MINISTRY OF LABOR
THE REPUBLIC OF MOZAMBIQUE

NO. 1

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR THE IMPROVEMENT OF EQUIPMENT FOR VOCATIONAL TRAINING CENTERS IN THE REPUBLIC OF MOZAMBIQUE

October 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
SYSTEM SCIENCE CONSULTANTS INC.

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PREFACE

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

JICA sent to Mozambique a study team from July 11 to August 4, 1996.

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

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 Mozambique for their close cooperation extended to the team.

October, 1996

Kimio Fujita
President
Japan International Cooperation Agency

October, 1996

Letter of Transmittal

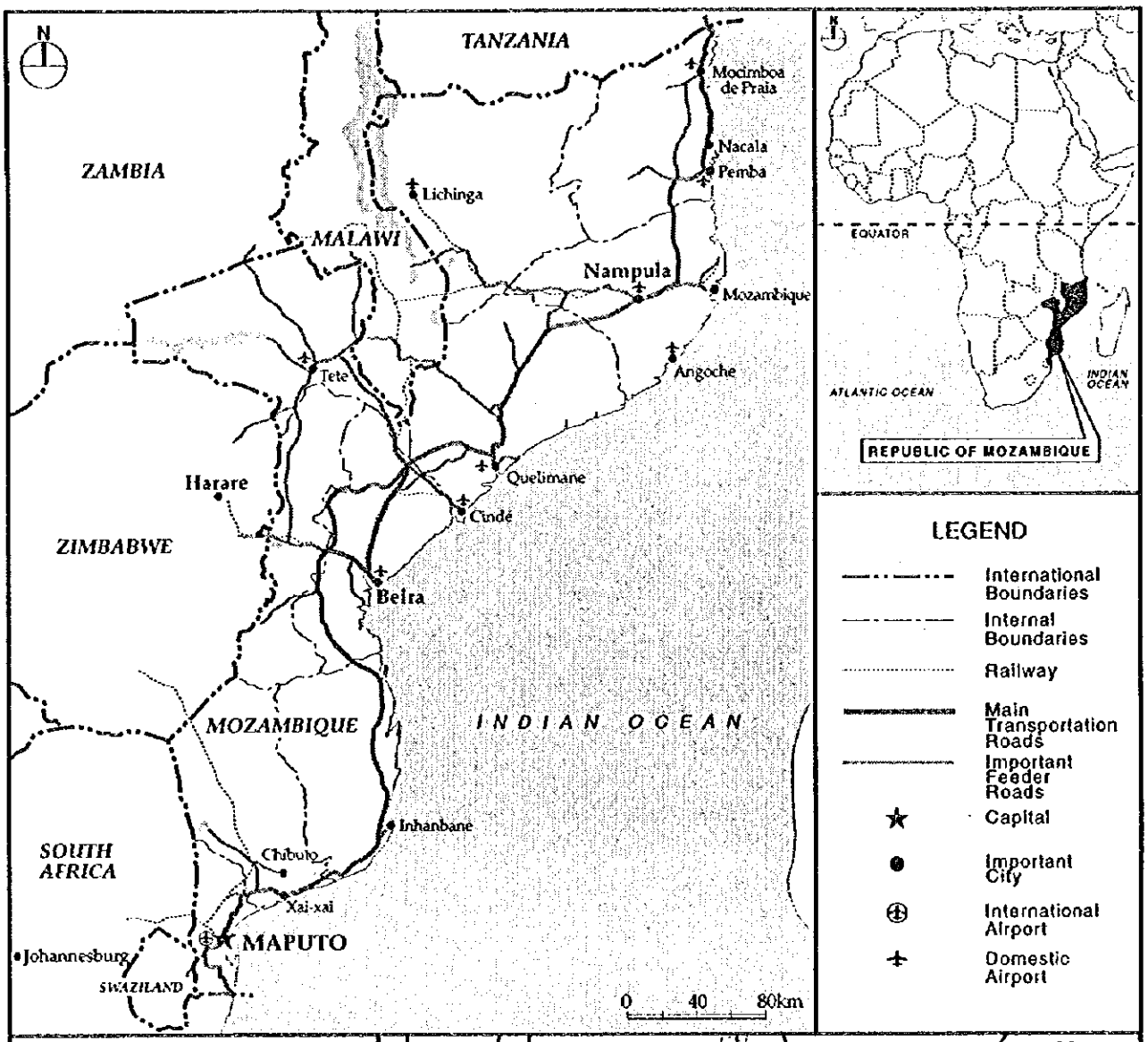
We are pleased to submit to you the basic design study report on the Project for the Improvement of Equipment for Vocational Training Centers in the Republic of Mozambique.

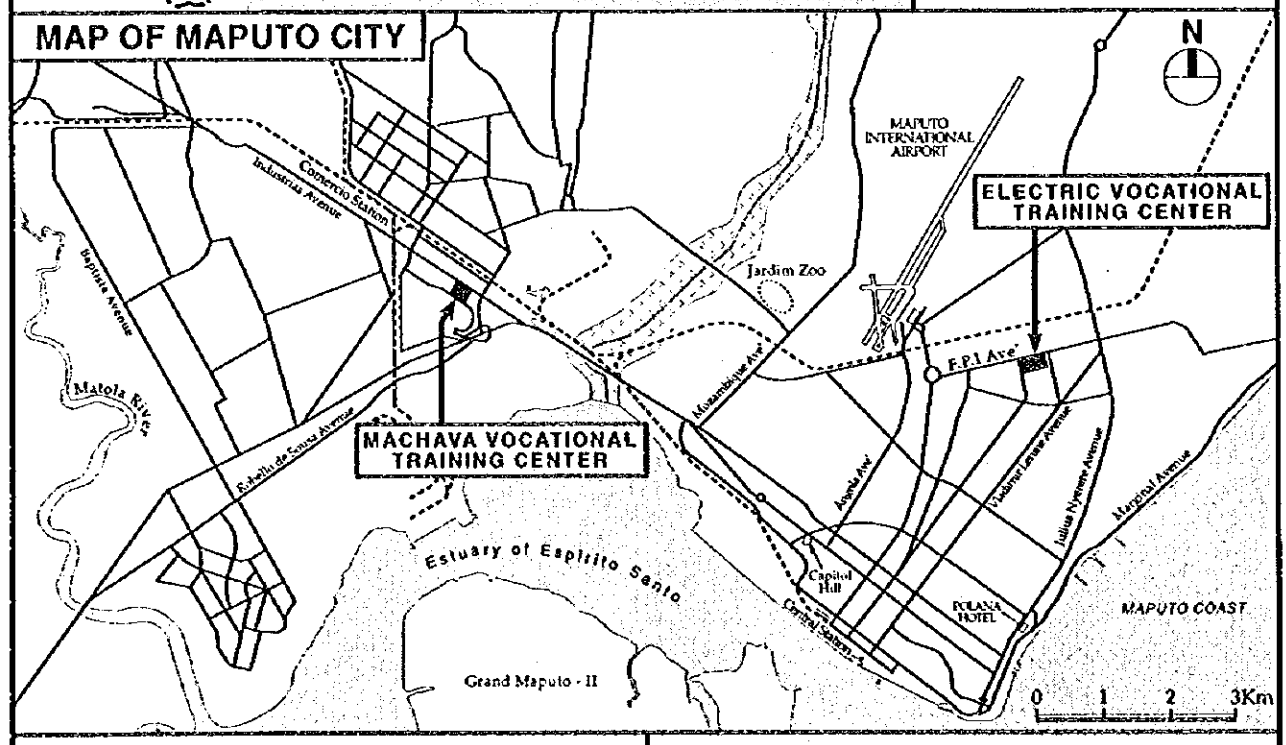
This study was conducted by System Science Consultants Inc., under a contract to JICA, during the period from June 20, 1996 to November 25, 1996. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mozambique and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

Very truly yours,

Hiroshi Kishimoto
Project manager,
Basic design study team on the Project
for the Improvement of Equipment for
Vocational Training Centers in the
Republic of Mozambique
System Science Consultants Inc.





SITE LOCATION MAP

Abbreviations

COSV	COMITATO DELLE ORGANIZZAZIONI PER IL SERVIZIO VOLONTARIATO(ITALIAN NGO)
GTZ	DEUTSCHE GESELLSCHAFT FUR TECNISCHE ZUSAMMENARBEIT(German Agency for Technical Cooperation)
INEFP	INSTITUTO NACIONAL DE EMPREGO E FORMACAS PROFISSIONAL(National Institute for Employment and Vocational Training)
IMF	INTERNATIONAL MONETARY FUND
ILO	INTERNATIONAL LABOR ORGANIZATION
ISCOS	INSTITUTO SINDICALE COOPERAZIONE PAESI EN VIA DI SVILUPPO(ITALIAN NGO)
JICA	JAPAN INTERNATIONAL COOPERATION AGENCY
MT	METICAL/ METICAIS - Mozambican currency unit
NGO	NON-GOVERNMENTAL ORGANIZATION
USAID	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

CONTENTS

CHAPTER 1 Background of the Project

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The Republic of Mozambique is located in the southeastern part of the African continent. Tanzania lies to its north, Malawi, Zambia, and Zimbabwe to the west, and the Republic of South Africa is located to the south. Its eastern boundary is comprised of 2,600 kilometers of coastline bordering the Indian Ocean. The nation encompasses an area of 802,000 square kilometers (about 2.1 times larger than Japan) and has a population of 17.35 million people (as of 1994). With the exclusion of the mountainous area with an elevation of higher than 1,000 meters to the north of central Mozambique, the climate is tropical with an annual rainfall volume of 1,200 to 2,000mm. In contrast, the southern area has a subtropical climate with an annual rainfall volume of 400 to 600mm. Due to extreme fluctuations in rainfall from year to year, the area is subject to droughts and floods. In the capital, Maputo, located in the southern end of the country, the average temperature is 19.8^{o}C and 24.5^{o}C during the dry season (May to September) and wet season (October to April), respectively. The average annual volume of rainfall is only about 68mm.

The Basic Education Law which was enacted in 1983, established a seven year system of free compulsory education for children 7 to 14 years of age. However, the primary school attendance rate is a low 60 percent at present; and many children quit school half-way. The average number of completed years of schooling is said to be 1.6 years (1995 JICA project formulation report). The illiteracy rate for adults is 67 percent and it is the highest rate in Africa (1995 World Bank report). With the assistance of the IMF and World Bank, a national plan to rebuild the economy was implemented in order to change the economy from a socialist to a market economy.

The potential working population of the country is estimated to be about 6.1 million people (from 15 to 59 years of age) and approximately one half of this population is engaged in some form of economic activity. Of this figure only 10 percent or about 300,000 people are employed in the formal sector comprised of private companies, public institutions, etc. The remaining 90 percent are engaged in the informal sector of urban and rural areas and in small-scale farming and fisheries. According to the Ministry of Labor statistics, nearly 44 percent of the working population are employed in Maputo City and 15 percent are employed in Maputo Province, outside of the capital, i.e. nearly 60 percent of the entire working population is employed within the capital city and its

environs. In the aftermath of the 16 year civil war which ended in 1992, military soldiers have been discharged and the repatriation of refugees have rapidly progressed. The current development plan (the Economic and Social Rehabilitation Program) was created as a guide to rebuild a nation devastated by civil war and to assist the return of expatriates who had left to escape the war. Under these circumstances, implementing vocational training to promote self-employment among the unskilled and unemployed ex-soldiers has become a priority issue for the government of Mozambique. Vocational training is seen not only as a scheme to rehabilitate the approximately 100,000 former soldiers back into society, but it is also seen as an important mean of avoiding the social instability caused by declining employment.

In order to cope with the priority issue of vocational training and employment, the government of Mozambique integrated the two departments of vocational training and employment within the Ministry of Labor in 1992 and established the National Institute for Employment and Vocational Training (INEFP) to address these two priority issues. INEFP has five vocational training centers and 22 employment centers located throughout the country under its jurisdiction. It has been responsible for implementing such measures such as admitting former soldiers to the vocational training centers on a priority basis, waiving tuition fees, etc.

JICA carried out a project identification study in April 1994 and a two month planning survey in February 1995. This was followed by a project formulation study in the fields of education and vocational training in October 1995. Four vocational training institutions in the Maputo City area were surveyed. Based on the results of this survey, the two vocational training centers selected for this project were considered the appropriate recipients for Japanese cooperation; and equipment at the centers was organized and surveyed. The two vocational training centers targeted in this project were selected, based on conditions which made project implementation viable. Both centers were located near Maputo City with a large working population, both were equipped with buildings, utilities, and other facilities, in addition to a qualified teaching staff.

Both vocational training centers have plans to greatly increase the number of trainees at their centers, in response to the social needs of the country. However, there is a shortage of training equipment, in terms of quality and quantity, at the two centers. Equipment which is currently in use is greatly deteriorated and effective training has been

hampered. Due to these circumstances, the government of Mozambique requested the Japanese government for grant aid cooperation to improve and strengthen the training equipment, etc. of the vocational training centers.

CHAPTER 2 Contents of the Project

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2-1 Objective of the Project

The 16 year civil war in the Republic of Mozambique ended when the peace accord was signed in August 1992. However, social issues such as employment and permanent homes for nearly 100,000 ex-soldiers and repatriated refugees have arisen in the aftermath of this war. In particular, implementing vocational training to accelerate self-sufficiency among unskilled ex-soldiers and others has become a national priority issue. The government of The Republic of Mozambique has worked to resolve this problem through the National Institute for Employment and Vocational Training (INEFP). However, the Vocational Training Center which is responsible for actually implementing vocational training programs, has been unable to carry out their work effectively due to a shortage and deterioration of equipment.

This project plans to improve the training equipment of the Machava Vocational Training Center and the Electric Vocational Training Center, both located near Maputo City, the capital of Mozambique. The objectives are to improve and strengthen the training environment at both centers, raise the level of training content, and to foster technical skills that can be practically applied in the job market after graduation. In addition, by increasing the number of trainees who are admitted to the centers, vocational training opportunities will be made available for many former military soldiers, work capabilities will be raised, and employment opportunities will increase, a goal which is targeted by the INEFP.

2-2 Basic Concept of the Project

This project is based on a request for equipment needed at Machava Vocational Training Center for eight of their courses(Soldering and Welding, Carpentry, Building (Masonry), Plumbing, Auto Mechanics, Panel Beating & Painting, Refrigerator & Air Conditioner Repair/ Installation, Car Electric Repair), for four courses at the Electric Vocational Training Center, in Electricity Installation (Wiring), Radio & Home Appliances Repair, Industrial Electricity, the newly established Welding course and for printing & producing of teaching materials, such as textbook, test manuscript and other instruction papers at the both centers. At the Electric Vocational Center, courses which

reflect social needs and have a large number of training aspirants will be targeted by this project. The remaining five courses will be excluded from this project due to the small number of trainees, the adequacy of existing equipment, etc.

The objective of these centers is not to teach highly technical knowledge, but basic and practical technical skills.
Applicants are required to meet the academic requirements of each vocational course at the Machava Vocational Training Center. Trainees in the fields of Carpentry, Building (Masonry), and Plumbing are required to have completed the first term of the fourth year of primary education (G4), applicants in the field of Refrigerator & Air Conditioner Repair/ Installation must have completed the first year of secondary education (G8), and applicants in the remaining courses are required to have finished the second term of the first year of primary education (G6). In principle, trainees at the Electric Vocational Training Center are required to have completed the second term of primary education (G7) by the age of 17 or higher. However, according to government policy, exceptions have been made for ex-soldiers applying to both these centers. As a result, the age of the trainees differs greatly and ranges from 18 to 36; and there is a conglomeration of various academic backgrounds and student levels. This situation is anticipated to continue for an extended period of time. This project will be planned with sufficient consideration of these circumstances. Its chief aim will be to provide "basic skills that can be practically applied" and "training with an emphasis on observation rather than theory".
In addition, equipment which is low in maintenance and control costs will be planned and selected.

The request was reviewed and the type and specification of each equipment included in the request was evaluated according to its suitability to the content of each course. In addition, the quantity or amount of equipment which will be provided was reviewed and determined according to the number of trainees and whether the quantity contributed to efficient and effective training.

The following tables show the training courses implemented at both centers.

