

4-4 Details of the Renovation Plan

A list of the projects of which the renovation plan is composed, is shown in Tables 4-4 (1) to 4-4 (3). The number given in parentheses in the following description refers to the number given in that table.

4-4-1 Renovation and Modernization of Production Facilities

(1) Renovation of Existing Production Facilities and Enhancement of Production Bases for Future Development

1) Repair and Replacement of Worn-out Machinery, Equipment and Facilities and Improvement of Bottlenecks

The projects to be implemented for this objective are listed in Table 4-5.

2) Rationalization of Production Lines for Future Expansion of the Production

a) No.3 HI AME Project Plants (#1-14) (System improvement of AME shops)

It is planned to make modifications of the layout as described below, along with the provisions for the production system in consideration given to increases in production of the products and expansion of the local production of component parts.

The basic concept for the modifications of layout is as follows:

1. AME Shop No.2: Set up the specialized line for processing rough forged products and steel parts to manufacture the component parts of the engines and pumps.
2. AME Shop No.3: Set up the specialized line for processing rough cast products to manufacture the component parts of the engines and pumps, and also processing case parts.
3. AME Shop No.4: Set up the specialized processing line for the manufacture of the component parts for the transmission of the power tillers.

Table 4-4 (1) PROJECT LIST OF RENOVATION PLAN OF THE FOUR INDUSTRIAL PROJECT

No.	Project	HI	Shop/plant
1. Repair/replacement of deteriorated M/E, debottlenecking, and line plan/layout improvement			
1- 1	Shop rehabilitation	No.2	Dry Cell Battery Shop
1- 2	Lighting fixture line rehabilitation	No.1	Coating Shop, etc.
1- 3	Lighting fixture line rehabilitation	No.3	Lighting Fixture Shop, etc.
1- 4	Improvement of shop/line system	No.1	Bus Assy Plant (Htauk Kyant)
1- 5	Rehabilitation of worn-out ME	No.1	HV Assy Shop
1- 6	Rehabilitation of worn-out ME	No.1	Leaf Spring Shop
1- 7	Metal handling equipment rehabilitation	No.1	HV project plants
1- 8	Rehabilitation of worn-out ME	No.4	LV Assy Shop
1- 9	Rehabilitation & shop improvement	No.4	LV Body Assy Shop
1-10	Improvement of shop system	No.4	Plating shop
1-11	Rehabilitation of worn-out ME	No.4	Compressor Room
1-12	Rehabilitation of worn-out ME	No.4	Chemical Analysis Room
1-13	Rehabilitation of worn-out ME	No.4	LV project plants
1-14	AME plants rehabilitation	No.3	AME project plants
1-15	Improvement of AME shop system	No.3	Plating Shop No.1, etc.
1-16	Reorganization of metal handling	No.3	AME Project Plants
1-17	Rehabilitation of worn-out ME	No.3	Chemical Analysis Room
1-18	Water intake/treat rehabilitation	No.3	Water Treatment Plant
1-19	Water intake/treat rehabilitation	No.4	Water Treatment Plant
1-20	Improvement of inter-HI transportation system		
2. Improvement of instrument calibration system			
2- 1	Establishment of calibration system	No.5	#Calibration center
3. Improvement and strengthening of maintenance system and supporting jigs/tools/dies production			
3- 1	Construction of auxiliary MC shop	No.1	#Auxiliary machine shop
3- 2	Gauge manufacturing	No.5	#Gauge mfg shop
3- 3	Die repair & making	No.5	#Die repair/making shop
3- 4	Cutting tool manufacturing	No.5	#Cutting tool mfg shop
3- 5	Establishment of production engineering system	No.5	#Production engineering center

Note: # -- Planned shop/plant

Table 4-4 (2) PROJECT LIST OF RENOVATION PLAN OF THE FOUR INDUSTRIAL PROJECTS

No.	Project	HI	Shop/plant
4. Buildup of metal processing capacity and changeover metal parts import to domestic production			
4- 1	Buildup of press capacity	No.1	Press Shop No.2
4- 2	Construction of new press shop	No.1	#Press shop
4- 3	Buildup of casting capacity	No.3	Foundry
4- 4	Buildup of forging capacity	No.3	Forging Shop
4- 5	Improvement of piston & ring line	No.4	Light alloy foundry, etc.
4- 6	Improvement of shop/line system	No.1	M/C & H/Tr shop
4- 7	Improvement of shop/line system	No.4	Machine Shop
4- 8	Improvement of shop/line system	No.4	H/Tr Shop
4- 9	Improvement of shop/line system	No.4	Diesel Engine Shop
4-10	Cylinder liner production	No.3	#foundry (Centrifugal), etc.
4-11	Bolt & nut production	No.1	Bolt & Nut Shop
4-12	U-bolt production	No.1	Leaf Spring Shop
4-13	Rear axle housing production	No.1	#Rear axle housing mfg shop
4-14	Radiator production	No.1	Press Shop No.2
4-15	Bevel gear production	No.1	M/C & H/Tr shop
4-16	Diff carrier production	No.1	M/C & H/Tr shop
4-17	Piston pin production	No.4	Machine shop, etc.
4-18	T2000 parts production	No.4	Machine Shop
4-19	DS parts production	No.4	Diesel Engine Shop
4-20	Exhaust & inlet valve production	No.3	#Exhaust & inlet valve line
4-21	Increase of 2000cc engine production	No.4	Machine Shop
4-22	Production of CP of thresher	No.3	Press & Welding Shop
4-23	Production of CP of power-tiller	No.3	Press & Welding Shop, etc.
4-24	Production of diesel engine CP	No.3	AME Component Shop No.1
4-25	Electrician tool production	No.3	Hand tool shops
4-26	Construction of alloy steel foundry	No.3	#Alloy steel foundry

Note: # -- Planned shop/plant

Table 4-4 (3) PROJECT LIST OF RENOVATION PLAN OF THE FOUR INDUSTRIAL PROJECTS

No.	Project	HI	Shop/plant
5. Changeover parts/materials import to domestic production			
5- 1	Rubber parts production	No.6	#Rubber parts production plant
5- 2	Plastic parts production	No.3	AME Component Shop No.1
5- 3	Enamel coated wire production	No.5	#Enamel coated wire shop
5- 4	Manganese dioxide production		
6. Conversion of furnace fuel to ensure the fuel supply			
6- 1	Conversion of furnace fuel	No.1	Leaf spring Shop
7. Recycling and reclamation of wasted materials			
7- 1	Coated sand reclaiming/recycling	No.3	Foundry
7- 2	Cutting tips/oil recovery	No.1	#Cutt'g tips/oil recover plant
7- 3	Reclamation of aluminum chip	No.4	Piston Mfg Shop
8. Production increase to meet the market needs			
8- 1	Increase of F/L production	No.1	Lamp Manufacturing Plant
8- 2	Increase of I/L production	No.1	Lamp Manufacturing Plant
8- 3	Increase of dry cell production	No.1	Dry Battery Plant
8- 4	Increase of electric accessories production	No.1	Bakelite Molding Shop
8- 5	Increase of watt-hour meter production	No.3	Watt Hour Meter Shop
8- 6	Increase of electric motor production	No.3	AME Shop No.1
9. Model change and new product mix introduction to meet the market needs			
9- 1	2000cc engine model change	No.4	Machine Shop, etc.
9- 2	B600 pick-up model change	No.4	LV Assy Shop, etc.
9- 3	Conversion of DS for marine use	No.4	Diesel Engine Shop
9- 4	Model change of power tiller	No.3	AME project plants
9- 5	Self-priming pump production	No.3	AME project plants
9- 6	Low-tension panel production	No.1	
10. Establishment of production development system			
11. Establishment of production control system			

Note: # -- Planned shop/plant

Table 4-5 LIST OF PROJECTS FOR REPAIR/REPLACEMENT OF DETERIORATED M/E AND DEBOTTLENECKING

No.	Project	HI	Shop/plant	Description
1-1	Shop rehabilitation	No.2	Dry Cell Battery Shop	Repl:Winding MC for light'g f
1-2	Lighting fixture line rehabilitation	No.1	Coating Shop Elec Home Appliances Plant Press Shop No.1 Bakelite Molding Shop	Repl:T/L & D/L Inspect'n table Repl:Iron core blanking dies Repl:Dies for light'g f socket
1-3	Lighting fixture line rehabilitation	No.3	Lighting Fixture Shop	1 Repl:Winding MC for light'g f 2 Repl:Inspect'n tables L/F etc 3 Repl:Dies for light'g f socket Repl:Apparatus for MI plat'g
1-5	Rehabilitation of worn-out ME	No.3 No.1	Plating Shop No.2 HV Assy Shop	1 Repr/Repl:Welder 2 Repr/Repl:DME (Rear Body Shop) 3 Repr/Repl:Measrg.Eq 4 Repl:Paint drying
1-6	Rehabilitation of worn-out ME	No.1	Leaf Spring Shop	1 Repr/rep1:Deteriorated M/E
1-8	Rehabilitation of worn-out ME	No.4	LV Assy Shop	2 Supplement:work/measur'g tools
1-9	Rehabilitation & shop improvement	No.4	LV Body Assy Shop	
1-11	Rehabilitation of worn-out ME	No.4	Compressor Room	
1-12	Rehabilitation of worn-out ME	No.4	Chem Analysis Room	
1-14	AME plants rehabilitation	No.3	AME project plants	Repl:Deteriorated M/E
1-17	Rehabilitation of worn-out ME	No.3	Chem Analysis Room	Repr/rep1:Deteriorated ME
4-1	Buildup of press capacity	No.1	Press Shop No.2	Repr/rep1:Deteriorated M/E
4-3	Buildup of casting capacity	No.3	Foundry	Repr/rep1:Deteriorated M/E
4-4	Buildup of forging capacity	No.3	Forging Shop	Repr/rep1:Deteriorated M/E
4-6	Improvement of shop/line system	No.1	M/C & H/Tr Shop	Repr/rep1:Deteriorated M/E
4-7	Improvement of shop/line system	No.4	Machine Shop	Repr/rep1:Deteriorated M/E
4-8	Improvement of shop/line system	No.4	H/Tr Shop	Repr/rep1:Deteriorated M/E
4-9	Improvement of shop/line system	No.4	Diesel Engine Shop	Repair:Induction hardening M/E
4-11	Bolt & nut production	No.1	Bolt & Nut Shop	Repr/Rep1:Plating facil
4-24	Production of diesel engine CP	No.3	AME Component Shop No.1	Repl:DME & debottlenecking
8-1	Increase of F/L production	No.1	Lamp Manufacturing Plant	RR:DME & Conversion of 38/28 Repl:ME for quality control
8-3	Increase of dry cell production	No.1	Dry Battery Plant	Repr:Deteriorated ME
8-5	Increase of watt-hour meter production	No.3	Watt Hour Meter Shop	Repl:Deteriorated ME

Notes: 1.Repr--Repair 2.Repl--Replace 3.DME--Deteriorated machine and equipments

4. AME Shops No.2, 3 and 4: Set up the lines for processing small items in the respective shops.

Based on the above concept the following system is to be provided for the following shops:

Press and Welding Shop

This shop is small and is situated in unfavorable conditions for both productivity and safety. The extension of the existing shop building is planned in order to prepare working spaces required. Along with the extension of the shop building, the working place in the shop is divided into the following four sections:

1. Press section
2. Spot welding, and assembling
3. Welding section mainly for arc welding
4. Cutting and drilling section

AME Shop No.1

The present confusion of machining processes in the shop requires line planification of material flow in the shop putting emphasis on efficiency of material handling, and forming process lines into a direct straight line type, using roller conveyors and palettes.

Plating Shop No.1

Space is extremely cramped in this shop. Deterioration of the plating equipment is severe and the replacement of all the equipment is necessary. The shop should be extended in order to install the new plating equipment.

AME Assembly Shop

The layout of this shop has to be entirely reconsidered so as to specialize the AME Assembly Shop No.1 for assembling the engines and pumps to set up straight-line type assembly conveyor lines including the painting and washing section in the line, while transferring the engine running test section to the indoor. The assembly lines for the sprayers, power tillers and threshers are set up in AME Assembly Shop No.2.

b) No.4 HI Machine Shop (#4-7)

This shop using the Job Shop method produces some 1,200 units of component parts for vehicles. Further, in the future it is to produce more varieties of the parts. In order to assure the operation efficiency and quality control, it is planned to establish specialized processing lines as required. The present machine shop is divided into seven sub-shops. The layout is designed so as to undertake a complete processing of the individual items of parts in each of the particular sub-shops, in which the improvements of line balancing are made to recover the initial installed capacity. On the other hand, the processing of small parts is to be made by job shop method so as to take the advantages of this method.

Then as the second step (#4-18), for the local production of the main parts including important functional parts, parts involving several processes and large-sized parts, the specialized lines for individually processing these parts are set up. To this end the extension of a shop building with an area of 2,000 square meters is to take place. Also, it is planned to extend a building of about 5,670 square meters on the north of the existing machine shop in order to respond to the local production of the engine for T-2000 and the increase of the production of the engine for X-2000 (#4-21).

c) No.3 HI Water Treatment Plant (#1-18)

The water intake facilities installed for the intake of water from the Irrawaddy River, the water treatment facilities and connecting pipeline at No.3 HI have been corroded and deteriorated.

The present plan is for the repair and replacement of these corroded or deteriorated equipment and pipes.

d) No.4 HI Water Treatment Plant (#1-19)

The present plan is for the repair and replacement of corroded or deteriorated water intake facilities, water treatment facilities and pipes and also for an extension of the water piping to relocate the water intake point to the deeper place in the Irrawaddy River

in order to secure the intake during the dry season when the water level is lowered.

e) Inter-HI Transportation System (#1-20)

Seventy percent of the inter-factory movement is by boat, of which 85% depends on the boats chartered from the Inland Water Transport Corporation (IWTC) and others, and HIC's own boats handle only 15%. There are five boats owned by HIC; the 50 ton boat which is exclusively used for ferrying between Prome and Sinde, and the four 100 ton Z-craft boats used for conveyance between Rangoon and No.2, No.3 and No.4 HIs. The annual transportation capacity of HIC's boats is estimated to be 6,000 tons.

The volume of inter-factory movement is predicted to be twice its present volume in 10 years.

Therefore it is planned to have another 110 ton Z-craft for moving increased cargo from Rangoon to Malun, Sinde, and Htonbo in the Irrawaddy River in order to meet the increase of inter-factory movement volume.

3) Measures for Assuring Stable Supply of Economical Fuel (#6-1)

The existing natural gas distribution pipelines do not connect to the vicinity of the HIC's factories at present. However, the Myanma Oil Corporation has a plan to extend the gas pipeline to each of the factories by 1990. Assuming that this plan is implemented as per schedule, it is planned to use the natural gas for fuel. The renovation plan includes the pipeline within the factory site and modification of furnaces to adapt to the natural gas.

As combustion devices equipped for heavy oil are not adaptable, the modification includes changes in combustion devices, auxiliary equipment and combustors of the furnaces for using gas.

4) Recovery of Waste Materials for Utilization

a) Re-use of the coated sand used for shell molding (#7-1).

1. Recover and re-use the coated sand currently discarded.

2. By milling the coarse sand currently discarded in the course of the sieving process, increase the yield of the sea sand to be used for the coated sand.
3. Reduce the occurrence of defective parts caused by the sand condition of the river sand used as raw material sand for the green sand mold and self hardening molding lines by means of the improvement of the inferior grain form of river sand which can be made by removing powdery sand and the iron content and also by shaping the sand particle round.
4. Proceed with research and tests to confirm as to whether the improved quality river sand can be used as coated sand. If this is possible the volume of sea sand employed could be reduced. This possible development is kept in mind for designing the equipment of the recovery system.

b) Recovery and re-use of machining oil and chips (#7-2)

In Burma the machining oil is imported. If recovery and re-use could be effected, this would contribute to the saving of foreign exchange. Further, effective use can be made of the chips as part of raw material after removal of the oil.

One unit of the recovery equipment is installed in No.1, No.3, No.4 and No.5 HI respectively.

