and foreign investment. In the process, revitalization of the private sector and deregulation are considered to be important policy objectives. In the 5th five-year plan started in April 1989, the government sets priority to structural reforms of the national economy by encouraging accelerated growth of the industrial sector with active investment of the private sector as a principal source.

Another issue facing the Indonesian economy is found in its poor economic efficiency, generally referred to as "high cost economy." The lack of economy efficiency comes from poor infrastructure, high distribution costs, and high interest rates, which are largely the consequence of the past economy policy depending upon the oil and gas sector. To double non-oil/gas exports targeted in the 5th five-year plan, the improvement of the overall economic efficiency is essential, and redirecting the country from the high cost economy is one of the most urgent issues.

Clearly the government's efforts have brought some changes in industrial structure over the past three decades. Measured by sectorial breakdown of gross domestic product (GDP), the agriculture/fisheries/forestry sector accounted for 19.5%, the mining/manufacturing sector 40.6% (mining - 13.6%; manufacturing - 21.3%; construction - 5.7%), service and other sectors 39.9% in 1991, compared to 56%, 13% (manufacturing - 8%), and 31% in 1965, respectively. Over the 26-year period, the share of the agriculture sector dropped sharply while other sectors gained their shares. In particular, the manufacturing sector recorded notable growth.

**Table 2.1.1 Changes in Sectorial Composition of GDP (%)**

Industrial sector	1983	1985	1987	1989	1990	1991
Agriculture/fisheries/forestry	24.0	23.7	25.5	23.4	21.4	19.5
Mining	18.9	16.3	13.1	13.1	12.9	13.5
Manufacturing	11.1	13.5	13.9	18.1	20.3	21.3
Construction	6.2	5.6	5.3	5.3	5.5	5.7
Service and others	39.8	40.8	42.2	40.1	39.9	39.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

(Source) Central Bureau of Statistics

As a result, Indonesia was classified as the second group in the NIEs, which includes Thailand and Malaysia, in the 1989 World Bank report. The country has confidence in further progress of industrialization, since it reflects the surge of the industrial sector's share in GDP and a rapid increase in exports of industrial products. The manufacturing industry in Indonesia grew at an annual 12.4% over 20 years between the first - the fourth five-year plans, approximately twice GDP's average annual growth rate of 6.7%. The manufacturing sector continued to expand its share of GDP (on current price basis) thereafter, which soared from 7.6% in 1965 to 21.0% in 1992.

**Table 2.1.2 Changes in Industrial Sector's Share of GDP  
(Current Price)**

Year	1965	1970	1975	1980	1985	1990	1991	1992
%	7.6	9.0	8.9	11.6	16.0	19.9	20.8	21.0

(Source) Central Bureau of Statistics

The major driving force of industrial growth was import substitution between the late 1960s and the early 1980s, and was shifted to exports in the mid-1980s. The initial stage of the industrialization process was led by investment of foreign countries who initiated localization of industrial products, followed by local companies. Import substitution progressed rapidly, and investment in the final assembly process was completed in many product areas by the mid-1970s. Then, the focus on investment was moved to midstream and upper stream divisions. On the other hand, the government played an active role in heavy and chemical industries, including urea fertilizer, petroleum refining, liquefaction of natural gas, integrated steel making, large diesel engines, casting, aircraft, railway rolling stock, cement, and shipbuilding.

In the late 1980s, exports of industrial products grew steadfastly, both in quantity and item. In particular, industrial products accounted for major portions of non-oil and gas exports which surpassed oil and gas exports in 1987. Major export items of industrial products are plywood, textile products, aluminum ingots and products, fertilizer, cement, iron and steel, edible oil, furniture, paper and paper products, electrical equipment, shoes, tires, sheet glass and glass products, low-cost cameras, and other general merchandise.

Table 2.1.3 shows recent trends in the country's exports on a value basis. As seen in the table, the share of industrial products surged from 10.6% in 1981 to 50.1% in 1989.

**Table 2.1.3 Recent Trends in Indonesia's Value of Exports (1981 - 1989)**

(Unit: Million US\$)

	Total export value (including oil and gas) (1)	Non-oil and gas products (2)	Percentage share (2)/(1)	Exports of industrial products (3)	Percentage share (3)/(1)
1981	25,164.5	4,501.3	17.9	2,666.6	10.6
1982	22,328.3	3,929.2	17.6	2,466.1	11.0
1983	21,145.9	5,005.3	23.7	3,219.7	15.2
1984	21,887.8	5,869.7	26.8	3,982.5	18.2
1985	18,586.7	5,868.8	31.6	4,083.7	22.0
1986	14,805.0	6,528.4	44.1	4,508.4	30.5
1987	17,135.6	8,579.6	50.1	6,683.7	39.0
1988	19,218.5	11,537.1	60.0	9,162.0	47.7
1989	22,160.2	13,480.0	60.8	11,105.1	50.1

(Source) Central Bureau of Statistics of Indonesia, Indikator Ekonomi, March 1990

To maintain growth of industrial exports in the long run, the availability of skilled labor force and technological development are essential factors in guiding the industry to the advanced level with international competitiveness. In particular, the development of human resources holds the key to the evolution of the industrial structure, in addition to construction of physical infrastructure.



## 2.2 Strategic Directions in Previous Development Plans

### 2.2.1 First - Fourth Five-Year Development Plans

Since its independence, Indonesia gave priority to domestic politics over two decades, while virtually neglecting economic aspects. As a result, the Indonesian economy faced a major setback in the mid-1960s. Then the government started national development, focusing on economic growth, in the late 1960s. An economic rehabilitation plan including foreign aids and attraction of foreign investment was formulated. During the first five-year development plan (April 1969 - March 1974), the Indonesian economy received favorable winds of stabilization of the international community and the increase in foreign aids and investment from industrialized countries, and the annual average GDP growth rate reached 7.7%, well over the target rate of 5%. At the same time, the country boosted rice production and controlled inflation to accomplish the objective of stable growth of standards of living.

The second five-year plan (April 1974 - March 1979) aimed to establish the foundation of economic growth and to achieve balanced socioeconomic development, while correcting a widened difference in income level in the process. However, the country failed to capitalize on soaring oil prices in the early 1970s and was forced to devalue its currency, rupiah, (50% against the U.S. dollar) due to sluggish economic conditions in 1978. As a result, the annual average growth rate of GDP remained at 6.9%, below the target rate of 7.5%.

Then, the third five-year plan (April 1979 - March 1984) set forth the development of industry and fair distribution of development benefits as its basic objective. The rise in oil prices in the late 1970s drove the Indonesian economy that grew at an annual 8.0% over three years between 1980 and 1981. Then, oil prices plummeted again in the early 1980s, and economic growth slowed down again to force the country to devalue the rupiah by 38% in March, 1983. As a result, the annual average growth rate remained at 5.7% during the third five-year plan, below the target rate of 6.5%. In addition, the government failed to correct the inequality of income distribution,

and difference in income level widened further.

In line with the national policy guideline adopted in March 1983, "to build the foundation for economic take-off during the sixth five-year plan, the fourth five-year plan (April 1984 - March 1989) set the primary objective in achieving social justice in the development process. Nevertheless, the persistent low level of oil prices caused the country's export revenues to hang low and hindered the government to promote industrialization plan. After the 45% devaluation of the rupiah in September 1986, the government shifted its policy to revitalize the economy by using private initiatives and promoting non-oil and gas exports. Partially driven by deregulation in various fields, exports boomed after 1986, and coupled with recovered oil prices, the economy expanded steadily. During the five-year period, GDP grew at an annual 5.2% over the target rate of 5%.

#### **2.2.2 General Outline of the Fifth Five-Year Plan**

The fifth five-year plan period (April 1989 - March 1994) is positioned as the final stage of the first 25-year long-term development plan and the preparation stage for the subsequent development plan which aims at economic self-sufficiency. Three development guidelines set forth in the fifth five-year plan are as follows:

- (1) Fair distribution of benefits produced in the development process
- (2) Sufficient economic growth
- (3) National development with stability and vitality

Based on the above guidelines, the following three objectives are set forth in the fifth five-year plan:

- (1) To raise standards of living for the entire population
- (2) To transform the economy to a more balanced structure
- (3) To absorb growing labor force

As the strategy to achieve the above objectives, the plan proposes structural reforms aiming at further diversification, streamlining,

and revitalization of the Indonesian economy. For the agriculture sector, the plan sets priority to the establishment of the stable food supply system and diversification of agricultural products, and for the manufacturing sector, export promotion accompanied by the earning of foreign currencies and the creation of employment opportunities. In particular, the following initiatives are required for the structural reforms:

- (1) Construction and development of socioeconomic infrastructure
- (2) Development of human resources
- (3) Deregulation and the encouragement of private initiatives to replace government-led projects

In addition, the above activities should be managed in careful coordination with natural resource management.

Finally, it should be noted that the fifth plan forecast an annual 5% for GDP growth and 3.1% for GDP per capita, since population is expected to increase 1.9% annually during the period.



## 2.3 Current State of Vocational Training in Indonesia

### 2.3.1 Labor Market and Education System

During the fourth five-year plan period, Indonesia's population increased 2.1%, and work force grew by 12.4 million (3.7%) to 74.5 million. During the fifth five-year plan period, 11.9 million people will be added to the work force totaling 86.4 million.

According to data published by Central Bureau of Statistics, the unemployment rate remained stable between 2% and 3% over the past decade or so, e.g., 2.76% (2,080,000 persons unemployed) in 1989. However, the problem is hidden in a high rate of underemployment (weekly working hours of less than 35 hours) which amounted to 31.9 million. Looking at the overall employment structure, while the percentage of employed workers decreased from 31.1% in 1983 to 26.9% in 1989, that of the self-employed and family workers, who are deemed to be largely underemployed, increased instead. Also, there is a significant gap in employment rate between regions and between industrial sectors.

The fifth five-year plan envisages that employment opportunities for 11.5 million people will be created (4 million in the agriculture sector, 2.3 million in the manufacturing sector, and 5.2 million in other industrial sectors), which will mostly match the growing labor force. At the same time, the plan predicts that the work force will further concentrate in urban areas, while young workers with relatively high educational levels and female workers (who increasingly take employment in recent years) will feel increasing difficulty to find jobs.

In contrast to employment opportunity, the quality of labor force is the other side of the coin in the employment structure and is governed by the level of public education including the quality of vocational training. As shown in Table 2.3.1, the level of education is still very low among the majority of population; the 1991 statistics of working population by educational background shows that persons who have graduated from elementary schools or with lower levels of education account for approximately 75% of the total

working population.

Thus, unemployment and underemployment issues originating in numerous working population have diverse aspects, and comprehensive measures are called for to effectively deal with them. Clearly, employment is the most serious and urgent problem facing the country.

**Table 2.3.1 Working Population by Level of Education (1991)**

Educational Level	Working Population (1,000)	Percentage share (%)	Unemployed (1,000)	Total labor force (1,000)	Percentage share (%)	
1.No formal education	10,242	13.4	31	10,273	* 13.1	* Total 74.7%
2.Dropout from elementary school	18,807	24.6	101	18,908	* 24.1	
3.Graduated from elementary school	29,008	38.0	404	29,412	* 37.5	
4.Graduated from junior high school	7,292	9.5	317	7,609	9.7	
5.Graduated from technical school	1,085	1.4	44	1,130	1.4	
6.Graduated from high school	4,543	6.0	663	5,206	6.7	
7.Graduated from technical high school	3,902	5.1	331	4,233	5.4	
8.Graduated from college/ technical junior college	860	1.1	61	921	1.2	
9.Graduated from university	780	0.9	79	859	0.9	
Total	76,520	100.0	2,031	78,551	100.0	

Covering workers of 10 years or older  
(Source) Statistical Year Book of Indonesia 1992

To improve the quality of labor force, different government authorities provide vocational training through various organizations, which are roughly classified into the following three types (see Fig.2.3.1):

- (1) Educational institutions as part of the public education system supervised by the Ministry of Education and Culture, such as technical schools and technical high schools
- (2) Educational organizations (academies) supervised by the Ministry of Manpower and other government authorities, e.g., public vocational training centers
- (3) Private vocational training institutions, such as corporate vocational training schools and private vocational training schools

① Ministry of Education and Culture

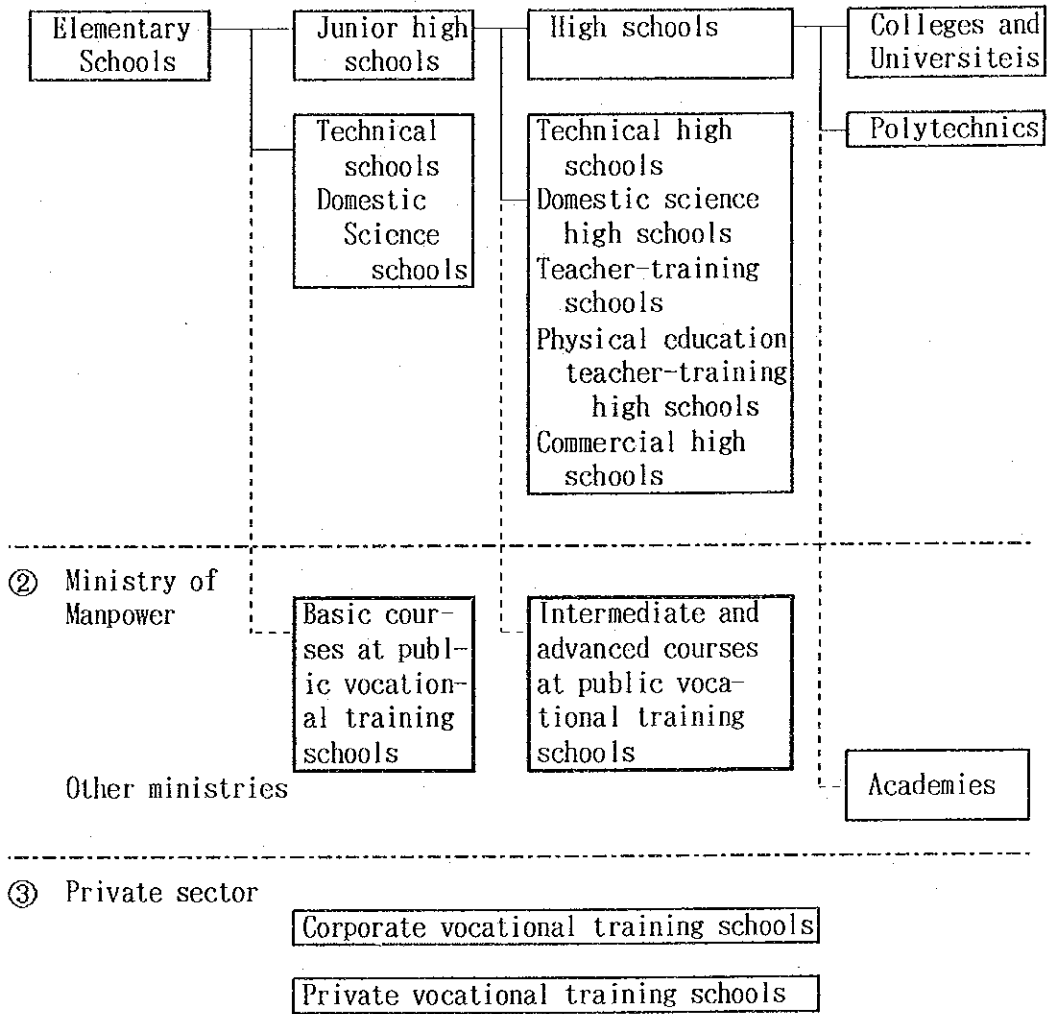


Figure 2.3.1 Vocational Training and Education System in Indonesia

Students receiving vocational training in the public education system supervised by the Ministry of Education and Culture are limited to those in technical schools and technical high schools, totaling 570,000 as shown in Table 2.3.2. On the other hand, unskilled workers who have completed elementary schools only or have no formal education amount to 58 million, who represent approximately 75% of working population. These unskilled workers have few opportunity to learn new skills, and public vocational training centers which offer short-term education at low cost play an important role in upgrading their skill levels.