Table 2.1. Training Course and Course Description

Machava Vocational Training Center

Course	Course Description • Objective
Soldering and Welding	Gas and electric welding/cutting; finishing; brazing
Carpentry	Architectural fittings; furniture manufacture; carpentering
Building (Masonry)	Stone processing; tile/brick construction, troweling
Plumbing	Processing steel/copper pipes (bending, threading), soldering, plumbing
Auto Mechanics	Adjusting/disassembling/inspecting engine, chassis, exchanging parts
Panel Beating & Painting	Panel beating & Painting process for body repair of automobiles
Refrigerator & Air Conditioner Repair/Inst.	Replenishing air conditioning refrigerant; adjusting, disassembling, inspecting the condenser; exchanging parts
Car Electric Repair	Adjusting, disassembling, inspecting electric parts on car body; exchanging parts

Electric Vocational Training Center

Course	Course Description • Objective
Electricity Installation (Wiring)	Indoor/outdoor electric wiring/distribution; Electric measurement; drawing up schematics
Radio & Home Appliances Repair	Inspection, repair, parts exchange of televisions, radio cassettes, fans
Welding	Welding, cutting, finishing techniques in gas and electric arc welding, brazing
Industrial Electricity	Inspection, installation of circuit for electric facilities with motor, starting switch, etc.

Although the number of trainees per class at the Vocational Training Centers has been set at 16 students, the actual number of trainees averages 20 or more per class, due to the priority status given to ex-soldiers and refugees in vocational training programs. However, in order to carry out safe and effective vocational training programs where equipment and machinery are often used in practical training, the number of students must be limited to within a range that an instructor can supervise. In view of the instructor and trainee levels and the present circumstances in Mozambique, the appropriate number of students per course has been determined as 20 students. The actual quantity of equipment utilized in the training sessions differs and is determined based on the following premises.

(1) In some training sessions, one unit is allocated to each student.

(2) In sessions where the trainees have been divided into small groups, one unit is designated to a group of students.

(3) One course may contain several classes. It has been determined that the amount of equipment which is required for one of these classes will adequately cover the needs of all the classes in that course, if the curriculum is arranged accordingly.
Hence the quantity of equipment which will be provided in the project was calculated on these premises.

Based on the aforementioned, the quantity of equipment which will be provided was calculated according to the following guidelines.

Table 2.2. Guideline on Calculating the Quantity/Volume of Equipment

Type	Guideline	Total Number Required Per Course
A	•Each trainee needs to operate their own instrument in order to learn a skill	20
B	•Group study where trainees observe others and take turns operating the equipment in order to learn a skill •Training practice which requires that trainees work in pairs •Equipment which can be used in turn due the frequency and duration of use	10 trainees in one group:2 4 trainees in one group: 5 Pairs: 10
C	•Equipment which is required in theory and principle. Courses in structural example where one unit of equipment is sufficient •Course where one unit of equipment is sufficient due to the frequency of use	1
D	•Courses where the instructor personally explains usage of the equipment, etc. and trainees learn through observation	One unit for the instructor is added to the total number of units per course.
E	•Protective working gear which is required by each trainee	21
F	•Similar equipment which the centers already possess	Deducted from the total quantity
G	•Common goods which several pieces are used at the same time by each trainee according to necessity	Necessary and sufficient number
H	•Equipment for printing and production of teaching materials is minimized to produce only necessary materials	

The equipment which will be provided in this project was selected according to the aforementioned results; ant it has been compiled into a list in section, 2-3-2 Basic Plan.

2-3 Basic Design

2-3-1 Design Concept

The equipment which will be provided in this project will not require highly technical skills or experience to operate and it will not include equipment which is anticipated to be difficult to procure. Therefore, the equipment plan was drawn up based on the requested equipment list; and the following points were taken into consideration.

(1) The equipment must be tool, implement and instruments required to learn the basic skills in each course.

(2) The application and operation of the equipment must conform to the technical skills of the user.

(3) Equipment must conform to training content and user objective.

(4) Equipment must be durable, easy to maintain, repair, and inspect.

(5) Equipment must actually be used by workers at the job site.

(6) Equipment must have the minimum functions needed to meet the vocational training objectives.

(7) Priority was given to equipment with consumables and spare parts which could be easily and locally procured.

(8) The consumption of electricity, consumables, and maintenance and control costs of the equipment must be minimal.

2-3-2 Basic Design

(1) Overall Plan

The two vocational training centers where the equipment in this project will be distributed are both located near the capital, Maputo City. A summary of the two centers is given below.

1) Machava Vocational Training Center

Established in February 1984, this center is largely comprised of three buildings. The main building contains the director's office, the administrative office, classrooms

for the automotive related courses, etc. The second training building houses classrooms for the carpentry course, and the third training building contains classrooms for the brazing and welding, building (masonry), and plumbing courses. The overall maintenance conditions of the slate shingled, partial two storied reinforced concrete structures are relatively good. The compound is enclosed by a concrete block wall and wire fence with barbed-wire entanglements as a security measure.

A summary of the courses offered at this center is given below.

Table 2.3. Summary of the Training Courses at Machava Vocational Training Center

Training Course	Number of Class	Number of Trainees	Period of Training (Months)
1.Auto Mechanics	1	16	4.5
2.Car Electric Repair	1	15	5.0
3.Building (Masonry)	2	29	5.0
4.Soldering & Welding	1	14	5.0
5.Panel Beating & Painting	1	15	4.5
6.Carpentry (furniture)	1	15	5.0
7 Plumbing	1	15	5.5
8.Refrigerator & Air Conditioner Repair/ Installation	1	16	4.5
Total	9	135	

* Figures for September 1996 to present

Each course at the center has a classroom and training room. Equipment which requires installation will be placed in these rooms. All other equipment will be stored in either the storage room or in the storage cabinets in the training rooms. Equipment will be lent to trainees attending the class session. Some of the existing equipment which is presently installed in the training rooms will be moved to accommodate the new equipment supplied under the project. Problems are not anticipated with the layout plan.

Since there is no power transformer at the center, low voltage city electricity (380/220V) is directly provided by the Mozambique Electric company. Electricity is supplied via a distribution board which has been installed in each training room and the equipment which will be provided in this project will receive its source of electricity from there. In addition, equipment such as the fuel injection pump tester

coolant and circulation) or the high pressure washer (water for washing) which will be provided by the project, does not require a continuous supply of water. The water faucet in each training room is an adequate water source for this equipment.

2) Electric Vocational Training Center

The center was established in 1978 and it is composed of one reinforced concrete, slate shingled roofed building. This building contains offices, classrooms, training rooms, etc. It has been maintained in good condition; and each room is clean, neat, and organized. All rooms including the restrooms can be locked as a security measure.

A summary of each course at this center is given below.

Table 2.4. Summary of the Courses at the Electric Vocational Training Center

Training Course	Number of Class	Number of Trainees	Period of Training (Months)
1.Shoe Repair	1	16	2.0
2.Home Appliance Repair	1	16	5.0
3.Tin Plate Processing	1	0	2.5
4.Tire Repair	1	16	2.0
5.Typewriter Repair	1	0	3.5
6.Electric Wiring	1	16	3.0
7 Radio Repair	1	16	5.0
Total	7	80	

* Figures for September 1996 to present

There is a training room for each course and the classroom and storage room have been combined. Equipment requiring installation will be located in the training rooms and all other equipment will be kept in the storeroom when not in use. Some of the existing equipment which is presently installed in the training rooms will be moved to accommodate the new equipment supplied under the project. No problems in the layout plan are anticipated.

There is a power transformer within the center compound which distributes low voltage electricity (380V three-phase current, 220V single phase current) through the distribution board in each room. This capacity will adequately power the equipment

which will be provided in this project. Equipment which requires a water supply source is not planned for this center.

The equipment in the request was reviewed and the following conclusions were made based on the project's basic concept and design policy.

MACHAVA VOCATIONAL TRAINING CENTER

Soldering & Welding

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
SW - 1	Gloves for Welding	21	Hand protection	E
SW - 2	Hand Drill - 5mm , Wheel ø50mm	10	Drilling	B
SW - 3	Electric Drill - 220V,13mm	5	Drilling	B
SW - 4	Angle Grinders - 115mm/600W	5	Grinding & buffing	B
SW - 5	Drill Presses - 19mm/0.75kW/220V	2	Drilling	B
SW - 6	Electric Forge -220V/0.5kW	2	Blowing	B
SW - 7	Sword Handled Wire Brush - 3 rows	20	Removing spatter & rust	A
SW - 8	Bench Grinders - 200mm/0.37kW/220V	2	Grinding	B
SW - 9	Folding and Bending Machine -1.6mmt x 1,250mmW	1	Bending metal sheet	C
SW - 10	Sheet - Metal Guillotine - 1.6mmt x 1,250mmW	1	Cutting metal sheet	C
SW - 11	Bench Shear - 6mm x 1,200mmW	1	Shearing metal sheet	C
SW - 12	Power Hack Saw - ø400mm/3kW/380V	1	Cutting metal bar & pipes	C
SW - 13	Hack Saw with Blades - 500mm	20	Cutting metal	A
SW - 14	Set of Iron Twist Drill - 1 to 13mm , 25pcs	5	Drilling bit	B
SW - 15	Vernire Caliper - 150mm	21	Measuring length, height, diameter	D
SW - 16	Hinged Pipe Vice - 3/8" to 2"	10	Clamping pipe	B
SW - 17	Electrode Holder	5	Welding rod holder	B
SW - 18	Pliers with spring	5	Electric terminal for welding	B
SW - 19	Anvil - 15kg	5	Metal work	B
SW - 20	Parallel Jaw Vice - 120 x 160mm	10	Clamping material	B
SW - 21	Measuring Tape - 5m Steel	20	Measuring length	A
SW - 22	Machinist Hammer - 500g	20	Hammering	A
SW - 23	Cold Chisel - 1 point, 1 chisel	20	Metal cutting	A
SW - 24	Set of Cutting & Welding Equipment (regulator, twin house, welding torch,cutting torch,set of tips,tip cleaner,igniter,oxygen and acetylene cylinders)	2	Gas welding & cutting	B
SW - 25	Flip Front Brazing Goggles	21	Face protection	E
SW - 26	Bolt Cutter - 16mm	5	Cutting wire	B
SW - 27	Oxygen and Acetylene Bottles Car Transport	2	Gas cylinder transport	B
SW - 28	Hand held shield	21	Face protection	E
SW - 29	Circuit Breaker, 3ø 30A	20	Breaking electric circuit	A

Carpentry

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
CP - 1	Plane No. 4	20	Planing wood	A
CP - 2	Plane No. 3	20	Planing wood	A
CP - 3	Plane No. 5	20	Planing wood	A
CP - 4	Set of Wood Chisels - 6, 12, 20, 25, 32mm	20	Cutting wood	A
CP - 5	Claw Hammer - 500g	20	Hammering & removing rust	A
CP - 6	Engineers Hammer - 300g	20	Hammering	A
CP - 7	Rectangular File - 10"	20	Filing wood	A

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
CP - 8	Round File - 10"	20	Filing wood	A
CP - 9	Combination Square - 300mmL	20	Angle check	A
CP - 10	Jaw Carpenters Brace	20	Drilling wood	A
CP - 11	Hand Drill - Cap 16mm	20	Drilling	A
CP - 12	Folding Rule - Wood 2 m	20	Measuring length	A
CP - 13	Carpenters Compass - max.300mm	20	Describing circle	A
CP - 14	Center Punch Set- 6 pieces	10	Punching point	B
CP - 15	Engineers Scriber - 20"	20	Describing line	A
CP - 16	Expansive Bar Clamp (1000mm Opening)	10	Clamping material	B
CP - 17	G type Clamps - 20"	10	Clamping material	B
CP - 18	Set of Wood Twist Drill - 6mm-18mm ,6pcs	20	Drill bit	A
CP - 19	Electric Drill - 220V, 13mm	5	Drilling	B
CP - 20	Wheel Barrow Concrete	5	Transporting material	B
CP - 21	Combination Cutting Pliers - 180mm	20	Cutting & clamping	A
CP - 22	Measuring Tape - 5m, Steel	20	Measuring length	A
CP - 23	Glass Cutter	20	Cutting glass	A
CP - 24	Clamp - 250mm L x 120mm throat deter depth	20	Clamping material	A
CP - 25	Stainless Steel Rule - 150mm	20	Measuring length	A
CP - 26	Set of Screw Drivers - 4mm to 10mm,6pcs	20	Tightening / loosening screws	A
CP - 27	Clear Safety Goggles	21	Eyes protection	E
CP - 28	Hydraulic Presses - 20ton/900mm	2	Press combining wooden material	B
CP - 29	Compass Saw - 300mm	20	Sowing wood	A
CP - 30	Set of Rasps - flat, half found, round 10"	20	Filling material	A
CP - 31	Oil Stone - 200mm x 50mm x 25mm	20	Sharpening knife edge	A
CP - 32	Square - 90"	20	Right angle check	A
CP - 33	Square - 45"	20	Angle check	A

Builder (Mason) - Stonemason

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
BS - 1	Brick Hammer - 1 kg	20	Hammering	A
BS - 2	Wheel Barrow Concrete/builder	20	Transporting material	A
BS - 3	Shock - Resting Safety Helmet	21	Head protection	E
BS - 4	Plasters Float - 250 x 70mm	20	Plastering	A
BS - 5	Split Level - 400mm	20	Level check	A
BS - 6	Tile Trowel - 290 x110mm	20	Tile troweling	A
BS - 7	Finishing Trowel - 280 x 100mm	20	Trowling	A
BS - 8	Pointing Trowel - 125 x 60mm	20	Troweling	A
BS - 9	Folding Rule - Wooden made, 1 m	20	Measuring length	A
BS - 10	Stainless Steel Ruler - 2m	20	Measuring length	A
BS - 11	Measuring Tape - 30m	20	Measuring length	A
BS - 12	Combination Cutting Pliers - 200mm	20	Cutting & clamping	A
BS - 13	Combination Pliers Slip joint- 180mm	20	Cutting & clamping	A
BS - 14	Claw Hammer - 28mm/500g	20	Hammering	A
BS - 15	Glass Cutter	20	Cutting glass	A

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
BS - 16	Pick with Handle	20	Picking soil	A
BS - 17	Shovel with Handle	20	Shoveling	A
BS - 18	Plumb Bob	20	Determine vertical line	A
BS - 19	Concrete Mixer (Cement) - 120L/Gasoline engine drive	1	Mixing concrete & aggregate	C
BS - 20	Set of Paint Scraper 30, 70, 90mm	20	Scraping	A
BS - 21	Mallet - 4kg	5	Beating	B
BS - 22	Wood Saw - 550mm long	20	Sawing wood	A
BS - 23	Round Chisel	20	Cutting wood	A

Plumber

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
PL - 1	Pipe vice on Stand - 3/8"- 2"	10	Clamping pipe	B
PL - 2	Ratchet Die Stock	5	Thread cutting	B
PL - 3	Drill Press - ø15mm, 220V	5	Drilling	B
PL - 4	Hand Drill - ø5mm , Wheel ø50mm	5	Drilling	B
PL - 5	Pipe Cutter - 3-28mm	5	Cutting pipe	B
PL - 6	Soldering Iron - 220V/100W	20	Soldering	A
PL - 7	Flexible Measuring Tape - 3m	20	Measuring length	A
PL - 8	Combination Pliers Slip joint- 180mm	20	Cutting & clamping	A
PL - 9	Adjustable Wrench - 250mm	20	Wrenching screw bolt	A
PL - 10	Die Nuts - 1/4" to 1&1/4"	10	Thread cutting	A
PL - 11	Hack Saw for Plumber (with blades) - 300mm	20	Cutting pipe	A
PL - 12	Tin Snips - 200mm long	20	Cutting tin	A
PL - 13	Parallel Jaw Vice - 120W x 160mmL	10	Clamping material	B
PL - 14	Split Level - 500mm	5	Level check	B

Auto-Mechanic

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
AM - 1	Injector Test Machine - 400 bar	1	Injection nozzle testing & calibration	C
AM - 2	Diesel Injection Pump Test Bench with accessories	1	Injection pump testing & calibration	C
AM - 3	High Pressure Cleaner - 500L/hr	1	Cleaning chassis & body	C
AM - 4	Inspection Lamp - 220V	2	Visual inspection	B
AM - 5	Inspection Lamp - 12V	2	Visual inspection	B
AM - 6	Compressor - belt drive - 11bar/220V/ 1 .5kW	1	Compressed air supply	C
AM - 7	Engine Diagnostic Unit - 220V	1	Ignition/injection adjustment	C
AM - 8	Wheel Balancer - Stationery - 0.5kW/220W	1	Wheel balance adjustment	C
AM - 9	Drill Presses - 115mm/600W	1	Drilling	C
AM - 10	Benches Grinders - 200mm/0.37kW/220V	1	Grinding	C
AM - 11	Hydraulic Presses - 20ton/900mm	1	Pressing	C
AM - 12	Engine Crane - 0.5ton/max lift 2600mm on 0.5 ton	1	Removing engine	C
AM - 13	Engine Crane - 0.5 to 3ton/max lift 2600mm on 3 ton	1	Removing engine	C
AM - 14	Timing Light - DC12V	2	Ignition timing adjustment	B
AM - 15	Parallel Jaw Vice - 120W x 150mmL	20	Clamping material	A