Long chips produced from machining should be cut into smaller pieces using a chipper, and the machining oil on the chips separated using a centrifugal separator. After this step of separation, the iron powder and water contained in the oil should be separated out.

c) Recovery and re-use of aluminum chips (#7-3)

At present there is no attempt at recovery or re-use of the aluminum chips which are produced in the piston manufacturing process. Recovery activities are limited to such items as riser, sprue, casting fin, and residual molten metal.

The No.4 HI Piston Manufacturing Shop is the specialized processing shop for aluminum pistons. Since there is no danger of other

materials getting mixed in with the aluminum, this provides very favourable conditions for recovery.

(2) Realization of Production Facilities Capable of Responding to the Tasks Imposed on the Four Industrial Projects

1) Enhancement of Capabilities for Product Supply

1-1) Enhancement and Expansion of Production Facilities and Systems for Agricultural Machinery to Meet Expansion of Mechanized Agriculture

a) Enhancement of production facilities for thresher (#4-22)

Most of the component parts of the threshers which are not localized yet are large-sized pressed parts, requiring a large investment in acquiring necessary dies. In order to reduce this, it is necessary to change the design to a simple one. However, this will require time for necessary research and development. Therefore, the local production should first be undertaken for those parts which a design changes and require no substantial investments, and then when the modifications in design have been completed further changeover to the local production should be pursued.

The production of pressed parts requires blanking dies, but by introducing a NC punch press the cost of dies can be substantially reduced. Further, since processing can be shared over a large range of similar parts, the present plan includes the installation of a NC punch press.

b) Enhancement of production facilities of the power tillers

1. It is planned to proceed with a model change in two phases. The first phase will involve simplification of the rotary tiller parts. This model change can be relatively easily accomplished and a reduction in production costs anticipated. At the same time, one of the simplified models used in Thailand should be obtained to conduct field testings for checking its adaptability to Burma, and a model suited to Burma be developed using that as the base model (#9-4).
2. The local production of the main handle cover which can be easily accomplished should first be undertaken. Next, the

local production of the rotary tiller parts is to be undertaken, for which the local production can be expected to have substantial effects. The local production of other component parts is to be undertaken at the time of commercial production of the above-mentioned simplified model of power tiller (#4-23).

c) Enhancement of production facilities of the diesel engine for agricultural machinery (#4-24)

1. Repair and replacement of worn-out machines, and the installation of additional boring machines so as to remove bottlenecks.
2. Expansion of the local production of component parts. As a first step the local production of the air cleaner and fuel tank which can be locally produced with a supply of dies is to be undertaken. After this, the local production of the remaining parts is to be undertaken.

d) Enhancement of production facilities for water pump (#9-5)

The water pumps manufactured by HIC the priming type. The users desire self-priming type pumps, and there are enquiries for export of this type of pumps. Development for local production is already advanced through the copying of a sample of this type of pump and the design of 3" diameter self-priming type pump is nearly completed. It is planned to set up a specialized processing line for the self-priming pump at the place left vacant in the AME Shop of No.3 HI after the transfer of the die repair shop elsewhere.

1-2) Expansion of Production of Vehicles and Spare Parts for Vehicles Responding to Expansion of Transportation Means

a) Provision of vehicle production system

a-1) Provision of engine production system

The present plan is for an increase in production of the DS-70 engine. Further, for light vehicles the T-2000 engine is to be locally produced and at the same time measures taken for increasing the production of the X-2000 engine.

a-1)-1 Provision for increase in production of the DS-Engine (#4-9)

When the presently hindering causes are removed and if the operation is performed as per the work standard after the production control system is improved, this section would be capable of producing 1,200 units of the DS-70 diesel engines per annum. Therefore, the further increase in production of the DS-Engine can be realized by applying a two-shift operation but without the installation of additional machines.

a-1)-2 Local production of the engine for T-2000, and expansion of the production of the engine for X-2000 (#4-21)

The present plan is for the reorganization and expansion of the machines for the local production of the component parts of the engine for T-2000 and for the increase of the production of component parts of the engine and transmission for the X-2000 and B-600. To this end the present plan is to extend an area of approximately 5,670 square meters in the present machine shop on the north side and to redesign the layout on a flow-line system for the production lines manufacturing the main component parts and for other parts on a job shop system. By these measures this section could be capable of producing component parts which meet the production of 1,000 units of the engine for T-2000 per annum.

In these conditions the production schedules of 1,000 units per annum for the engine for B-600 and 1,600 units for the engine for X-2000 can be met by overtime or a two shift operation.

a-2) Provision for bus production system (#1-4)

The aim of the present plan is the acquisition of jigs and dies and the expansion of the assembling capacity of the Htauk Kyant branch factory in order to meet the requirements for undertaking the local production of the component parts of the bus body which currently rely on imports. At the Htauk Kyant branch factory, it is planned to set up an integrated production line for bus production, including the processing and welding of the

pressed parts, painting equipment, and vehicle inspection equipment. Further, the production equipment for the upper parts of the dump car, wrecker, tanker, etc. which is located in the No.1 HI Heavy Vehicle Assembly Shop is to be transferred to the Htauk Kyant branch factory.

a-3) Provision for vehicle assembly facilities

a-3)-1 No.1 HI HV Assembly Shop (#1-5)

The present plan aims at the improvement of the following problems:

1. Welding machines and vehicle testing equipment installed in that shop is beyond repair because of severe deterioration.
2. There are balancing problems in the frame assembly line which result in production bottlenecks.
3. The space is cramped by disorderly layout of some machines. (The space for handling the semi-processed parts and also the additional space required for the expansion of the local production of component parts are to be secured.)

a-3)-2 No.4 HI LV Assembly Shop (#1-8)

This shop is for the assembly and painting of the B-600, X-2000 and T-2000. This section suffers from the problems of the deterioration of machinery and equipment, scarcity and deterioration of tools and testing equipment, bottlenecks in the processes, and deterioration of painting equipment, and these problems are adversely affecting the production and product quality. The present plan is to undertake the amelioration of these problems to improve the production efficiency and product quality.

a-3)-3 No.4 HI LV Body Assembly Shop (#1-9)

It is planned to undertake the following provisions and improvements:

1. Transfer the B-600 and X-2000 frame assembly areas to the north side of the shop and reorganize the assembly equipment on a flow-line.
2. Make use of the currently idle Gantry for minibus use, in order to increase productivity.
3. Provide jigs for body assembly and welding machines for the Path Finder and T-2000 in order to increase the productivity of the assembly of the Path Finder and also to facilitate the local production of the T-2000.

b) Improvement of metal processing sections

b-1) Specific projects for the enhancement of casting sections

The plan for strengthening the foundry consists of the followings:

1. Enhancement of the No.3 HI Foundry
2. Improvement of No.4 HI Light Alloy Foundry
3. Introduction of a new casting system for manufacturing the cylinder liner
4. Installation of an alloy steel foundry

Of these the enhancement of the No.3 HI Foundry will be the most important project in order to form the basis for expanding the local production of component parts and also for promoting exports in future.

b-1)-1 Enhancement of the No.3 HI Foundry (#4-3)

1. As a first step the enhancement of the existing facilities is to take place. Movements of heavy articles are involved in the Foundry, but no conveyance equipment is available at present. It is planned to introduce the conveyance equipment which can help production efficiency increase. Another plan is to supplement compressors so as to increase the capacity of compressors presently being inadequate so that the existing foundry can be operated at normal conditions.
2. The present raw materials yard is on a small scale and should be newly installed at a place located between the generators and motors manufacturing shop and the foundry. The new yard should include a scrap yard, an equipment for raw material charging to the charging bucket and the sizing equipment for scrap. The present raw materials yard can be used as an area for placing castings. This is a component of the rationalization plan for the finishing section as described later. As the charging system for raw materials and the conveyance system to the melting furnace have mutually close relationship, the expansion of the melting facilities should also be implemented at the same time.
3. An overall renovation of the old casting facility (E line) is to take place. Since this casting facility is obsolete and seriously deteriorated, it is planned to replace the E line with a complete set of new casting line together with sand treatment equipment and other ancillary equipment. During the renovation of the E line the production should be undertaken by both lines of A and B.
4. Provision for the finishing section for castings including inspection equipment for products, and the introduction of anti-rust treatment facilities for casting, etc.

5. Expansion of shell molding machines of the C line.
6. Improvement of the A line. In chief the improvement is to be done by the introduction of cope roll-over device and change of the metal flasks in order to increase the production capacity. Small-sized castings items are to be dealt with by the E line as far as possible and other castings transferred to the B line during the time when the A line is undergoing improvement.
7. Improvement of the B line and change of the molding processes. Change of the processes in the B line should be undertaken only for the molds. As the core making section of the B line is conditioned under unfavorable working environment, this section should be transferred to a part of the facilities constructed with the replacement of the existing E line. Effective use of the space vacated by the movement of the core making section is included in the plan for the rationalization of the finishing facility for castings.

b-1)-2 Improvements of the No.4 HI Light Alloy Foundry (#4-5)

Improvements of the Light Alloy Foundry to meet increases in the production of pistons and piston rings.

b-1)-3 Introduction of the casting equipment for manufacturing the cylinder liner (#4-10)

Establishment of a new casting equipment to meet the production of cylinder liners.

b-1)-4 Establishment of Alloy Steel Foundry (#4-26)

Establishment of an alloy steel foundry to manufacture the blocks for dies.

b-2) Expansion of the press section

The plan consists of the enhancement of the existing press shop No.2 of No.1 HI and the establishment of a new press shop.

b-2)-1 Enhancement of Press Shop No.2 of No.1 HI (#4-1)

Expansion plan for the existing Press Shop No.2 of No.1 HI is as follows:

1. Repair and replacement of deteriorated equipment
2. Improvement of the following bottlenecks occurring in processes

a) Reduction of time for changing dies

At present, the die changing is a time-consuming work. In order to reduce this time, it is planned to adopt a quick die changing system.

b) Mechanization of trimming process

The introduction of a three dimensional cutting device using plasma.

3. As part of an integrated maintenance system, it is planned to establish a die repair shop.
4. Introduction of the equipment for the local production of pressed parts

Enhancement of the equipment at the existing Press Shop No.2.

b-2)-2 Construction of a new press shop (#4-2)

The new press shop aims at the production of large-sized pressed parts such as the main frame for heavy vehicles. It will include a pressed panel production line for vehicles, disk wheel production line, main frame (chassis) production

and assembly line, and a rear axle housing production line. Outline of the new press shop is described below:

1. Construction of the building
2. Acquisition of the dies to be used for the pressing of small parts in Press Shop No.2
3. Panel making for vehicles

For making the panels the following are to be installed;

1,500 ton oil hydraulic press	1 unit
1,000 ton mechanical press	1 unit

Production arrangements will be made for an efficient utilization of the benefits of the large-size press machines. The above-listed press machines can also be used for the production of disk wheel.

4. Disk wheel production line
5. Production and assembly line for main frame (chassis)
6. Rear axle housing production line

b-3) Expansion of Forging Section (#4-4)

The expansion plan for the forging shop consists of the following:

1. Provisions and expansion for the existing forging shop
2. Construction of a new forging shop

b-3)-1 Provisions and expansion of the existing forging shop

1. Repair and replacement of existing machines

The present plan is designed to increase the production by the efficient utilization of the existing forging machines. As the drop hammers and trimming presses, the main machines of the shop, have been deteriorated, the repair of

these machines is planned. At the same time other relevant facilities are also repaired so as to ensure a stable operation.

2. Improvement of production lines

There are one old 3 ton hammer and another 3 ton hammer recently installed. However, as the 3 ton hammer recently installed can not be operated because the trimming press with which it is to be combined for use has not been installed, only the old 3 ton hammer is used in a three-shift operation. Further, there is a lack of necessary compressed air. It is planned to urgently take measures for undertaking the normal operation of these machines. Besides the above, provision for magna flux flaw detector and shot blasting machines is to be made. Further there are no conveyance equipment, though this is needed for the movement of materials and products in progress, and for the shipment of the manufactured products. Provision of this conveyance equipment is to be undertaken.

b-3)-2 Construction of a new forging shop

The main purpose of the new forging shop is to be the forging of large items scheduled for the local production.

The present plan has been devised so that demand for large size forged items received from other state corporations in the future could be met and handled.

c) Enhancement of machine sections responding to expansion of local production of metal parts

As has been mentioned in the description of the metal processing sections, in order to form the base for the development of machinery industry together with possible exports of component parts in future, the component parts which can be manufactured by using machines widely adaptable to common uses or using specialized machines usable also for other purposes have been considered for the local production to be undertaken in the

renovation plan, even if they are negative from the viewpoint of production economics. Other items have been examined mainly from the viewpoint of economic effects on investment and production economics.

c-1) Local production of cylinder liner (#4-10)

It is planned to produce all of the cylinder liners which are currently imported. To realize this a building is constructed in No.3 HI, in which a centrifugal mold casting equipment is installed. The castings thus manufactured, after rough machining, are to be supplied to the shops for machining.

The cylinder liners for the agricultural machinery will be processed and assembled at the AME shop of No.3 HI. The cylinder liners for the heavy and light vehicles will be processed at the specialized lines to be established in the No.4 HI Machine Shop. The manufactured cylinder liners are supplied for assembly to the No.4 HI Diesel Engine Shop in the case of the cylinder liners for heavy vehicle engines and to the engine assembly line located in the LV Machine Shop of No.4 HI in the case of the cylinder liners for light vehicle engines.

Therefore the present plan includes:

1. Casting lines based on the centrifugal mold casting process and equipment for rough machining
2. Establishment of the cylinder liner machining line in the No.4 HI Machine Shop

The machining of cylinder liners for the agricultural machinery and also assembly of all the cylinder liners will be carried out by using the existing machinery and equipment.

Along with the setup of the machining line for the cylinder liners in the No.4 HI machine shop, the existing lines of the machine shop will be reorganized (#4-7).

c-2) Increased production of pistons and piston rings (#4-5)

It is planned to increase the production of pistons and piston rings including the supply of service parts to the market. To this end a new casting equipment is installed in the Light Alloy Foundry of No.4 HI, in which consideration is made to the reduction of riser volume quantity and the simplification of die setting for piston casting. Further in order to improve the safety conditions and work efficiency of the pouring shop and piston casting shop, the modification of the layout of the pouring shop is to be made.

At the same time, the recovery and re-use of aluminum chips are also to be undertaken.

Layout of the machining processes in the Piston Manufacturing Shop is to be modified so as to adopt to a flow-line operation. Additional jigs and dies required for producing service parts for the general market is to be acquired.

c-3) Local production of inlet/exhaust valves of engines (#4-20)

The present plan is to undertake the production of all of the inlet and exhaust valves required for the heavy and light vehicle engines and agricultural machinery engines.

To this end it is planned to construct a shop building with an area of 1,080 square meters and another building for ancillary equipment having an area of about 120 square meters in No.3 HI, in which an integrated production line, including the forging and machining, for the manufacture of inlet/exhaust valves of engines for light and heavy vehicles and agricultural machinery.

c-4) Machining Facilities for Other Metal Parts of Vehicles

c-4-1) Machining facilities for rear axle housing (#4-13)

The present plan consists of the removal of the warehouse located on the north side of the HV Assembly Shop of No.1 HI, the construction of a new building with an area of some 4,050 square meters at the place vacated after the removal of the warehouse, and the installation of a series of production

equipment so as to produce all of the rear axle housing for heavy and light vehicles.

c-4)-2 Radiator production equipment (#4-14)

The present plan aims at the production of radiators for both heavy and light vehicles. To this end the production line for radiators is to be installed in the Press Shop No.2 of No.1 HI.

c-4)-3 Production facilities for bevel gear (#4-15)

The present plan aims at the local production of all of the bevel gears for the heavy and light vehicles and agricultural machinery. The production equipment, including those for machining and heat treatment, is to be installed in the Machine and Heat Treatment Shop of No.1 HI. The forged products required are to be supplied from No.3 HI.

c-4)-4 Machining equipment for the component parts of the rear axle for the heavy vehicles (#4-16)

The present plan consists of the local production of various component parts of the rear axle for the heavy vehicles and the assembly of the rear axle made of the manufactured component parts.