**Table 2.3.2 Number of Schools, Teachers and Students in the Public Education system Supervised by the Ministry of Education and culture (1990)**

Educational institutions	Duration (years)	Number of schools	Number of teachers	Number of students
Elementary schools	6	144,066	1,136,907	26,348,376
Junior high schools	3	20,265	401,289	5,582,565
Technical schools	3	265	6,826	87,701
Domestic science schools	3	89	1,623	15,852
High schools	3	8,019	222,604	2,619,847
Technical high schools	3	1,016	39,008	484,432
Domestic science high schools	3	155	4,482	48,522
Teacher-training high schools	3	355	9,012	32,173
Physical education teacher-education high schools	3	67	1,574	7,978
Commercial high schools	3	1,881	49,997	717,163
Colleges	3 - 5	962	128,652	1,503,196
Universities				

\*Total  
572,133

(Source)Statistical year Book of Indonesia 1992

### 2.3.2 Vocational Training

The first public vocational training center in Indonesia was established in Yogyakarta in 1948. Then, new centers were constructed throughout the country, totaling 153 at present. Pasar Rebo and Singosari training centers, for which the grant aid project is contemplated, are among ten oldest vocational training schools in the country. Both of them were established in 1952 and 1953, and were provided with training equipment between 1953 and 1956 under the Colombo Plan.



To further effective implementation of the country's public education and training policy, Presidential Decree (Kepperes) 34/1972 was issued in 1972, followed by execution ordinance in 1974. In essence, the decree clearly defined the division of responsibility for education and training between the Ministry of Education and Culture and the Ministry of Manpower, and set forth basic guidelines for vocational training supervised by the Ministry of Manpower. In particular, the guidelines define vocational training as "part of education to teach knowledge and skills required for a particular profession" and require the Minister of Manpower to perform the following duties:

- (1) To develop the training system for vocational training centers, both public and private;
- (2) To employ and assign instructors required at vocational training centers organized by the Ministry of Manpower;
- (3) To provide and maintain buildings, training equipment and materials, and textbooks required at vocational training centers organized by the Ministry of Manpower;
- (4) To provide all types of training programs required to support the national development process; and
- (5) To determine skill levels targeted at public and private training centers under the consultation with related ministries and other government organizations.

Then, the nationwide vocational training system was established, marking the government's commitment to improving workers' skills and productivity through vocational training.

As part of its efforts to improve training resources, the Ministry of Manpower requested the Japanese government to provide grant aid for 5 vocational training centers in Pekanbaru, Tanjung Pinang, Tangerang, Pasar Rebo, and Singosari, selected from 153 centers under its supervision.

Figure 2.3.2 shows the organizational chart of the Ministry of Manpower, and the vocational training centers are supervised by DGMPD.

153 public vocational training centers are distributed throughout the country (Figure 2.3.3) and have the total enrollment capacity of 120,000 persons. In fiscal 1991, approximately 80,000 persons graduated from all the vocational training centers. As shown in Table 2.3.3, the number of graduates varies greatly from year to year, and the type and size of courses offered changes according to popularity among students.

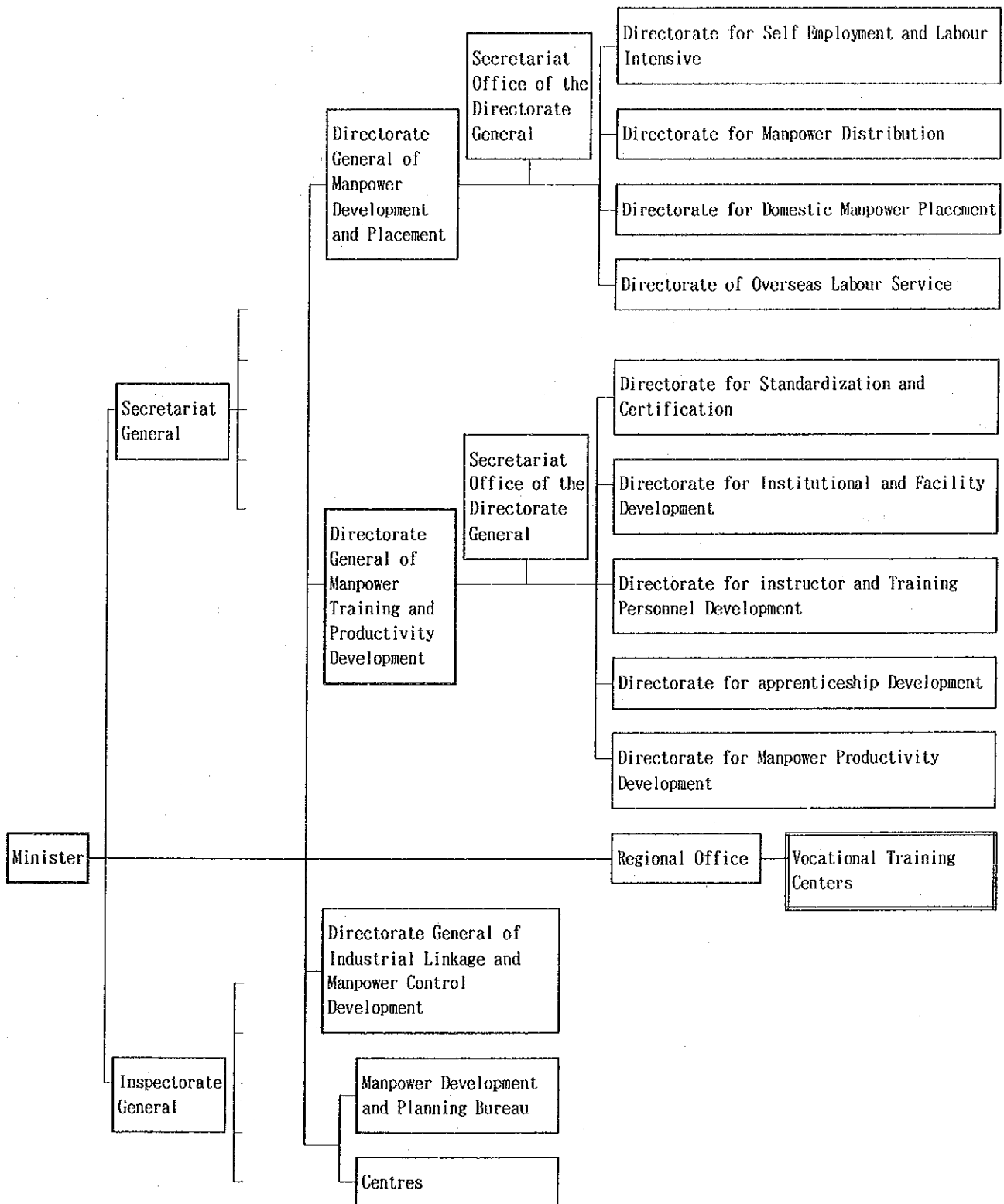
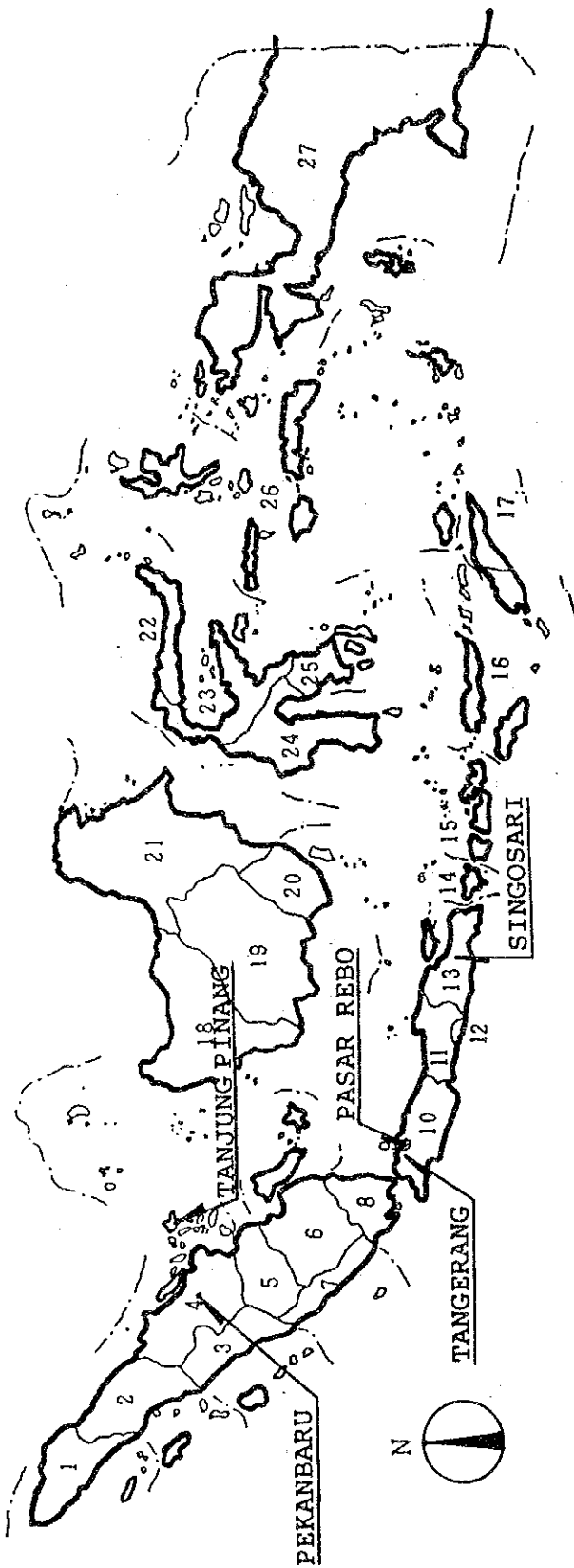


Figure 2.3.2 Organization of the Ministry of Manpower



No.	PROVINCE	TYPE OF VTC			No.	PROVINCE	TYPE OF VTC		
		A	B	C			A	B	C
1	DI Aceh	1	0	4	15	Nusa Tenggara Barat	1	0	4
2	Sumatera Utara	1	1	5	16	Nusa Tenggara Timur	1	0	2
3	Sumatera Barat	1	1	6	17	Timor Timur	0	0	1
4	Riau	1 (1)*1	0	2 (1)*2	18	Kalimantan Barat	1	0	4
5	Jambi	1	1	3	19	Kalimantan Tengah	1	0	2
6	Sumatera Selatan	1	1	7	20	Kalimantan Selatan	1	0	5
7	Bengkulu	1	1	1	21	Kalimantan Timur	1	1	1
8	Lampung	1	1	2	22	Sulawesi Utara	1	0	3
9	DKI Jakarta	2 (1)*3	0	0	23	Sulawesi Tengah	1	0	3
10	Jawa Barat	1	1	12 (1)*4	24	Sulawesi Selatan	1	1	4
11	Jawa Tengah	5	5	7	25	Sulawesi Tenggara	1	0	2
12	DI Yogyakarta	1	1	3	26	Maluku	1	0	2
13	Jawa Timur	3 (1)*5	1	12	27	Irian Jaya	1	0	4
14	Bali	1	1	3					
Note *1: Pekanbaru VTC					Sub Total		33	16	104
*2: Tanjung Pinang VTC					Grand Total				153
*3: Pasar Rebo VTC									
*4: Tangerang VTC									
*5: Singosari VTC									

Figure 2.3.3 Public Vocational Training Center in Indonesia

Table 2.3.3 Recent Changes in the Number of Graduates from Public Vocational Training Schools

	1986	1987	1988	1989	1990	1991
1. Mechanical	5,432	2,268	2,470	3,506	6,329	10,020
2. Electronics	5,922	3,196	3,708	5,197	8,743	11,400
3. Automotive	7,354	3,234	3,190	4,800	9,004	11,380
4. Construction	4,721	1,998	3,028	4,028	7,580	9,140
5. Commerce	4,133	1,297	2,230	3,254	2,769	4,040
6. Agriculture	2,746	3,415	4,090	5,411	20,754	15,500
7. Others	13,503	6,620	4,720	9,179	13,634	15,060
Total	43,811	22,028	23,436	35,375	68,923	76,540

(Source)DGTMPD

Also, the Ministry of Manpower makes facilities and staff of vocational training centers available to private enterprises for training of their own employees. Thus, 10,000 - 20,000 employees are trained at the centers annually.

The vocational training centers are classified into three types according to their location, size, and year of establishment, as follows:

Type A (33 centers) : Vocational training centers located in capital city of each state

Type B (16 centers) : Vocational training centers located in regional cities

Type C (104 centers): Vocational training centers located in rural towns and villages

Total 153 centers

The proposed project is designed to provide training equipment and tools for 3 Type A vocational training centers (Pekan Baru, Pasar Rebo, and Singosari) and 2 Type C centers (TJ. Pinang and Tangerang).

As mentioned earlier, the major problem in the country's labor market is that 75% of working population, 58.6 million

out of 78.5 million, have received low levels of education, elementary schools only or no formal education. The situation creates a large gap between supply and demand in the labor market, and all the vocational training centers offer basic courses for graduates from elementary and junior high schools. On the other hand, intermediate and advanced courses are limited to Type A centers

which have sufficient resources and receive the request from local industries.

It should be noted that, although each vocational training center lend its facilities and instructors for employee training by individual companies, the hire-out program is not operated under an established system. A company may use facilities and equipment only if there is no competent instructors to teach skills or techniques it want to teach.

Training courses and eligibilities are summarized as follows:

<u>Course</u>	<u>Eligibility</u>
Basic course:	Graduates from elementary and junior high schools
Intermediate course:	Persons who have completed basic courses, or graduates from high schools and technical schools (1 - 2 years of practical experience)
Advanced course:	Persons with 3 or more years of practical experience

Training centers which are authorized to offer advanced courses are as follows:

1. CEVEST
2. Palembang
3. Pasar Rebo
4. Las Condet
5. Bandung
6. Singosari
7. Ujung Pandang
8. Surabaya
9. Samarinda

These centers are all classified as Type A, and Pasar Rebo in 3. and Singosari in 6. are under consideration for the project.

Major areas of training at the vocational training centers are

mechanical engineering such as machining, welding, and pipe fitting, electrical engineering and electronics including the repairing of automobiles, radios, TVs, and air-conditioners, and electrical wiring, and other areas including construction, commerce, agriculture, poultry farming, sawing, embroidery, sculpture, and pottery. Training courses are planned and designed according to the request of local industries.