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
AM - 16	Metallic Work Bench - 1800W x 900mmL	10	Working bench	B
AM - 17	Bottle Jack - 5ton	5	Jacking up	B
AM - 18	Garage Trolley Jack - 15 ton	2	Jacking up & moving body	B
AM - 19	Tool Trolley - 3shelves	5	Containing tools	F
AM - 20	Tappet Spanner Set - 4/5mm to 30/32mm	5	Adjustment of tappet clearance	B
AM - 21	Tappet Spanner Set - 5/16" to 1 1/4"	5	Adjustment of tappet clearance	B
AM - 22	Ring Spanner Set - 4/5 mm to 30/32mm	5	Tightening/loosening screw bolts	B
AM - 23	Combination Tappet /Ring Spanner Set - 4mm to 32mr	5	Removing/assembling tappet/ring	B
AM - 24	Box Socket Wrench Set - Hexagonal/8mm to 32mm	10	Tightening/loosening screw bolts	B
AM - 25	Box Socket Wrench Set - Flared/ 8mm to 32mm	10	Tightening/loosening tappet/ring	B
AM - 26	Ring Spanner Set - 5/16" to 1 1/4"	5	Tightening/loosening screw bolts	B
AM - 27	Combination Tappet/ring Spanner Set - 5/16" to 1 1/4"	5	Removing/assembling tappet/ring	B
AM - 28	Box Socket Wrench Set - Flared/ 5/16" to 1 1/4"	5	Tightening/loosening tappet/ring	B
AM - 29	Box Socket Wrench Set - Hexagonal / 5/16" to 1 1/4"	5	Tightening/loosening tappet/ring	B
AM - 30	Hex Allen Key Set - 4mm to 12mm	5	Tightening/loosening hex bolts	B
AM - 31	Hex Allen Key Set -1/16" to 1/2"	5	Tightening/loosening hex bolts	B
AM - 32	Hex Allen Key Set - Flared/4mm to 12mm	5	Tightening/loosening hex bolts	B
AM - 33	Hex Allen Key Set - Flared/ 1/16" to 1/2"	5	Tightening/loosening hex bolts	B
AM - 34	Set of Screw Drivers - Small Sizes	5	Tightening/loosening screw	B
AM - 35	Set of Screw Drivers - Large Sizes	5	Tightening/loosening screw	B
AM - 36	Set of Phillips Screwdrivers - Small Sizes	5	Tightening/loosening screw	B
AM - 37	Set of Phillips Screwdrivers - Large Sizes	5	Tightening/loosening screw	B
AM - 38	Water Pump Pliers	10	Clamping material	B
AM - 39	Adjustable Wrench - 250mm	10	Tightening/loosening screw bolt	B
AM - 40	Combination Cutting Pliers - 180mm	10	Cutting & clamping	B
AM - 41	Stop ling Pliers Set - 10 mm to 25 mm	10	Removal & installation of stop ling	B
AM - 42	Long Nose Pliers - Insulated	10	Cutting & clamping	B
AM - 43	Diagonal Cutting Nippers - 200mm	10	Cutting & stripping electric wire	B
AM - 44	Locking Plier (Adjustable Spanner Wrench) - 250mm	5	Tightening / loosening locking nut	B
AM - 45	Welding Clamp Set - 3 pieces	5	Clamping material	B
AM - 46	Punch Set - 6 pieces	5	Punching mark	B
AM - 47	Piston Ring Compressor Set - 60mm to 90mm	5	Cylinder Piston & piston ring Insertion	B
AM - 48	Oil Filter Pliers - 95mm	5	Removal & installation of oil filter	B
AM - 49	Valve Spring Compressor	5	Removal & installation of valve springs	B
AM - 50	Coil Spring Restraining Tools - 220mm length	5	Coil spring adjustment	B
AM - 51	Piston Groove Cleaner Set	5	Cleaning piston grooves	B
AM - 52	Stocks & Die Set - 1/2" to 2" Capacity	5	Cutting thread	B
AM - 53	Two-arm Puller - 250 x 200mm	2	Removing gear	B
AM - 54	Steering Wheel Puller-Column	2	Removing steering wheel	B
AM - 55	Vernier Caliper - 120mm	21	Measuring length, height, diameter	D
AM - 56	Flat File - 200mm	10	Filing	B
AM - 57	Round File - 200mm	10	Filing	B
AM - 58	Triangular File -200mm	10	Filing	B
AM - 59	Valve Refacer- 220V	1	Valve Refacing, etc.	C
AM - 60	Die Nuts - 1/4" to 1&1/4"	5	Cutting thread	B
AM - 61	Pressure Gauge 0-25Kg/cm2	2	Measuring cylinder pressure	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
AM - 62	Pressure Gauge 0~750Kg/cm2	2	Measuring cylinder pressure	B

Panel Beating & Painting

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
BP - 1	Set of Screwdrivers - 6 pieces	5	Tightening / loosening screws	B
BP - 2	Combination Pliers Slip joint- 180mm	10	Cutting & clamping	B
BP - 3	Steel File Flat - 34 x 26 x 23cm	10	Filing	B
BP - 4	Needle File Set - 6 pieces	5	Filing	B
BP - 5	Half Round files - 34 x 26 x 23cm	5	Filing	B
BP - 6	Needle Square File Set - 6 pieces	5	Filing	B
BP - 7	Body File Holder	10	Flexible file holder	B
BP - 8	Body File Blade - 350mm	10	Flexible file	B
BP - 9	Body File Flat Blade - 350mm	10	Filing	B
BP - 10	Body File Triangular Blade - 350m	10	Filing	B
BP - 11	Pinch-off Pliers - 175mm	5	Clamping	B
BP - 12	Set of Panel Beating	1	Panel beating tools	C
BP - 13	Combination Spanners Set, 12-26mm, 6pcs	10	Tightening/loosening screw bolts	B
BP - 14	Box Socket Wrench Set, 12-26mm	10	Tightening/loosening screw bolts	B
BP - 15	Hack Saw, 500mm	5	Sawing metal	B
BP - 16	Wire Brush with 3 rows	10	Removing rust	B
BP - 17	Hand Scriber	10	Describing lines	B
BP - 18	Steel Ruler - 1.5m	10	Measuring length	B
BP - 19	Measuring Tape - 5m	10	Measuring length	B
BP - 20	Engineers Square - 90	10	Right angle check	B
BP - 21	Set of Cutting & Welding Equipment (regulator, twin house, welding torch,cutting torch,set of tips,tip cleaner,igniter,oxygen and acetylene cylinders)	2	Gas welding & cutting	B
BP - 22	Electric Drill - 13mm/220V	5	Drilling	B
BP - 23	Disc Sander/ Polisher - 180mm /220V	5	Buffing	B
BP - 24	Bench Grinders - 220V/600W	1	Grinding	C
BP - 25	Bench Drilling Machine - ø13mm/220V	2	Drilling	B
BP - 26	Folding and Bending Machine - 1.6mmt x 1,250mmW	1	Bending metal sheet	C
BP - 27	Tube Bander Set - 10,12,14,16mm	2	Bending pipe	B
BP - 28	Oil Cooled Welding Machine - 140A, 220V	2	Arc welding	B
BP - 29	Sheet-Metal Guillotine - 1.5mm, Foot operation	1	Cutting metal sheet	C
BP - 30	Compressor-Belt Driven - 220V/1,5kW/11bar	1	Compressed air supply	C
BP - 31	Air Hoses and Fittings - 30m	2	Air supply	B
BP - 32	Spray Guns - High Pressure	2	Spray painting	B
BP - 33	Face Mask	21	Nose mask for painting work	E
BP - 34	Flip Front Welding Goggles	21	Eye protection	E
BP - 35	Protective Spectacles	21	Face protection	E
BP - 36	Leather Gloves	21	Hand protection	E
BP - 37	Protective Apron, Rubber	21	Body protection	E
BP - 38	Safety Helmets	21	Head protection	E
BP - 39	Parallel Jaw Vise- 120W x 160mmL	10	Clamping material	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
BP - 40	Work Bench, Steel - 1800W x 900mmL	10	Working bench	B
BP - 41	Water Buckets - 20L	5	Containing fluid	B
BP - 42	Bottle. Pack - Steer , 3shelves,1500W x 600D x 1800H	3	Paint can storage	F
BP - 43	Nail Punches, 6pcs/ set	10	Punching mark	B
BP - 44	Chisels, 6pcs/ set	10	Cutting metal	B
BP - 45	Twist Drill Set - 2mm - 8mm, 15pcs/ set	5	Drill bit	B
BP - 46	G - Cramps - 500mm	10	Clamping material	B
BP - 47	T - bar Cramps - 1,000mm	5	Clamping material	B
BP - 48	Tinman's Snips- 250mm	5	Cutting metal sheet	B
BP - 49	Combination Cutting Pliers - 200mm	5	Cutting & clamping	B
BP - 50	Multi-grip Plumbing Pliers - 600mm	5	Clamping pipe	B
BP - 51	Engineers Cross Pein Hammer - 500g	10	Hammering	B
BP - 52	Engineers Boll Pein Hammer - 500g	10	Hammering	B
BP - 53	Engineers Boll Pein Hammer - 250g	5	Hammering	B
BP - 54	Oxygen and Acetylene Bottles Car Transport	2	Gas cylinder transport	B

Refrigerator & Air Conditioner Repair

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
RA - 1	Combination Cutting Pliers	10	Cutting & clamping	B
RA - 2	Pressures Pliers	10	Crimping terminal sleeves	B
RA - 3	Long Needle Nose Pliers	10	Cutting & clamping	B
RA - 4	Round Nose Fliers	10	Cutting & clamping	B
RA - 5	Set of Screw Drivers and Philips	10	Tightening/loosening screws	B
RA - 6	Bent Nose Adjusting Pliers	5	Precision clamping work	B
RA - 7	Box Socket Wrenches Set - 4mm to 21 mm	5	Tightening/loosening screws bolts	B
RA - 8	Hex Allen Key Set - 2mm to 12mm	10	Tightening/loosening hex bolts	B
RA - 9	Tube Bander - 3/4" 5/8", 1/2", 3/8",1" 2"	5	Bending pipes	B
RA - 10	Pipe Cutter - 1/8" to 1/2", 3/8" to 1/8"	20	Cutting pipes	A
RA - 11	Adjustable Wrench - 500mm	5	Tightening/loosening screw bolts	B
RA - 12	Pinch-off Pliers - 175mm	5	Clamping pipe	B
RA - 13	Hacksaws - 300mm	10	Sawing pipe	B
RA - 14	Soldering Iron - 220v/80w	10	Soldering	B
RA - 15	Tinman's Snips- 250mm	10	Cutting metal sheet	B
RA - 16	Electrician's Knife	10	Cutting	B
RA - 17	Digital Multimeters	10	Measuring voltage, current, resistance	B
RA - 18	Mega-ohmmeters	5	Measuring insulation resistance	B
RA - 19	Diagonal Cutting Nippers	10	Cutting & stripping	B
RA - 20	Mercury Thermometer	5	Thermal measurement	B
RA - 21	Electrician Hand Drill - 13mm, 220V	5	Drilling	B
RA - 22	Pedestal Grinder - 200mm, 220V	5	Grinding	B
RA - 23	Bench Drilling Machine - 15mm, 220V	2	Drilling	B
RA - 24	Bench Vises 120mm x 160mm	10	Clamping material	B
RA - 25	Work Benches - Steel 1800W x 900mmL	8	Working bench	F
RA - 26	Freon 12 Bottles - 5kg	10	Refrigerant	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
RA - 27	Freon 22 Bottles - 5kg	10	Refrigerant	B
RA - 28	Air-conditioned Apparatus - 220V/24000BTU	5	For practical training	B
RA - 29	Graciers(Angle Grinder) - 115mm, 600W	5	Grinding / buffing	B
RA - 30	Set of Cutting & Welding Equipment (regulator, twin house, welding torch,cutting torch,set of tips,tip cleaner,igniter,oxygen and acetylene cylinders)	5	Gas welding / cutting	B
RA - 31	Packless Valves - 1/4"	20	Flared type	A
RA - 32	Thermometer, Remote measuring(with probe)	5	Thermal measurement	B
RA - 33	Set of Nort Assortment - 1/4", 3/8",1/2" , 1&1/2",3/4"	10	Copper joints, elbows, T-sockets	B
RA - 34	Flip front brazing goggles	21	Face protection	E
RA - 35	Leather gloves	21	Hand protection	E
RA - 36	Vacuum Pump - 1/4", 200w	2	Vacuum deaerater for refrigerant circuit	B
RA - 37	Freon Gas Detector	10	Gas leakage detection	B
RA - 38	Flaring tools	10	Copper tube flaring tool	B
RA - 39	Charging hose with Fitting - 1/4", 1.5m	10	Charging refrigerant	B
RA - 40	Reamer - 5 to 40mm	10	Removing bur	B
RA - 41	Manifold Set	5	Inspection of refrigerant circuit	B
RA - 42	Oxygen and Acetylene Bottles Car Transport	5	Gas cylinder transport	B

Electricity Car Repair

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
EC - 1	Set of Screwdrivers and Philips - 6 pieces	10	Tightening / loosening screws	B
EC - 2	Box Socket Wrenches Set	5	Tightening / loosening screw bolt	B
EC - 3	Combination Spanner Set	5	Tightening / loosening screw bolt	B
EC - 4	Hex Allen Key Set	5	Tightening / loosening hex. bolt	B
EC - 5	Set of File - Round, Rectangular, Triangular, Flat	5	Filing	B
EC - 6	Needle Files Set	5	Filing	B
EC - 7	Hacksaws - 300mm	10	Sawing metal	B
EC - 8	Cutting Pliers - 200mm	10	Cutting & clamping	B
EC - 9	Combination Pliers Slip joint - 180mm	10	Cutting & clamping	B
EC - 10	Diagonal Cutting Nippers - 200mm	10	Cutting & stripping	B
EC - 11	Crimping Pliers	10	Crimping terminal sleeves	B
EC - 12	Tester Screwdriver - 6 to 24V	10	Screwdriver with tester	B
EC - 13	Spark Plug Spanner - 3pcs/set	5	Removal & installation of ignition plug	B
EC - 14	Feeler Ganges - 10pcs/set	5	Measuring thickness	B
EC - 15	Micrometer - 0 to 25mm	5	Precision measurement	B
EC - 16	Electrical Test Bench - 6 to 24V, 50A	1	Testing electric parts	C
EC - 17	Battery Charger - 6 to 24V	5	Charging battery	B
EC - 18	Distributor Tester - 4000rpm	1	Testing distributor	C
EC - 19	Thermometer	10	Thermal measurement	B
EC - 20	Multimeter	10	Testing voltage, current, resistance	B
EC - 21	Soldering Iron-220V,100W	10	Soldering	B
EC - 22	Headlight Tester - 1m, 100,000cd	2	Testing & adjusting headlight	B
EC - 23	Cooling System Analyzer	2	Checking & adjustment air-con system	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
EC - 24	Battery Volt Meter - DC12/24V	5	Measuring battery voltage	B
EC - 25	Battery S.G. Checker	5	Measuring specific gravity of battery fluid	B
EC - 26	Spark Plug Cleaner &Tester - AC220V, 9kg/cm2	1	Cleaning & testing spark plug	C

Printing and Production of Teaching Material

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
PP - 1	Photo Copying Machine(A3,Monochrome)	1	Copying	H
PP - 2	Duplicating Machine - A3, AC220V	1	Mimeograph type	H
PP - 3	Scanning Machine for Stencils - AC220V	1	Processing block copy	H
PP - 4	Accessories(2 kinds of stencil, ink & needle)	10	For printing	H
PP - 5	OHP for Training	2	Projector	H
PP - 6	Personal Computer	1	Documentation calculation, etc.	H
PP - 7	Laser Printer - A3, Monochrome	1	Printing	H
PP - 8	Floppy Disc - 3.5in, 1.4MB	2	Data back up	H
PP - 9	UPS - 500VA/ AC220V	1	For personal computer	H

ELECTRIC VOCATIONAL TRAINING CENTER

Electricity Installation (Wiring)