To realize the above, the old Painting Shop for light vehicles is at No.1 HI to be reorganized with the installation of the machines for the production of above items. Castings and forged products to be used for processing are to be supplied from No.3 HI.

c-4)-5 Equipment for machining and heat treatment of piston pins (#4-17)

The present plan is for the local production of all of the piston pins to be used in the various engines and also to be supplied as service parts to the market. To this end, specialized machining lines for the integrated production of the various types of piston pins are to be installed in the No.4

HI Machine Shop. Further, in order to respond to the increased requirements for heat treatment, the No.4 HI Heat Treatment Shop is to be extended by an area of approximately 156 square meters and addition of a simple gas carburizer.

c-4)-6 Machining line for component parts of T-2000 (#4-18)

It is planned to undertake the following parts for T-2000:

1. Rear axle shaft
2. Front axle
3. Steering knuckle
4. Knuckle arm
5. Differential carrier
6. Differential case

In order to install the various machines needed for the production of each of the above parts, a building with an area of about 2,000 square meters will be constructed. All the lines are specialized for the individual parts. Castings and forged products required are to be supplied from No.3 HI.

c-4)-7 Machining equipment for the component parts of the DS engine parts (#4-19)

The present plan aims at the local production of the following parts:

1. Engine gear
2. Pulley
3. Inlet manifold
4. Exhaust manifold
5. Water pump

To realize this, the warehouse located on the south side of the present No.4 HI Diesel Engine Shop is to be redesigned so as to install the production lines for these parts.

The inlet manifold is made from light alloy castings which are supplied from the No.4 HI Light Alloy Foundry. Castings and forged products to be used for other items of the parts are supplied from No.3 HI.

d) Strengthening of Vehicle Spare Parts Supply System

The present plan aims at providing a system for the supply of spare parts to meet the shortage of these vehicle spare parts in other state corporations and on the market. This plan is a part of the plans for the enhancement of production facilities for component parts, including the Metal Processing Sections, as described in the previous section.

e) Model changes in response to market demands

e-1) Model change of the 2000 cc engine (#9-1)

Since further economic expansion and increase in the passenger movements are inevitable in the years to come, it will soon be impossible to meet market demands for vehicles only with the X-2000 model designed as the rough road passenger vehicle.

Moreover, HIC has made a trial export of the Path Finder, a locally modified model of the X-2000. However, in order to expand the exports, it will be necessary to change the specifications so that the model can compete with other models in the export markets and also pass the various legal requirements of the destination market.

In order to respond to these necessary conditions of the market, the present plan is designed to meet the following targets, in a view to replacing the VA engine mounted on the X-2000 with the FE engine in the future:

1. If the wide export markets are set as a target, development of new specifications over a wide range of features will be necessary. Therefore the target should be restricted to those markets which can be entered by the modifications of the X-2000 specifications and mounting engines that will clear the emission control regulations.

2. At the same time a system which is capable of responding to a future diversification of the needs of the domestic market should be established.

With these targets in view, the following plan is to be implemented:

1. The basic concept is the replacement of the currently mounted VA engine by the FE engine which can pass the emission control. Together with this, in order to adapt the transmission to the performance of the FE engine, the 4 drive transmission used for the VA engine will have to be replaced by the 5 drive transmission which has proved performance with the FE engine. Technical investigations regarding the mounting of the FE engine and new transmission is to be undertaken by HIC.

Development, design and trial manufacturing should be carried out with consideration of the modification of bonnet design and also possible utilization of mass produced parts, and then based on the result of these activities the jigs and dies needed for the commercial production should be developed.

2. Based on the result of the above activities, the activities are launched in the local production. In order to produce the FE engine and the 5 drive transmission, some 100 extra items of component parts will have to be produced. For this production all of the existing machines for the VA engine installed in No.4 HI can be used, although the manufacturing of component parts of the FE engine requires the modification of 6 units of the existing machines together with the installation of additional 30 units of new machines. Hence, the production of the FE engine can be undertaken with a comparatively small amount of additional investment for machines, although the jigs and dies should be purchased.

By these measure, the following market needs are to be met:

1. Increase the commercial value of the X-2000 through shift operating efficiency and reduction of gear noise by modifications of the transmission.
2. Increase the exportability of the X-2000 through mounting of an engine which can clear the emission regulations. However, other design features will limit the export markets.
3. Possibilities for HIC to supply the engine and transmission component parts to vehicle manufacturers abroad, under the so-called OEM (Original Equipment Manufacturing) arrangement or other form of subcontract system, as required by them for the vehicles which they manufacture on a CKD basis. Another possibility for HIC is to export the spare parts to be used for repair of vehicles running abroad.
4. In addition to the possibilities of export for the engine and transmission as completed units, possibilities to export either component parts or castings and forged products to be used for manufacturing those parts.
5. Forming the foundation for a response to the diversification of vehicles in the future in the domestic market, since the FE engine and the 5 drive transmission have been proven in use with various models.

e-2) Model change of the B-600 pickup truck (#9-2)

Aiming at proceeding with the model change of the B-600 to meet the needs of the domestic market in Burma, it is planned that HIC carry out necessary development activities with technical advices provided by outside experts.

The model change should be performed in the following steps divided into two:

1. Extension of the length of the vehicle
2. Widening of the width of the vehicle

This plan is to be implemented as part of the project for establishing the product development system (#10-1).

- e-3) Possibility of converting DS-70 diesel engine for marine use, and local production of marine engine (#9-3)

If the DS-70 Diesel Engine mounted on the HIC's heavy vehicles can be used for marine-use, it could enable HIC to undertake the production of marine engines by using the existing facilities.

However, the investigation of this possibility indicates a conclusion that the conversion of the DS-70 Diesel Engine for marine use is technically impossible from the following reasons:

1. The structure of the DS-70 Diesel Engine is unfit to be equipped with various accessories for marine use.
2. The capacity of the DS-70 Diesel Engine is inadequate for marine use. Hence the commercial value of the engine will be substantially lowered if it is mounted on boats.

Hence the plan alternatively envisages the introduction of the H diesel engine which has been commercially proven for both heavy vehicle and marine use.

The adoption of the H diesel engine will bring about the following effects:

1. Satisfy the demand for marine engine.
2. Use the engine for both heavy vehicles and marine use.

3. Improve the performance of the engine for heavy vehicles because of the superiority of the H diesel engine compared to the DS diesel engine.

However, the level of demand for a marine engine is not yet clear. Therefore the present plan envisages the import of component parts of the H engine for the CKD assembly which will be supplied to the market in order to evaluate market response including market trends and demand tendency.

If a large demand for the marine use H engine can be anticipated, then investigation of the replacement of the DS Engine by the H engine should take place. In this event, since the machining section for the DS engine comprises universal type machines for the most parts, it is expected to be possible to use most of them for processing of the H engine. But as such a conversion requires technical investigations of numerous aspects, the local production of the H engine is to be undertaken after such investigations are completed.

1-3) Provision for Production Facilities and System for Electrical Products

a) Realization of increased production responding to market demand

a-1) Provision for production facilities in responding to industrial demand

a-1)-1 Increased production of fluorescent lamps (#8-1)

The present plan aims at the setup of additional line. The new line is based on the 28 mm diameter type, and the existing 38 mm line is to be converted to the 28 mm type in the future. Together with the expansion of one line similar to the existing one, an increase in the production efficiency of the existing line will be endeavoured and at the same time a two shift operation for each line will be adopted so as to produce 2,000,000 pieces per annum.

a-1)-2 Production increase of electric accessories (#8-4)

Shedding of the items with low demand should take place to concentrate the production of high demanded 14 items.

The repair and replacement of deteriorated machinery, and the replacement of dies will be undertaken for the realization of this plan.

a-1)-3 Production increase of electric motors (#8-6)

To realize the planned increase in production, the following measures are planned:

1. A model change from the present three-phase type to a single-phase type, unification of the type to be produced, and standardization of component parts so that these can be commonly applicable to the various models to a possible maximum extent.
2. Reorganization of the entire layout of the AME Shop No.1 of No.3 HI to establish the specialized shops for specific products.
3. Introduction of equipment for mechanization of the assembly which is presently done by manual work.

a-1)-4 Provision of production facilities for low tension panel (#9-6)

The present plan aims at the installation of equipment for production of the low tension panel at No.5 HI.

It is planned to set up equipment which can produce cabinets, the panels without housing parts, panel frames and supports.

a-2) Provision for production system for producing electrical products required for improvement of living standard

a-2)-1 Production increase of incandescent lamp (#8-2)

The present plan is to undertake the repair and replacement of the existing equipment which is badly deteriorated, and also

enhance the system for minor repair work is the shop and the system for quality control and quality inspection. Further it is planned to install additional production line in the latter half of the 1990's.

a-2)-2 Production increase of dry cell battery (#8-3)

It will be necessary to provide for increased production of both lines of No.1 HI and No.2 HI. The present plan, however, is for the establishment of an increased production system for No.1 HI only.

The present plan aims at the improvement of processing yield and operating efficiency by the replacement of the UM-IH line which shows serious deterioration with an ABI system (automatic-bobbin inserting system).

However, in order to operate the ABI system most effectively, it will also be necessary to strengthen the production facilities for components, particularly the zinc can and zinc pellets. These measures will ensure the almost complete automation of the entire assembly line and can be expected as a result to realize an improvement in the production control including quality control in each process.

The present plan consists of the re-organizaition of the existing production line and introduction of the ABI system in accordance with the following step:

Step 1: Reinforcement and renovation of the zinc pellet process in order to ensure production of superior quality zinc cans.

Step 2: Reinforcement and renovation of the zinc can process line prior to introduction of the ABI equipment, in order to adapt the shape and dimensions of the zinc can to the ABI equipment which will be eventually introduced.

Step 3: Stabilization of product quality and automation of the entire line through the introduction of ABI

equipment and reinforcement and renovation of the existing line.

In future it is planned to install additional production line so as to meet the increasing demand.

a-2)-3 Model change and production increase of watt-hour meter (#8-5)

The present plan is to undertake the model changes and expansion of the production as follows:

1. Model change of the TE1 model of single-phase two-wire watt-hour meters which is produced at present, to the TE5 type which is produced in many countries outside of Burma. This will assure the stable supply of component parts.
2. As the three-phase three-wire type (TW1) presently produced helps illegally consume electricity without metering, it is planned to develop a three-phase four-wire type which meet the electricity distribution system in Burma, and convert to this from the present three-phase three-wire type.
3. Renovation of the existing equipment, and preparation for the expansion of the production facilities are to be undertaken in conjunction with the above.

a-2)-4 Provision for production system of portable diesel generators

Refer to (2) 1-1) of 4-4-1 - "Enhancement and Expansion of Production Facilities and System for Agricultural Machinery to Meet Expansion of Mechanized Agriculture".

a-2)-5 Enhancement of supply system for fire engine and ambulance

The fire engines and ambulances are special users of the TE 6.5 ton trucks and the X-2000 jeeps respectively. As to the enhancement of supply system for the TE trucks and the X-2000 jeeps, refer to (2) 1-2), 4-4-1 - "Expansion of Production of Vehicles and Spare Parts for Vehicles Responding to Expansion of Transportation Means".

1-4) Provision for Production Facilities and System for Production of Spare Parts and Tools to be Supplied

a) Production of gauges and cutting tools (#3-2, #3-4)

Refer to (1).3, 4-4-2 - "Production of Gauges and Cutting Tools".

b) Local production of electrician tools (#4-25)

As far as possible the machinery, equipment and dies of the hand tool forging and finishing shops of the No.3 HI are to be used and any special machinery, equipment and dies needed for the production of electrician tools are supplemented.

c) Development of capability for designing various spare parts and tools

Refer to (1) 1), 4-4-2 - "Establishment of Auxiliary Machine Shop (#3-1) and (2), 4-4-2 - "Acquirement and Accumulation of Production and Engineering Technology."

2) Strengthening of the Self-Sustaining Production

2-1) Renovation and Expansion of the Metal Working Sections

Details are described in (2) 1-2), 4-4-1 - "Enhancement of Production Facilities for Production of Vehicles and Spare Parts for Vehicles Responding to Expansion of Transportation Means"

2-2) Enhancement of Machining Sections Responding to Expansion of Local Production of Metal Parts

a) Local production of bolts and nuts (#4-11)

The present plan is to collectively produce bolts and nuts which are used for the products produced at HIC. It aims at expanding the range of items produced by including those not yet produced and also improving the quality and economic efficiency of the bolts and nuts produced.

It is planned to extend an area of about 1,600 square metres to the west side of the present bolt and nut shop of No.1 HI in which the following production lines are to be set up:

1. Bolt and nut production line.
2. Hub bolt, hub inner production line.
3. Nut production line for use of hub nut, drum nut and U bolt.
4. Spring water production line.
5. Plating parts production line.

The presently operating bolt and nut shop of No.1 HI will remain centered on the machines working in relatively good order, in which wood screw, tapping screw and machine screw production lines together with one slade rolling machine will be installed, while the old wood screw production line is scrapped.

b) Local production of U bolts (#4-12)

All of the U bolts used for the heavy vehicles and for the T-2000 depend on imports. The present plan aims at the local production of the U bolts used for the heavy vehicles and T-2000.

In order to realise this plan, a new U bolt line shall be installed in the No.1 HI Leaf and Spring Shop.

2-3) Expansion of local production of other raw materials and component parts

a) Domestic production of rubber parts (#5-1)

The plan aims at the local production of rubber parts for vehicles by shared use of a part of the currently operating tire manufacturing plant of No.6 HI, promoting effective utilization of domestic resources.

b) Local production of plastic parts (#5-2)

The present plan concerns the change to the use of plastic components for the electric fan which are less preferred by users in comparison with other competing similar products which use plastic component because the HIC's electric fan uses no plastic components. To this end, the injection molding machines are to be installed.

In order to utilize the injection molding machines for the production of plastic components to be used for the other products, the

layout of AME Shop No.1 will be reorganized to set up a section for the manufacturing of various plastic components.

c) Local production of enamel coated wires (#5-3)

Domestic demand for the enamel coated wires is anticipated to increase not only in HIC but among other state corporations. The present plan is for installation of the production facilities capable of responding to the demands for enamel coated wires. The facilities are to be located at No.5 HI. The enamel coated wires currently produced in Burma have quality problems such as instability in thickness of coated enamel and less strength and adhesion. Thus those wires are not usable with high voltages, though usable with low voltages. The present plan is to adopt the vertical type process due to its superiority in enamel coating.

d) Use of local manganese ores (#5-4)

HIC has requested the Survey Team to conduct an analysis of two samples of domestic manganese ores. However the analysis results for these samples alone have not provided sufficient information to make the detailed evaluation of the possibility for commercial production. However, it is recommended that further survey be conducted by HIC of the following points in view of assuring the effective use of the domestic manganese:

1. Undertake a sample analysis survey of an adequate number of samples collected from each of the manganese deposits.
2. Confirm the recoverable reserves of the deposits and other technical conditions including the analysis of composition which can be the basis for designing the production facilities.
3. Implement on-site surveys by qualified specialists.

4-4-2 Establishment of Auxiliary Sections Capable of Supporting Renovated Facilities

(1) Establishment of Maintenance System

The present plan consists of the enhancement of workshops and maintenance facilities and of the strengthening of a system for continuous maintenance activities. Further, the process of implementation is divided into the step for implementation of urgent matters and introduction of systems, and the step for subsequent enhancement of systems introduced.

1) Establishment of Auxiliary Machine Shop (#3-1)

The Auxiliary Machine Shops (A/M Shop) are to be set up in the No.1 HI, No.3 HI and No.4 HI respectively. The basic aim of the A/M Shops is to carry out small repairs on the machinery, jigs and dies of the individual shops as these are required.

In No.1 HI the existing buildings should be used and new machines installed. In No.3 HI since the existing building facilities can not be used a new building will be constructed. In No.4 HI the existing buildings can be used. In the A/M Shops the broken machines are to be disassembled and the malfunctioning part newly made or repaired, then the machine to be re-assembled and inspections and adjustments to be carried out. The A/M Shops cannot handle the large items such as the bed, column, or gear box of machine tools. The main items to be handled by the A/M Shops are shafts, cases, plates, collars, metal parts and drill bushes etc. together with jigs and dies.

2) Improvement of Maintenance System (#11-1)

The basic points for improvement of the maintenance system are the shift from the present system which is engaged mainly in breakdown repairs to a preventative maintenance system.

3) Domestic Production of Gauges and Cutting Tools (#3-2, #3-4)

Since the gauge manufacturing shop is closely related to the calibration equipment for measuring equipment and instruments, it should be set up in No.5 HI near to the Calibration Center discussed later.