Vocational training methods are classified into two types; education and training at the vocational training centers, and mobile training in which instructors bring equipment and tools to a rural town or village and train local workers for a few months.

Persons between 18 and 45 years old and who have passed a qualification test are eligible to receive training at the vocational training center. The average course last 480 - 600 hours, depending upon the type of course and the center.

Major problems facing most of the vocational training centers are low education levels of trainees, the shortage of instructors in terms of ability and availability, and the shortage of training equipment and tools as well as their deterioration due to aging.

There are approximately 3,200 instructors working at the 153 training centers. 20 instructors per center do not seem to be sufficient in consideration to the number of students and variety of courses. Around 6% of instructors are university graduates, 11% received post secondary education equivalent to DIII (3-year education after high schools), and 83% have graduated from high schools. They are dominantly young, seemingly not having much practical experience. Efforts are needed to improve their teaching skills and knowledge.

Most of equipment and tools owned by the training centers have been acquired when the centers were opened, and they are 10 - 40 years old. They are deteriorated due to aging and/or outdated and intensify the shortage of equipment.

Clearly, the shortage of instructors and equipment, both in terms of quantity and quality, forms a bottleneck to effective vocational

training activity in the country.

### 2.3.3 Fifth Five-Year Plan and Role of Vocational Training

So far, various government authorities have been making efforts to create employment opportunities and provide vocational training for the labor force that increases steadily year after year. However, the unemployment problem which takes the form of underemployment continues to be a serious issue facing the country. A major reason lies in a large gap between levels of skill and knowledge required by industries and actual skills of workers.

The fifth five-year national development plan identifies the creation of employment opportunities and production of highly skilled workers as the most important issues. In particular, the plan sets the following targets related to vocational training in order to improve the quality of workers:

- (1) To train 600,000 persons at the 153 vocational training centers during the period;
- (2) To increase the number of instructors and improve teaching skills and knowledge (To increase them from current 3,200 to 5,000, and to provide re-education for instructors at home or overseas);
- (3) To ensure the effective use of the training centers by making their facilities, equipment, and staff available to general public and private companies;
- (4) To implement the national skill test in some chosen VTCs;
- (5) To promote mobile training;
- (6) To establish model schools for public and private vocational training institutes; and
- (7) To increase the related training implementation between institutional training at VTC and apprentice training at private enterprises.



## 2.4 General Outline of Vocational training Centers Selected for the Project

### 2.4.1 Geographical Background

Locations of vocational training centers selected as the recipients under the project are as follows:

Name	Location
(1) Pekanbaru Vocational Training Center	Pekanbaru, Riau Province, Sumatra
(2) Tanjung Pinang Vocational Training Center	Tanjung Pinang, Bintang Pulau, Riau Province
(3) Tangerang Vocational Training Center	Tangerang, West Java Province, Java
(4) Pasar Rebo Vocational Training Center	East Jakarta, Special District of Jakarta (D.K.I. Jakarta), Java
(5) Singosari Vocational Training Center	Singosari, East Java Province, Java

Their locations are classified into the following three regions:

- (1) Riau Province (Pekanbaru and Tanjung Pinang centers)
- (2) D.K.I. Jakarta, and West Java Province (Pasar Rebo and Tangerang centers)
- (3) East Java Province (Singosari center)

As mentioned later, these regions undergo rapid economic development, with industrial output accounting for two-third that in the country as a whole. At present, nationwide efforts are being made to promote industrial projects and construct infrastructure in these areas. Thus, the selection of the vocational training centers for the project is believed to be justifiable in consideration to their potential impacts on the areas they are operated.

Breakdown of industrial production in the above three areas, in terms of percentage share in 1988, is shown in Table 2.4.1.

**Table 2.4.1 Breakdown of Industrial Production by Product Category (1989)**

(Unit: Billion rupiahs)

	1 s t	2 n d	3 r d	4 t h	5 t h	Other	Total
Riau Province (Pekanbaru, Tanjung Pinang)	272 (47%) Machinery/ metalwork products	193 (33%) Wood and woodwork products	63 (11%) Papermaking and paper products	29 (5%) Food and beverage	16 (2%) Chemical products	8 (2%)	575 (100%)
D.K.I. Jakarta (Pasar Rebo)	1,629 (46%) Machinery/ metalwork products	560 (16%) Textile and apparel	538 (15%) Chemical products	335 (10%) Food and beverage	177 (5%) Papermaking and paper products	255 (8%)	3,494 (100%)
West Java Province (Tangerang)	1,424 (29%) Textile and apparel	979 (20%) Basic metal	764 (15%) Machinery/ metalwork products	629 (13%) Chemical products	253 (5%) Non-ferrous metal	860 (18%)	4,909 (100%)
East Java Province (Singosari)	2,023 (57%) Food and beverage	397 (11%) Chemical products	295 (8%) Machinery/ metalwork products	244 (7%) Textile and apparel	217 (7%) Papermaking and paper products	327 (11%)	3,503 (100%)

The general status of economic development in these areas is described as follows.

(1) Riau Province

The province forms the "Golden Triangle Zone" with Singapore and the State of Johor (Malaysia) and is currently developed as a regional center of industry, trade, and tourism under the close cooperation of the three countries. At present, a wide range of industries is operated in the province, including machinery (inclusive of boilers and refrigerators), wood and related products (pulp and paper, and plywood), oil (drilling, refining, and storage), and textiles.

Major industrial projects under planning are summarized as follows:

- (a) Manufacture of oil drilling equipment and accessories (Batam)
- (b) Oil refining (Dumai)
- (c) Plywood, pulp and paper (Pelalawan)
- (d) Hydropower generation (Kotapanjang)
- (e) Apparel
- (f) Doubling the palm planting area and the number of palm oil plants (namely, from 500,000 ha to 1 million ha, and from 50 plants to 100 plants, respectively)
- (g) Construction of an industrial park and port (Bintang)

An industrial park to accommodate 120 companies, with access roads

and port facilities, is under construction.

Infrastructure projects related to transportation and tourism are as follows:

- (a) Road construction
  - i) Trans-Sumatra highway
    - Pakanbaru - Palembang - Jakarta
  - ii) Pakanbaru - Minas - Tanjung Budon
    - A port will be constructed in Tanjung Budon
- (b) An oil export harbor in Dumai
- (c) Bridges and roads connecting Batam, Rempang, and Galang islands
- (d) Batam International Airport under construction

Foreign investment in Batam, the island nearest to Singapore, can enjoy a variety of benefits, compared to other areas, including few restriction on equity participation rate of foreign capital, unrestricted remittance of profit, free management rights, and simplification of approval and permit procedures.

(2) D.K.I. Jakarta and West Java Province

These areas are located within the JABOTABEK region which consists of Jakarta, and its surrounding municipalities, Bogor, Tangerang, and Bekasi. There are many industrial parks developed by the private sector in the areas, where many Japanese companies are operating. In fact, D.K.I. Jakarta and West Java Province account for 18.4% and 25.8%, respectively, of total industrial output in the country, with a combined total of 44.2%. The leading industry in the areas is machinery and related products, which production value exceeds a combined total of the textile industry (ranked second) and the chemical industry (ranked third). Today, modern plants producing electronic and electrical equipment, automobiles, aircraft, and machine tools are concentrated in these areas.

(3) East Java Province

The province is the second largest in total industrial output, next to West Java, accounting for 18.4% of the national total. It accommodates large-scale plants which produce petrochemical products, fertilizer, tobacco, and other products. Also, machinery, iron and steel, textile, tobacco, and chemical plants are concentrated in the Malang - Pasuruan area with Singosari as the center.

2.4.2 Current State of Vocational Training Centers

General description of the vocational training centers selected for the project and their equipment is as follows.

(1) Pekanbaru Vocational Training Center

The center is located in the south margin of Pekanbaru, the provincial capital of Riau situated in the central part of Sumatra. It was established as Type A training center in 1983 and offers a variety of basic and intermediate courses according to demand, but it has no advanced courses.

The project will cover five courses, machine shop, arc welding, refrigeration repair and service, furniture, and automotive repair and service, which training equipment and tools are largely 10 years or older and have not been replaced since their initial installation.

Current conditions of training equipment and tools at each of the above five courses are described as follows.

(a) Machine shop course

The course occupies around two-third of the 36m x 21m building. 18 machine tools, including lathes, milling machines, shaping machines, drilling machines, and sawing machines, are installed. Most of them are made in Korea or India, and 8 are not operational and left without proper repair due to the lack of spare parts. There are some measuring instruments, including two hardness testers which are not in use.

(b) Arc welding course

Within the above machine shop, 13 machines (including gas welding machines, electric welding sets, spot welding machines, TIG welding sets, MIG welding sets, electrode dryers, and generators) are maintained in good operating condition. However, auxiliary equipment and tools (e.g., grinders and anvil blocks) are not sufficient in number, and there is no testing equipment (such as magnetic and ultrasonic testing). Compared to a large number of students to reflect high demand for welders, training equipment is apparently in short supply.

(c) Refrigeration repair and service course

The course is designed to teach skills required for the maintenance and repair of refrigeration and air-conditioning equipment. Originally, it has been started as part of the electrical work course because these equipment is operated by electricity. Then it has become a separate course to meet increasing demand. The course teaches techniques and skills required to maintain and repair compressors, condensers, and heat exchangers (radiators), and other components through training in overhauling and assembly operations. 16 machines including large air-conditioners, refrigerators, freezers, air-conditioning maintenance training sets, compressors, and vacuum pumps, and other equipment and tools for welding and repairing are installed.

(d) Furniture course

The two-month course is offered twice each year, plus the two-month mobile training course 1 - 4 times.

There is a 288m<sup>2</sup> training yard where minimum required woodworking machines are installed, including lifting circular sawing machines, automatic single-face planes, band-sawing machines, and corner chiseling machines. However, the facility does not have equipment and tools related to finishing and design, which are important elements of the furniture making process. As a result, furniture produced in shop training is robust in construction but

its design and workmanship is not refined from the viewpoint of marketability. Also, there is the shortage of hand tools, in terms of type and quantity, to hinder fair and effective learning by students.

(e) Automotive repair and service course

The automotive repair and service course is very popular and teaches relatively high levels of techniques and skills, including the overhauling of gasoline and diesel engines, the replacement of piston rings, and the repairing of cylinders. The course also covers a variety of vehicles including passenger automobiles, passenger/freight vehicles (vans), trucks, and industrial vehicles. Major equipment and tools available are engine models for different types of vehicles, engine analyzers, plug testers, brake testers, nozzle testers, valve spring testers, gear box jacks, and hydraulic jacks.

(2) Tanjung Pinang vocational training center

The center is located approximately 5km east of Tanjung Pinang City, the center of Bintang Island in Riau Province. It was established in 1983 as Type C vocational training center. Training equipment and tools are generally limited in quantity and variety and are mostly outdated as they have not been replaced since their initial installation. However, the center's manager is willing to upgrade facilities and equipment and is making efforts to increase instructors and secure financing for future expansion. The center plans to double the campus site by expanding into an adjacent site that has already been acquired.

The most distinctive feature of the center is a hotel management course for hotel employees in the resort area of this district which draws a large number of tourists from nearby Singapore on weekends. The center requests the supply of equipment for language training. In addition, training equipment and tools are requested for five courses, machine shop, arc welding, refrigeration repair and service, pipe fitting, and automotive repair and service. The current state of equipment and other resources of these courses is described as

follows.

(a) Machine shop course

The machine shop is 11m x 15m in size has only 6 lathes (medium-size and small-size), 1 upright drilling machine, and 3 grinders. The drilling machine is not operational due to the lack of spare parts. Instructors are well trained, and some of them are trained at CEVEST to operate CNC machines.

(b) Arc welding course

Training equipment is also limited in number, although well maintained; 2 electric welding machines, a generator, a transformer for welding machines, a hand drill, and 2 portable grinders.

(c) Refrigeration repair and service course

The course has been started only recently. With new instructors, the training environment is still at the development stage. The center owns measuring instruments and tools but has few machinery. Most of training equipment, including compressors, is mostly rented from outside. Nevertheless, the center plans to give priority to the course in resource allocation as it is very popular in the local community.

(d) Pipe fitting course

At present, pipe fitting is offered as a sub-course of the machine shop course that includes machining and welding, thus it does not have its own equipment. As it will become a separate course under the project, instructors are now receiving special training at Samarinda Vocational Training Center which is only one center offering the pipe fitting course in the country.

(e) Automotive repair and service course

The course does not have much training equipment; 3 automobile

engines, 5 motorcycle engines, a gasoline engine model, and a diesel engine model. It mainly teaches maintenance and repair techniques for gasoline engine cars. The center is currently reinforcing equipment to meet increasing demand in the local community.

(f) Language laboratory

At present, there is no equipment for language education. The course has been established to train conversation skills in English, Japanese, and Chinese, which are considered as basic requirements for various industries operating in the hinterland of Singapore, particularly hotel, restaurant and other service industries. At present, the course is taught by outside instructors hired on a hourly basis.

(3) Tangerang vocational training center

Like the Tanjung Pinang center, this is also a small training center (Type C) established in 1983. Its strategic location in Tangerang, approximately 30km west of Jakarta, which is within the JABOTABEK industrial zone, constitutes a primary reason for selecting the center as one of the project sites. Training courses requesting equipment and tools to be supplied by the project are machine shop, arc welding and pipe fitting. Existing equipment is limited in number and has not been upgraded since the opening of the center.

(a) Machine shop course

The course has a working space of 26m x 10m and has 17 machine tools, including lathes, shaping machines, milling machines, drilling machines, grinders, and saws. 5 are out of order. Overall, training equipment and tools are limited in number and variety.

(b) Arc welding course

There are 4 acetylene generators, 2 electric welding kits, 2 gas welding and cutting kits, and grinders, which are not sufficient



for proper training. Also, one-third of these equipment do not work.

(c) Pipe fitting course

The course is offered as part of the machine shop course and does not have its own facility nor equipment. The center plans to establish a separate course for pipe fitting and has reserved a space and budget. It will employ instructors who receive training at the Samarinda center and will adopt the curriculum and educational guideline of the center.

(4) Pasar Rebo vocational training center

This is one of the ten oldest vocational training centers, established in 1952. Located in Jakarta, it is classified as Type A training school and offers a large number of courses including advanced ones to teach high levels of technology. It has a variety of training equipment as well as teaching staff, both in terms of quality and quantity. Under the project, the center requests equipment and tools for a new course to be established, industrial electronics and instrumentation.

(a) Industrial electronics and instrumentation course

This is a newly established course and does not have its own equipment. The center is currently offering basic courses on electricity and electronics. The former basically teaches lowvoltage electrical work, including interior wiring, and the latter concentrates on repair, including radios, TVs, and audio systems. Training equipment and tools for the basic courses are relatively plenty to reflect the center's proximity to Jakarta.

(5) Singosari vocational training center

This is also one of the ten oldest schools, established in 1953. It is located in Singosari, part of the industrial zone around Surabaya, the provincial capital of East Java. It is a Type A training school offering advanced courses. The center has a variety of training

equipment and tools as well as instructors to teach a wide range of courses. Like the Pasar Rebo center, the project will supply training equipment and tools for a new course, industrial electronics and instrumentation.