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
EI - 1	Multimeter	21	Measuring voltage, current, resistance	D
EI - 2	DC Voltmeter Set (2 units)	11	DC voltage measurement	D
EI - 3	DC Ammeter Set (2 units)	11	DC current measurement	D
EI - 4	AC Voltmeter Set (2 units)	11	AC voltage measurement	D
EI - 5	AC Ammeter Set (2 units)	11	AC current measurement	D
EI - 6	Electroscope, 500V 140mA	11	Detecting electric charging condition	D
EI - 7	Phasemeter	11	Digital type vector phasemeter	D
EI - 8	Electric Drill - ø13mm, 220V	10	Drilling	B
EI - 9	Electric Code - 6m, 15A, 220V	100	Extension code	G
EI - 10	Wooden Board for wiring Training 60x90cm	21	For practical training	D
EI - 11	Drill Set with Case - 25pcs/set	10	Drill bits	B
EI - 12	Pressure Pliers	20	Crimping terminal sleeves	A
EI - 13	Soldering Iron Set - 220V, 100W	20	Soldering	A
EI - 14	Steel Spiral Set - 11 to 29mm	10	Electric cable pulling grip	B
EI - 15	Draw-in Spiral - 20m	10	Spiral rope for cable pulling	B
EI - 16	Hacksaw Frame - 300mm	20	Sawing	A
EI - 17	Combination Pliers Slip joint- 180mm	20	Cutting & clamping	A
EI - 18	Diagonal Cutting Pliers L - 160mm	20	Cutting & stripping	A
EI - 19	Flat Nose Pliers L - 160mm	20	Cutting & clamping	A
EI - 20	Long Needle Nose Pliers, Straight - 200mm	20	Cutting & clamping	A
EI - 21	Long Chain-Nose Pliers, Curved - 200mm	20	Cutting & clamping	A
EI - 22	Bent Nose Pliers - 160mm	20	Cutting & clamping	A
EI - 23	Center Punch - 125mm	20	Punching mark	A

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
EI - 24	Screw Driver Set 16 pcs., Plus	20	Tightening / loosening screw	A
EI - 25	Driver Set 16 pcs., Minus	20	Tightening / loosening screw	A
EI - 26	Masonry Drill Set for wiring - 10pcs/set	20	Drilling	A
EI - 27	Wire Stripper	20	Stripping electric wire	A
EI - 28	Insulation-Resistance tester - 500V	2	Measuring insulation resistance	B
EI - 29	Earth Tester - 0~1000Ω	2	Measuring earth resistance	B
EI - 30	Clamp Meter	2	Measuring AC./DC current	B
EI - 31	Lux Meter - 0~300 LX	2	Illuminance measurement	B
EI - 32	Wiring Parts Set (Breaker, Plug etc.,)	20	Practical training for wiring	A
EI - 33	Drawing Set	21	Practical training for drawing	D
EI - 34	Measuring tape - 3m	20	Measuring length	A
EI - 35	Flat file - 150mm	20	Finishing pipe end	A
EI - 36	Hinged pipe vice	5	Clamping pipe	B
EI - 37	Pipe Threader 5/8,3/4, 1&1-1/4"	5	Thread cutting	B
EI - 38	Tube bender set	5	Bending pipe	B
EI - 39	Pipe wrench - 250mm	5	Clamping/ Rotating pipe	B
EI - 40	Bolt cutter - 500mm	5	Cutting thick wire	B

Radio & Home Appliances Repair

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
RH - 1	Multitester AC/DC Digital	21	Measuring voltage, current, resistance	D
RH - 2	Frequency Generator	5	Frequency calibration	B
RH - 3	FM/AM Signal Generator	5	Signal calibration	B
RH - 4	Digital RMS. Multimeter - 20MHz	5	RMS measurement	B
RH - 5	High Voltage Meter - 40KV	5	Measuring high voltage	B
RH - 6	Oscilloscope	5	Measuring waveform	B
RH - 7	Syncloscope	5	Measuring synchronous waveform	B
RH - 8	Voltage Changer 0-20 V with Meter	20	Generating variable voltage	A
RH - 9	Radio Set	20	For practical training	A
RH - 10	Radio Training Kit - 10 main parts	10	For practical training	B
RH - 11	Radio Training Kit - 60 main parts	10	For practical training	B
RH - 12	Both End Connector with cable - 0.5m, 1.25mm2	200	For electronic instruments	G
RH - 13	Soldering Station	10	Soldering	B
RH - 14	Decade Capacitance Box	2	For resistant load testing	B
RH - 15	Digital LCR Meter	2	Measuring inductance (L), Quality factor (Q), Capacitance (C), Resistance (R)	B
RH - 16	Regulated DC Power Supply - 0~30V	10	Stable voltage output	B
RH - 17	Low Frequency Oscillator - 0~500KHz	5	Measuring waveform	B
RH - 18	Voltmeter - AC300V	21	Measuring voltage	D
RH - 19	Ammeter - DC10A	21	Measuring current	D
RH - 20	Electronic Volt meter - DC1000V	21	Measuring voltage	D
RH - 21	Transistor Checker	10	Testing semiconductor	B
RH - 22	Noise Meter	5	Measuring sound level	B
RH - 23	Universal Counter	5	Measuring frequency, etc.	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
RH - 24	Semiconductor Training Set	10	For practical training	B
RH - 25	Electronic Circuit Training Set	21	For practical training	D
RH - 26	Radio Set T raining Set	5	For practical training	B
RH - 27	Digital Circuit Training Set	10	For practical training	B
RH - 28	Breadboard, Transistor & Resistance	10	Practical training on semiconductor circuit	B
RH - 29	Electronic Tool Set(six drivers, pincher, radio pincher, nipper,six files, soldering iron, and tool set)	20	Basic tools	A
RH - 30	Television Set for Training	3	For practical training	F
RH - 31	Electric fan Set for Training	3	For practical training	F
RH - 32	Tape Recorder Set for Training	3	For practical training	F
RH - 33	Stereo Cassette Recorder for Training	3	For practical training	F
RH - 34	Electric Iron for Training	3	For practical training	F
RH - 35	Electric Heater for Training - 1kw	3	For practical training	F

Welding

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
WL - 1	Small Arch Welding Set	5	Arc welding	B
WL - 2	Portable Spot Welding Set 3kVA	5	Spot welding	B
WL - 3	semiautomatic Gas Welding & Cutting Machine Set	3	Welding & cutting metal	F
WL - 4	Set of Cutting & Welding Equipment (regulator, twin house, welding torch,cutting torch,set of tips,tip cleaner,igniter,oxygen and acetylene cylinders)	3	Welding & cutting metal	F
WL - 5	Cutting Support	3	Supporting material	F
WL - 6	Welders Handshield	21	Face Protection	E
WL - 7	Welding Apron	21	Body Protection	E
WL - 8	Welding Gloves	21	Hand Protection	E
WL - 9	Twist Drill Set-25pcs	5	Drill bit	B
WL - 10	Electric Portable Drill 10mm-13mm/220V	5	Drilling	B
WL - 11	Air Compressor 500L/min	1	Compressed air supply	C
WL - 12	Angle Grinder Portable - ø115mm, AC220V/600W	5	Grinding	B
WL - 13	Allen Key Set 2 to 10mm	10	Tightening / loosening hex bolt	B
WL - 14	Vernier Caliper 150mm	10	Measuring length, height, diameter, depth	B
WL - 15	Engineers Level - 300mm	5	Checking level	B
WL - 16	Letter Stamp Set - 26 letters	1	Alphabet punching set	C
WL - 17	Number Stamp Set	1	Number punching set	C
WL - 18	Hand Vise - 50mm wide, 35mm Span	10	Clamping material	B
WL - 19	Welders tipped Hammer - 300mm	10	Removing spatter / slag	B
WL - 20	Oxygen and Acetylene Bottles Car Transport	3	Gas cylinder transport	F

Industrial Electricity

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
IE - 1	Electric Motor - 1phase, AC220V/50HZ, 0.2kW	5	Spiral cage type, Condenser start up	B
IE - 2	Electric Motor - 3phase, AC380V/50HZ, 0.4kW	5	Spiral cage type	B

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
IE - 3	Electric Motor - 3ph. 2speeds,AC380V/50HZ,0.4kW	5	Open variable pole & cage type	B
IE - 4	Electric Motor - 3phase, AC380V/50HZ, 0.75kW	5	Spiral cage type	B
IE - 5	Electric Motor - 3phase, AC380V/50HZ, 1.5kW	5	Spiral cage type	B
IE - 6	Magnetic Contactor - AC220V 2P, 0.2kW	21	Motor control	D
IE - 7	Magnetic Contactor - AC220V 3P, 1.5kW	21	Motor control	D
IE - 8	Push Button Box - 2P	21	Electric circuit control	D
IE - 9	Push Button Box - 3P	21	Electric circuit control	D
IE - 10	Push Button Box - 4P	21	Electric circuit control	D
IE - 11	Push Button Box - 5P	21	Electric circuit control	D
IE - 12	Over Load Relay for Contactor - AC380V/ 20A	21	Motor protection, Thermal type	D
IE - 13	Time Relay - AC220V, 60min	21	Electric circuit control	D
IE - 14	Time Relay - AC380V, 10min	21	Electric circuit control	D
IE - 15	Manual Star-Delta Starter Switch - AC380V	21	Motor start up	D
IE - 16	Manual Direct Starter Switch - AC380V	21	Motor start up	D
IE - 17	Automatic Star-Delta Starter - AC380V	21	Motor start up	D
IE - 18	Board for Training - 60 x 90cm	21	Plywood Board for wiring training	D
IE - 19	Multimeter - ~1000VAC	21	Electric measurement	D
IE - 20	Power Factor Meter - Switchboard internal type	5	Factor Meter measurement	B
IE - 21	Electroscope - 100~6000V	21	Electric charging detection	D
IE - 22	Electrolod - 500V	21	Electric charging detection	D
IE - 23	Indicator w/Alarm and Illumination	21	Switchboard internal indicator	D
IE - 24	Clamp Meter - AC0~200A/ 0-600V	5	Electric current measurement	B
IE - 25	Circuit Breaker - 2P/ AC220V/ 25AT/ 50AF	21	Electric circuit break	D
IE - 26	Circuit Breaker - 3P/ AC380V/ 25AT/ 50AF	21	Electric circuit break	D
IE - 27	Knife Switch - 2P, 25A	21	Electric circuit control	D
IE - 28	Knife Switch - 3P, 25A	21	Electric circuit control	D
IE - 29	Terminal Board - 10P, 4m/m2	21	Electric connection	D
IE - 30	Electric Power Supply - AC220~380V	3	Variable power supply	F
IE - 31	DC Motor - DC220V/ 0.2Kw	3	DC Motor for practical training	F
IE - 32	Voltmeter - AC 0-400V	2	Electric voltage measurement	B
IE - 33	Ammeter - AC 0-50A	2	Electric current measurement	B
IE - 34	Frequency meter - Analogue 50Hz	1	Frequency measurement	C
IE - 35	Tachometer, Electronic contact type - 1~10000rpm	1	Measuring rotation	C
IE - 36	Wattmeter - 1 phase/ 220V	1	Integrated wattmeter	C
IE - 37	Wattmeter - 3 phase/ 380V	1	Integrated wattmeter	C

Printing and Production of Teaching Material

Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
PP - 1	Photo Copying Machine(A3,Monochrome)	1	Copying	H
PP - 2	Duplicating Machine - A3, AC220V	1	Mimeograph type	H
PP - 3	Scanning Machine for Stencils - AC220V	1	Processing block copy	H
PP - 4	Accessories(2 kinds of stencil, ink & needle)	10	For printing	H
PP - 5	OHP for Training	2	Projector	H
PP - 6	Personal Computer	1	Documentation calculation, etc.	H

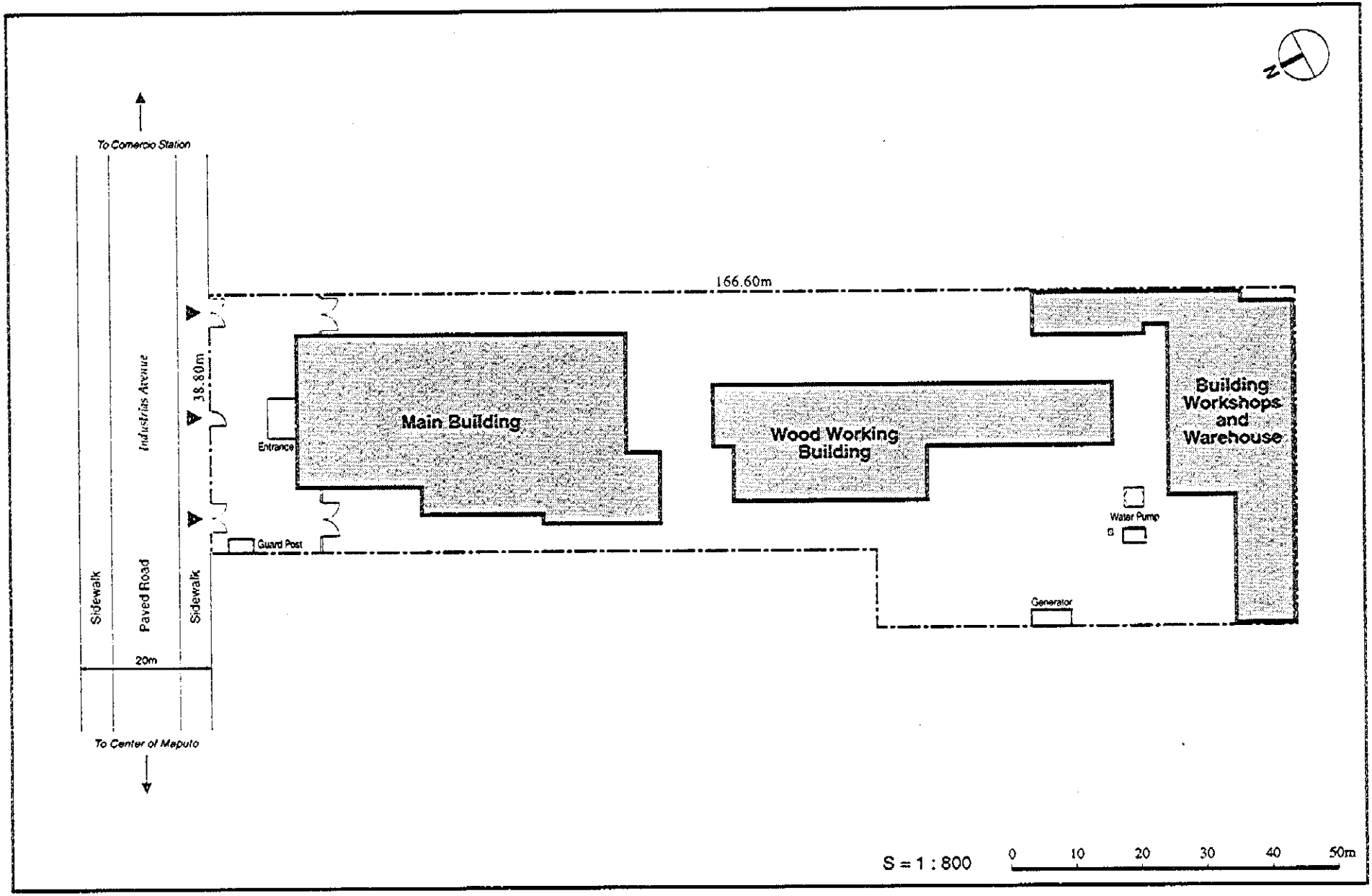
Code	Item / Short Spec.	Q'ty	Purpose / Remarks	Type
PP - 7	Laser Printer - A3, Monochrome	1	Printing	H
PP - 8	Floppy Disc - 3.5in, 1.4MB	2	Data back up	H
PP - 9	UPS - 500VA/ AC220V	1	For personal computer	H