Production of the cutting tools is to be done in the cutting tool shop to be set up in No.5 HI. Since the production of cutting tools requires a high level of technology, production is scheduled to be divided into a drill group production and tap group production.

4) Establishment of Dies Repair Shop (#3-3)

General repairs of the dies require special machines for these, requiring a large amount of investments. Hence it is planned to establish dies repair shops which are engaged in temporary repairs which can be taken place without special machines. Repairs for No.1 HI are to be carried out in the new workshop to be set up in the New Press Shop, and the repairs for No.3 HI and No.4 HI are in the A/M Shop of No.3 HI.

(2) Acquisition and Accumulation of Production and Engineering Technology

Production engineering teams are to be attached to each A/M Shop to make them accumulate the technology and expertise for repairing work. At the same time, the production technology of gauges and cutting tools are centralized and accumulated in the Calibration Center.

After these technologies have been accumulated, the Production Engineering Center and the Dies Manufacturing Shop should be set up in No.5 HI. The Production Engineering Center is to centralize the production engineering technology accumulated in the A/M Shops and the technology for manufacturing the gauges and cutting tools which have been accumulated in the Calibration Center. Further, members of the Production Engineering Center are to be stationed in each of the individual A/M Shops to make them give technical guidances to the individual shops. Of the machines installed in the A/M Shop of No.3 HI, those required for the manufacture of large-sized dies will be transferred to the Dies Manufacturing Shop of No.5 HI.

(3) Enhancement of Calibration System for Measuring Equipment and Instruments

1) Provision of Equipment

The Calibration Center is established and equipment required for the calibration of measuring equipment and instruments are centralized there. This center will be equipped with a full set of equipment for conducting periodical check and calibration of measuring equipment and instruments installed in the shops. Since this sort of facility does not exist yet in Burma, the Calibration Center should provide its service not only for HIC but offer this to other industries and state corporations. This facility is to be located in No.5 HI.

2) Establishment of Calibration System

1. Undertake the training of personnel to be engaged in the calibration activities.
2. Establish comprehensive HIC standards defining checking system, organization, personnel, required technical expertise, and the rule of regular inspections.
3. Carry out guidance for the measurement control of each of the individual shops.

4-4-3 Preparation for Self-Sustaining Operation in Future

(1) Establishment of Capability for Improvement and Development of Products

This plan is to be implemented in three stages as follows:

First Stage: Preparation and initial system setup stage

Second Stage: Initial development and technology acquirement stage

Third Stage: Technology development stage, including the development of new products

1) First Stage: Preparation and Initial System Setup Stage

Main activities to be performed at this stage consists of (i) the compilation of data and information concerning specifications and characteristics of the component parts of the HIC's products and applied standards, (ii) the enhancement of a system for conducting the tests and analyses and (iii) the establishment of a system for feeding collected information and the results of conducted tests and analyses to the production departments concerned.

a) Provision of Equipment

Provision of equipment necessary for measuring basic points, such as the tension and bending test machine, hardness test machine, metallurgical microscope, instruments, etc.

b) Organizational Setup

1. By the time when the installation of the equipment for tests and research are completed list-up and classification of testing equipment and instruments which have been installed in the shops are to take place so that these equipment can be used as required.
2. The staff assigned to the research and development have to prepare detailed programs for the research and development including the definition of the objective, methodology, subjects and contents with reference to relevant literature and other information.
3. Identification of the subjects for research and development have to be performed in consideration of the research activities which can possibly be worked out by utilizing the available equipment.

c) Provision of Data and Information

Filing and classification for reference concerning of all records relating to the research and development activities, tests, analyses and measurements performed; classification for reference of standards and codes; and classification for reference of drawings,

bill of materials, and other technical and design documents of the products manufactured by foreign manufacturers, together with the design standards, drawings and specifications, the standards of raw materials, preparation standards for bill of materials, standards of component parts, and other standards to be applied for the HIC's products.

2) Second Step: Initial Development and Technology Acquirement Stage

Design for modification, trial manufacture, performance test and further improvement are to take place for the HIC's products which require partial modification. In the course of these activities, technology for (i) defining the specifications of component parts and (ii) drafting the drawings of those parts shall be acquired.

a) Provision of Equipment

The definition of specifications and design of component parts have to be performed with the expertise based on actual conditions and characteristics of the products. In order to grasp these it is necessary to perform the tests and analyses of the raw materials, component parts and the products. Therefore the equipment and instruments needed for these tests and analyses are to be installed.

b) Organizational Setup

1. Organize a system for producing HIC's shop drawings based on the original drawings of foreign products which HIC possesses, and starting the production according to the thus prepared drawings.
2. Organize a system for conducting the strength test, availability test and performance test of the products as required for the research activities. These tests and research shall be performed, respectively, by the teams organized for the specific fields and in accordance with the objective, methodology and contents of the research prepared on the individual subjects.
3. Conduct research for clarifying the causes of defective component parts which have been used for the defective products

sold, by means of repeating the manufacturing processes under the same conditions.

c) Provision of Data and Information

Scrutinize the test and analysis data compiled in the file to select those useful for the research.

3) Third Stage: Technology Development Stage

Technology for the product development which have been accumulated through the above activities will be centralized on the Product Development Center (#3-5) when it is established and thereby the product development activities are systematized.

(2) Improvements and Modernization of Production Control

Improvements and modernization of production control are to be undertaken putting emphasis on points of quality control, delivery control and facility control which require urgent introduction of appropriate system to cope with the current situation, among the production control, procurement control, schedule control, material control, quality control, facility control and information control. Further, for a future introduction of a comprehensive production control system, initial preparational activities are to begin. (The provision for the maintenance system is to be performed simultaneously as stated earlier.)

It is necessary to form a specialist project directly led by the Managing Director which is responsible for the achievement of the improvement and modernization of the production control systems, and these to be developed throughout the organization of HIC. In order to proceed with the development in effective adaptation, the programme will be implemented through the following steps:

The first step will be to review the present system and to identify and scrutinize the problem areas. At the same time availability of basic manuals, standards and other relevant statistics will be checked.

The second steps will be to revise the original production system by improving the problems identified at the first step and thereby deve-

lop the applicable system. The following operations will be carried out for each system:

1. Setting of standards
2. Making of control documents
3. Preparation of ledger and data sheets
4. Setting of rules
5. Documentation and manual preparation of the developed system

In the third step, No.1 HI will be chosen as a model shop and introduction of production control systems will be attempted for all the products and component parts handled at No.1 HI. Firstly, introduction of the schedule control system, quality control system and facility control system will be undertaken, and then the application of the other systems will be attempted. Once the introduction to No.1 HI is completed, the introduction will be extended to other factories.

This introduction and development will be advanced in the following manner.

1. Organize a project team which has a secretariat to monitor the progress of the program.
2. Conduct trainings to all concerned at each step of the implementation of the program.
3. Conduct propagation and familiarization of the program to the shop workers.

4-5 Implementation of the Plan

(1) Implementation Plan

The present Renovation Plan covers a number of diverse items to be implemented and thus comprises numerous projects that take up these items in groups. These projects are inter-related, and in their implementation, it is necessary that consideration is given to the results expected from the implementation, to the need for such results and to the schedules of other projects. Consequently, the formulation of an implementation plan which has considered the above, and the establishment of an implementing organization with the proper control functions, to be discussed later, become essential.

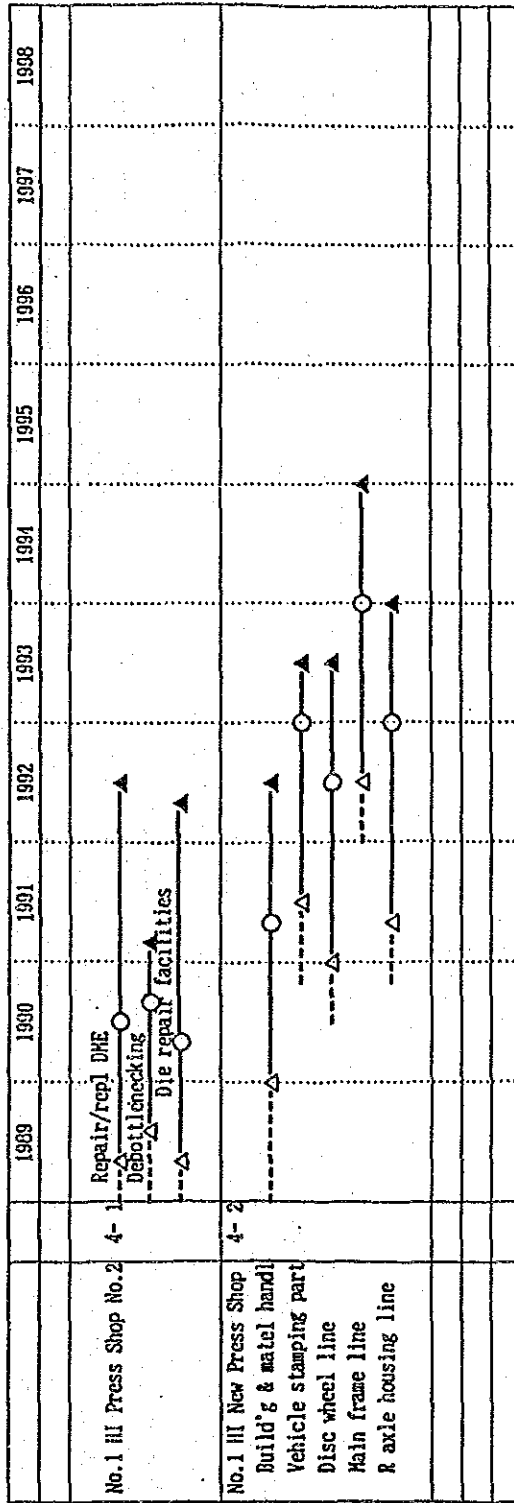
Step 1 in the plan is the basic step that is to be implemented immediately and Step 2 is the step for developing the renovation on the foundation established by Step 1. (The steps of implementation as stated below are conceptual and, at the specific projects level, there are adjustments in timing relative to other projects because of the differences among the projects in the time required for preparation, the time required for fabrication of the equipment and their adjustment and the construction schedule.) (The implementation schedules of individual projects are shown in Figures 4-1 (1) to 4-1 (8).

Step 1

1. The imports of the component parts for heavy vehicles, including those for engines account for about 50% of the total imports of all raw materials and component parts, and the imports for light vehicles, excluding those for engines account for about 10% of the total imports. In view of these facts, the enhancement and expansion of the metal processing sections will be undertaken so as to promote the local production of component parts for vehicles.

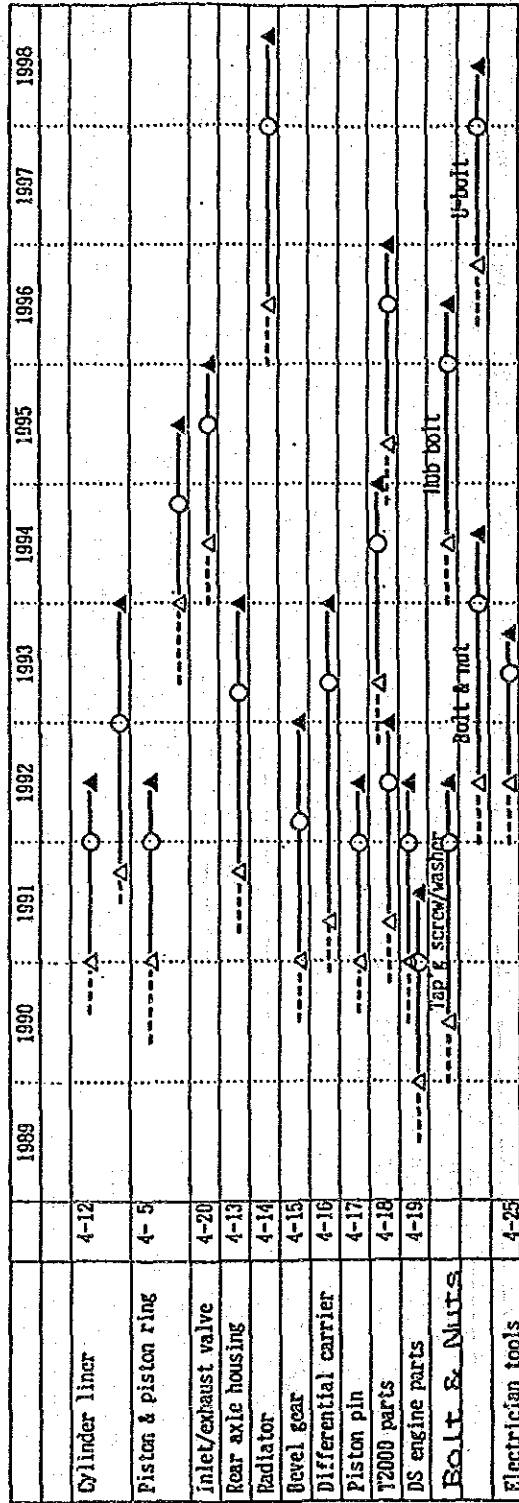
In the metal processing section, the Foundry Shop of No.3 HI, of the foundry section which is most needed for the local production of component parts and which has the potential to grow into an export industry will be expanded.

Figure 4-1(2) IMPLEMENTATION SCHEDULE
 - BUILD UP OF PRESS CAPACITY -



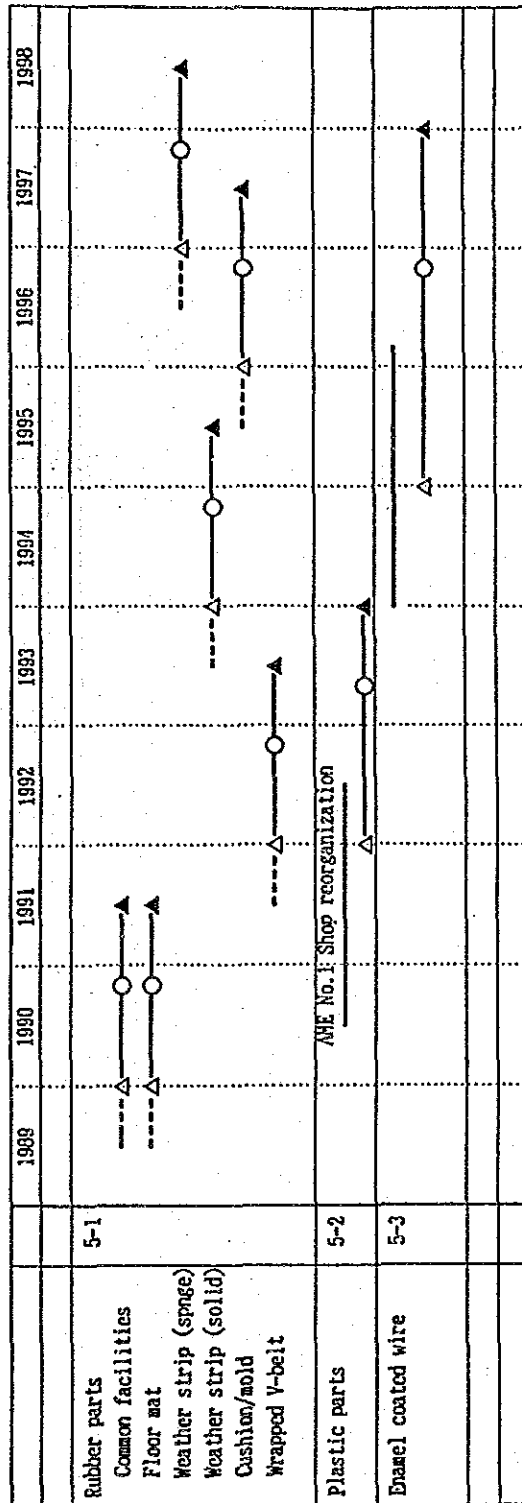
Notes:
 ----- Preparation Δ Contract ○ Delivery ▲ Commencement of operation