(a) Industrial electronics and instrumentation course

As in the case of the Pasar Rebo center, this course will be newly established under the project and has no equipment at present. The center is currently teaching basic courses for electricity and electronics. The former teaches low-voltage electrical work including interior wiring, and the latter the repairing of radios, TVs, and audio systems.

Appendix 6 attached to this report shows a list of existing equipment and tools at the courses selected for the project.

2.4.3 Organization of Vocational Training Centers

The organizational structure of vocational training centers in Indonesia is set forth according to the type of each center. General organizations of Types A (Pekanbaru, Pasar Rebo, Singosari) and C (Tanjung Pinang and Tangerang) centers selected for the project are shown in Figures 2.4.1 and 2.4.2. Table 2.4.2 shows the number of personnel by function, and Table 2.4.3 the number of instructors by course.

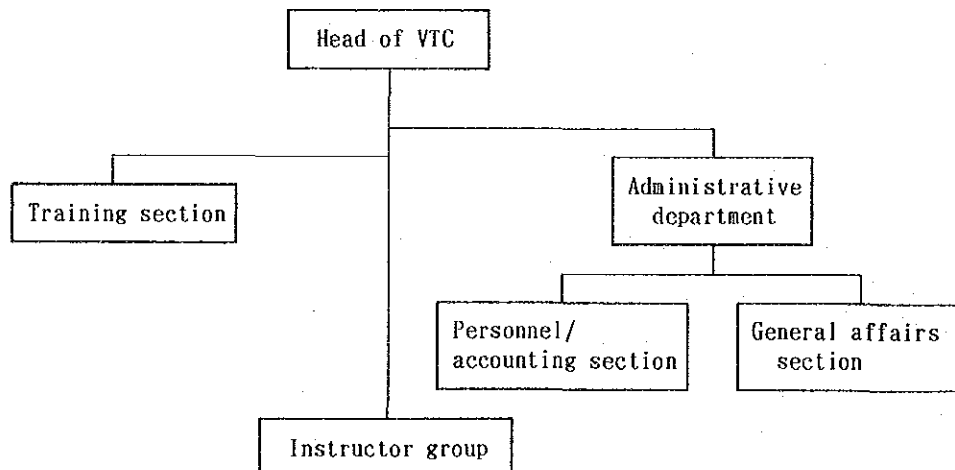
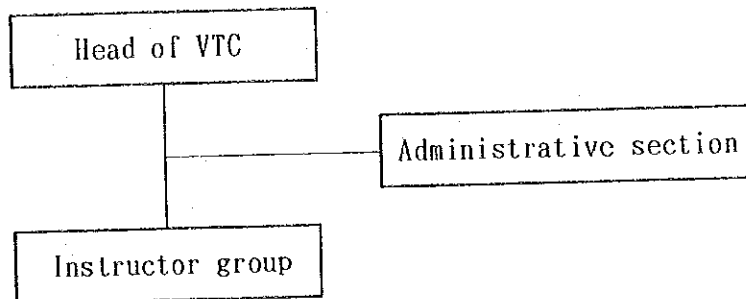


Figure 2.4.1 Organization of Type A Vocational Training Center



**Figure 2.4.2 Organization of Type C Vocational Training Center**

**Table 2.4.2 Number of Personnel by Function**

	Pekanbaru	Tanjung Pinang	Tangerang	Pasar Rebo	Singosari
Head of VTC	1	1	1	1	1
Administrative department/section	1	6	5	1	1
Training section	5	-	-	7	7
Personnel/accunting section	10	-	-	16	16
General affairs section	10	-	-	26	19
Instructors	55	15	33	63	48
Total	82	22	39	114	92

(Source)Each VTC

Table 2.4.3 Number of Instructors by Course

	(1) Pekanbaru	(2) Tanjung Pinang	(3) Tangerang	(4) Pasar Rebo	(5) Siangosari
(1) Machine shop	10	5	7	7	5
(2) Arc welding	3	(Counted in machine shop course)	(Counted in machine shop course)	7	8
(3) Refrigeration repair/service	(Counted in electricity course)	(Counted in electricity course)	-	-	-
(4) Pipe fitting	-	-	(Counted in machine shop course)	-	-
(5) Automotive repair/service	10	3	5	11	5
(6) Furniture	2	-	-	-	-
(7) Electricity/electronics	11	3	8	20	10
(8) Foreign language	-	-	-	-	-
(9) Others	16	4	8	18	20
(10) Assistant	3	-	5	-	-
Total	55	15	33	63	48

(Source) Each VTC

#### 2.4.4 Training Courses Selected for the Project

As discussed in 2.3.3, the reinforcement of basic vocational training for unskilled workers is a major challenge for Indonesia which faces a problem of providing jobs for ever increasing labor force. At the same time, the government's export promotion policy focusing on industrial products creates a pressing need for improving technical levels of skilled workers in order to establish the industrial structure capable of producing high grade products with international competitiveness.

Meanwhile, domestic demand for workers with advanced skills ramps up since a variety of industries emerges rapidly, led by foreign companies operating in industrial parks. The emerging industries include machinery, iron and steel, automobiles, electronics and electrical equipment, consumer equipment, chemicals, petrochemical products, fertilizer, cement, textile, and food processing. The

service sector is also booming. Demand for automotive repair as well as the repairing of consumer equipment including air-conditioners is on the rise. With the government's policy to encourage tourism, a large number of modern hotels and restaurants is constructed and operated.

The training courses selected for the project are expected to meet such demand: machine shop and welding courses for the machinery industry; pipe fitting and welding courses for petrochemical, chemical, and steel, and other industries; and industrial electronics and instrumentation for production of electronics and electrical equipment and process industries. In particular, industrial electronics and instrumentation is viewed as a major source of economic development keeping the pace with ASEAN countries. These technologies lead to production systems based on electronics (CAD and CAM) and instrumentation for plant facilities (such as sequence controllers and feedback controls combining instruments and controllers) that serve as an impetus for growth of Singapore and Malaysia. Foreign language and furniture making courses have been selected for the tourism industry such as hotels. Finally, automotive and refrigeration repair and service courses have been selected to meet growing demand for these services.

Table 2.4.4 summarizes training courses at each center selected for the project.

Table 2.4.5 lists the curriculum of each course (basic course). Note that no curriculum has been established for the two new courses, industrial electronics/instrumentation and foreign language. Also note that the number of hours indicated in each table is the figure recommended by the Ministry of Manpower. The actual number of hours allocated to the courses generally ranges between 480 - 600 hours, as mentioned in 2.3.2.

Table 2.4.4 Vocational Training Courses Selected for the Project  
by Center

	(1) Pekanbaru	(2) Tanjung Pinang	(3) Tangerang	(4) Pasar Rebo	(5) Singosari
(1)Machine shop	○	○	○		
(2)Arc welding	○	○	○		
(3)Refrigeration repair and service	○	○			
(4)Pipe fitting		○	○		
(5)Automotive repair and service	○	○			
(6)Furniture	○				
(7)Industrial electronics and instrumentation				○	○
(8)Language laboratory		○			

Table 2.4.5 Curriculum by Training Course (Basic Course)

(1) Machine shop Course

Total: 900 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	Material of work piece	16	24	40
2	Technic drawing	36	48	84
3	Electric motor instalation	8	4	12
4	Turning	54	204	258
5	NC lathe	38	102	140
6	Machine shop	24	32	56
7	NC milling	38	102	140
8	Safety and health	18	-	18
9	Evaluation	16	16	32
10	On the job training (OJT)	-	120	120
Total		248	652	900

(5) Automotive repair/service work

Total: 488 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	Petrol engine			174
2	Electricity			58
3	Chassis			66
4	Automotive body			68
5	Bench work			48
6	Maintenance and troubleshooting			32
7	Technical drawing			24
8	Safety and health			18
Total				488

(2) Arc welding course

Total: 920 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	General education	33	57	90
2	Metallurgy	16	8	24
3	Technical drawing	16	20	36
4	Masurement	12	16	28
5	Bench work	12	32	44
6	Electrical technique	16	8	24
7	Basic welding technique	16	32	48
8	Arc welding	24	382	406
9	Welding inspection	6	12	18
10	Safety and health	42	-	42
11	OJT	-	120	120
12	Final Test	24	16	40
Total		217	703	920

(6) Furniture course

Total: 785 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	Furniture material (I)	20	10	30
2	Hand tools	10	30	40
3	Wood working machines	10	35	45
4	Technical drawing	15	35	50
5	Furniture construction	20	40	60
6	Furniture makinig (I)	-	100	100
7	Furniture material (II)	15	45	60
8	Furniture making (II)	20	300	320
9	Cost estimation	10	20	30
10	Finishing	15	35	50
Total		135	650	785

(3) Refrigeration repair and service course

Total: 600 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	Basic electricity	20	-	20
2	Measurement/tools			
	Electricity	8	24	32
	Hand tools	8	16	24
3	Materials	10	-	10
4	Refrigeration	16	30	46
5	Air-conditioning	40	100	140
6	Refrigerators	40	100	140
7	Electrical drawing	16	40	56
8	Troubleshooting (failure diagnosis)	20	70	90
9	Safety and health	16	-	16
10	Evaluation	6	20	26
Total		200	400	600

(4) Pipe fitting course

Total: 1,192 hour

No.	Curriculum Subject	hour		
		Theory	Field Training	Total
1	General education	33	57	90
2	Metallurgy	20	-	20
3	Technical drawing	10	40	50
4	Bench work	20	120	140
5	Supporting tools	20	60	80
6	Piping work	60	400	460
7	Technical calculation	40	-	40
8	Rust-proofing	8	12	20
9	Safety and health	42	-	42
10	OJT	-	200	200
11	Final test	10	40	50
Total		263	929	1,192





## 2.5 Related Sectors

### (1) Vocational/professional training institutes

Vocational training activities in Indonesia are classified as follows:

#### 1) In-house training by individual government agencies

To provide education and training for lower-level government officials graduated from junior high schools.

#### 2) Vocational training under jurisdiction of the Ministry of Manpower

##### <1> Vocational training centers managed by the Ministry of Manpower

Including those selected for the project, vocational training centers are principal organizations to train semi-skilled workers in the industrial sector and provide basic technical training for job seekers and workers in the informal sector. There are 153 public vocational training centers.

##### <2> Private training institutes

There are 3,193 private vocational training institutes throughout the country, which are regulated by the Ministry of Manpower and provide the same or lower level of training as that given by the public vocational training schools. Geographical concentration is seen in Central Java (425), North Sumatra (398), Jakarta (251), and East Java (247). Industrial courses most widely taught at the private training institutes are automobile/motorcycle maintenance and repair, welding, and radio repair. In the commerce and service areas, accounting, typing, sales, secretarial science, and tailoring are most popular.

- 3) Vocational/professional training facilities owned by private enterprises

Around 70 major corporations conduct in-house training courses and apprentice schools, which not only provide field training for their own employees, but for the general public as well to meet the needs of local communities they operate. The government recognizes these efforts as an integral part of the human resource development system for the country as a whole and support them in various ways.

(2) Instructor training institutes

Technical instructors and vocational training instructors in the country are trained through any of the following courses.

First of all, teachers of technical high schools are trained at any of the following institutes:

- 1) Teachers' colleges and technical teachers' training programs at universities
- 2) Polytechnics (technical teachers' training programs)
- 3) Vocational Education Development Center (VEDC: Established as part of the World Bank's Polytechnic Project)

Technical teachers' training programs are offered by 8 public educational institutions; 1 university and 7 teachers' colleges. In particular, 2 out of 7 teachers' colleges have modern facilities and equipment provided under the assistance of the World Bank, and teach advanced techniques.

On the other hand, private universities and colleges having technical teachers' training programs are limited to 3 universities and 7 teachers' colleges, out of 284 institutes that have science and engineering programs.

Polytechnics' diploma courses consist of professional training programs and technical instructors' programs in a variety of fields. The latter differs from the former in that 20% of the curriculum are allocated to the theory of education, teaching methods, and field

training.

Instructors of vocational training centers managed by the Ministry of Manpower come from three training centers in Bekasi (CEVEST), Bandung, and Banjarbaru.

CEVEST (Center for Vocational and Extension Service Training) was established in the suburb of Jakarta, as part of "ASEAN Human Resources Development Project" under JICA's technical assistance. CEVEST's vocational training instructors' training section provide a 2-year instructors' assistance program, a 3-month instructors' upgrading program, and a 3-month advanced program for the 153 vocational training centers operated by the Ministry of Manpower. Instructors receiving the CEVEST training programs are all government employees and are assigned to their own centers upon completion of training.

In addition to its role as the national center for training of instructors, CEVEST is required to promote and reinforce cooperation among ASEAN countries through proliferation of vocational training and training techniques.



## 2.6 Foreign Aids Related to Vocational Training

Major foreign aids granted to Indonesia in connection with vocational training projects before 1980, either under bilateral arrangement or through international organizations, are listed in Table 2.6.1.

Table 2.6.1 Foreign Aids Related to Vocational Training (I)

No.	Year	Vocational training center	Donor	Remarks
1	1955	Pasar Rebo	Australia	Colombo Plan
2	1955	Singosari	New Zealand	-Ditto-
3	1955	Bandung	U.S.A.	ILO
4	1968	Palembang	West Germany	Bilateral
5	1970	Medan	Netherlands	-Ditto-
6	1974	Ujungpandang	Japan	-Ditto-
7	1975	Lás Condet	New Zealand	-Ditto-
8	1978	Samarinda	Canada	-Ditto-

(Source) DGTMPD

Similar foreign aids granted after 1980 are listed in Table 2.6.2.

Table 2.6.2 Foreign Aids Related to Vocational Training (II)

No.	Project	Donor	Period	Type of Aid	Remarks
1	Training of instructors	Germany	Phase 1 1986 - 1990 Phase 2 1990 - 1994	Technical assistance	Technical training of instructors at Bandung Vocational Training Center by 3 experts
2	Mobile training unit	South Korea	1989 - 1991	Grant and soft loan	Equipment supply, training of instructors by 12 experts
3	Development of the training system	World Bank	Phase 1 1990 - 1991 Phase 2 1992 - 1993	Soft loan	Assistance and advice in setup and management of vocational training centers by 5 experts
4	Furniture manufacture training center	Denmark	1990 - 1993	Technical assistance	Technology transfer related to the manufacture of furniture and rattanwork
5	Training of instructors (CEVEST)	Japan	Phase 1 1983 - 1990 Phase 2 1992 - 1999	Technical assistance	Initial and advanced training of instructors by 6 experts (Phase 1)
6	Electronics and furniture design	Italy	1991 - 1994	Technical assistance	Training related to the design of electronics/electrical equipment, automobiles, and furniture. 20 instructors are under training in Italy



## 2.7 Background and Outline of the Request for the Grant Aid Project

### 2.7.1 Background

The Indonesian government has been implementing series of five-year national development plans since the late 1960s for the purpose of reinforcing the political and economic foundations of the country. Under the current fifth five-year plan, the government promotes economic development policy focusing on the shift of the country's economic structure which overly depends upon the oil and gas sector, the promotion of export industries, and the creation of employment opportunities for growing population, particularly young labor force. As part of its efforts to achieve these objectives, the government sets forth the development and reinforcement of human resources through the improvement of vocational training as one of major challenges in its development projects. To supply skilled workers who can meet the needs of the industrial community, the Ministry of Manpower plans to provide vocational training for approximately 600,000 workers over the period of the current fifth five-year plan at 153 vocational training centers it operates throughout the country.