(3) Drawings

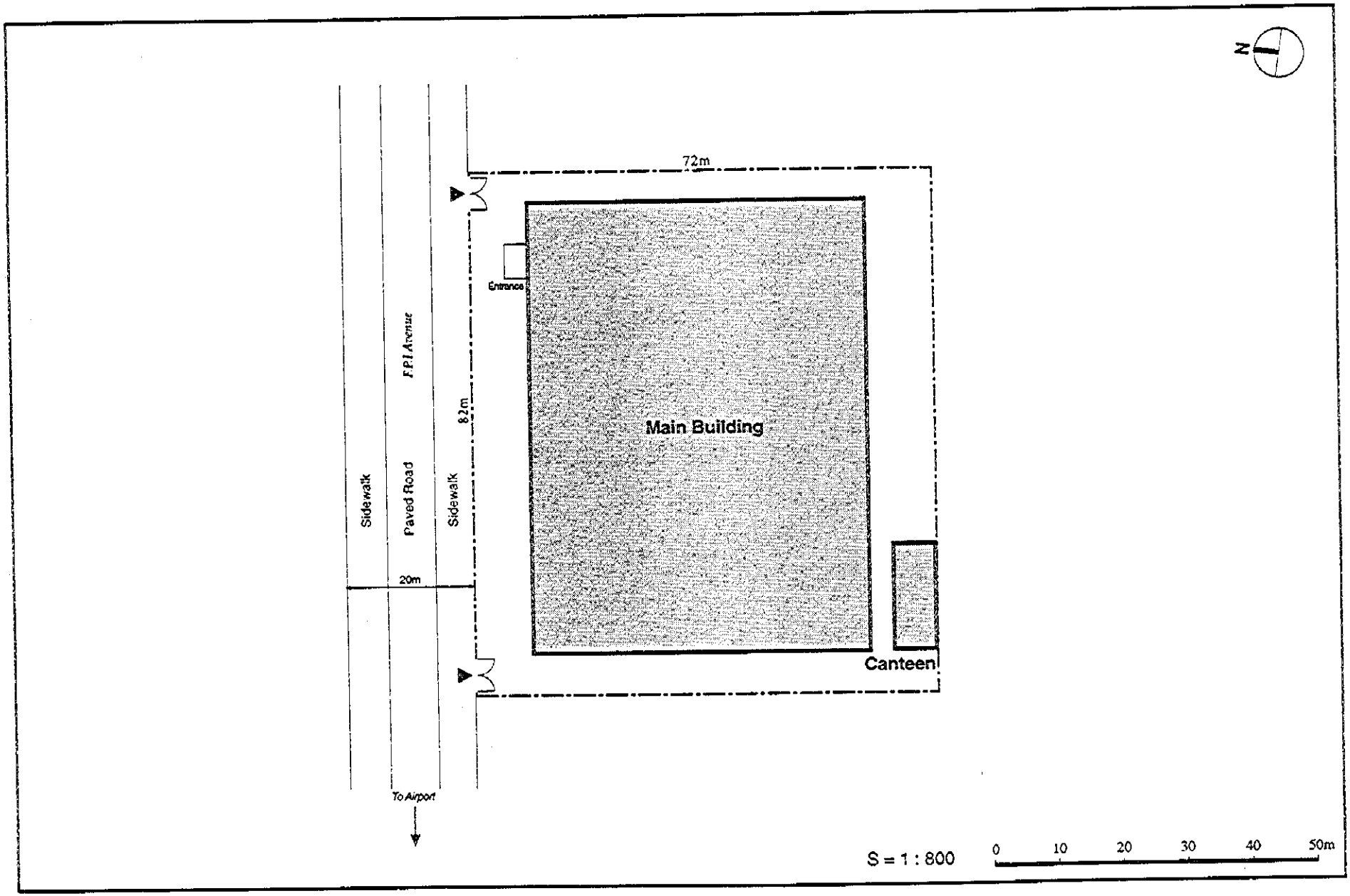
1) Site Drawings

2) Facilities Layout Drawings

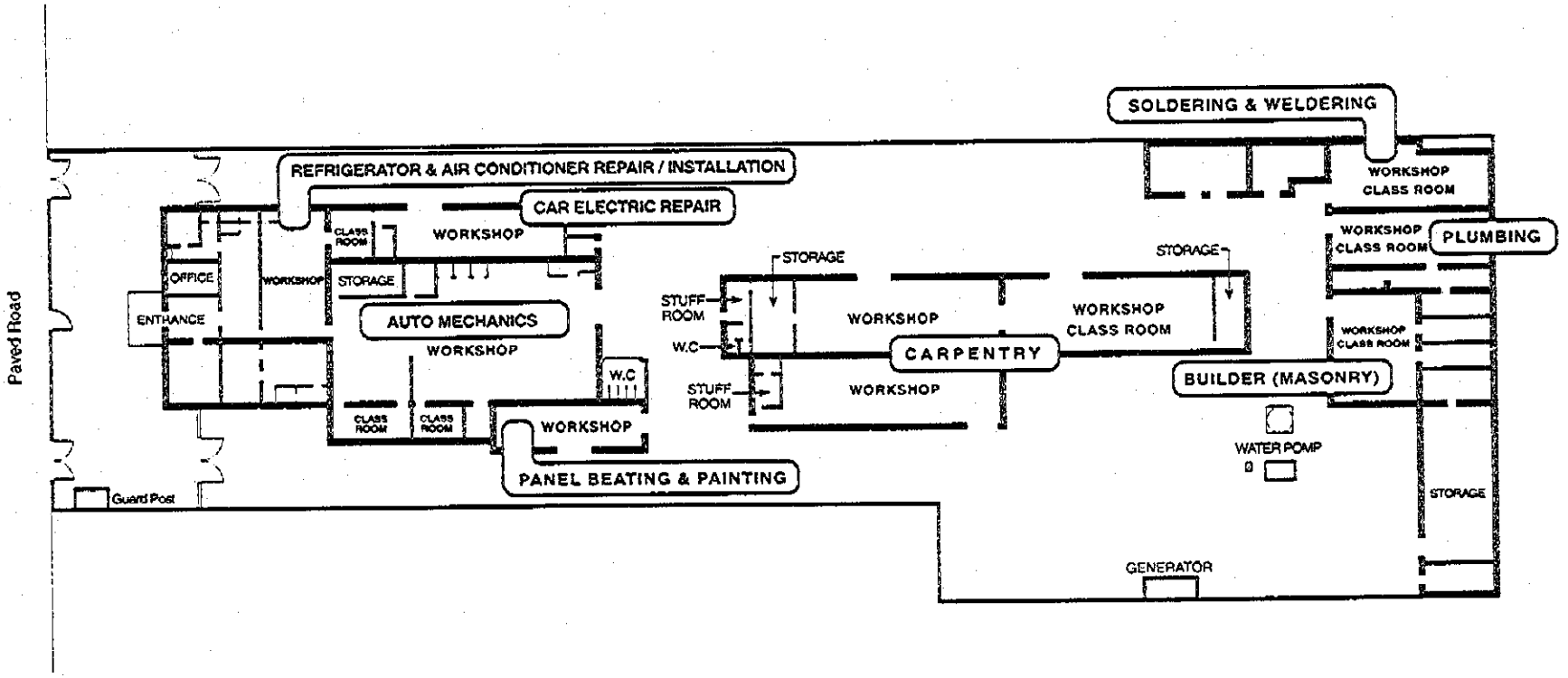
3) Equipment Layout Drawings



MACHAVA VOCATIONAL TRAINING CENTER



ELECTRIC VOCATIONAL TRAINING CENTER



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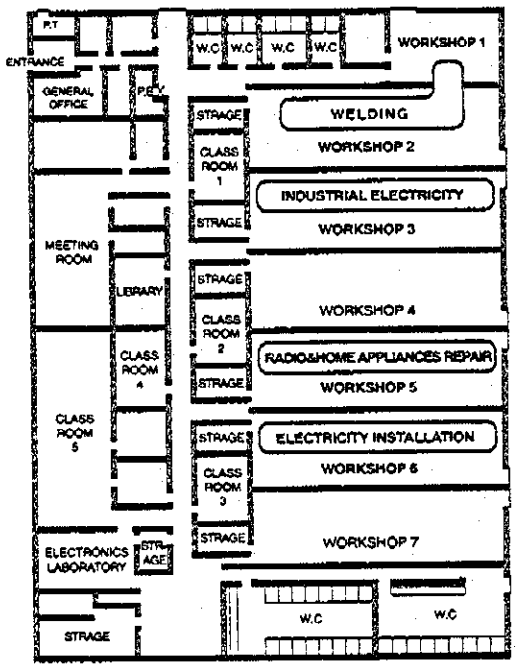

N

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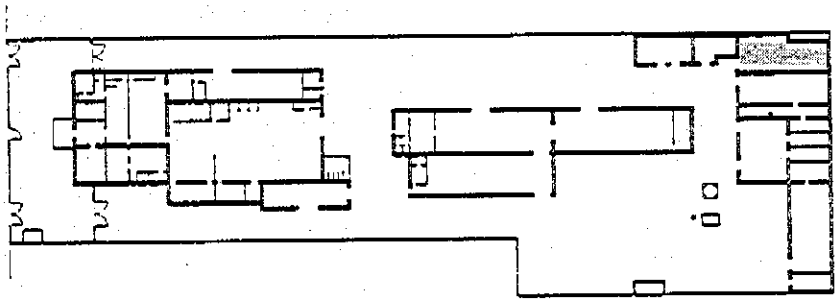

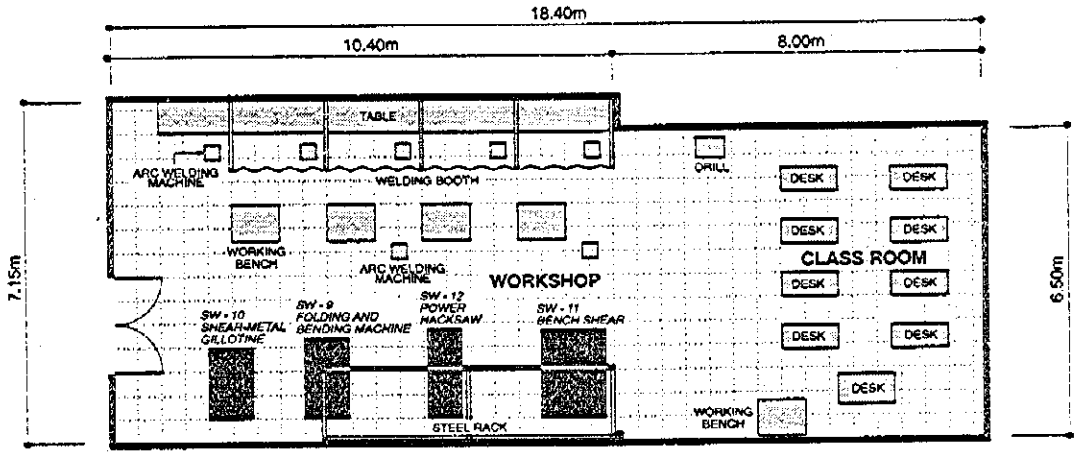

SOLDERING & WELDERING

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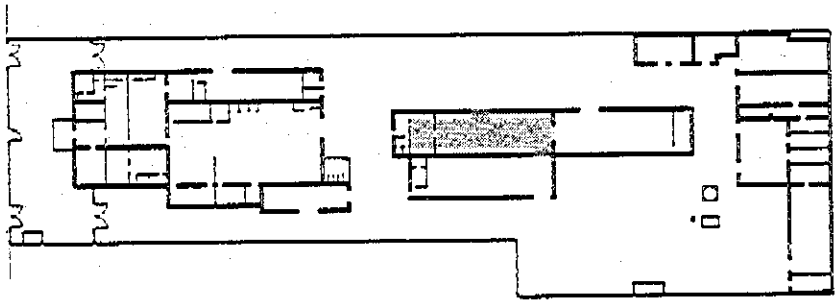

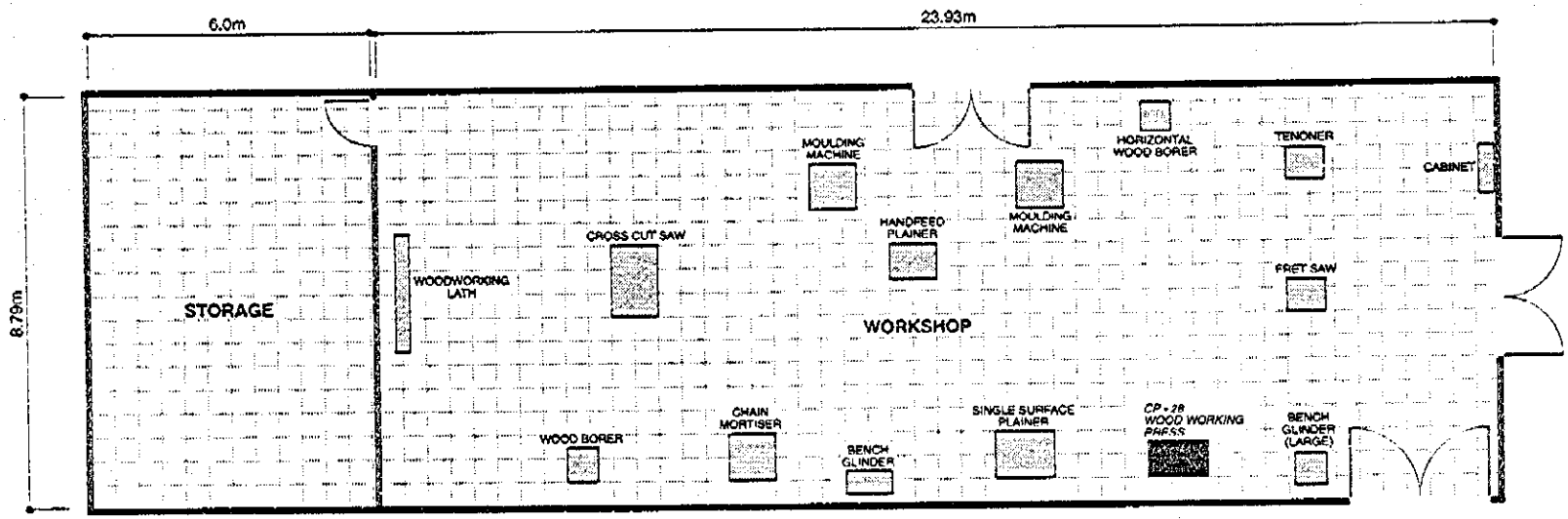

CARPENTRY 1/3

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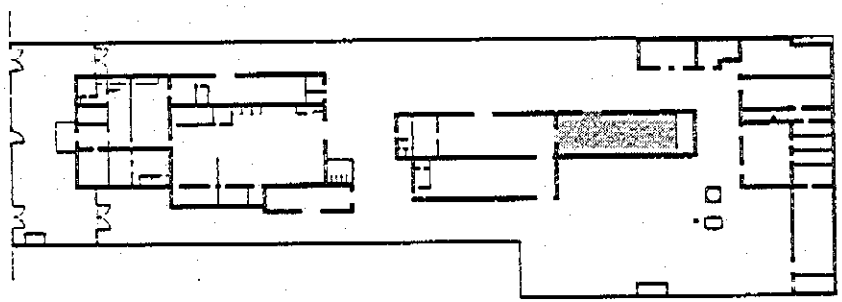

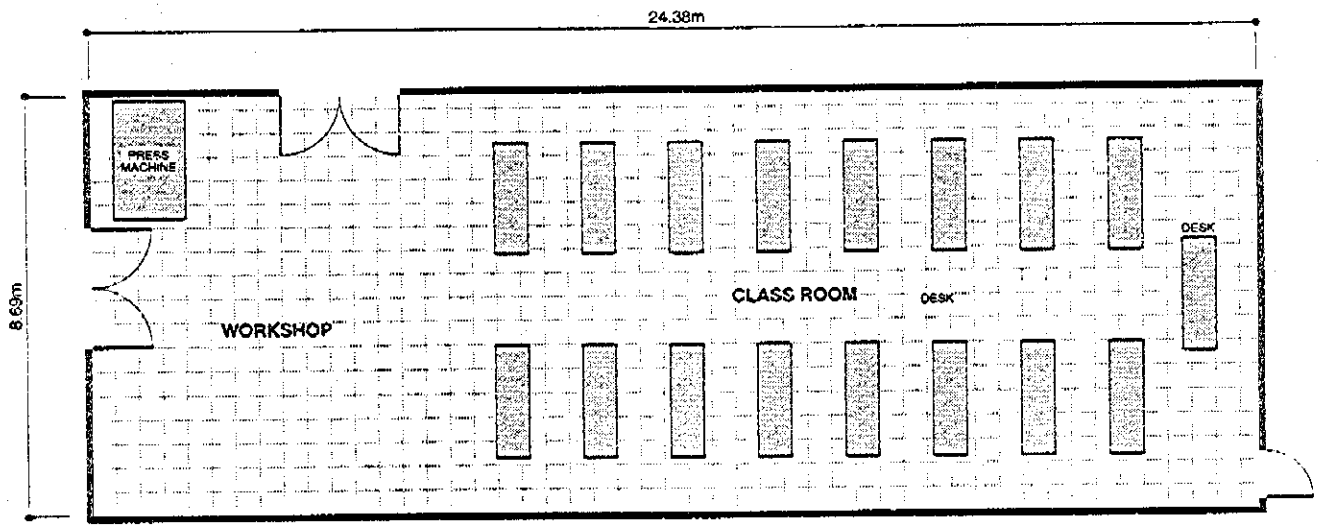

CARPENTRY 2/3

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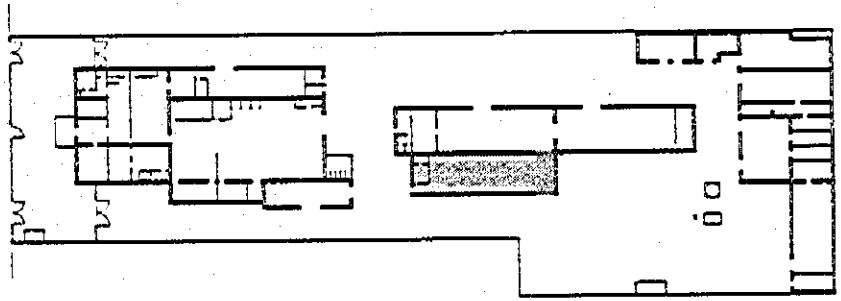