Figure 4-1 (3) IMPLEMENTATION SCHEDULE
- VEHICLE METAL PARTS PRODUCTION -



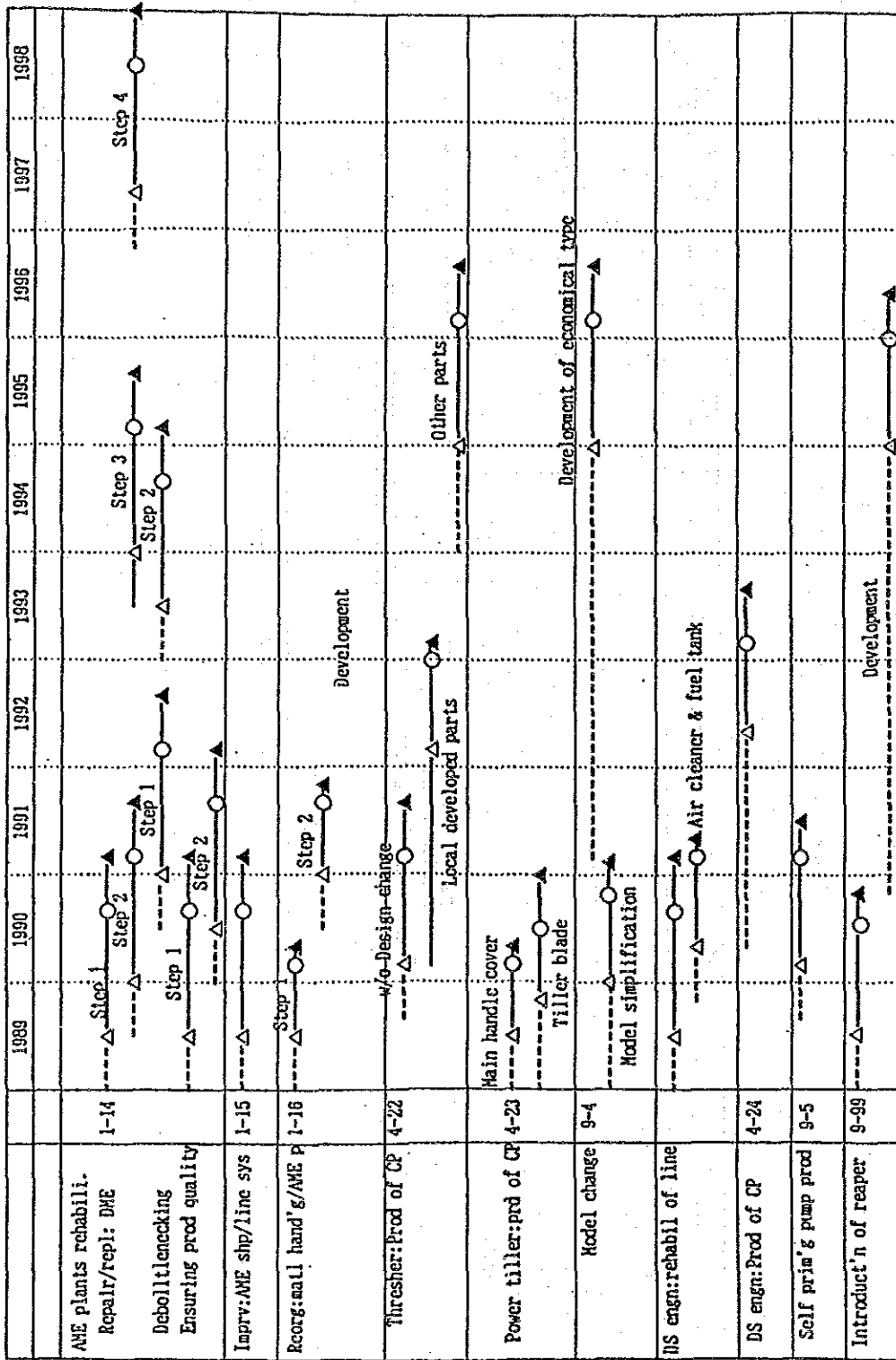
Notes:
 ----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4-1(4) IMPLEMENTATION SCHEDULE
- PRODUCTION OF OTHER PARTS -



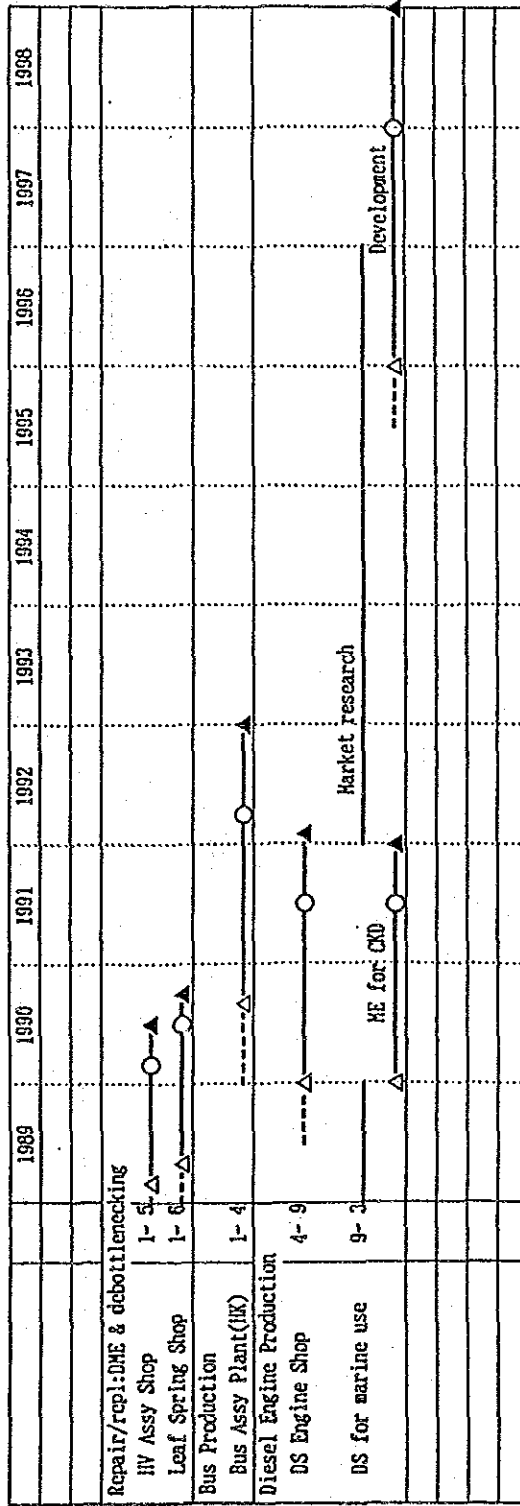
Notes:
 ----- Preparation Δ Contract ○ Delivery ▲ Commencement of operation

Figure 4-1(5) IMPLEMENTATION SCHEDULE
 -- AGRICULTURAL MACHINE & EQUIPMENTS PRODUCTION --



Notes:
 ----- Preparation Δ Contract ○ Delivery ▲ Commencement of operation

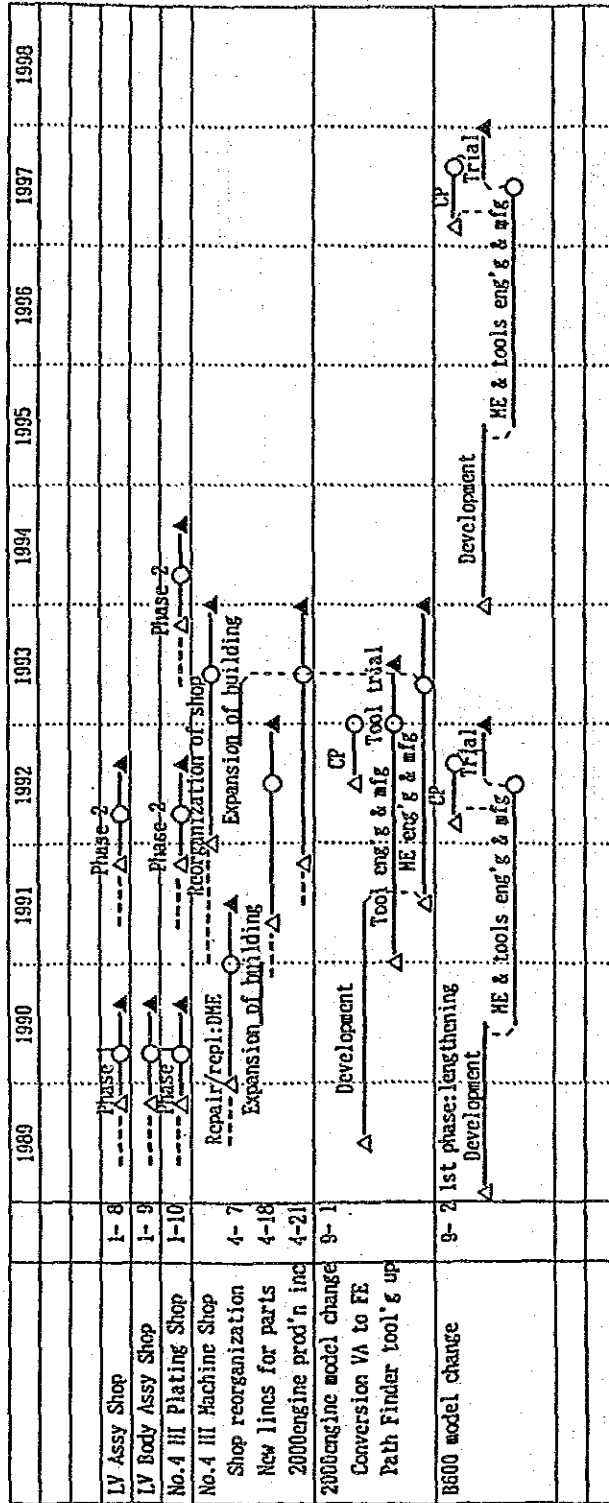
Figure 4-1(6-1) IMPLEMENTATION SCHEDULE
 - VEHICLE PRODUCTION/HEAVY VEHICLE -



Notes:

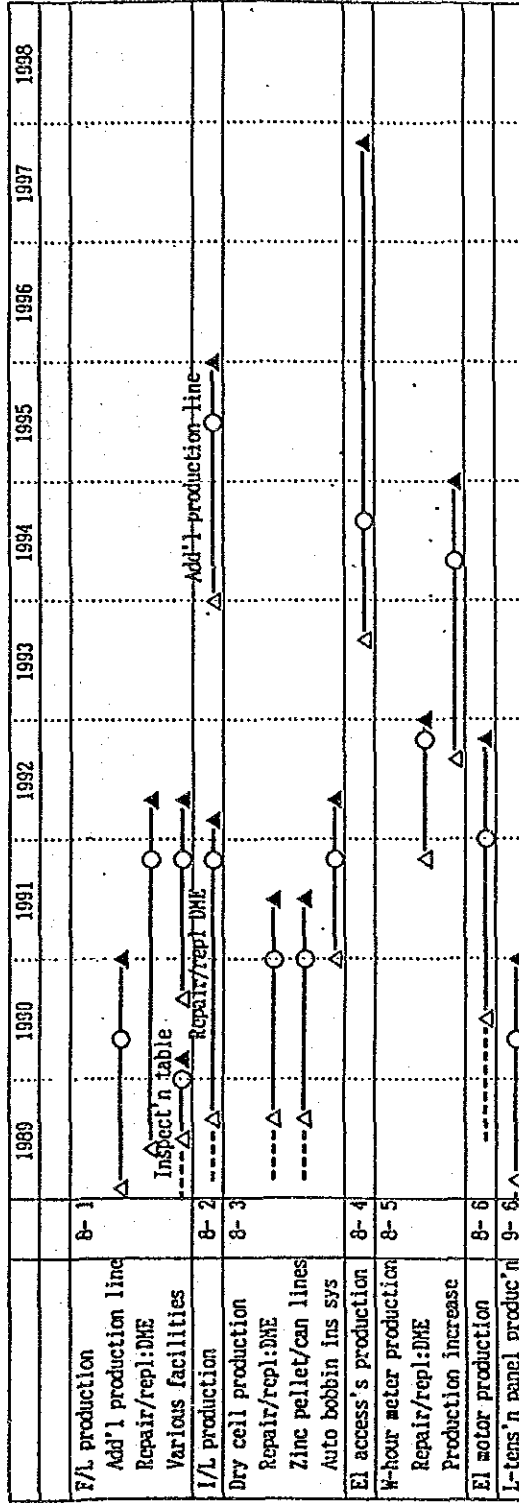
----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4-1 (6-2) IMPLEMENTATION SCHEDULE
 -- VEHICLE PRODUCTION/LIGHT VEHICLE --



Notes:
 ----- Preparation Δ Contract ○ Delivery ▲ Commencement of operation

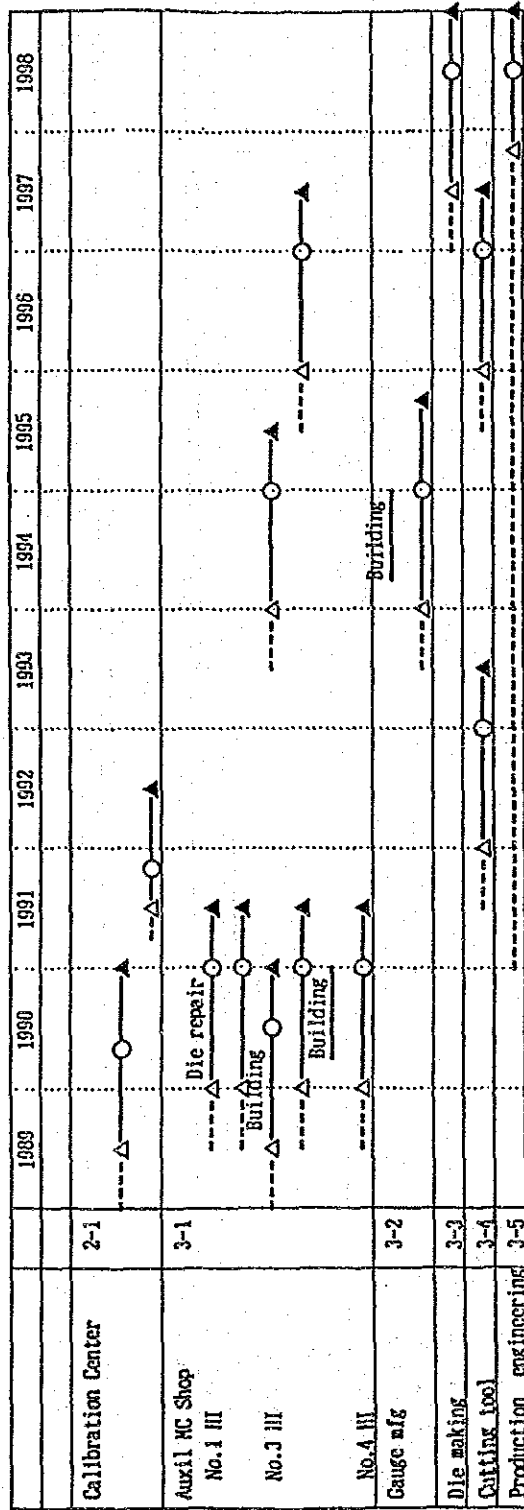
Figure 4-1(7) IMPLEMENTATION SCHEDULE
 - ELECTRIC PRODUCTS PRODUCTION -



Notes:

----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4-1(8) IMPLEMENTATION SCHEDULE
 - AUXILIARY SECTOR -



Notes:
 - - - - - Preparation △ Contract ○ Delivery ▲ Commencement of operation

In the press section, the production system of the Press Shop No.2 of No.1 HI will be improved by removing the bottlenecks.

In the forging section, an operating system will be organized to operate the new 3-ton hammer which has remained unused since its installation because of inadequate auxiliary facilities, thus removing the bottleneck in this section.

These plans will be executed by the middle of 1991, provided, however, that the reinforcement of the foundry shop of No.3 HI will be completed by the end of 1992 because the work will be done in parts which will require extra time, so that the production is not interrupted.

2. Simultaneously, the maintenance system will be improved. The basic actions for improvement of maintenance activity will be commenced immediately, and the A/M Shops will be constructed in No.1, No.3, and No.4 HI by the middle of 1991. The Dies Repair Shops will be constructed in No.1 and No.3 HI by the end of 1992.
3. Preparatory actions for induction of a modern production control system will be implemented immediately. The preparatory actions will start with the extracting of the problems, and the preparation of standards and control data. Such preparatory activity will be completed by the end of 1990.
4. In each production section, plans for renovation of worn-out equipment which is the major obstruction of production and for debottlenecking will be implemented and completed by the middle of 1990.
5. Component parts that can be made by using the present production lines will be made locally.