A major bottleneck to this plan, however, are deteriorated and outmoded facilities and equipment of the training centers. Unless they are upgraded or renewed, it is difficult to ensure stable supply of workers who have high levels of skills demanded by local industries.

The Ministry of Manpower has decided to rehabilitate the vocational training facilities and equipment. As the first step, the Ministry selected five vocational training centers, Pekanbaru, Tanjung Pinang, Tangerang, Pasar Rebo, and Singosari, to be be upgraded with latest training equipment. These centers have been selected because of their strategic locations in the areas where industries are growing most rapidly (Provinces of Riau, West Java, and East Java, and D.K.I. Jakarta). Then, the Indonesian government requested the Japanese government to provide grant aid for obtaining training equipment and tools required by the five centers.

### 2.7.2 General Outline of the Request for Grant Aid

The request for grant aid made by the Indonesian government is summarized as follows.

#### (1) Objective

Training equipment and tools installed in the vocational training centers are not sufficient in quantity, and are mostly aged and outmoded. The project is designed to provide appropriate equipment and tools suitable for the designated training courses, thereby to train highly skilled workers who can meet increasing demand from a variety of industries.

#### (2) Project implementation body

Supervising agency : The Ministry of Manpower

Implementation body: Directorate General of Manpower Training and Productivity Development (DGMPD)

#### (3) General outline of requested equipment and tools

The number of equipment and tools requested by the Indonesian government, by training center and course, is tabulated in Table 2.7.1, and a general list of requested equipment and tools in Table 2.7.2. In total, 1,181 items of equipment and tools are requested for the eight courses which are currently conducted or newly established by the five vocational training centers.



**Table 2.7.1 Requested Equipment and Tools by the Number of Items, Vocational Training Center, and Course**

	(1) Pekanbaru	(2) Tanjung Pinang	(3) Tangerang	(4) Pasar Rebo	(5) Singosari	Total
(1) Machine shop	80	82	85	0	0	247
(2) Arc welding	63	63	65	0	0	191
(3) Refrigeration repair and service	91	91	0	0	0	182
(4) Pipe fitting	0	62	62	0	0	124
(5) Automotive repair and service	54	76	0	0	0	130
(6) Furniture	95	0	0	0	0	95
(7) Industrial electronics and instrumentation	0	0	0	100	100	200
(8) Language laboratory	0	12	0	0	0	12
Total	383	386	212	100	100	1,181

**Table 2.7.2 List of Requested Equipment and Tools by Course**

Course	Requested Equipment and tools
(1) Machine shop	Lathes, copying lathes, crankshaft grinding machines, automotive boring machines, milling machines, hobbing machines, grinders, CNC lathes, CNC machining centers, CAD, CAM, EDM, tools, measuring instruments, educational videos
(2) Arc welding	Arc welding machines, TIG welding sets, MIG-MAG welding sets, Plasma welding machines, automatic steel plate cutters, automatic steel pipe cutters, grinders, drilling machines, work benches, helmets, cutters, OHPs, tension testing machines, X-ray radiographic equipment, ultrasonic testers, tools, measuring instruments, and educational videos
(3) Refrigeration repair and service	Air compressors, vacuum pumps, hoses, refrigeration systems, air-conditioners, voltmeters, pipe cutters, and educational videos
(4) Pipe fitting	Gas cutting sets, drilling machines, grinders, flanges, elbows, squares, pipe wrenches, valves, and educational videos
(5) Automotive repair and service	Engine stands, hydraulic presses, battery chargers, break testers, wheel balancing machines, and educational videos
(6) Furniture	Wood lathes, disk sanders, hacksaw frames and band saws, clamps, planes, chisels, hammers, and drills
(7) Industrial electronics and instrumentation	Control trainers, programmable controllers, servo units, logic analyzers, and ampere meters
(8) Language laboratory	Language training equipment, TV sets, videos, language training tapes, and laser disk drives



## **CHAPTER 3 OUTLINE OF THE PROJECT**



## Chapter 3 Outline of the Project

### 3.1 Objective of the Project

As discussed in Chapter 1 "Introduction," the Ministry of Manpower trains skilled workers at 153 vocational training centers throughout the country. However, most of training equipment and tools available at the centers are not sufficient in quantity and are deteriorated and/or outmoded. The project is designed to enable the training centers to supply human resources suitable for the industry's demand by obtaining the required equipment and tools.



### **3.2 Evaluation of the Original Request**

#### **3.2.1 Evaluation of Rationale and Need for the Project**

Judging from the background and the objective of the project, as discussed in 3.1 "Objective of the Project," the project is expected to produce direct and indirect benefits as contemplated. Directly, the project will enable the five centers to train skilled workers meeting industrial needs by supplying adequate training equipment and tools. The development of the well-trained labor force will lead to the decline in unemployment rate and the dissemination of advanced production techniques and skills to the manufacturing industry. Overall, the project will help improve the quality of Indonesian products, reinforce international competitiveness of Indonesian manufacturers, promote economic development, and raise standards of living. Thus, the project is considered to be a viable project with high priority to meet the three guidelines of the current fifth five-year plan, (1) fair distribution of benefits produced in the development process, (2) sufficient economic growth, and (3) the development of the country with stability and vitality.

#### **3.2.2 Evaluation of the Project Implementation and Management Plan**

The project will supply training equipment and tools that are in short supply or are deteriorated to the five vocational training centers, thereby enabling them to provide training that satisfies the needs of the industrial community.

The project implementation body will be vocational training centers (VTC) supervised by DGTMPD of the Ministry of Manpower. These centers are well organized, consisting of heads of VTCs, chief instructors, and instructors and assistants, and do not need any reorganization for the project.

In addition, each Type A training center has administrative department and training section to assist the head of VTC. The former controls personnel/accounting and general affairs sections, and the latter is responsible for planning individual training courses and reporting the results. On the other hand, Type C

training center has administrative section which handle personnel management, accounting, and general affairs, and report to the head of VTC.

Operation and maintenance of training equipment and tools are performed by chief instructors, instructors, and assistants in each course. In fact, equipment and tools at each vocational training center are maintained in good operating condition, except for some which are not repaired due to the shortage of repair parts. Thus, all the centers have technical resources to maintain existing equipment. Nevertheless, adequate training for operation and maintenance of new equipment and tools to be introduced under the project will be required, followed by efforts of instructors and assistants.

The centers plan to remodel or expand the existing facilities to accommodate new equipment and tools to be supplied. Costs and expenses related to construction of buildings and foundations for installing equipment, as well as utilities-related work, will be borne by each center as part of its budget for facility improvement approved by the Indonesian government.

Then, operating expenses required by the vocational training centers and their financial sources are evaluated as follows.

In Indonesia, costs and expenses required for daily operation of the vocational training centers are classified as follows:

- (1) Labor cost
- (2) Material cost (including utilities)
- (3) Equipment maintenance cost
- (4) Other expenses (traveling, etc.)

In addition to the operating budget, the cost for any special project implemented in a particular year is entirely granted by the government.

Table 3.2.1 "Changes in Operating Budget for Vocational Training Centers" and Table 3.2.2 "Changes in Equipment Maintenance Budget"



show budget estimates between 1990 and 1994 when the project is completed in FY1993. As a result, the 1993 budget is larger than other years due to the addition of the project cost borne by the Indonesian side. It should be noted, however, that the 1994 budget of two training centers in Pasar Rebo and Singosari is larger than the 1993 budget, due to the facility expansion work in FY1994 that is not covered by the project. As seen in Table 3.2.2, equipment procurement and maintenance costs in the 1994 budget will increase approximately 40% over those in the 1992 budget (20% annually), which will be financed by the Ministry of Manpower. Thus, the centers have sufficient financial resources to maintain training equipment and tools.

**Table 3.2.1 Changes in Total Operating Budgets of Vocational Training Centers**

(1,000 rupiahs)

	1990	1991	1992	1993	1994
Pekanbaru	58,830	131,480	152,110	606,864	439,598
Tanjung Pinang	31,500	73,180	102,110	661,831	353,259
Tangerang	55,900	146,240	114,390	582,955	330,587
Pasar Rebo	239,170	544,310	710,780	1,272,296	2,277,410
Shingosari	76,140	188,080	247,470	623,819	883,988

(Source) Indonesian Official Request for the Project

**Table 3.2.2 Changes in Equipment Procurement and Maintenance Budgets**

		1990	1991	1992	1993	1994
Pekanbaru	Equipment Procurement	11,987	10,193	13,174	13,174	-
	Maintenance	9,871	17,581	19,581	26,021	-
	Total	21,858	27,774	32,755	39,195	-
Tanjung Pinang	Equipment Procurement	9,050	9,075	9,355	9,355	13,100
	Maintenance	9,000	9,000	10,700	10,640	14,896
	Total	18,050	18,075	20,055	19,995	27,996
Tangerang	Equipment Procurement	-	8,580	8,860	8,860	-
	Maintenance	-	10,000	21,500	13,140	-
	Total	-	18,580	30,360	22,000	-
Pasar Rebo	Equipment Procurement	42,424	37,554	55,369	55,869	67,642
	Maintenance	17,754	21,245	24,844	26,344	40,612
	Total	60,178	58,799	80,213	82,213	108,254
Shingosari	Equipment Procurement	23,765	25,265	26,765	33,705	38,761
	Maintenance	915	955	955	955	1,098
	Total	24,680	26,220	27,720	34,660	39,859

(Source) Each VTC

### 3.2.3 Evaluation of Training Equipment and Tools Requested

From preliminary evaluation of training equipment and tools requested, the study team found the following issues which may necessitate the reconsideration of the proposed list (see Appendix 5, List of Requested Equipment and Materials)

- 1) The list includes equipment that has undue advanced functions compared to expected levels of students and requires advanced knowledge and experience for operation.
- 2) No curriculum has been developed for the proposed industrial electronics and instrumentation course. It is relatively easy to develop the curriculum for the industrial electronics course since basic courses on electricity and electronics are already offered. On the other hand, instrumentation is the area to be first taught at vocational training schools in the country, so that it will take considerable time to develop the appropriate curriculum. Training equipment and tools requested for the instrumentation course are mainly related to measurement and control. They represent minimum requirements to teach instrumentation technology needed to foster the process industry. The early development of the course curriculum, therefore, holds the key to the success of the course.
- 3) No curriculum has been developed for the foreign language laboratory course at the Tanjung Pinang vocational training center, which has been newly developed and is currently taught by outside instructors.
- 4) There is no workshop nor equipment dedicated for the pipe fitting course since it has been offered, together with the arc welding course, as part of the machining course. The course itself has been taught by instructors of the welding course. In the country, only the Samarinda vocational training center offers the pipe fitting course, and the pipe fitting courses proposed under the project will be taught by graduates of the Samarinda center. The curriculum is available for the pipe fitting course.

- 5) The list includes equipment which is already owned by some of the centers, but not in actual use.
- 6) Some of equipment requested have too large capacity or performance for training purposes, including those which are larger than the largest type produced in Japan. The list should therefore be modified to designate the type and capacity suitable for training.

Finally, the Ministry of Manpower requests that locally available equipment and tools be procured as far as possible. The study team agrees that it is desirable from the standpoint of convenience for future maintenance and will take the factor into consideration in the selection process.

The result of evaluation on training equipment and tools requested for each of the eight courses is summarized below.

(1) Machine shop course

Training equipment for the course is requested by only 3 vocational training centers, Pekanbaru, Tanjung Pinang, and Tangerang, all of which do not offer advanced courses.

1) Basic equipment

Various types of lathes, milling machines, drilling machines, and grinders are requested, because these machines available at the centers are limited in variety and quantity, and some of them are not in operating condition due to the lack of spare parts. These are equipment to teach basic skills related to machining operation and will be essential in training a large number of unskilled workers as planned.

2) CNC equipment, CAD/CAM

The Pekanbaru, Tanjung Pinang, and Tangerang centers request fully computerized, advanced equipment, such as CNC lathes, CNC machining centers, CNC related equipment and tools (Computerized

numerically controlled machine tool), CAD (computer aided design) and CAM (Computer aided manufacturing). However, these centers mainly teach unskilled workers who have graduated from elementary schools or have no formal education. With a relatively short training period (only 4 months), the teaching of knowledge and skills using these equipment seems to be very difficult. Thus, the request is not appropriate.

3) Machine tools for automotive repair

Automotive boring machines and crankshaft grinding machines are very specialized equipment among machine tools for automotive repair, and are not frequently used in practice. Thus, they are not appropriate for training equipment used in basic and intermediate courses.

4) Electrical discharge machines

Electrical discharge machines are precision machines used for producing molds and requiring advanced knowledge and techniques to operate, thus not suitable for basic training.

5) Hobbing machines

Hobbing machines are special machine tools cutting gears and spline shafts. Basic training for gear cutting is usually done by using milling machines attached with gear cutters, and the current curriculum of the vocational training centers specifies the use of milling machines. Thus, there is no pressing need for hobbing machines.

6) Tensile testing machines

Although the tensile testing machine is essential in measuring tensile strength of materials, it is rarely used in the machine shop course. As the same request is made by the arc welding course, it is recommended to have it on a shared basis.

7) Shaping machines

Shaping machines requested have the maximum ram stroke of 1,000mm, which is larger than 700mm manufactured in Japan. Thus, specifications need to be modified.

8) Hack-sawing machines

Hack-sawing machines are designed to cut steel materials. Requested machines have the cutting diameter of 400 $\phi$ , which is larger than 350 $\phi$  for hack-sawing machines made in Japan. In fact, band-sawing machines are used for the cutter diameter in excess of 350 $\phi$ . Specifications need to be modified as it is not desirable to have beginners operate large equipment from the safety viewpoint.

9) Other auxiliary equipment

Auxiliary equipment such as hand lifters and compressors is essential in the machine shop. However, since electric furnaces are used for heat treatment of workpieces, such as annealing, there is no strong reason for installing these equipment in the machine shop course.

10) Measuring instruments

Measuring instruments, such as inside and outside micrometers, digital micrometers, screw micrometers, vernier calipers, and dial gauges, are essential in basic training for the machine shop course.

11) Working tools and hand tools

Working tools, including various cutting tools, milling cutters, drills, and grinding wheels, and hand tools, including surface plates, bench vices, anvil blocks, squares, steel rules, dividers, taps and dices, are indispensable for basic training.

12) Educational videos

Video programs visually explaining basic machining, drilling, and surface grinding techniques, cutting tool grinding methods, and the use of various tools are highly effective in educating unskilled workers.

(2) Arc welding course

Again, the Pekanbaru, Tanjung Pinang, and Tangerang centers are requesting new equipment and tools for the arc welding course.