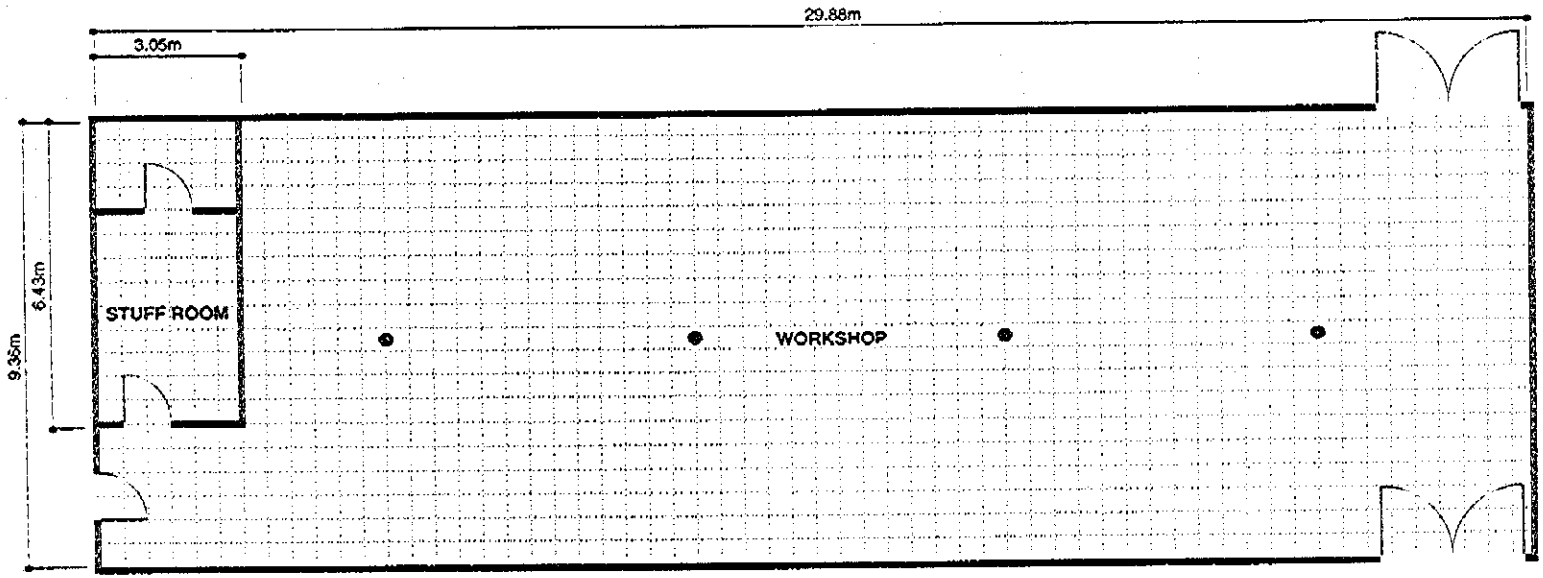

CARPENTRY 3/3

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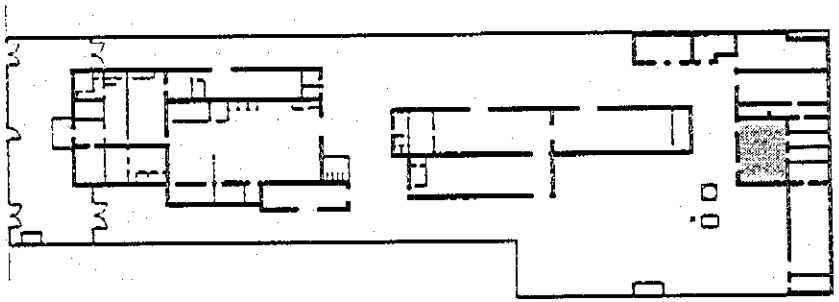

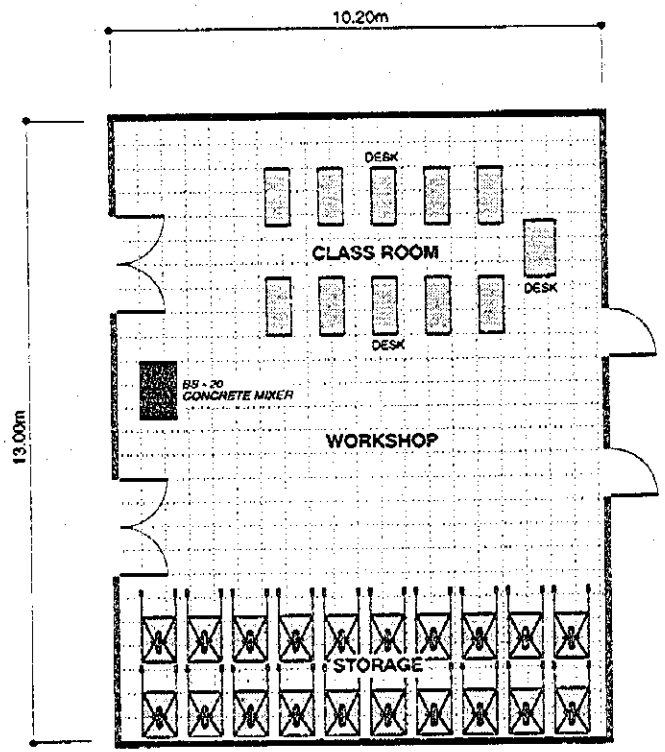

BUILDER (MASONRY)

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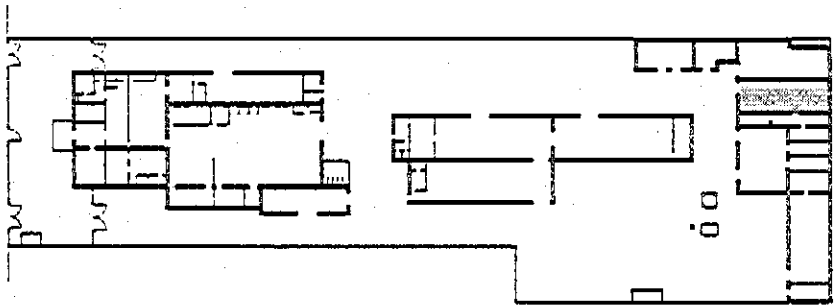

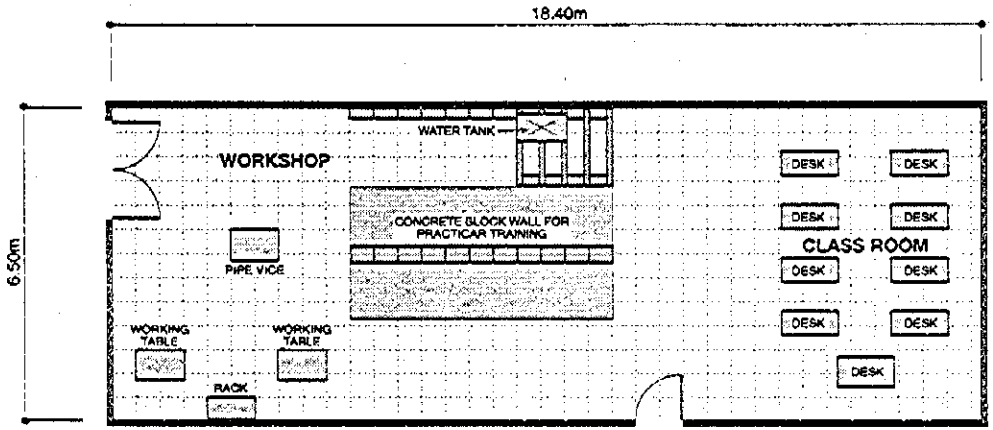

PLUMBING

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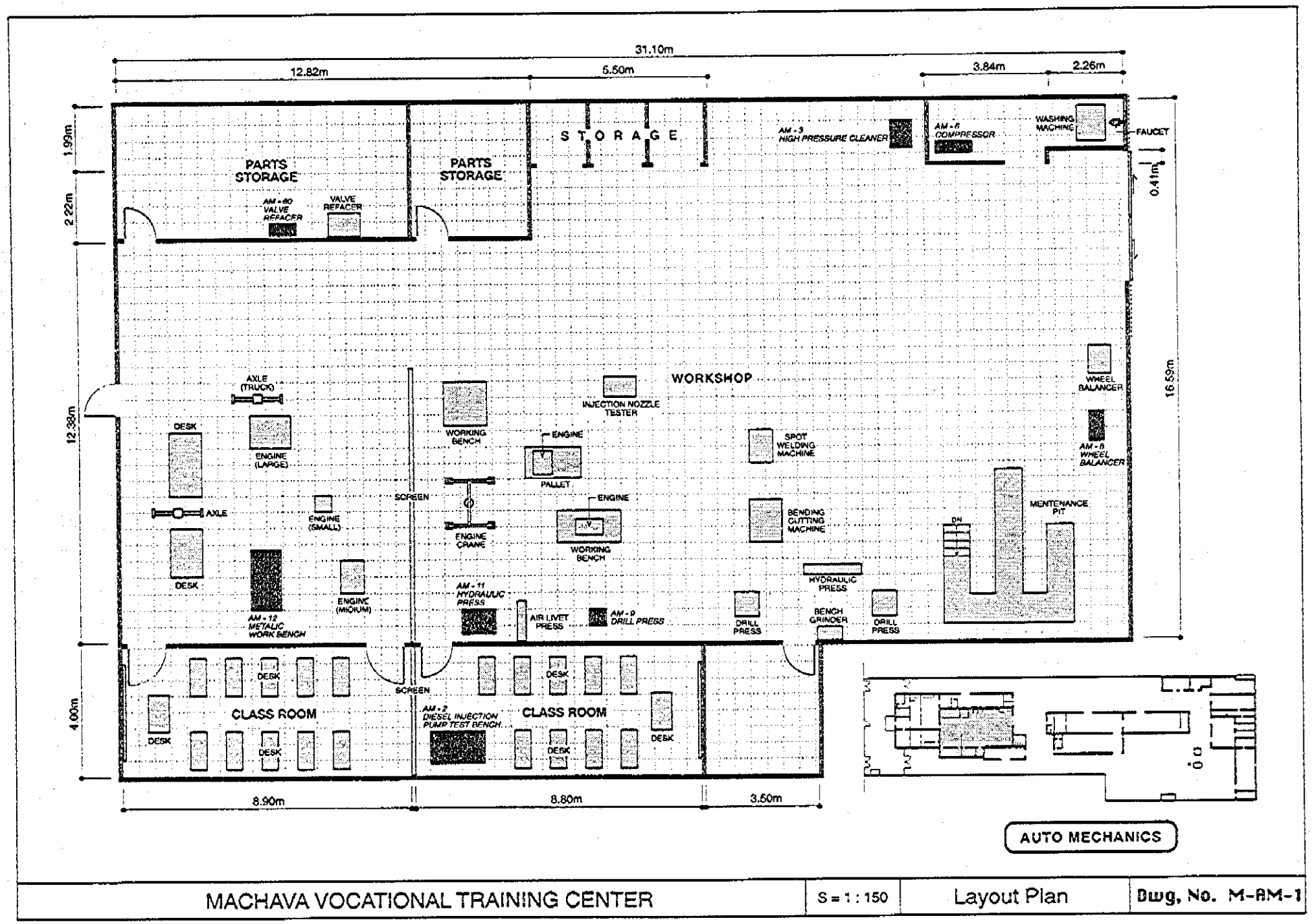

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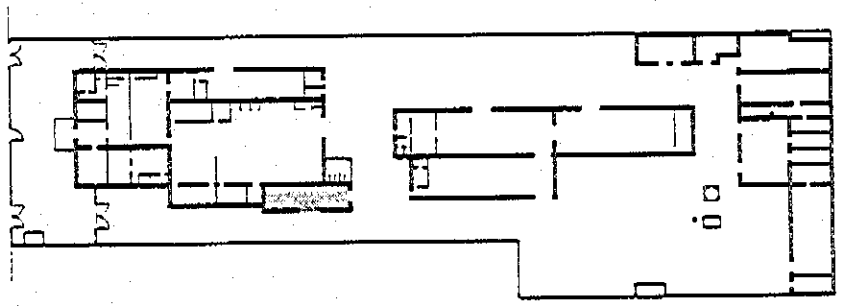

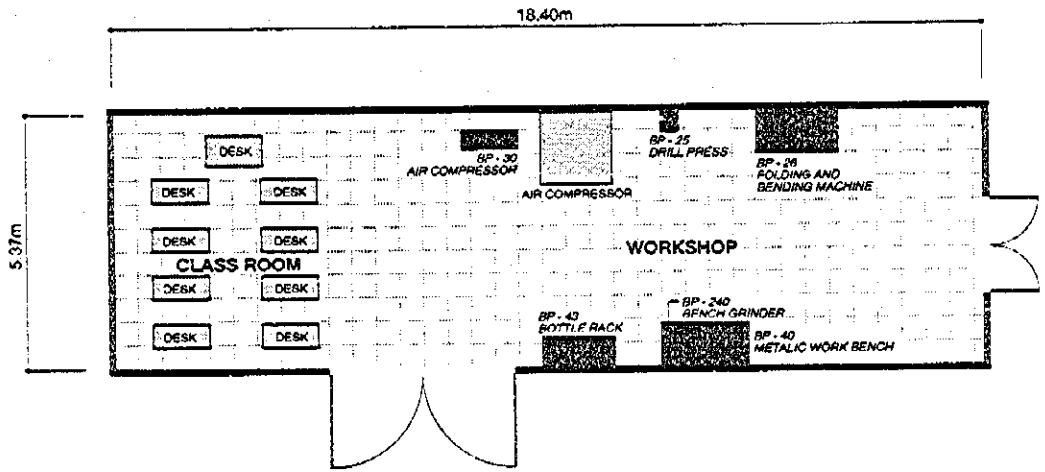

PANEL BEATING & PAINTING

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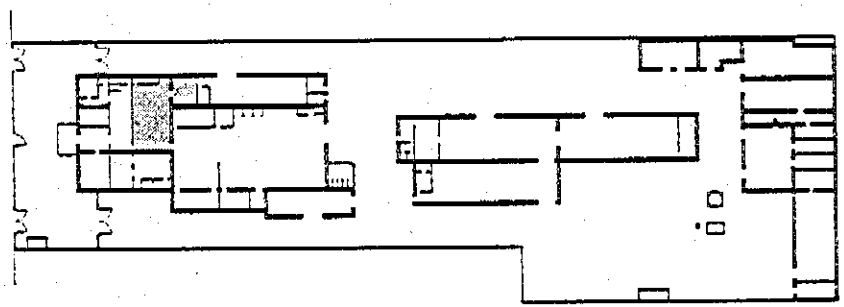

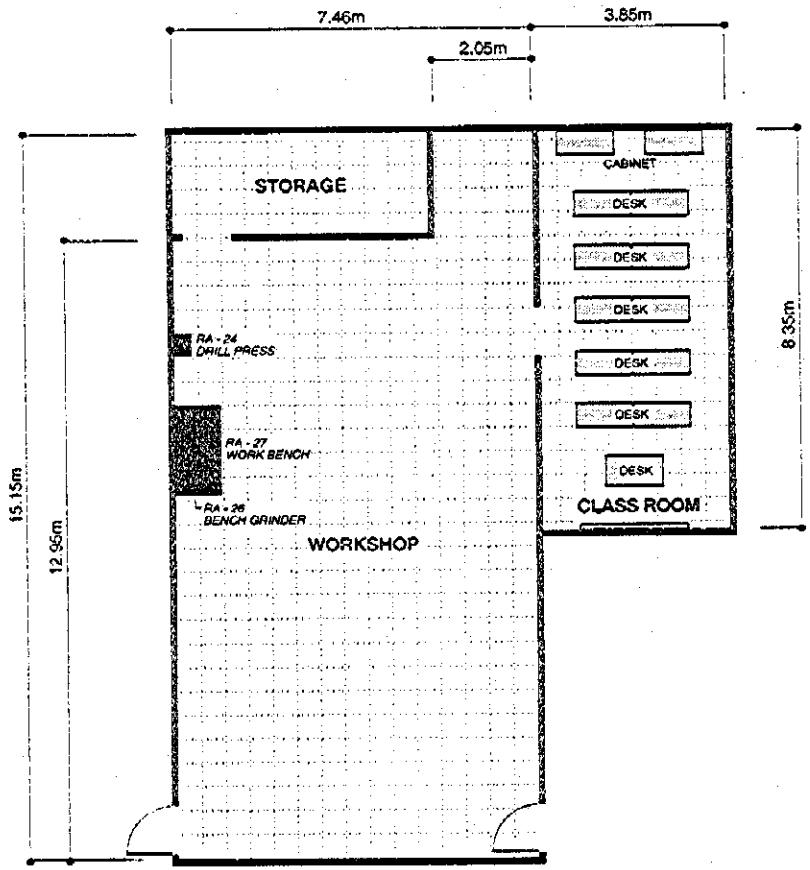

REFRIGERATOR & AIR CONDITIONER REPAIR / INSTALLATION

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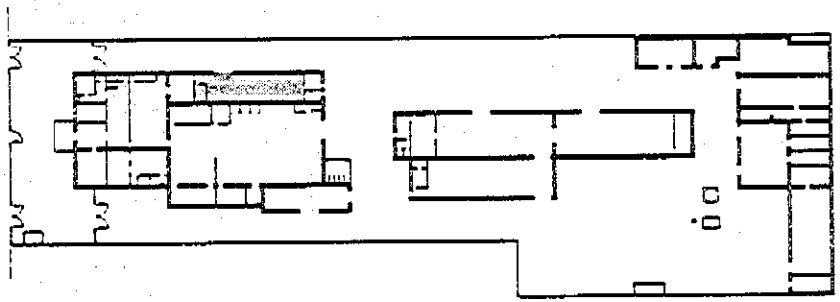