Step 2

1. Attempts will be made for the metal processing sections to advance into new fields. The local production of metal parts will be expanded by this and the possibility of exports of parts will be enhanced.

The core of this activity lies in the new press shop to be constructed in No.1 HI. The production of large pressed parts will become possible.

In the foundry section, a centrifugal mold casting equipment will be installed, followed by equipment for casting valves and alloy steel.

In the forging section, equipment will be improved to enable the production of large size articles.

2. The production system for jigs, gauges and tools will be improved. Also, in the shops manufacturing these jigs, gauges and tools, skills for production and repair shall be acquired to establish in the future their own technology and make the dies by themselves.
3. Induction and development of production control system will be started in 1991. The system will be inducted first at No.1 HI and proliferated to the other factories. After 1995, actions will be taken to computerize the production control system.
4. In each production section, following the renovation of the production facilities, the production system will be improved or reorganized for expansion. The improvement of the production system and the reorganization for expansion will be implemented in concert with the progress of the Renovation Plan in other sections and with the increase in the demand for the products.
5. Local production of component parts which require new production lines will be implemented in succession. The projects that save more foreign exchange will be given priority.

(2) Mode of Implementation

1) The HIC's Preparation for Implementation

1)-1 Establishment of the Implementation Organization

a) Step 1

- a-1) Repair, adjustment and transfer of existing equipment, and installation of new equipment.

With respect to the projects related to the following three areas,

- a. Expansion of equipment in the metal processing sections
- b. Repair and replacement of worn-out equipment, and removing of bottlenecks in the production sections other than the metal processing sections, and
- c. Construction of the A/M Shops and the Dies Repair Shops,

these work should be commissioned to foreign companies having experience in the respective fields concerned, including the supply of new equipment, and provision of engineering services and technical supervisions for the installation of the new equipment supplied, repairs, adjustment and transfer activities for existing equipment and transfer of equipment. Actual works are to be chiefly carried out by the employees of HIC working in accordance with the technical documents and supervision provided by the foreign companies commissioned. However, civil and building work, plumbing and electrical work and installation work are to be carried out as necessary by specialized Burmese construction companies appointed for this purpose.

In order to proceed in this manner, HIC must decide on the items, quantities and specifications of the new equipment, jigs, dies and tools, and repair parts which are to be supplied from foreign companies and it is also necessary that HIC first define the details concerning the engineering services and technical supervision to be provided by the foreign companies. To this

end, based on the present study, HIC must undertake basic designs and draw up technical specifications for bid invitation.

a-2) Establishment of production systems

The establishment of a production system centers on the acquirement of the production technology needed to carry out the production effectively using the above production equipment. This technology includes that required to carry out the local production of component parts. Such technology transfer is included as a service provided by the foreign companies mentioned in a-1) above.

Further, this is the same for the specific technology required in the A/M Shops and the Dies Repair Shops to be constructed.

a-3) Establishment of a maintenance system for equipment

This task is to establish comprehensive equipment maintenance system for the whole factory, including the establishment of a Preventive maintenance (PM) system, which must be carried out by HIC's own efforts. However, it is essential that a staff equipped with sufficient expertise and experience be at the center of these activities. Since HIC currently is almost completely without staff possessing adequate knowledge and experience, it is necessary initially to appoint experienced foreign consultants for guidance, working with whom the central members of the staff will be trained.

a-4) Preparatory activities for the introduction of modern production control system

As with the above task for the maintenance system, this task also centers on the activities of HIC staff possessing abundant knowledge and experience and it is necessary that HIC proceeds independently, but since HIC currently is almost completely without staff possessing adequate knowledge and experience, it is necessary initially to appoint experienced foreign consultants to advance the work under their guidance, working with whom the central members of the staff will be trained.

b) Step 2

- b-1) Increase of equipment and the repair, adjustment and transfer of existing equipment.

The projects related to the following four areas will be performed in the same manner as described in a-1) above.

- a. Expansion of the metal processing sections.
- b. Expansion of production equipment of production sections other than above.
- c. Installation of the production equipment for jigs, dies, gauges and tools.
- d. Installation of equipment needed for the expansion of local production of component parts.

- b-2) Establishment of production systems involved in the above.

To be promoted using the same means as noted in a-2).

- b-3) Establishment of production control systems and computerization of these.

As this project is to be implemented in continuation of the project mentioned in a-4), it is basically to be promoted by HIC independently. However, since computerization of production control systems is to take place at this stage foreign consultants having experience in this field should be appointed and under their guidance together with decisions as to the type and specification of computer and the details of software to be acquired from abroad.

1)-2 Project Management Duties

The modes for the implementation of the individual projects and an outline of the tasks to be carried out by HIC have been noted above. In order to proceed with the effective advance of the entire plan a project management including the following tasks are vitally important for HIC:

- a) Determination of detailed implementation plans.

- b) Preparations and placing of the orders with foreign companies and undertaking of the commissions (drawing up of bid specifications, bidding procedures, management of the bidding, evaluation and award of the bids received, and contractual negotiations, etc.).
- c) Placing of orders with domestic enterprises.
- d) Coordination of the orders placed with foreign and with domestic companies, and coordination with related governmental authorities and other foreign institutions.
- e) Coordination with the various related departments, in the Headoffice and factories of HIC.
- f) Control of the overall schedule for the plan and the project costs (budget).

1)-3 Outline of Project Management Organization

Figure 4-2 is a chart showing the organizational structure and framework of the project management organization.

1. Project Director and Deputy Directors

A project director is appointed who is fully responsible for the overall management and unification. Under him three deputy directors are to be appointed under whom three groups are to be organized.

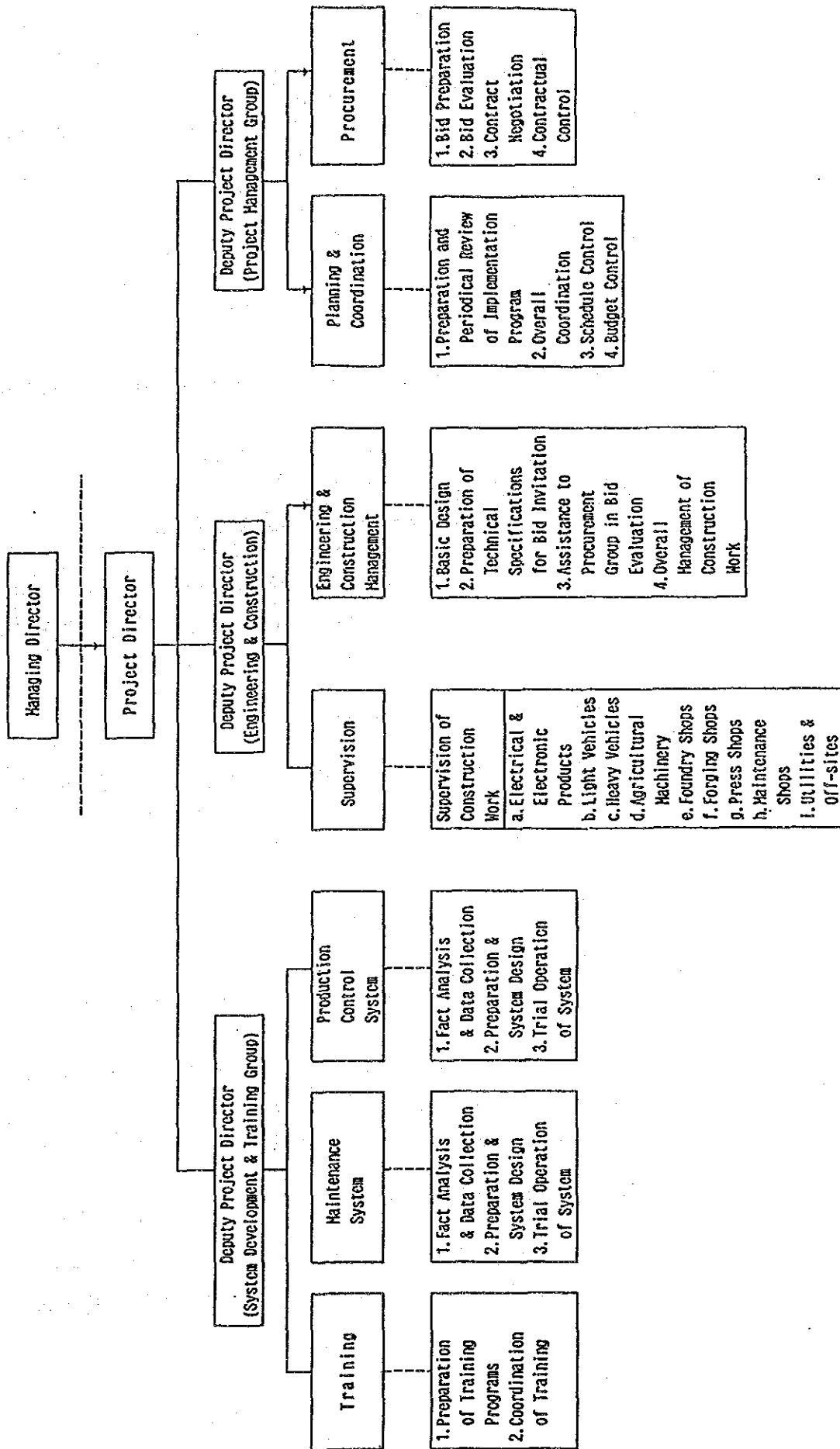
- a) Project management group.
- b) Engineering and construction group.
- c) System development and training group.

The functions of each of the above groups are outlined below.

2. Project Management Group

It consists of the two sections of planning/coordination and of procurement.

Figure 4-2 ORGANIZATION OF PROJECT MANAGEMENT FOR IMPLEMENTATION OF RENOVATION PLAN



Planning/Co-ordination

- a) Formulation of the details of the implementation program and periodical reviews.
- b) Overall coordination.
- c) Schedule management.
- d) Budgetary management.

Procurement

- a) Preparations for bidding, bidding procedures and control of bidding.
- b) Evaluation and award of the bids received.
- c) Contract negotiations.
- d) Management of the contract after its execution.

The headquarter of the Project Management Group is to be located at the HIC Headoffice but the Planning and Co-ordination Section is to have branches in the factory.

3. Engineering and Construction Group

The engineering and construction group consists of two sections; one for the engineering and construction management and the other for supervision of construction work.

Engineering and Construction Management

- a) Basic design.
- b) Drawing up of the technical specifications for bid invitation.
- c) In the evaluation of the bids, render assistance to the procurement group in the technical evaluation.
- d) Management of the overall construction work.

Supervision of Construction Work

To supervise construction work. The actual teams carrying out work will be formed specifically for the work including outside contractors.

The headquarter of the Engineering and Construction Group is to be located at the HIC Headoffice but it is to have branches in each of the factories.

4. Systems Development/Training Group

It consists of three sections of production control systems, maintenance systems and training. The functions of these are as follows:

Production Control System

- a) Undertake basic on-site surveys and gather data in preparation of adopting a production control system.
- b) Preparation for and the design of system for system planning.
- c) Trial implementation of the designed systems.

Maintenance Systems

- a) Basic surveys of the sites and data gathering as preparation for the establishment of maintenance systems.
- b) Preparation for and design of system.
- c) Trial implementation of the systems planned.

Training

- a) Preparation of training programs.
- b) Coordination for training.

This group will have its headquarter at the HIC Headoffice but it is to have branches in each of the factories.

2) Training Program Necessary in the Implementation of the Plan

The training program is divided into two categories.

One is a general training program for all members of the organization from management to staff in order to enhance the general level to enable them to meet the tasks required by the implementation of the Plan.

The other is the training that is required in the implementation of the individual projects of the Plan.

a) General Training Program (#11-2)

The main subjects of the general training program are as follows:

1. Improvement of the ability to control.
2. Improvement of the ability to supervise.
3. Acquiring of control methods.
4. Improvement of technical skills.
5. Improvement of the technical expertise of the middle management.
6. Thorough practice of safety control.

With respect to the training to improve the ability to control and the ability to supervise in this Training Program, the first step will be to engage outside experts to survey the present status of HIC and to prepare the curriculum and texts for the training based on the survey. The second step is to develop the trainers capable of conducting the training of the managers and supervisors within HIC. The trainers of HIC developed by the Trainer Developing Program will carry out the training of the managers or supervisors in sequence.

For the training to be conducted for the improvement of technical skills, the improvement of the teaching materials and tools will be made, and the training will be centered on the upgrading of the middle class skilled workers. These tasks will be conducted by the Training Department of HIC.

The training for the improvement of technical expertise of the middle management will be provided by the lecturers invited from the universities around the country, and a one year training period is considered reasonable. Also, with respect to safety and health control, outside experts will be engaged to prepare the safety management organization, safety management standards and the necessary texts, and conduct the development of trainers.

The trainers developed will carry out the safety and health training of the factories.

b) Training Program for Developing the Personnel for Implementation of the Projects.

b-1) Training Program for the Basic Technical Items

As each project will adopt new equipment, technical training of the personnel is necessary throughout the course from installation of machinery and equipment to the test runs of the shops.

b-2) Training Program for the Special Technical Items

For the projects which adopt equipment requiring high level of technology, or equipment of a type in which HIC has no experience, a training of special technical items will be necessary in addition to the basic technical items above-mentioned.

3) The Role of the Technical Advisory Team of the Four Industrial Projects in the Implementation of the Plan

In implementing the Plan, many experts will be engaged in technical assistance for the respective projects, but their service will be for short periods and confined to the specific equipment. In the case of the Technical Advisory Teams, as they will stay at the same factory they will be able to follow-up the services of the experts. In the implementation of the Renovation Plan, the full utilization of the Technical Advisory Teams is desirable but, for that, the following points need to be considered,

1. Themes for the Technical Advisory Teams should be formulated at the headoffice level of HIC. The formulation of the themes should be systematic so that they will be effective in implementing the Renovation Plan by HIC.
2. The Technical Advisory Teams will stay at the factories as in the past, but will be organized to render advisory service to the Headoffice in addition to the factory level service.

4) Activities of External Consultants towards Plan Implementation

As has already been stated in the previous section with regard to the implementation organization of HIC, engagement of qualified consultants assisting the project management organization set up by HIC is recommended. The main areas on which the consultants, services should be rendered are as follows:

1. Professional services supporting the general aspects to be performed by the Project Management Group.
2. Professional services supporting the section in charge of engineering and construction management of the Engineering/Construction Group.
3. Technical guidance to and training of the HIC staff belonging to the department in charge of production control system and the section in charge of maintenance system of the System Development/Training Group.

The functions for which the consultant will be responsible in each of the above mentioned areas are as follows:

1. Professional services and advice to the Project Management Group.

The consultant will provide professional services and advice for the following undertakings realized by the staff of HIC.

- a) Formulation of a detailed implementation program (including coordination procedures and systems for schedule and budgetary control).
- b) Examination of bidding procedures (including the procedures and criteria for evaluation and award of bids received).
- c) Drawing up of tender documents.
- d) Evaluation and award of the received bids.
- e) Control of schedule and budget.

2. Professional services to the section in charge of engineering and construction management of the engineering/construction group.

The consultant shall provide professional services and advice for the following undertakings to be realized by the staff of HIC:

- a) Basic design.
 - b) Drawing up of technical specifications for bid invitation.
 - c) Technical evaluation of the details of the received bids.
3. Technical guidance to and training of the HIC staff belonging to the section in charge of production control system and the section in charge of maintenance system of the Systems Development/ Training Group.

The functions of the consultant in this area are included in the training program outlined under the previous section. Therefore, the required expenses are also included in the expenses for the training program.

4-6 Capital Requirement Plan

The estimated capital requirements for the implementation of the present Renovation Plan is shown in Table 4-6. The detail of the capital requirements is shown in Tables 4-7 (1) to 4-7 (3) by implementation year for the coming 10 years and in Table 4-8 by project category.