1) Welding machines

A variety of welding machines and auxiliary equipment, including arc welding machines, AC/DC TIG welding kits, MIG welding kits, plasma welding machines, gas welding kits, and automatic pipe cutters, are essential in learning welding techniques. While some of equipment is not suitable for short-term basic and intermediate courses, they can also be used for re-training employees of local industries. However, machines which function is duplicate with substitutive machines or which are also obtained by the pipe fitting course, such as TIG arc welding machines, DC TIG welding machines, plasma cutting machines, and gas pipe cutters, need to be excluded.

2) Universal material testing machines

As mentioned in the previous section on the machine shop course, the universal material testing machine is essential in measuring tensile strength of materials. Furthermore, it allows trainees to check their welding techniques by testing strength of welds, and motivate them for further study.

3) Non-destructive testing machines

X-ray radiographic testers, ultrasonic testing equipment, and magnetic particle testing equipment are very effective means of non-destructive testing for materials and welds and are

indispensable in the welding course. Similarly, water pressure testing pumps are required to check pressure resistance of welds by applying water pressure to containers and pipes having welds.

4) Weld joint bending testers

The testing machine is used to check bending strength of weld joints by applying bending load, while checking skill levels of welders.

5) Shearing machines and guillotine cutters

Both of them are used to cut steel plates and other materials by shearing force. They are required for training the welding process involving boiler making operation. However, guillotine cutters are inferior to shearing machines in terms of safety and work efficiency, and should preferably be replaced with the latter.

6) Bending rollers

Bending rollers are general machinery used for bending plates. Those with appropriate sizes for training need to be selected.

7) Sheet metal folding machine and flanging and bending machines

Both of them are used to fold thin plates and have widely applications due to the ease of use. They are highly required for training.

8) Annealing furnaces

The annealing furnace is used for a variety of heat treatment, such as stress relief of alloy steel after welding. It requires a high skill level for the basic course, thus the priority for procurement is very low.

9) Hack-sawing machines

As mentioned in the machine shop course, requested machines are too large and require reconsideration to select the size suitable for training.

10) Weld fumes extractors

Metal fumes generated in the welding process are detrimental to human body, but none of the recipient centers have fumes extractors. It is highly recommended to install them under the project.

11) Other auxiliary equipment and materials

Request equipment including welding rod dryers, weld positioners, welding tables, and work benches are essential in welding operation, while machine tools such as drilling machines and grinders are needed for training purposes.

12) Measuring instruments and hand tools

Measuring instruments and hand tools, such as welding gauges, squares, dividers, steel rules, bench vices, anvil blocks, and taps and dices, should be provided in large quantities.

13) Educational videos and projectors

Video programs explaining general knowledge on welding, arc welding, gas cutting, and pipe welding techniques and skills, and safety during welding operations are effective educational tools. Overhead projectors and slide projectors are also useful educational tools.

(3) Refrigeration repair and service course

2 centers, Pekanbaru and Tanjung Pinang, request the supply of training equipment and tools for the course.



The refrigeration repair and service course of the Pekanbaru center has relatively a long history and has sufficient teaching staff with knowledge and experience. However, most of existing equipment are outmoded and fail to provide training useful for local industries who use latest equipment. Thus, the center wants to renew equipment and tools in order to train maintenance techniques and skills that meet latest needs of the industries.

On the other hand, the Tanjung Pinang center has recently established the course, and instructors have been transferred from the Pekanbaru center. As a result, the center plans to have training resources similar to those at the Pekanbaru center, and requests equipment and tools accordingly.

1) Refrigerators, freezers, and air-conditioners

4 types of refrigerators and freezers are requested; 2 large refrigerators and 2 large freezers, each for household and business uses. And 5 types of air-conditioners are requested; window, split, package (commercial use), central, and absorption types (the absorption type gains popularity as it does not use flon gas).

Since the center teaches maintenance skills through the overhauling of compressors, availability of refrigerators and freezers determines the training effect.

2) Compressors and other major components

Refrigeration forms one cycle of technologies, starting from compression and cooling of the coolant, followed by evaporation for heat exchange. The compressor, condenser, and evaporator are key components in the process.

Auxiliary parts include pipes to connect the key components, and temperature sensors and controllers. These parts are considered to be useful in teaching operating principles and practical repair skills through the replacement using actual components.

3) Measuring instruments

Instruments to measure equipment performance, such as air flow meters, anemo meters, and hygrothermographs, as well as detectors to check the leakage of flon gas, pressure gauges and thermometers to check the refrigeration cycle, are requested.

They are useful in understanding refrigeration technology in qualitative and quantitative manners.

4) Tools

Requested tools include gas welding and cutting kits, pipe benders, cutters, reamers used to shape pipes that connect key components of the refrigeration system, and charging cylinders used to inject coolant. Also, vacuum pumps, swaging tools, flaring tools, and other tools for maintenance and repair of refrigerators and freezers are requested.

5) Simulators and educational videos

Simulation training equipment for refrigerators, freezers, air-conditioners, and compressors is requested, and is considered to be very useful for beginners.

Also, educational videos visually explaining air-conditioning and refrigeration, the refrigeration cycle, and maintenance techniques and procedures, and the use of test equipment are useful to teach operating principles of refrigeration equipment.

(4) Pipe fitting course

The Tanjung Pinang and Tangerang centers request training equipment for their new pipe fitting courses. As mentioned earlier, the course has previously been taught as part of the machine shop course, with the arc welding course. Since most of large machinery and equipment required for the course are the same as those used for the arc welding course and have been requested by the arc welding course, the pipe fitting course requests training equipment and tools for its own use. As a result, requested equipment and tools cover those essential for basic training, mainly piping parts, measuring

instruments, and hand tools.

1) Welding machines and cutters

Arc welding machines, automatic gas cutters, and automatic gas pipe cutters are essential equipment for the pipe fitting course.

2) Drilling machines

Upright drilling machines and bench drilling machines are required for drilling flanges and other parts.

3) Piping parts

Valves, flanges, reducers, elbows, and tees are essential in demonstrating and training their applications and fitting methods.

4) Measuring instruments and hand tools

Levels, squares, steel rules, dividers, bench vices, taps and dices, protective glasses, and welding glasses are essential for basic training.

5) Educational videos

Video programs showing pipe fitting techniques and procedures, pipe connecting methods, fundamentals of connection methods for lead pipes as well as steel pipes are obviously effective educational tools.

(5) Automotive repair and service course

Two centers are requesting training equipment for this course, Pekanbaru and Tanjung Pinang.

At present, there is growing demand for automobiles in Indonesia. Most of major foreign manufacturers are doing local production. In particular, Japanese automakers seem to be highly reputed for their quality and technology. Sedan types are mainly sold in Jakarta and its surrounding areas, while jeeps and other four-wheel drive cars,

accommodating 10 persons, are widely used in rural areas to reflect the fact that automobiles by large families. As motorization continues to progress in future, demand for automotive maintenance service is on the rise. The public vocational training centers have been training a number of auto mechanics and other skilled workers to meet such demand. Nevertheless, they are expected to upgrade their curriculum and training resources in the following areas.

1) Car bodies

Complete sets of automobiles are requested to teach actual maintenance procedures in the field environment. Furthermore, the Tanjung Pinang center requests 2 types of mini-buses (gasoline and diesel) used for field training as well as field tour. However, engine trainers and other cut-away models, rather than whole vehicles, seem to be useful in teaching maintenance and repair techniques. Field tours are not frequently conducted, and the use of the public transportation system would suffice.

2) Engines

Maintenance of engines requires the highest level of skills, and the centers request 11 types of engines; 2 gasoline engines and 2 diesel engines, having 4-cycle 4-cylinder and 6-cylinder each; 3 types of 2-cycle engines and 1 type of 4-cycle engine for motorcycles (all are gasoline engines); 2 boat engines; and 1 engine for manually pushed tractors. All of them are useful in field training for overhauling, assembly, testing, and operation. At present, all the vocational training centers emphasis engine maintenance skills, and teach maintenance techniques up to the engine overhauling and the replacement of piston rings.

3) Measuring instruments

Automotive maintenance requires a variety of specialized measuring instruments, including brake testers, headlight testers, thermostat testers, valve spring testers, engine scope, carburetor balancers, and electrical component testers, and tune up testers. Also, ordinary measuring instruments such as gauges and

micrometers are considered to be basic requirements.

4) Repairing tools

Basic tools required for training automotive repair techniques include speciality tools such as hydraulic garage jacks, hydraulic garage presses, portable cranes, tire changers, wheel balancers, battery quick chargers, spark plug cleaners, and general-purpose tools such as grinders, drilling machines, torque wrenches, spray guns, and air impact wrench sets.

5) Cut-away models and educational videos

Cut-away models as well as video programs, are effective tools for training beginners.

(6) Furniture course

The Pekanbaru center is requesting training equipment for the furniture course.

1) Woodworking equipment

Woodworking operations are classified into cutting, grooving and moulding, drilling, grinding and polishing. For cutting, band saws, radial arm saws, rippers, circular saws and electric jig saws are requested; for grooving and moulding, spindle shaper, wood lathes and portable routers; for drilling, automatic round-end tenoner, hollow chisel mortiser automatic slot mortiser and boring machine; for grinding, surface planer, portable electric planers; and for polishing, portable belt sanders, disk sander and polishers. These machines and tools are required to learn the whole process of furniture manufacturing, from cutting and shaping of raw lumber into materials for furniture making, processing of materials according to design, such as grooving, moulding, assembly and finishing. In particular, skills to use large machinery, such as band-saw, wood lathes, and automatic slot mortiser, are essential in mass production of furniture. Also, for customized production as well as small-scale production at

family-operated furniture shops, circular saw, electric jig saws, and portable router are needed for labor saving and the manufacture of furniture with sophisticated design features. On the other hand, four-axle tenoner, double sided moulding borer, and spindle moulders are not frequently used and are not required for the course.

## 2) Hand tools

Manual work forms a basic element of furniture making to be fully understood and mastered before learning machining techniques. In particular, hand tools are indispensable for assembling components shaped by woodworking equipment and making fine adjustment. Major hand tools required for field training for the furniture course are as follows. They are diverse due to design requirements.

- (1) Saws (including back saws, frame saws, hole saws);
- (2) Planes (including block planes, jack planes, and jointer planes);
- (3) Chisels (including square, flat, and large chisels)
- (4) Hammers (including single-hand, claw, and large hammers)

3) Woodworking equipment, tools required for adjustment of hand tools (saw setters, files), auxiliary equipment (vices, drill, making gauge, clamps), and attachments to woodworking equipment for design changes (router bits, drill bits) are also basic tools for woodwork training.

## (7) Industrial electronics and instrumentation course

The Pasar Rebo and Singosari centers plan to newly establish the industrial electronics and instrumentation courses and request training equipment for them.

These courses have not been officially offered. Similar courses currently conducted include electricity, electronics (communications), and computers (personal computers).

The electricity course covers interior wiring and the repairing of household appliances (mainly lighting apparatuses and motors). On the other hand, the electronics course teaches operations of

electronics equipment (mainly measuring instruments) and basic electronic circuits. In fact, the electronics course is positioned as basic training for the course teaching the repairing of radio, TV, and audio systems (including cassette tape recorders), which is called the communications course at some of the vocational training centers.

The computer (personal computer) course mainly focuses on its operation, rather than repairing skills. Students learn computer operation for office use and virtually practice word-processing and typewriting operations. Some of the centers, however, have started the training for programming skills, mainly using BASIC.

Clearly, the establishment of the industrial electronics and instrumentation course at the two centers reflects the increasing need for technologies and skills which create higher value added for the manufacturing industry in Indonesia, which is increasingly shifting itself from labor-intensive to technology-intensive.

The manufacturing industry in the country is actively introducing the latest machinery, equipment, and tooling. They are fully aware of the fact that such machinery and equipment is controlled by electronic equipment. They are also aware of the importance of engineers and skilled workers in operation and maintenance of the procured machinery and equipment.

This leads to increasing demand for skilled workers in the area of industrial electronics. In particular, those capable of operating and maintaining instruments and control systems, which are the heart of modern process plants and production facilities, are highly demanded.

The public vocational training centers are currently fulfilling only a part of such demand by providing the courses on electricity and electronics. The establishment of the industrial electronics and instrumentation course is, therefore, quite timely and appropriate to address the industrial need.

As implied in the above discussion, industrial electronics and

instrumentation course is expected to cover a wide range of technical training. As a result, training equipment and tools requested by the two centers are classified into the following categories:

a) Training equipment related to electronics

- Training equipment related to electronic circuitry technology, including electronic circuit trainers, logic circuit trainers, pulse circuit trainers, semiconductor trainers, electronic counter trainers, and IC troubleshooting kits.
- Laboratory equipment and training equipment related to basic electronic circuits and devices, including oscilloscopes, signal generators (pulse generators and function generators), multi-meters, and measuring instruments (voltmeters and ampere meters).
- Electronic circuit making kits, including PCB artwork tools and parts

b) Training equipment related to instrumentation and control technology

- Training equipment related to control technology, such as flow control trainers
- Training equipment related to sequence control technology, such as programmable controllers
- Production equipment and its models actually used in the industry, such as industrial robotic trainers

c) Training equipment related to computer control technology

- Training equipment related to CAD/CAM techniques in the area of electronics, using personal computers and PC-based electronic design aid (EDA) software
- Training equipment related to control technology using microprocessors, such as microcomputer trainers, digital storage oscilloscopes, logic analyzers, logic comparators, ICEs, and EPROM programmers and erasers
- Laboratory equipment and training equipment related to the manufacture of microprocessor-based controllers using PCB



artwork tools and other tools included in training equipment related to electronics

As mentioned earlier, this course is the new course and given the highest priority by the Ministry of Manpower.

Note that basic equipment related to electronics education (such as synchroscopes and signal generators) is not requested or only few is requested, because the existing electricity and electronics courses have a large number of them. Instead, the request emphasizes equipment needed to provide proper training in combination with existing equipment (such as galvanometers, wheatstone bridges, lux meters, and lux meters), which seems to comply with the intent of the course.

The requested equipment related to computer control technology is considered to be essential in teaching basic industrial electronics.

On the other hand, some of the requested equipment related to instrumentation and control technology seem to be redundant. Selection of equipment types reflecting course requirements is required.

Finally, it is important to learn sequence control and industrial robot operation by using actual equipment and models that are widely used in the industry. Thus, the request is considered to be appropriate.

#### (8) Language laboratory course

As mentioned in 2.4.2 (2), the Tanjung Pinang center has established the language laboratory course in order to meet local demand arising from the proximity to Singapore, and request equipment and tools related to language laboratory training.

The requested equipment includes interactive LL equipment and materials, mainly tape recorders, and visual LL equipment and materials including video and laser disk, and multimedia-based equipment and materials (tapes and disks). Foreign languages taught at the center are English, Chinese, and Japanese, and software

products to teach them in Indonesian are requested. However, there are no laser disks, videos, and CD-ROM teaching Chinese and Japanese in the local language. Besides, interactive LL materials using tape recorders are proven to be very effective and are used worldwide. Thus, conventional LL equipment and tapes will suffice for the time being.

#### **3.2.4 Basic Policy of Implementation**

Since the above analysis has verified the effect of training equipment, viability, and the ability of the Indonesian implementation body, and since the expected outcome of the project is consistent with the intent of the grant aid system, the study team concludes that training equipment and tools under consideration should be supplied under the grant aid project. In the following sections, therefore, the study team examines the project outline and develops basic project design accordingly. It should be noted, however, that the study team believes that the request should be modified in part, as discussed in the above evaluation.