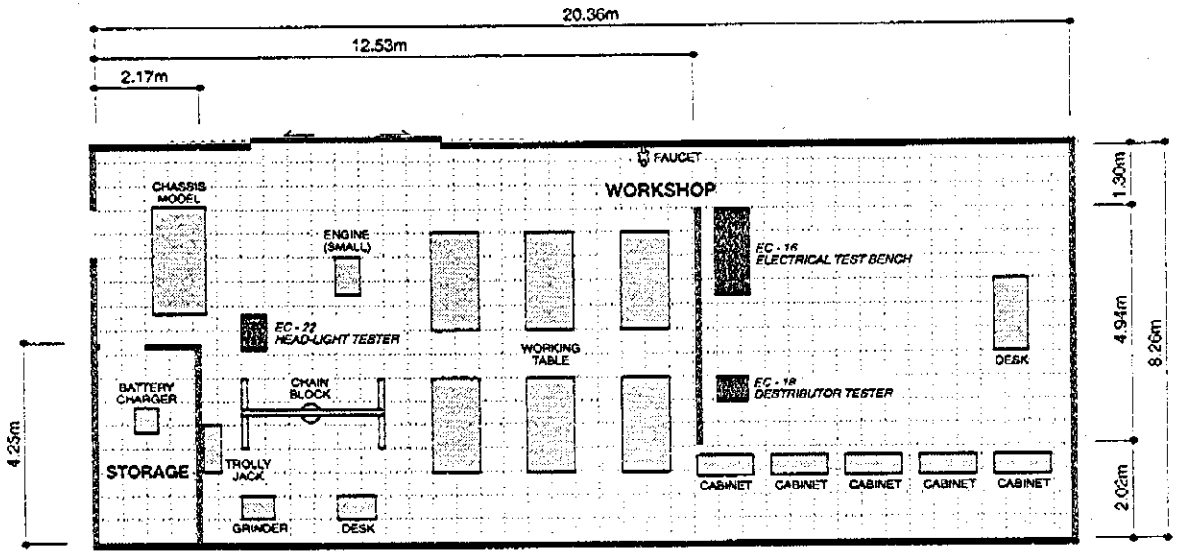

CAR ELECTRIC REPAIR

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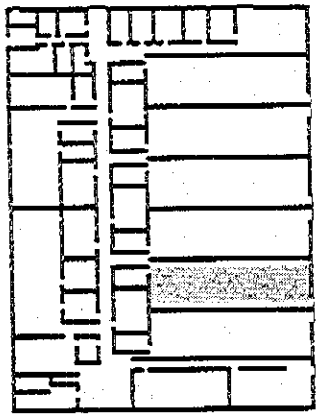
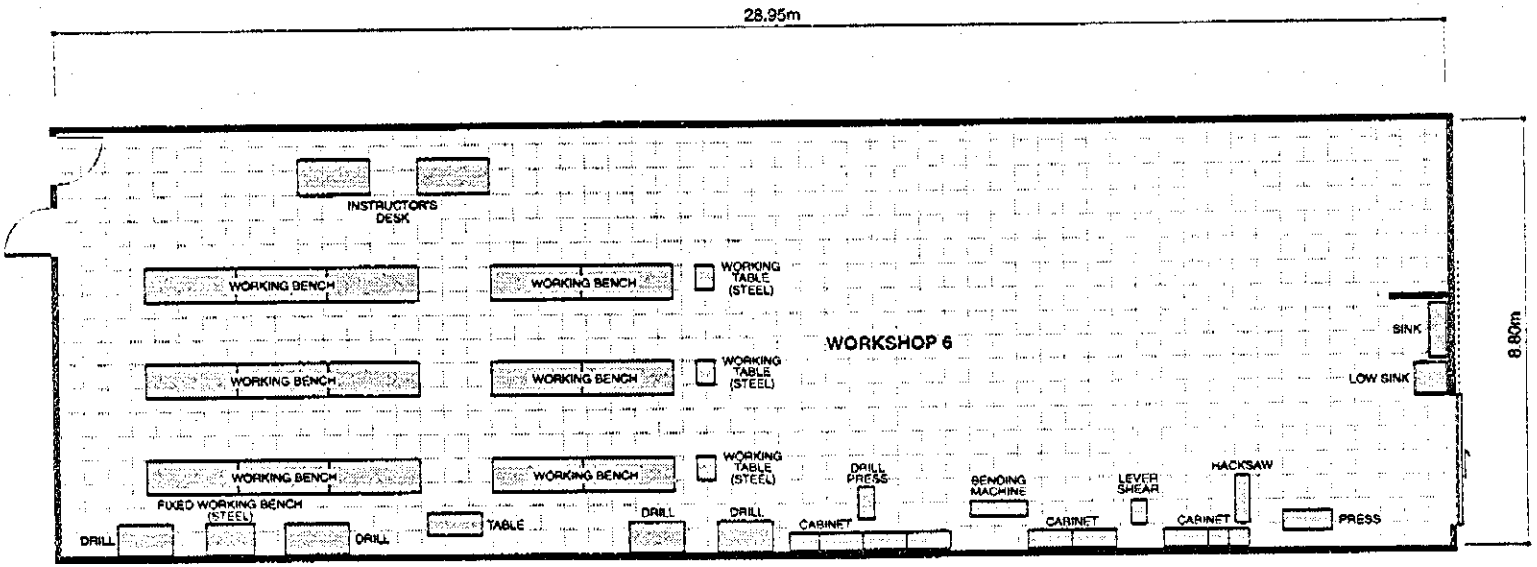
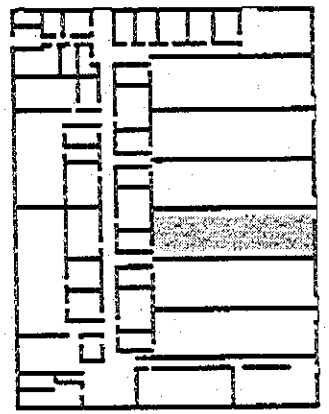
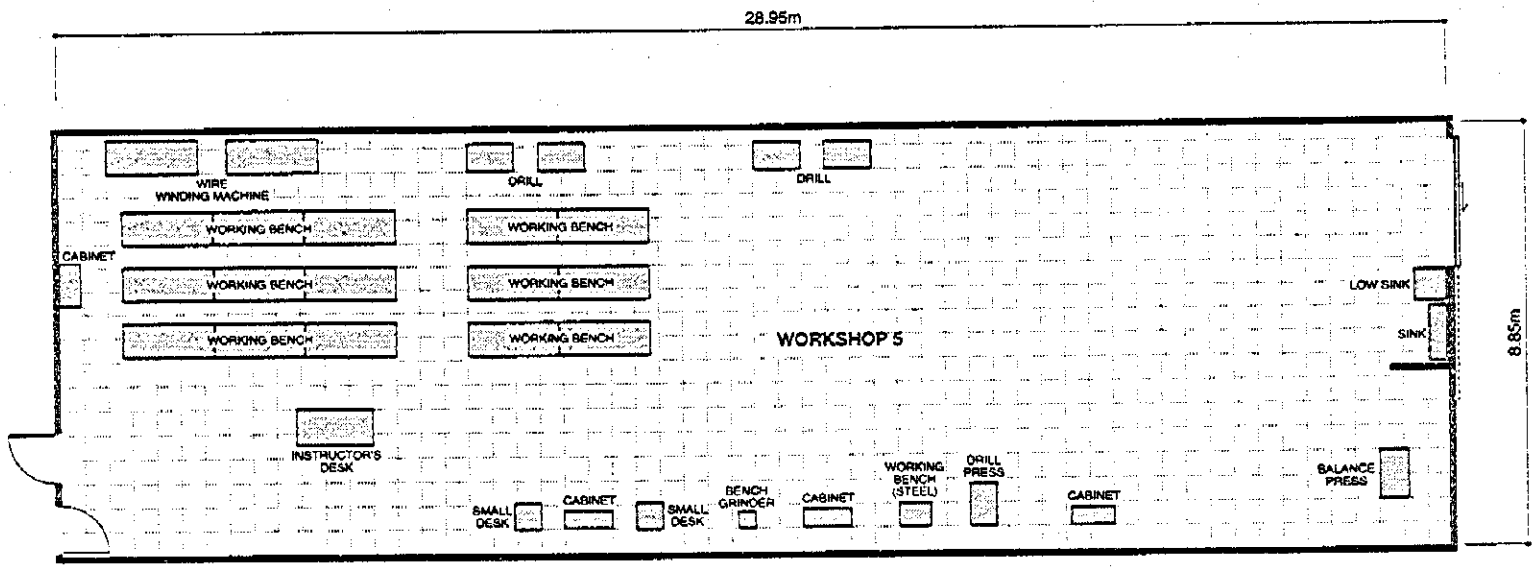




ELECTRICITY INSTALLATION

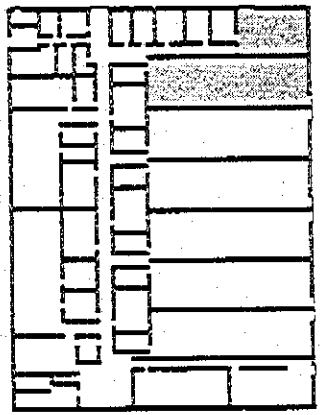
ELECTRIC VOCATIONAL TRAINING CENTER	S = 1 : 150	Layout Plan	Dwg, No. E-EI-1

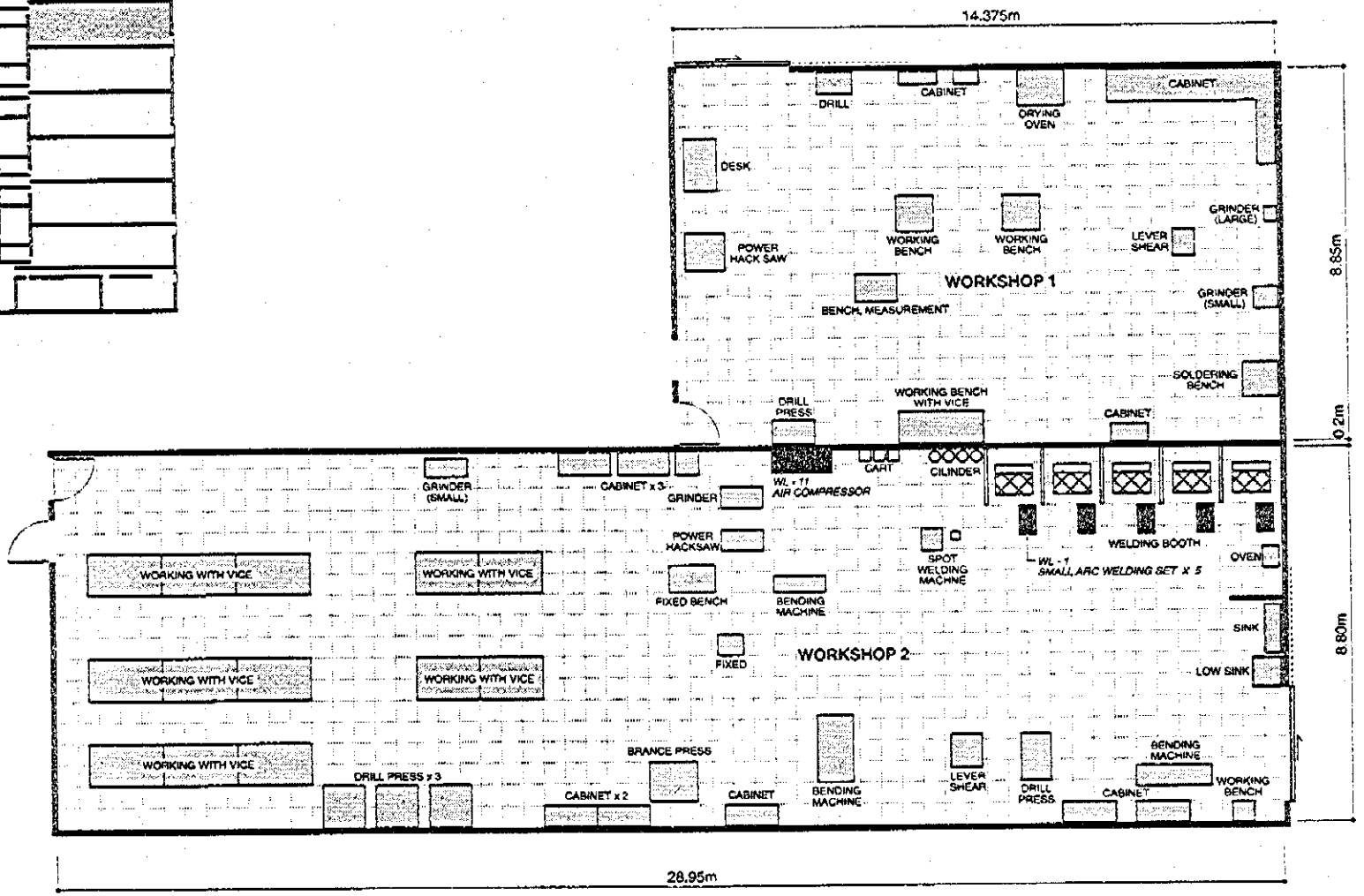




RADIO&HOME APPLIANCES REPAIR

ELECTRIC VOCATIONAL TRAINING CENTER	S = 1 : 150	Layout Plan	Dwg, No. E-RH-1





WELDING

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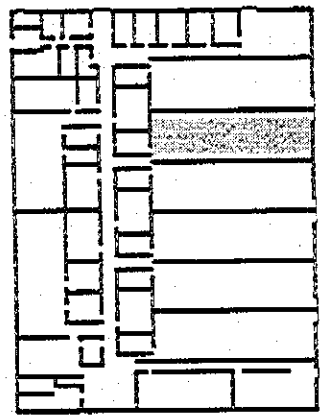
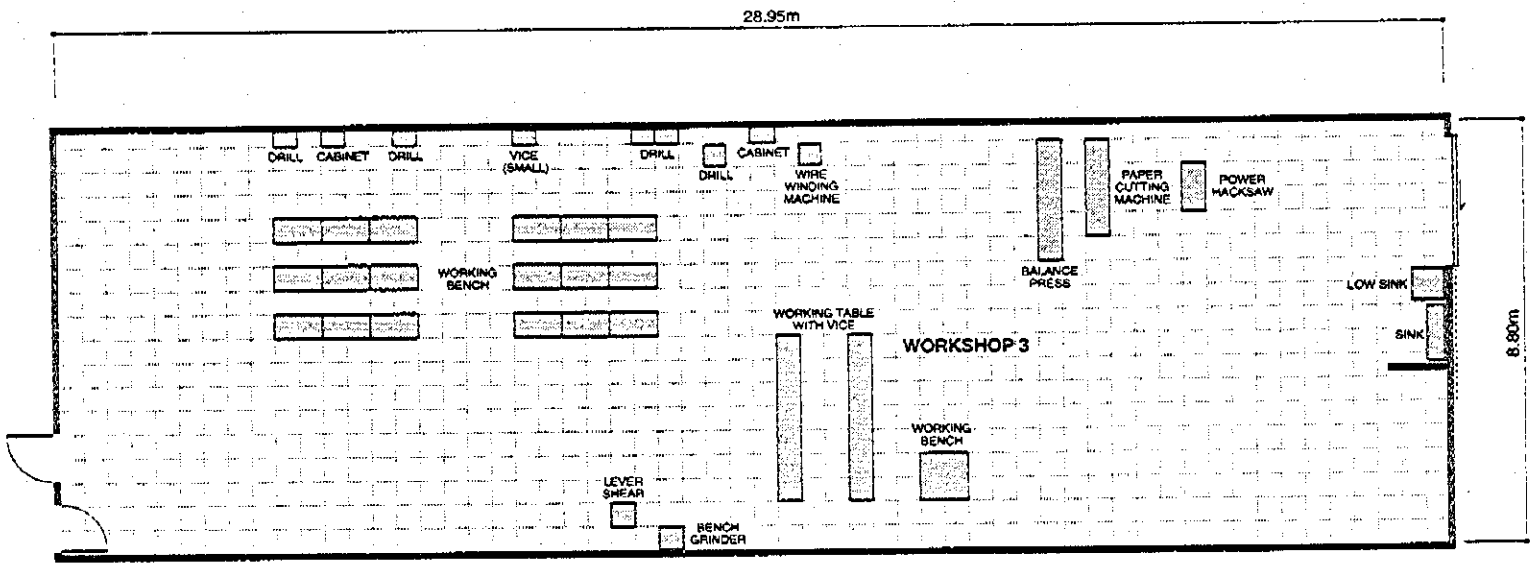




INDUSTRIAL ELECTRICITY

ELECTRIC VOCATIONAL TRAINING CENTER	S = 1 : 150	Layout Plan	Dwg, No. E-IE-1

CHAPTER 3 Implementation Plan

CHAPTER 3 Implementation Plan

3-1 Implementation Plan

3-1-1 Implementation Concept

(1) Project Implementation

The INEFP which is under the jurisdiction of the Ministry of Labor is the institution in charge of implementing this project in Mozambique.