4-7 The Effects of the Present Renovation Plan

(1) Introduction

As presented in the previous chapters, the objectives of Renovation Plan for the Four Industrial Projects are

1. to improve the foundation to sustain the present production and to expand the production in future by improving the production control and the maintenance system while carrying on the repairing and rationalization of the production facilities (Repairing and Rationalization of the Production Facilities and the Improvement and Establishment of the Foundation of Production),
2. to establish the foundation to promote local production to the extent possible in order to curtail imports of the raw materials and parts and to establish the foundation to foster exports in the future of products and parts which have such potentiality (Expansion of Local Production and Establishment of the Foundation for Exports),
3. to expand production by the subsequent step in order to respond to the anticipated increase of demand in the future (Expansion of Facilities for Increased Production), and
4. to establish a system whereby HIC is able to carry out model changes and product development on its own and achieve self-sustaining operation under such a system (Establishment and Structuring of a System for Product Development and Product Designing).

As examined in Chapter 1 and Chapter 2, it is obvious that the Four Industrial Projects will make great contributions to the development

Table 4-6 ESTIMATED CAPITAL REQUIREMENTS

(Million Yen)

	Foreign	Local	Total
1. Building materials	6,829.7	5,478.6	12,308.3
2. Machine and equipments	77,198.8	0.0	77,198.8
3. Ocean freight and insurance	8,169.4	0.0	8,169.4
4. Import duty	0.0	13,835.4	13,835.4
5. Local handling costs	0.0	1,451.2	1,451.2
6. Installation cost	0.0	1,031.0	1,031.0
7. Technical services	8,302.5	0.0	8,302.5
a) License fee	607.5	0.0	607.5
b) Engineering fee	6,974.8	0.0	6,974.8
c) Software	720.2	0.0	720.2
8. Advisory services	4,611.2	0.0	4,611.2
a) Project management & engineering/construct'n	968.0	0.0	968.0
b) System development & training	3,643.2	0.0	3,643.2
Base project cost	105,111.6	21,796.2	126,907.8
Contingency	10,511.2	2,179.6	12,690.8
Total project cost	115,622.8	23,975.8	139,598.6

Notes: 1. Base project cost; as of July, 1988.

2. Contingency: 10% of the base project cost.

Table 4-7(1) ESTIMATED CAPITAL REQUIREMENTS

	(Million Yen)										Total
	Year	1	2	3	4	5	6	7	8	9	
Foreign currency costs											
1 Building materials	384.4	703.9	3,370.5	912.9	114.1	747.3	38.7	97.5	460.4	0.0	6,829.7
2 Machine & equipments	7,440.3	11,292.9	22,164.5	9,785.1	3,401.5	11,180.2	2,858.0	3,897.7	5,015.8	162.8	77,198.8
3 Freight & insurance	716.3	1,144.5	2,689.8	991.8	341.9	1,128.1	266.0	380.2	495.3	15.5	8,169.4
4 Technical services	1,849.7	693.1	2,265.7	631.7	302.7	434.1	148.7	589.5	1,368.3	19.0	8,302.5
License fee	19.3	64.4	315.9	128.9	0.0	12.4	0.0	8.2	58.4	0.0	607.5
Engineering fee	1,659.4	621.5	1,779.4	479.5	251.9	361.2	148.7	398.9	1,267.1	7.2	6,974.8
Software	171.0	7.2	170.4	23.3	50.8	60.5	0.0	182.4	42.8	11.8	720.2
5 Advisory services	572.4	622.3	462.8	590.6	521.9	379.2	449.2	372.9	334.7	305.2	4,611.2
Project management	229.1	177.3	81.3	177.3	140.4	73.9	29.6	29.6	29.5	0.0	968.0
System development	343.3	445.0	381.5	413.3	381.5	305.3	419.6	343.3	305.2	305.2	3,643.2
Base project cost	10,963.1	14,456.7	30,953.3	12,912.1	4,682.1	13,868.9	3,760.6	5,337.8	7,674.5	502.5	105,111.6
Contingency	1,096.3	1,445.7	3,095.3	1,291.2	468.2	1,386.9	376.1	533.8	767.5	50.2	10,511.2
Sub-total	12,059.4	15,902.4	34,048.6	14,203.3	5,150.3	15,255.8	4,136.7	5,871.6	8,442.0	552.7	115,622.8
Local currency costs											
1 Building materials	468.3	433.2	2,401.2	749.6	112.5	646.2	54.3	117.6	495.7	0.0	5,478.6
2 Machine & equipments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 Import duty	1,281.0	1,976.1	4,234.0	1,753.5	578.9	1,958.6	474.4	656.4	895.8	26.7	13,835.4
4 Local handling cost	126.7	196.0	466.1	179.7	63.3	194.5	43.4	69.3	108.6	3.6	1,451.2
5 Installation cost	127.1	190.0	130.3	139.3	28.3	114.1	117.5	43.5	140.4	0.5	1,031.0
Base project cost	2,003.1	2,795.3	7,231.6	2,822.1	783.0	2,913.4	689.6	886.8	1,640.5	30.8	21,796.2
Contingency	200.3	279.5	723.2	282.2	78.3	291.3	69.0	88.7	164.0	3.1	2,179.6
Sub-total	2,203.4	3,074.8	7,954.8	3,104.3	861.3	3,204.7	758.6	975.5	1,804.5	33.9	23,975.8
Total project cost	14,262.8	18,977.2	42,003.4	17,307.6	6,011.6	18,460.5	4,895.3	6,847.1	10,246.5	586.6	139,598.6

Table 4-7(2) ESTIMATED CAPITAL REQUIREMENTS
(Step 1)
(Million Yen)

Year	1	2	3	4	Total
Foreign currency costs					
1 Building materials	384.4	375.0	2.2	0.0	761.6
2 Machine & equipments	7,440.3	9,465.1	1,927.3	757.0	19,589.7
3 Freight & insurance	716.3	927.0	193.6	84.0	1,920.9
4 Technical services	1,849.7	546.4	159.6	17.3	2,573.0
License fee	19.3	12.2	0.0	0.0	31.5
Engineering fee	1,659.4	527.0	95.5	17.3	2,299.2
Software	171.0	7.2	64.1	0.0	242.3
5 Advisory services	572.4	622.3	462.8	0.0	1,657.5
Project management	229.1	177.3	81.3	0.0	487.7
System development	343.3	445.0	381.5	0.0	1,169.8
Base project cost	10,963.1	11,935.8	2,745.5	858.3	26,502.7
Contingency	1,096.3	1,193.6	274.5	85.8	2,650.2
Sub-total	12,059.4	13,129.4	3,020.0	944.1	29,152.9
Local currency costs					
1 Building materials	468.3	226.3	3.1	0.0	697.7
2 Machine & equipments	0.0	0.0	0.0	0.0	0.0
3 Import duty	1,281.0	1,619.9	318.7	126.2	3,345.8
4 Local handling cost	126.7	153.1	33.3	11.7	324.8
5 Installation cost	127.1	188.9	35.4	6.6	358.0
Base project cost	2,003.1	2,188.2	390.5	144.5	4,726.3
Contingency	200.3	218.8	39.1	14.5	472.7
Sub-total	2,203.4	2,407.0	429.6	159.0	5,199.0
Total project cost	14,262.8	15,535.4	3,449.7	1,103.1	34,352.0

Table 4-7(3) ESTIMATED CAPITAL COSTS
(Step 2)

	Year	2	3	4	5	6	7	8	9	10	Total
(Million Yen)											
Foreign currency costs											
1 Building materials	328.9	3,368.3	912.9	114.1	747.3	38.7	97.5	460.4	0.0	6,068.1	
2 Machine & equipments	1,827.8	20,237.2	9,028.1	3,401.5	11,180.2	2,858.0	3,897.7	5,015.8	162.8	57,609.1	
3 Freight & insurance	217.5	2,496.2	907.8	341.9	1,128.1	266.0	380.2	495.3	15.5	6,248.5	
4 Technical services	146.7	2,106.1	614.4	302.7	434.1	148.7	589.5	1,368.3	19.0	5,729.5	
License fee	52.2	315.9	128.9	0.0	12.4	0.0	8.2	58.4	0.0	576.0	
Engineering fee	94.5	1,683.9	462.2	251.9	361.2	148.7	398.9	1,267.1	7.2	4,675.6	
Software	0.0	106.3	23.3	50.8	60.5	0.0	182.4	42.8	11.8	477.9	
5 Advisory services	0.0	0.0	590.6	521.9	379.2	449.2	372.9	334.7	305.2	2,953.7	
Project management	0.0	0.0	177.3	140.4	73.9	29.6	29.6	29.5	0.0	480.3	
System development	0.0	0.0	413.3	381.5	305.3	419.6	343.3	305.2	305.2	2,473.4	
Base project cost	2,520.9	28,207.8	12,053.8	4,682.1	13,868.9	3,760.6	5,337.8	7,674.5	502.5	78,608.9	
Contingency	252.1	2,820.8	1,205.4	468.2	1,386.9	376.1	533.8	767.5	50.2	7,861.0	
Sub-total	2,773.0	31,028.6	13,259.2	5,150.3	15,255.8	4,136.7	5,871.6	8,442.0	552.7	86,469.9	
Local currency costs											
1 Building materials	206.9	2,398.1	749.6	112.5	646.2	54.3	117.6	495.7	0.0	4,780.9	
2 Machine & equipments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3 Import duty	356.2	3,915.3	1,627.3	578.9	1,958.6	474.4	656.4	895.8	26.7	10,489.6	
4 Local handling cost	42.9	432.8	168.0	63.3	194.5	43.4	69.3	108.6	3.6	1,126.4	
5 Installation cost	1.1	94.9	132.7	28.3	114.1	117.5	43.5	140.4	0.5	673.0	
Base project cost	607.1	6,841.1	2,677.6	783.0	2,913.4	689.6	886.8	1,640.5	30.8	17,069.9	
Contingency	60.7	684.1	267.7	78.3	291.3	69.0	88.7	164.0	3.1	1,706.9	
Sub-total	667.8	7,525.2	2,945.3	861.3	3,204.7	758.6	975.5	1,804.5	33.9	18,776.8	
Total project cost	3,440.8	38,553.8	16,204.5	6,011.6	18,460.5	4,895.3	6,847.1	10,246.5	586.5	105,246.7	

Table 4-8 ESTIMATED CAPITAL REQUIREMENTS BY PROJECT CATEGORY

(Million Yen)

Project Category	Foreign currency costs					Total	Local currency costs	Total	
	Bldg mat'l & M/E	Freight/ insurance	Technical services	Project manage't	System develop't				Total
1 Rehabilitation & modernization of facilities	72,851.4	7,197.9	4,146.6			84,195.9	18,085.3	102,281.2	
1 Rehabilitation & prepar'n for future develop't	16,139.3	1,533.1	961.6			18,634.0	3,208.3	21,842.3	
- Rehabilitation & shop/line improvement	15,403.3	1,463.2	880.0			17,746.5	3,046.7	20,793.2	
- Furnace conversion to ensure supply of fuel	427.2	40.5	57.6			525.3	79.9	605.2	
- Recycling/reclaiming wasted resources	308.8	29.4	24.0			362.2	81.7	443.9	
2 Buildup of production capacity	56,712.1	5,664.8	3,185.0			65,561.9	14,877.0	80,438.9	
- Conversion of parts import to dom product'n	48,045.7	4,855.4	2,884.2			55,785.3	12,783.9	68,569.2	
- Production increase to meet demand increase	3,174.7	256.5	150.4			3,581.6	686.6	4,268.2	
- Product improvement/development to meet mkt	5,491.7	552.9	150.4			6,195.0	1,406.5	7,601.5	
2 Establishment of auxiliary department	9,473.0	836.2	2,026.5		1,052.5	13,388.2	2,892.3	16,280.5	
3 Improve:production control/product develop't	1,704.1	135.3	2,129.4		2,449.9	6,418.7	818.6	7,237.3	
4 Project implementation/training					968.0	140.8		1,108.8	
Total	84,028.5	8,169.4	8,302.5		968.0	3,643.2	21,796.2	126,907.8	

of industry in Burma. Therefore, it is needless to reiterate here the significance of the attempt to maintain and expand the production by renovation of the Four Industrial Projects. In this chapter, the effects realized by the implementation of the Renovation Plan will be evaluated in light of the objectives stated above alone.

(2) Repairing and Rationalization of the Production Facilities and the Improvement and Establishment of the Foundation of Production

In order to implement the Renovation Plan to achieve this objective, 17,750 million yen of foreign exchange including the auxiliary facilities is required. As reviewed in Chapter 3, the facilities of the Four Industrial Projects are extremely deteriorated and the production is obstructed, and as the situation is expected to intensify it cannot be neglected. It is judged that this is an indispensable investment to sustain the production of the Four Industrial Projects.

(3) Expansion of Local Production and Establishment of the Foundation for Exports

As investment in equipment for localization of parts and raw materials, foreign exchange in the amount of 55,790 million yen is required. Assuming the production for 1988 is achieved as planned by HIC, the foreign exchange required for importing the necessary parts and raw materials is estimated to be 10,420 million yen as shown in Table 4-9. Of that amount, the foreign exchange required to import parts and raw materials planned for local production in the present Renovation Plan is estimated to be 4,030 million yen. This is equivalent to approximately 40% of the total foreign exchange requirement for the imports mentioned above. In case the planned production for 1988 should be carried out as planned, it is estimated that a saving of approximately 440 million yen of foreign exchange would be realized if the localization plan is implemented. This is equivalent to approximately 11% of the foreign exchange required for imports of parts and raw materials which are listed for localization.

To support the plans for expanded production in the future, the imports of raw materials and parts will naturally increase. The foreign exchange requirement, assuming that no localization of parts

Table 4-9 REQUIRED IMPORT OF COMPONENT PARTS AND RAW MATERIALS
(WITH RENOVATION PLAN AND WITHOUT RENOVATION PLAN)

(Million Yen)

Products	1988	1993			1998		
		w/o Plan (A)	w/ Plan (B)	(A-B)	w/o Plan (C)	w/ Plan (D)	(C-D)
1 Agricultural M/E							
1) Power tiller	156	187	175	12	312	292	20
2) Power thresher	78	101	78	23	156	120	36
3) Diesel engine	801	918	586	332	1,057	681	376
2 Light vehicles							
1) B600 pick-up	277	346	343	3	368	366	2
2) X2000 cross country	369	430	360	70	773	647	126
3) T2000 light truck	287	287	254	33	574	509	65
3 Heavy vehicles							0
1) TE 6.5ton truck	1,597	2,228	1,962	266	2,264	1,993	271
2) BX 33-passengers bus	387	697	666	31	1,162	1,110	52
4 Electric products							
- Electric fan	78	151	124	27	151	124	27
5 Other factors contribute to reduce import requirement							
- Rubber parts product'	0	0	-75	75	0	-105	105
- Enamel coated wire	0	0	-138	138	0	-138	138
- Reclamation of alminm	0	0	-4	4	0	-6	6
- Gauge production	0	0	-4	4	0	-4	4
- Cutting tool product'n	0	0	-3	3	0	-3	3
Total	4,030	5,345	4,324	1,021	6,817	5,586	1,231

Note: Total import requirement including the parts not converted to the domestic production without the Plan is as follows;

	1988	1993	1998
Import requirement of the CP & RM not converted to the domestic production:			
1) Agricultural M/E	575	689	769
2) Vehicles	1,874	2,454	3,006
3) Electric products	3,876	4,647	6,169
Sub-total	6,325	7,790	9,944
Total import requirement	10,355	13,135	16,761

above-mentioned took place and that the production was expanded using imported raw materials and parts as in the past, would be estimated to amount to 13,140 million yen in 1993 and 16,760 million yen in 1998 based on the production plans for these years. Of these amounts, the amounts of raw materials and parts to be substituted by the above-mentioned local production plan would be 5,340 million yen in 1993 and 6,820 million yen in 1998, the corresponding savings in foreign exchange is estimated to be 1,020 million yen in 1993 and 1,230 million yen in 1998. (All calculations are based on 1988 prices.)