### 3.3 Project Outline

#### 3.3.1 Project Implementation Body and Organization

##### (1) Implementation body

The project will be implemented by Directorate General of Manpower Training and Productivity Development (DGMPD), the Ministry of Manpower.

##### (2) Management organization

The project will be operated by vocational training centers which are fully established educational institutions under the supervision of DGMPD of the Ministry of Manpower. (see Fig.2.4.1 "Organization of Type A Vocational Training Centers" and Fig.2.4.2 "Organization of Type C Vocational Training Centers" for details) Equipment and tools to be supplied under the project will be installed at the workshops for appropriate courses of the vocational training centers. The administrative department (or section) of each center will bear costs and expenses required for construction, addition and/or remodeling of workshop facilities, as well as foundation work, electrical work, and piping work. Also, it will be responsible for maintenance and repair of training equipment and tools, including contracting and procurement of repair materials, and asset management including the maintenance of the asset list. On the other hand, daily operation and management of procurement equipment and tools will be responsibility of instructors. Typically, the chief instructor of each course will supervise instructors and assistants and will develop and implement equipment allocation and maintenance plans, and field training programs. The training plan will be developed and implemented by the training section in the case of Type A centers, and by the chief instructor in the case of Type C centers.

#### 3.3.2 Locations and Conditions of Project Sites

##### (1) Geographical location and general conditions

The five vocational training facilities for which the supply of training equipment and tools is requested are Pekanbaru Vocational

Training Center in the Province of Riau, Sumatra, Tanjung Pinang Vocational Training Center in Bintan Island, the Province of Riau, Tangerang Vocational Training Center in the Province of West Java, Pasar Rebo Vocational Training Center in D.K.I. Jakarta, Java Island, and Singosari Vocational Training Center in the Province of East Java.

1) Pekanbaru Vocational Training Center (Figure 3.3.1)

The center is located in the outer margin of Pekanbaru City, the provincial capital of Riau, facing a 4.2m wide road which crosses with a main street (4-lane road). The site is generally flat and has a land area of 28,700m<sup>2</sup>, where a main building, an electricity and refrigeration workshop, an automobile workshop, staff housing, and other facilities are accommodated. The site is mostly used, but there is an space for facility expansion under the project.

2) Tanjung Pinang Vocational Training Center (Figure 3.3.2)

The center is located approximately 5km from Tanjung Pinang, the urban center of Bintan Island and faces a 2-lane road. It is situated on a gentle hill and covers approximately 20,000m<sup>2</sup> where a main building, a lecture building, a workshop, staff housing, and other facilities are arranged. One-third of the site is unused grassland, reserved for future expansion.

3) Tangerang Vocational Training Center (Figure 3.3.3)

The Tangerang center is located adjacent to a new residential area, 30km from the center of Jakarta. It faces a 4-lane road, from which a 6m road extends into the site. Its 25,400m<sup>2</sup> site is dotted with a main building, a workshop, a warehouse, and a garage for construction equipment. Most of the site is a flat, open space to provide an ample space for construction of workshop buildings.

4) Pasar Rebo Vocational Training Center (Figure 3.3.4)

The center is located in the suburbs of D.K.I. Jakarta and along an arterial road (4 lanes) leading to Bogor City. The site covers a land area of 72,800m<sup>2</sup>, which gently rolls down from the central

part. It accommodates educational facilities including a main building and workshops, staff housing, dormitories, and kindergarten.

5) Singosari Vocational Training Center (Figure 3.3.5)

The center is located in the suburbs of Malang, approximately 80km south of Surabaya and faces a 4-lane arterial road. The site is situated on flat land covering 58,500m<sup>2</sup>, where a main building, workshops (22 buildings), a clinic, dormitories, staff housing, a kindergarten, and other facilities are accommodated to form a well-designed community.

Equipment and tools to be supplied under the project will be accommodated in existing buildings (including remodeled ones), or extensions or new buildings. Building plans of the vocational training centers are summarized as follows.

Table 3.3.1 Space for equipment installation

	Machine shop	Arc welding	Refrigeration repair and service	Pipe fitting	Automotive repairs and service	Furniture	Industrial electronics and instrumentation	Language laboratory	Others	Total
1. Pekanbaru	Existing Build.	Existing Build.	Additional Build. 200a <sup>2</sup>	—	New Build. 120a <sup>2</sup>	Existing Build.	—	—	New Build. 280a <sup>2</sup> * 1	6 0 0 a <sup>2</sup>
2. Tanjung Pinang	Existing Build.	New Build. 280a <sup>2</sup>	New Build. 220a <sup>2</sup>	New Build. 280a <sup>2</sup>	Existing Build.	—	—	New Build. 88a <sup>2</sup>	—	8 6 8 a <sup>2</sup>
3. Tangerang	Existing Build.	New Build. 453a <sup>2</sup> * 2	—	New Build. 262a <sup>2</sup>	—	—	—	—	—	7 1 1 a <sup>2</sup>
4. Pasar Rebo	—	—	—	—	—	—	Existing Build.	—	—	0
5. Singosari	—	—	—	—	—	—	Existing Build.	—	—	0

\* 1: To be newly built as the course is transferred.

\* 2: Including an space for the electricity and electronic courses.

(3) Construction plans

The Pekanbaru, Tanjung Pinang, and Tangerang centers are planning to build new buildings or expand old buildings, which construction schedules and budgets are summarized as follows.

1) The Pekanbaru center

As of December 1993, preliminary design drawings have been completed, and the construction project is waiting for the

government's approval. 343 million rupiahs in total are reserved as the construction budget.

Detailed design/tendering	2 months
Construction	4 months
<hr/>	
Total	6 months

Wood piles for the foundation of the automobile workshop have been already brought into the site. Construction is scheduled to be completed in mid-1994.

2) The Tanjung Pinang center

Preliminary design drawings have been completed, and the construction project is waiting for the government's approval. 384 million rupiahs in total are reserved as the construction budget.

Detailed design/tendering	3 months
Construction	5 months
<hr/>	
Total	8 months

2 new buildings, scheduled to be completed in mid-1994, will accommodate 4 courses.

3) The Tangerang center

Preliminary and detailed designs have been completed, and the tender is under preparation. The construction budget of 215 million rupiahs is reserved. Construction period will be 5 months, and completion will be in mid-1994.

(4) Infrastructure

1) Roads (transportation routes)

Equipment will be shipped from Jakarta to the five centers. Possible transportation routes and road conditions are as follows.

<1> Pekanbaru

Pekanbaru is located in the interior of Sumatra Island and along the Siak river. However, the port is not accessible by large ships, and an alternative landing point will be Dumai Port located 180km north of Pekanbaru, from which truck transport will be used. If transported on land from Jakarta, ferry will be used for transportation between Sumatra and Java to travel approximately 1,500km. Roads on the entire route are paved.

<2> Tanjung Pinang

The city is located in Bintan Island. Equipment will be landed at the Batuenam port, located 3km from the city center, then will be transported by truck to the site. Roads are paved on the entire route.

<3> Tangerang, Pasar Rebo

These cities are located in the suburbs of Jakarta. Roads to the sites are all paved.

<4> Singosari

It is located approximately 70km south of Surabaya, Java Island. Equipment can be either transported to the port of Surabaya, or by truck to travel approximately 800km from Jakarta. Roads are all paved on the route.

2) Electricity

Electricity in Indonesia is generally supplied at 220V/380V, while some areas receive 127V/220V under the old system. The training centers have emergency power generation systems. In any case, the availability of electricity supply to each center, as well as workshops, needs to be checked in advance. Also, some old centers such as Pasar Rebo and Singosari use outlets different from current standard products, and plug compatibility needs to be checked.

Table 3.3.2 Electricity system

	Pekanbaru	Tanjung Pinang	Tangerang	Pasar Rebo	Singosari
Electricity system Three-phase AC Single phase AG Commercial frequency	380V±5% 220V±5% 50Hz	380V±2% 220V±2% 50Hz	380V±0.8% 220V±0.8% 50Hz	380V±2% 220V±2% 50Hz	380V±2% 220V±2% 50Hz
Incidence of power	1.5 times/ month 1 hour/ each	1 time/month 3 hours/each	2 times/ month 30 minutes /each	1 time/ month 1 hour/each	-
Plug type	BF type B type	BF type	B type	C type Old type	C type Old type

(5) Meteorological conditions

Meteorological conditions of the areas where the five centers are located are summarized in Table 3.3.3.

<1> Pekanbaru (Based on statistical data collected in Padang)

	1	2	3	4	5	6	7	8	9	10	11	12	Annual average
Monthly average temperature (°C)	27.0	27.0	27.0	27.2	27.5	27.0	27.0	27.0	26.7	26.7	26.7	26.7	27.0
Monthly average humidity (%)	78	77	77	78	76	75	74	75	76	78	79	79	77
Monthly average precipitation (mm)	270.3	199.5	344.9	423.7	260.9	264.0	268.9	262.8	436.4	527.4	539.6	410.7	Annual total 4,076.8

<2> Tanjung Pinang (Based on statistical data collected in Singapore)

	1	2	3	4	5	6	7	8	9	10	11	12	Annual average
Monthly average temperature (°C)	26.2	26.3	26.9	27.5	27.6	27.2	26.8	27.0	27.4	27.6	27.3	26.8	27.0
Monthly average humidity (%)	86	84	83	82	80	78	75	74	73	75	78	82	77
Monthly average precipitation (mm)	458.3	265.4	233.5	121.4	100.1	91.8	65.3	78.1	67.6	88.3	116.6	185.4	Annual total 1,909.6

<3> Tangerang and Pasar Rebo (Based on statistical data collected in Jakarta)

	1	2	3	4	5	6	7	8	9	10	11	12	Annual average
Monthly average temperature (°C)	25.6	26.1	26.6	27.0	27.3	27.2	26.9	26.8	26.7	26.6	26.1	25.6	26.5
Monthly average humidity (%)	84	83	83	84	84	83	83	82	82	84	86	87	84
Monthly average precipitation (mm)	218.9	170.4	162.1	158.8	148.7	158.5	152.1	164.4	150.6	189.2	248.5	313.2	Annual total 2,235.5



<4> Singosari (Based on statistical data collected in Surabaya)

	1	2	3	4	5	6	7	8	9	10	11	12	Annual average
Monthly average temperature (°C)	26.7	26.6	26.7	27.3	27.0	26.7	26.2	26.7	27.4	28.2	28.3	27.1	27.1
Monthly average humidity (%)	83	86	81	84	81	69	70	63	59	64	68	78	74
Monthly average precipitation (mm)	326.1	256.0	222.9	121.8	113.5	65.4	45.0	29.4	6.1	27.8	127.5	242.4	Annual total 1,501.5