Following the signing of the Exchange of Notes (E/N) between the government of Japan and the government of Mozambique, a Japanese consultant firm will sign a contract with the government of Mozambique to carry out the implementation design of this project and to supervise its implementation. In addition, the government of Mozambique will sign a contract with a Japanese firm which will provide and install the equipment in this project under the supervision of the Japanese consultant firm. Upon completion of equipment provision and installation, the operation and management of the equipment will be carried out by the Machava Vocational Training Center and the Electric Vocational Training Center, managed by the INEFP.

(2) None of the equipment which will be provided in this project requires highly specialized technical knowledge to install or set up. Respective technical personnel relevant to machinery/ automotive equipment and electricity/ electronics will be sent from the domestic local agent or the supplier in South Africa. These persons will install and set up the equipment and provide instruction on their operation, storage and maintenance.

This project will be implemented as a grant aid project of the Japanese government and the following policies on its implementation are desired.

1) A thorough exchange of opinion is carried out between the implementing agency of the government of Mozambique, the Japanese consultant firm, and the Japanese firm in charge of equipment provision and installation; a favorable dialogue is maintained; and the project is implemented efficiently.

2) Detailed scheduling and arrangements between project implementation and the educational curriculum are carried out in order to avoid any disruptions in the training sessions at the centers.
3) The scope of responsibility of the parties in charge of the electricity, water supply and other related utilities is clearly delineated in order to implement the project efficiently and effectively.
4) Equipment breakage or damage will be avoided during the temporary storage and transport of the equipment.

3-1-2 Implementation Conditions

The following considerations will be taken in project implementation.

(1) The majority of the equipment in this project will be supplied locally or from South Africa. In order to minimize late delivery of equipment or to avoid the loss of small parts or equipment, the equipment will be inspected at the procurement site and at the time of delivery. In addition, project personnel will be constantly informed about the details of the delivery process, in order to ensure that the project implementation schedule is not impeded.

(2) Import tax is levied on all commodities imported into Mozambique, including aid related commodities; and there are no tax exemptions at the time the items are imported. Hence in the case of aid related commodities sent from foreign countries, the beneficiary ministry must submit a budget equivalent to the amount of the import tax to the Ministry of Finance. This application must be submitted together with the shipping and other pertinent documents to the Ministry of Finance and authorization must be received. Hence meticulous communication with the Ministry of Labor and other related institutions must be pursued, in order to rapidly expedite the preparatory procedures required for project implementation.

3-1-3 Scope of Works

The divisions in the scope of works which will be undertaken by the respective Japanese and Mozambique sides have been compiled below.

Table 3.1. Scope of Works

Work Content	Japanese Side	Mozambique Side
(1) Equipment		
1) Equipment procurement	O	
2) Equipment installation, set up	O	
3) Test operation, adjustment	O	
4) On site guidance, instruction on equipment operation	O	
(2) Custom and import procedures		
1) Transport to and within Mozambique	O	
2) Appropriate budget pertaining to import tax on project equipment		O
3) Custom clearance procedures		O
(3) Payment of B/A fees to the bank in Japan with foreign exchange services		O
(4) Expedite immigration procedures for Japanese project personnel to allow stay in Mozambique		O
(5) Carry out appropriate and effective operation and management of equipment provided under grant aid		O
(6) Responsible for bearing the costs of all required expenditures not included in the grant aid such as construction of facilities, transport , installation, and set up of equipment.		O
(7) Obtain all permits and authorizations required in order to implement project		O

3-1-4 Consultant Supervision

A detailed supervisory plan on project implementation will be drawn up following thorough discussions with the Mozambique side. The respective consultant engineer who is in charge of the specific role will be sent to the project site at the appropriate time and will supervise the implementation of the project efficiently and effectively. In particular,

one responsible engineer will be stationed throughout the duration of the project to oversee equipment transport, installation, inspection, and the final hand over to the Mozambique side.

The following major measures in project supervision will be pursued.

(1) Meticulous adjustments will be made with the Mozambique side from the detailed design stages, in order to ensure that the machinery is procured and installed efficiently.

(2) Prior to the purchase of the machinery, the firm which will deliver the equipment will be asked to submit an implementation plan. This plan will be thoroughly studied to determine the appropriateness of the procurement, equipment specifications, etc.

(3) Prior to equipment delivery, the procured machinery will be inspected at the shipping warehouse to see that the equipment meets the design demands in terms of specifications, content, quantity, etc. If any adjustments are necessary, the appropriate instructions will be given and the necessary corrections made.

(4) At the time of equipment delivery and hand over, the equipment will be checked for appropriate installation and set up, in addition to instructions for suitable operation, maintenance and control.

(5) In order to efficiently implement the project, meticulous and constant communication between the Mozambique side, the Japanese consultant firm, and the equipment sales firm will be maintained and adequate consultations will be carried out.

3-1-5 Procurement Plan

Much of the industrial machinery and equipment in Mozambique have been imported from the United States, European countries, South Africa, China, Japan, and other foreign countries. Of the equipment including imported goods which will be provided in this project can be procured from Mozambique or a third country, such as South Africa, other than Japan without compromising equipment quality or functions. In addition, the supply of spare parts, consumables, and after service care can be provided without difficulty.

The existing equipment at the two vocational training centers earmarked for this project is mainly former Soviet Union or East German products. None of the equipment

in this project will be used conjointly with the existing equipment. Therefore, it was not necessary to coordinate or adjust the equipment's standards.
Based on the aforementioned, all the equipment which will be provided by this project will be supplied locally (in Mozambique) or from a third country (South Africa).

The majority of the basic equipment such as wrenches, spanners, etc. can be supplied in Mozambique. However, machinery such as measuring instruments, electric tools, welding machines, etc. cannot be supplied locally and must be ordered and imported from South Africa or any other third country. Direct procurement and delivery from South Africa is also advantageous in terms of cost and reliable delivery.

Based on the above, a summary of the origins of where major equipment in this project will be procured, is given below.

Table 3.2. Origin of Major Equipment

Equipment	Origin
Basic tools (driver, snapper, wrench, etc.)	Mozambique
Electric tools, measuring instruments, welding machines, industrial machines, testing instruments	Third countries

Equipment and materials which are procured from South Africa (Johannesburg) will be transported overland to Mozambique (Maputo City) where they will be transported to the respective project site.

3-1-6 Implementation Schedule

Since this project will be implemented under Japanese government grant aid, tender documents will be drawn up after the E/N between the government of Japan and the government of Mozambique is signed. This is followed by the actual bidding and signing of contracts pertaining to equipment supply and installation. Lastly, equipment will be procured and installed. The project implementation schedule will be carried out according to the following stages.

(1) Implementation Design

1) Work in Japan/formulating tender documents

Following the field study which was carried out in accordance with the basic design study report, an implementation design is meticulously drawn up and tender documents are formulated. This work will require a period of 1.7 months.

2) Bidding activities

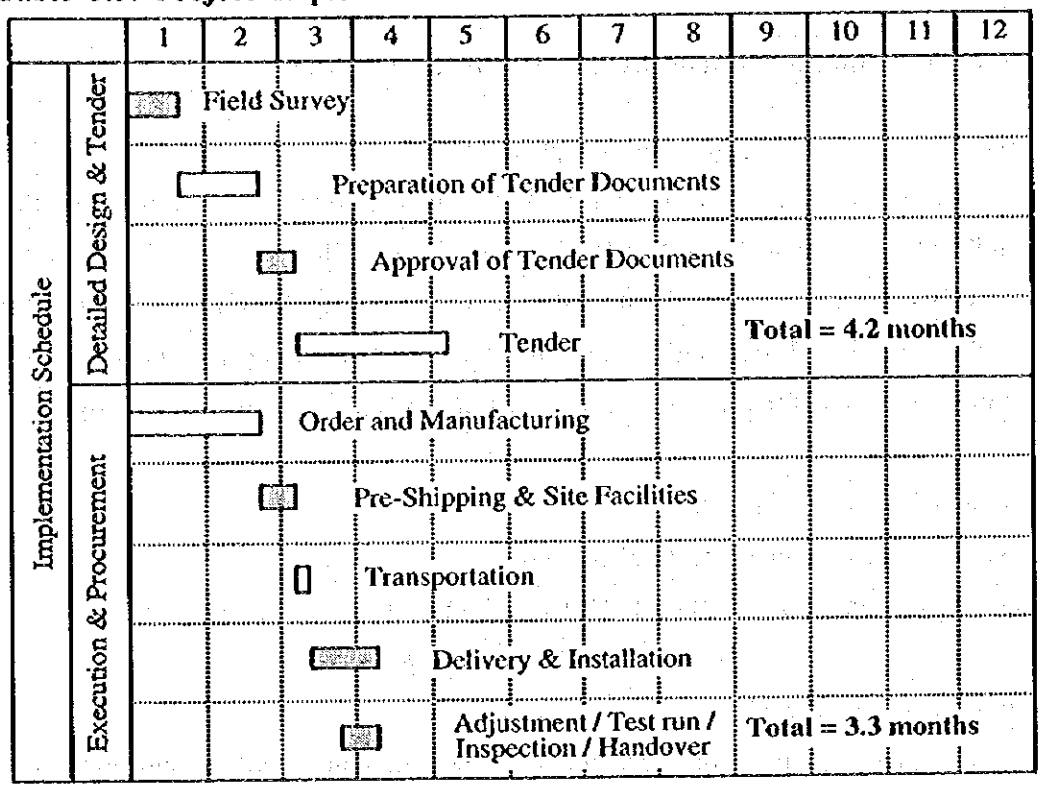
When the implementation design has been completed, confirmation work at the project site will be implemented. This is followed by advertising and recruiting participants in Japan to bid on this project's equipment procurement and installation work. The qualifications of the potential participants will be reviewed and the actual participants in the bidding process will be selected. Based on the results of this review, the project implementing agency will gather the participants and the bidding will begin in the presence of witnesses. This entire process will take about 2.5 months.

Based on the above, a total of 4.2 months will be required for project implementation design.

(2) Procurement/Supply

After the contract with the agent in charge of equipment procurement is signed, the supply/manufacture of equipment will begin with the authorization of the Japanese government. The period of time required to transport equipment from neighboring third countries, such as South Africa to Mozambique is estimated at 0.2 months. After the equipment has arrived at the sites, including from third countries, installation work will begin. Based on these estimations, the period required to implement and supply the equipment will take 3.3 months.

Table 3.3. Project Implementation Schedule



Legend:
Work in Japan Work Overseas

3-1-7 Obligations of recipient country

The work pertaining to this project which will be implemented by the Mozambique side is summarized below. In reference to this work, the Japanese side will inform the Mozambique side on payment periods and estimated costs and it will provide advice on the procedures required to secure the budget, etc.

(1) Calculate the budget pertaining to the import tax on equipment .

(2) Expedite custom clearance procedures for imported equipment.

(3) Pay B/A handling fees of the foreign exchange bank in Japan.

(4) Simplify procedures in immigration and expedite matters pertaining to the stay of Japanese personnel working in the project in Mozambique.

(5) Appropriately operate and effectively manage the equipment provided by grant aid.

(6) Pay all costs required to transport, install, and set up equipment and to construct facilities not included in the grant aid project.

(7) Fulfill procedures required to obtain all permits or licenses needed to implement the project.

3-2 Operation and Maintenance Plan

3-2-1 Cost Estimation Borne by the Recipient Country

(1) Expenses to be borne by the Mozambique Side

The expense which will be borne by the Mozambique side, including the B/A handling fee is estimated at MT 94.01MIL(about ¥0.920MIL).

This project is concerned only with renewing and supplementing equipment in existing facilities. It will not provide for direct costs stemming from infrastructural improvements, etc. for which the government of Mozambique is responsible for.

(2) Conditions on Cost Estimate

1) Period of Cost Estimate: December 1996

2) Exchange rate: US$1 = ¥110.0 ; U$1 = MT 11,140.52;
MT1 = ¥0.009874

3) Implementation period

The project which includes detailed design, equipment procurement and installation period is as shown in the work implementation schedule.

4) Others

This project will be implemented according to the procedures followed by all grant aid projects of the Japanese government.

3-2-2 Operations and Maintenance Costs

(1) Maintenance and Control

Maintenance and control of equipment in this project will be undertaken by the respective training center. With the exception of equipment which will be installed in each training room, all remaining equipment will be kept in the storage room or stored in the cabinets of the training rooms and lent out to trainees when needed. The equipment will be maintained and repaired by the staff technician or the instructor in charge of the course. The equipment provided in this project does not require highly specialized technical knowledge to operate and maintain and the present instructors are capable of doing so. However, in order to clearly designate the personnel responsible for equipment maintenance, a system which will assign regularly employed instructors or administrative staff members for this responsibility, is required.

(2) Maintenance and Control Costs

Equipment that will be provided by this project and which will incur maintenance and operation costs are the welding machines, machine tools and printing machines, etc. excluding hand tools. The price of consumables and spare parts is estimated at 0.5% of their original value of the equipment. The annual maintenance and control costs of the equipment is compiled below.

The ratio of annual maintenance and control costs of the budget for Machava Vocational Training Center is 39.9 percent, but as explained earlier, each training center's budget is basically comprised of operation, maintenance, and control costs when personnel costs, etc. are excluded. As a result, the maintenance and control costs are within the scope of the center's budget. Moreover, this ratio is based on the budget for currently existing facilities and equipment. The government of Mozambique is planning to provide an increased operating budget, which will cover new maintenance and control costs, when this project is implemented in 1997.

Table 3.4 Annual Maintenance and Control Costs (Machava Vocational Training Center)

Unit:MT

a) Electricity Costs:	Total load x Demand ratio x Average hours used x Number of days used per month x Electricity charge x 12 months	31kW x 0.5 x 3hr/day x 20 days x 744MT x 12 = 8,303,000
b) Water Costs	Volume of water used per month x water rate x 12 months	4 m2/month x 125,000mt/m^2 x 12 months = 6,000,000
c) Cost of Consumables/Spare Parts	Total cost of equipment x 0.005	5,511,000,000 x 0.005 = 27,555,000
d) Total		41,858,000 (US$4,709)
e) Budget Ratio		39.9%

Table 3.5 Annual Maintenance and Control Costs (Electric Vocational Training Center)

Unit:MT

Electricity Costs	Total load x Demand ratio x Average hours used x Number of days used per month x Electricity charge x 12 months	27kW x 0.5 x 3hr/day x 20 days x 744MT x 12 = 7,232,000
b) Cost of Consumables/Spare Parts	Total cost of equipment x 0.005	5,631,000,000 x 0.005 = 28,155,000
d) Total		35,387,000 (US$3,981)
e) Budget Ratio		14.3%

Note:
1) Electricity and water rates are from July 1996 to the present.
2) None of the equipment at the Electric Vocational Center uses water.
3) FY1995 budget was used to estimate the budget ratio of annual maintenance and control costs.
4) 1995 US$ exchange rate was used in the calculations (US$1=8889.6MT).