Source: Chronological Table of Scientific Data and Information

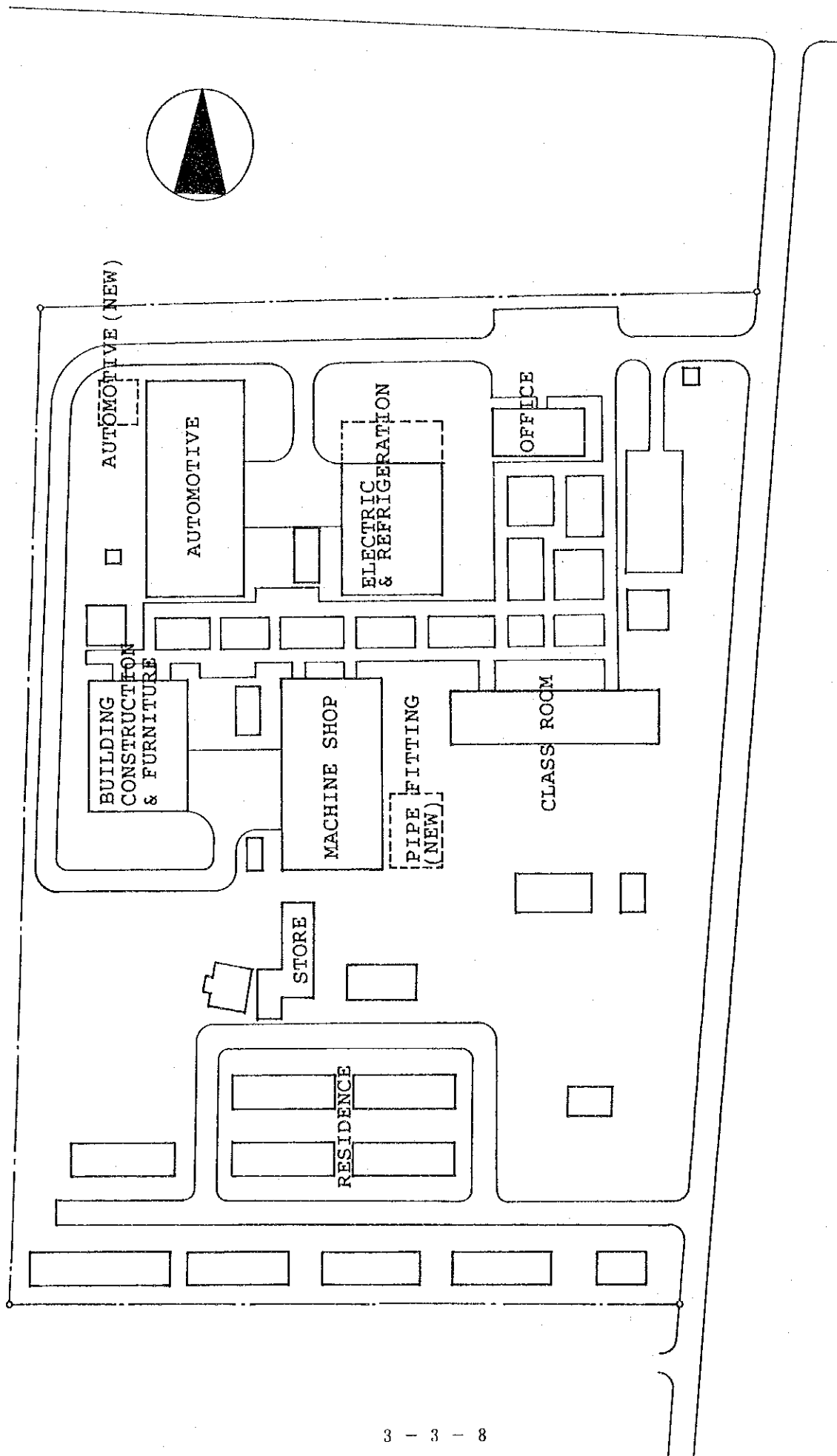


Figure 3.3.1 PEKANBARU VOCATIONAL TRAINING CENTER

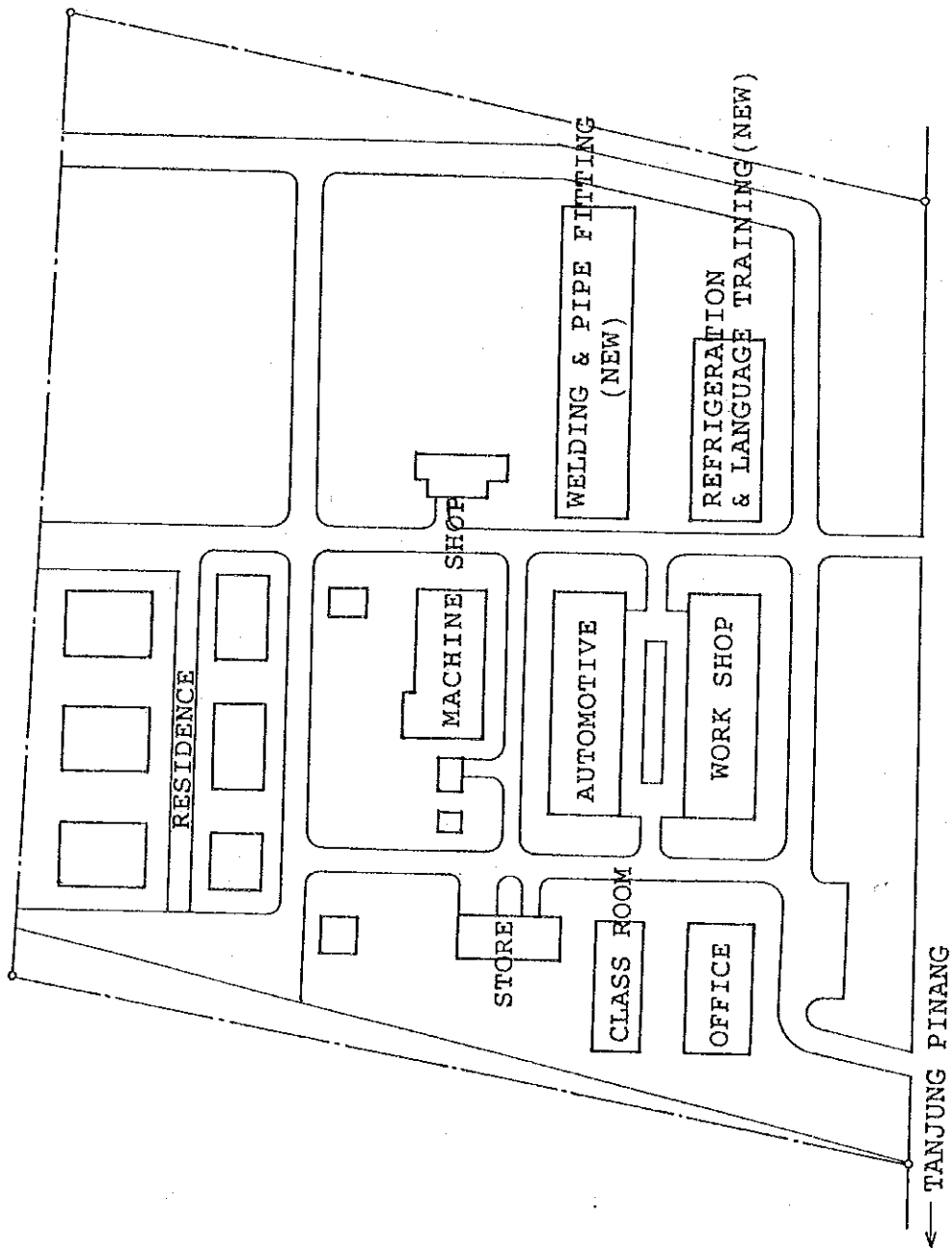


Figure 3.3.2 TANJUNG PINANG VOCATIONAL TRAINING CENTER

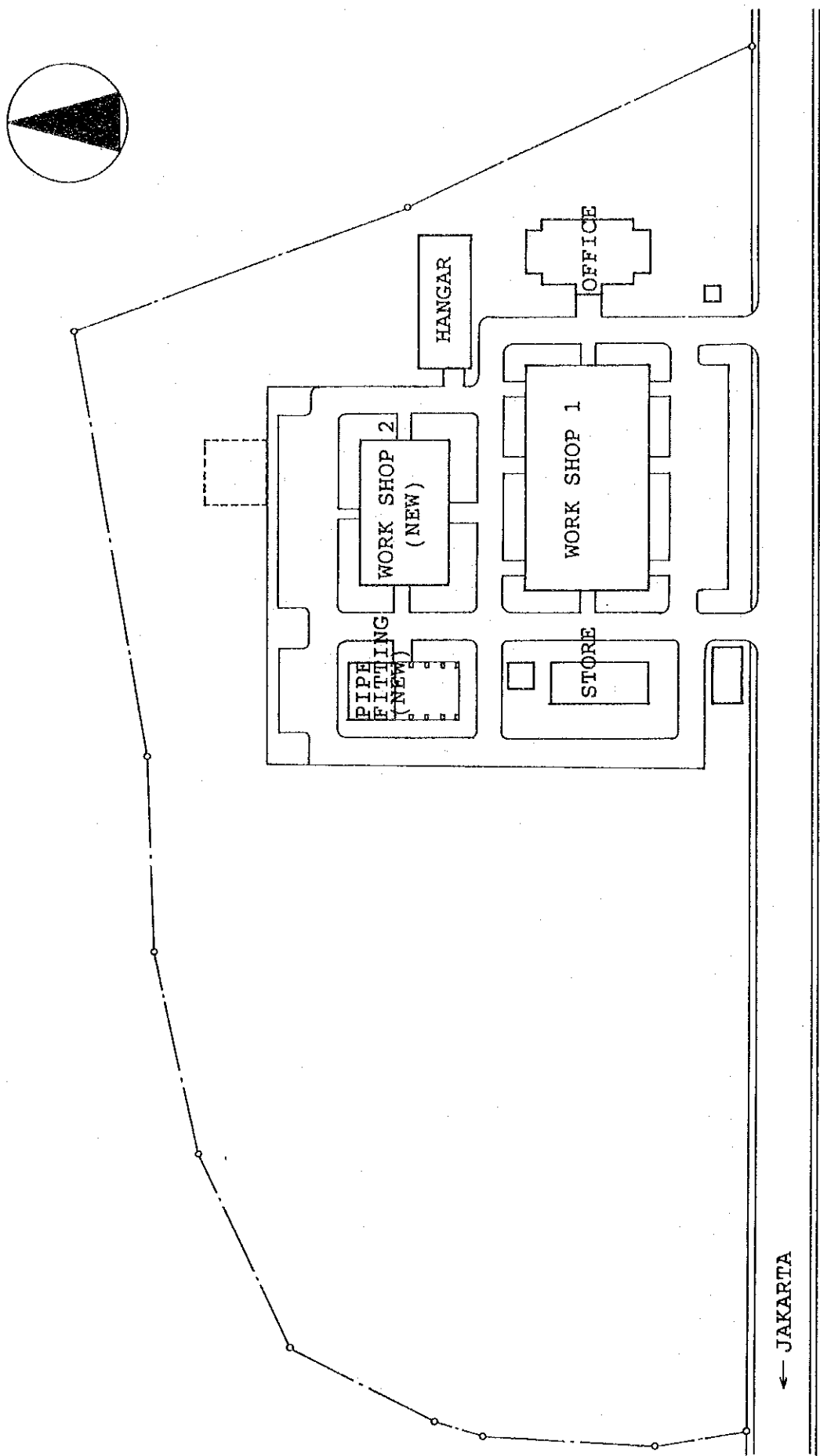


Figure 3.3.3 TANGERANG VOCATIONAL TRAINING CENTER

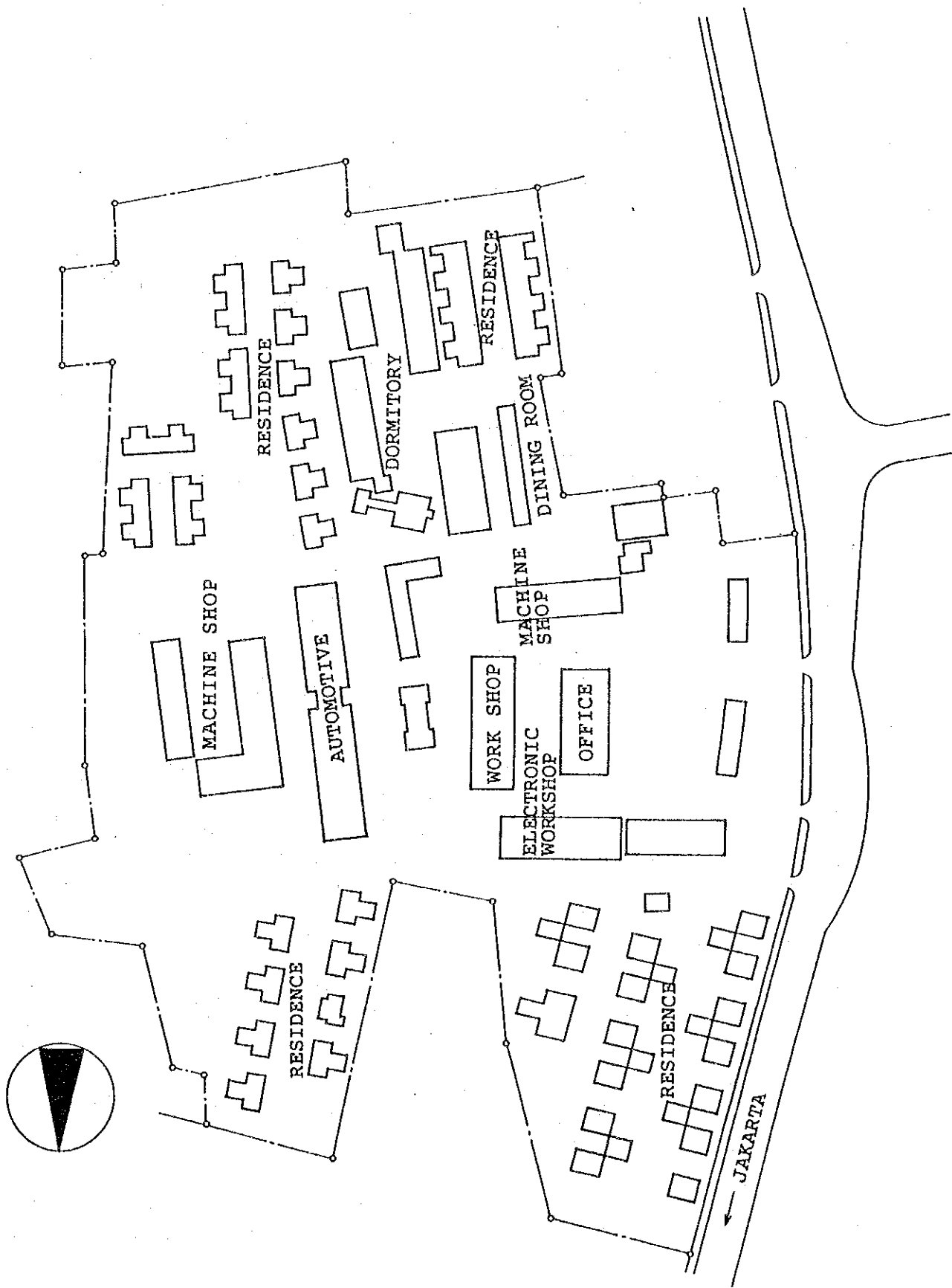


Figure 3.3.4 PASAR REBO VOCATIONAL TRAINING CENTER

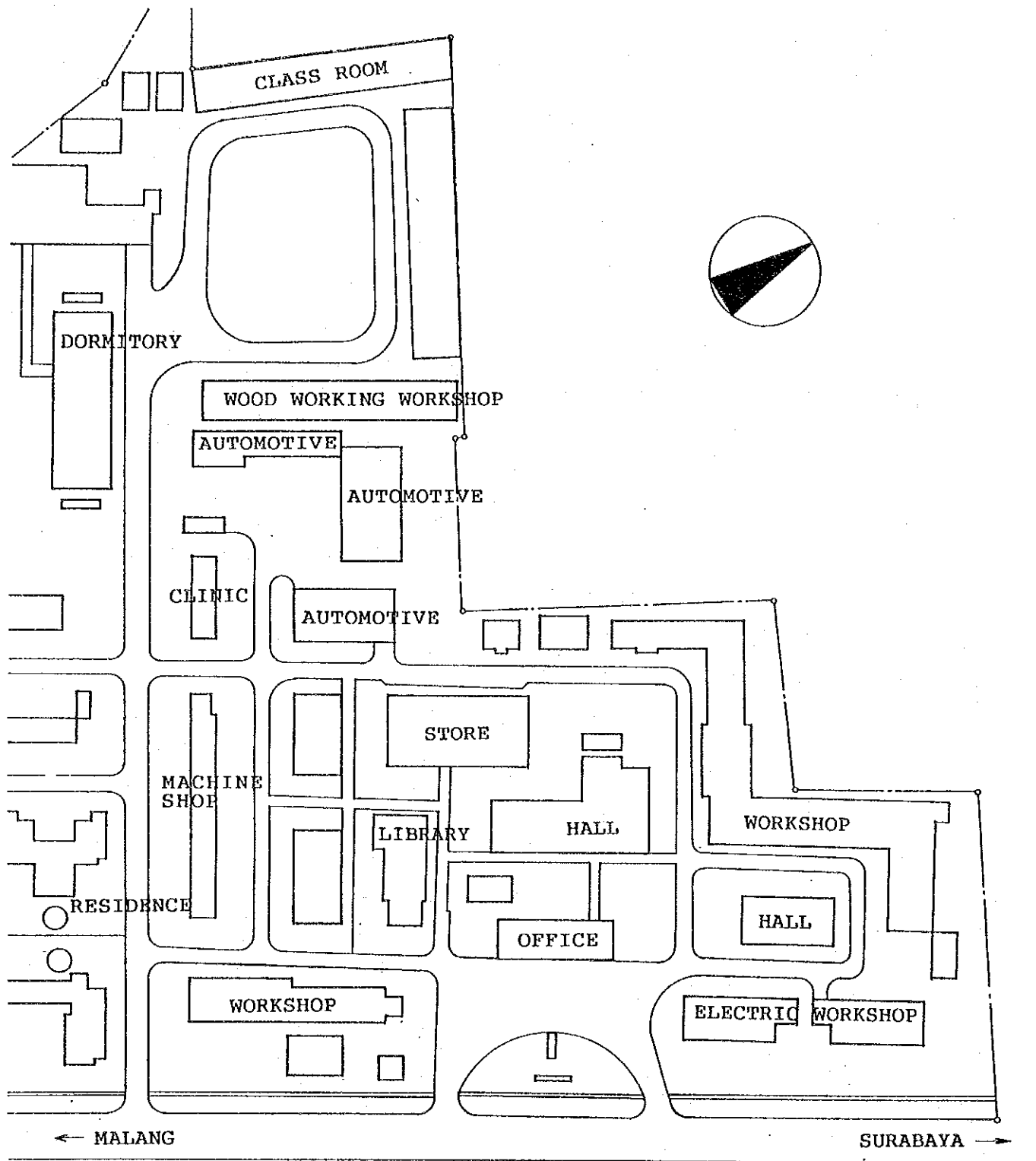


Figure 3.3.5 SINGOSARI VOCATIONAL TRAINING CENTER