These expected savings of foreign exchange are savings related to substitution of imported raw materials and parts and does not consider the investments in equipment. Looking at the savings of foreign exchange only, not a large saving can be expected in comparison with the required investment. The reason is that the most of equipment for the parts production include those designed larger than required to meet the probable expansion of production capacity at the same time, and therefore, bring small foreign exchange savings under the presently planned production scale. The projects that can be clearly expected to bring savings under the presently planned production scale, are as follows:

- #4-3 Expansion of the foundry
- #4-5 Increased production of pistons and piston rings
- #4-10 Local production of cylinder liners (provided that the savings come from integrated operation starting with the foundry)
- #4-22 Local production of parts for threshers
- #4-23 Local production of tillers

Even though the savings are small, however, there are projects as in the case of the construction of the new press shop (#4-2), that have to be implemented in order to improve the foundation for the future especially for exports. The possibility to export in the future can be expected by the expansion of the equipment in the metal processing sections and improvement of production control system, etc., as stated before.

Among the projects, however, there are those that are expected to have very high costs. At the stage of actual implementation, it is recom-

mended that decisions be made considering the results of this study and scrutinizing carefully the specific projects and the time of implementation.

(4) Expansion of Facilities for Increased Production

As reviewed in Chapter 2, the present production of the Four Industrial Projects are short of the domestic demand for the majority of the products. Assuming that finished products will be imported if domestic production does not meet the expected demand, the outlay of foreign exchange is estimated to be 1,200 million yen in 1993 and 3,230 million yen in 1998.

On the other hand, estimating the foreign exchange required for imports of raw materials and parts necessitated by the increased production under this Plan and calculating its rate to the outlay of foreign exchange for imports of finished products, they are 49.2% on a weighted average basis as shown in Table 4-10. In other words, if the investment in equipment is excluded, a 50% saving in foreign exchange can be expected. The required foreign exchange investment for this purpose is estimated 3,580 million yen and the foreign exchange saving effect is significant. However, it should be kept in mind that the other portion of required foreign exchange cost is included in the cost for domestic production of parts described already. In the actual implementation, therefore, it is recommended that a careful selection of the projects be made considering the results of this study.

(5) Improvement of Production Control System, Establishment and Structuring of a System for Product Development and Product Designing

The foreign exchange requirement for this category of projects is estimated to be 6,420 million yen. It is difficult to quantitatively determine the effects, but it is deemed to be a necessary investment for HIC to pursue self-sustaining operation and to establish, in addition, a system for exports.

Table 4-10 OPPORTUNITY SUBSTITUTION OF IMPORT BY THE RENOVATION PLAN

Products	Unit import price (FOB) (000Yen)	Production increase over exist'g capacity (Nos.)		Opportunity substitution of import (mil Yen)		% of CP/RM cost in case of dom. product'n
		1993	1998	1993	1998	
1 Agricultural M/E						
1) Pumping set	93	600	2,470	55.8	229.7	51.0
2) Power tiller	215	0	400	0.0	86.0	74.3
3) Power thresher	125	150	500	18.8	62.5	35.2
4) Diesel generating set	141	200	300	28.2	42.3	80.7
2 Light vehicles						
1) B600 pick-up	422	150	200	63.3	84.4	96.6
2) X2000 cross country	422	80	500	33.8	211.0	88.2
3) T2000 light truck	342	100	400	34.2	136.8	92.4
3 Heavy vehicles	682	225	600	153.5	409.2	47.5
4 Electric products						
1) Incandescent lamps	0.16	0	2,500,000	0.0	400.0	21.9
2) Fluorescent lamps	0.48	950,000	1,550,000	456.0	744.0	22.5
3) Electric accessories	0.13	0	350,000	0.0	45.5	23.8
4) Watt-hour meter	14	4,500	12,500	63.0	175.0	38.6
5) Electric motor	39	1,000	3,000	39.0	117.0	17.2
6) Dry battery	0.03	8,350,000	16,350,000	250.5	490.5	83.3
Total				1,196.1	3,233.9	49.2

Note: Unit import prices are the average prices of the similar type products exported from Japan in 1987 (f.o.b.).

(6) Overall Evaluation

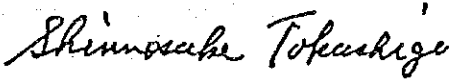
Summing up the above evaluations and taking an overall view, it is considered that the implementation of projects necessary for improving and establishing the foundation of production or those that can be fully expected to bring foreign exchange savings should be given priority. It is recommended that HIC establish a priority order for implementation of the projects based on the results of this survey.

A P P E N D I X

SCOPE OF WORK
FOR
THE STUDY
ON
THE RENOVATION OF THE FOUR INDUSTRIAL PROJECTS
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA
AGREED UPON BETWEEN
THE HEAVY INDUSTRIES CORPORATION
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

RANGOON: 14th OCTOBER, 1987


LT. COL. THAN SHWE
MANAGING DIRECTOR
HEAVY INDUSTRIES CORPORATION


MR. SHINNO SUKE TOKUSHIGE
LEADER, JAPANESE PRELIMINARY
SURVEY TEAM,
THE JAPAN INTERNATIONAL
COOPERATION AGENCY

I. Introduction

In response to the request of the Government of the Socialist Republic of the Union of Burma (hereinafter referred to as "GSRUB"), the Government of Japan has decided to conduct a study on the renovation of the Four Industrial Projects of Heavy Industries Corporation (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of GSRUB.

The present document sets forth the Scope of Work with regard to the Study.

II. Objective of the Study

The objective of the Study is to diagnose factories of the Four Industrial Projects of Heavy Industries Corporation (hereinafter referred to as "HIC") as shown below and investigate the possibilities of their renovation from technical and economic points of view and prepare the report.

1. Factories and sites
2. Products and assembly lines

III. Scope of the Study

In order to achieve the above objective, the Study will cover the following items:

1. Survey of the back-ground and relevant conditions of the Study

- 1-1. Present economic and social situation
- 1-2. Present situation and policies of industries
- 1-3. Development program of the Four Industrial Projects
- 1-4. Laws, regulations and other relevant information related to industries

2. Diagnosis of the factories

2-1. General aspects:

- 2-1-1. Location and layout
- 2-1-2. Production items and its production
- 2-1-3. Major facilities and equipment installed
- 2-1-4. Organization, administration scheme and manpower
- 2-1-5. Plan and past record of production
- 2-1-6. Sale of products
- 2-1-7. Education and training system

2-2. Management aspects:

- 2-2-1. Operation of machinery and equipment
- 2-2-2. Quality control
- 2-2-3. Process control
- 2-2-4. Maintenance of machinery and equipment
- 2-2-5. Procurement and stock control

2-2-6. Cost control and price mechanism

2-2-7. Test and inspection control

2-2-8. Safety and environmental control

2-3. Technical aspects:

2-3-1. Assembly lines, offsite and auxiliary facilities

2-3-2. Building, structure and warehouse

3. Market survey

4. Formulation of renovation program

4-1. Renovation plan

4-2. Financial requirement

4-3. Training plan

4-4. Implementation schedule

5. Conclusion and recommendation

IV. Steps and Schedule

1. Steps

Step 1: Preparatory office work

Step 2: Field work in Burma

Step 3: Home office work in Japan

Step 4: Presentation of and discussion on the interim report

Step 5: Home office work in Japan

Step 6: Presentation of and discussion on the draft final report

2. Tentative schedule

The tentative schedule of the Study is shown in Annex I.

V. Reports

JICA shall prepare and submit the following reports written in English to GSRUB.

1. Inception report at the beginning of step 2: 5 copies
2. Progress report at the end of the step 2: 10 copies
3. Interim report at the step 4: 20 copies
4. Draft final report and its summary within six months after commencement of the step 3: 20 copies
5. Final report and its summary within one and a half month after the receipt of comments on the draft final report by HIC: 50 copies

VI. Undertaking of GSRUB

1. To facilitate smooth conduct of the Study, GSRUB shall take necessary measures:
 - 1-1. to secure the safety of the Japanese study team,
 - 1-2. to permit the members of the Japanese study team to enter, leave, and sojourn in Burma for the duration of their assignment therein, and exempt from alien registration requirement and consular fees,
 - 1-3. to exempt the members of the Japanese study team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into Burma for conduct of the Study,
 - 1-4. to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study,

- 1-5. to provide necessary facilities to the Japanese study team for remittances as well as utilization of funds introduced into Burma from Japan in connection with the implementation of the Study,
 - 1-6. to provide the medical services as needed and its expenses will be chargeable on the members of the Japanese study team,
 - 1-7. to secure permission for the Japanese study team to take all data and all documents related to the Study out of Burma to Japan.
2. GSRUB shall bear claims, if any arises, against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or wilful misconduct on the part of the members of the Japanese study team.
 3. HIC shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
 4. HIC shall , at its own expenses, provide the Japanese study team with the following, if necessary:
 - 4-1. available data and information related to the Study,
 - 4-2. counterpart personnel,
 - 4-3. suitable office with necessary equipment in each Study site,
 - 4-4. credentials or identification cards,
 - 4-5. chauffeured vehicles.

VII. Undertaking of JICA

For the implementation of the Study, JICA shall take necessary measures as follows:



1. to dispatch, at its own expense, study team to the Socialist Republic of the Union of Burma,
2. to pursue technology transfer to the Burmese counterpart personnel in the course of the Study.

VIII. Consultation

JICA and HIC will consult with each other in respect of any matter which may arise from or in connection with the Study.

Tentative Schedule of the Study

ANNEX I.

Year & Month Item	1987												1988												Remarks
	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12								
Preparatory Work (Step 1)																									
Field Work (Step 2)																					<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  In Japan </div> <div style="text-align: center;">  In Burma </div> </div>				
Home Office Work (Step 3 & Step 5)																									
Presentation of Interim Report (Step 4)																									
Presentation of Draft Final Report (Step 6)																									
Submission of Final Report																					△				

FACTORIES AND SITES AS WELL AS PRODUCTS AND
ASSEMBLY LINES TO BE COVERED BY THE STUDY

1. Factories and Sites

No.(1) H.I	Rangoon (including Htauk Kyant)
No.(3) H.I	Sinde
No.(4) H.I	Htonbo
No.(5) H.I	Nyaungchidauk

Note. The Study Team might visit the No.(2) H.I Malun to have a look at production lines of injection pumps, if the Study Team has enough time left.

2. Products and assembly lines

2.1 Facilities

- 2.1.1 Die repairing and die making facilities.
- 2.1.2 Jig production facility.
- 2.1.3 Gauge production facility.
- 2.1.4 Scrap and raw material handling facility for iron foundry.
- 2.1.5 Forging facilities for rear axle shaft.
- 2.1.6 Pressing facilities for big parts.
- 2.1.7 Cylinder liner production.
- 2.1.8 Manganese dioxide purification facilities.
- 2.1.9 Components for dry cell batteries production facilities.
- 2.1.10 Sand reclaiming and recycling facilities.
- 2.1.11 2000cc Engine and transmission production facilities.
- 2.1.12 Bus component production facilities.
- 2.1.13 Rear axle housing production facilities.
- 2.1.14 Conversion of heating system for furnaces.
(from oil to LPG and Electricity)

- 2.1.15 Enamel copper wire production facilities.
- 2.1.16 Bolt and Nut making facilities. (Including U-bolt, stud bolt and long bolts)
- 2.1.17 Disc wheel production.
- 2.1.18 Radiator production.
- 2.1.19 Material handling and transport facilities for the above mentioned facilities.
- 2.1.20 Planning and drawing facilities.

2.2 Assembly line.

- 2.2.1 Dry cell Battery Assembly line.
- 2.2.2 Fluorescent Lamp Assembly line.
- 2.2.3 Incandescent Lamp Assembly line.
- 2.2.4 Watt hour meter Assembly line.
- 2.2.5 Electric motor Assembly line.
- 2.2.6 Distribution Transformer Assembly line.
- 2.2.7 Electric Accessories Assembly line.
- 2.2.8 Electric fan Assembly line.
- 2.2.9 Light Vehicle Assembly line.
- 2.2.10 Heavy Vehicle Assembly line.
- 2.2.11 Bus Assembly line.

2.3 Products

- 2.3.1 Dry cell batteries.
- 2.3.2 Fluorescent lamp.
- 2.3.3 Incandescent lamp.
- 2.3.4 Watt hour meter.
- 2.3.5 Lighting fixture.
- 2.3.6 Electric motor.

- 2.3.7 Distribution Transformer.
- 2.3.8 Electric Accessories.
- 2.3.9 Electric Fan.
- 2.3.10 600cc Vehicle.
- 2.3.11 2000cc Vehicle. (Including 2 ton Light Truck)
- 2.3.12 6.5 ton Truck series.
- 2.3.13 33 passenger Bus.
- 2.3.14 Water pumping set.
- 2.3.15 Power Tiller.
- 2.3.16 Thresher.
- 2.3.17 Portable diesel generator.
- 2.3.18 Spare parts and components for automobile and farm machinery:-
 - Cylinder liner.
 - Piston Pin
 - Rear Axle shaft.
 - Drive pinions and ring gears.
 - Gear for engine and transmission.
 - Rear axle housing.
 - Radiator.
 - Disc wheel.
 - Bolts and Nuts.

Minutes of Meeting
between
The Heavy Industries Corporation
and
The JICA Survey Team
on

The Progress Report for The Study on
The Renovation of The Four Industrial Projects

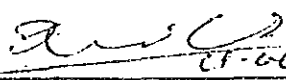
The JICA Survey Team (the Team) headed by Mr. Masayasu Sakanashi had a meeting with the Heavy Industries Corporation (HIC) chaired by Lt. Col. Than Shwe, Managing Director and attended by other HIC officers at HIC Head Office in Rangoon on February 22, 1988 in order to discuss on the Progress Report for The Study on The Renovation of The Four Industrial Projects (the Study). A list of the participants is attached as Appendix I.

Salient points of the discussion are as follows:

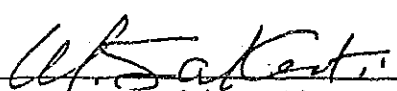
1. Both sides agreed in principle to proceed with the succeeding work of the Study in accordance with the approach and schedule stated in Chapters 3, 4 and 5 of the Progress Report.
2. HIC requested the Team to consider the following points:
 - 1) Investigation on steps to be taken by HIC if it undertakes the production of reaper and color television receiver sets in the future.
 - 2) Investigation on effective utilization of idled old machines such as their utilization for training purpose
 - 3) Investigation on availability of mini-machines designed for training purpose

The Team agreed to consider the foregoing investigations in the Study, however, the investigation on Item 1) above be made on a preliminary study basis by taking required machines and equipment as well as technology into consideration and also subject to approval of JICA.

Rangoon, February 24, 1988



Lt. Col. Than Shwe
Managing Director
Heavy Industries Corporation.



Mr. Masayasu Sakanashi
Leader, Japanese Survey Team
Japan International Cooperation Agency

LIST OF PARTICIPANTS

A. MEMBERS OF JAPANESE SURVEY TEAM

1. Mr. M. Sakanashi	Team Leader
2. Mr. H. Sasaki	Deputy Team Leader
3. Mr. M. Umeoka	Team Member
4. Mr. H. Osawa	Team Member
5. Mr. A. Horiguchi	Team Member
6. Mr. E. Katoh	Team Member
7. Mr. I. Sasaki	Team Member
8. Mr. S. Ochi	Team Member
9. Mr. H. Wani	Team Member
10. Mr. S. Miyamoto	Team Member
11. Mr. F. Satoh	Team Member
12. Mr. T. Hiratsuka	Team Member
13. Mr. O. Ebina	Team Member
14. Mr. M. Nakamura	Team Member
15. Mr. T. Yoshida	Team Member
16. Mr. T. Nakagawa	Team Member
17. Mr. M. Nagatomo	Team Member
18. Mr. S. Ikutoh	Team Member
19. Mr. Y. Fukuhara	Team Member
20. Mr. T. Baba	Team Member
21. Mr. N. Ohkawa	Team Member
22. Mr. T. Inada	Team Member
23. Mr. T. Inooka	Team Member
24. Mr. M. Sakakura	Team Member
25. Mr. M. Maruyama	Team Member

B. EMBASSY OF JAPAN

Mr. U. Kitamura	Administrative and Technical Staff (Deputy Representative, JICA)
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C. MEMBERS OF H.I.C. AND OTHER BURMESE COUNTERPARTS

H.I.C. Head Office

- | | |
|-----------------------|---------------------------------------|
| 1. Lt.Col. Than Shwe | Managing Director |
| 2. Lt.Col. Sein Htoon | Director (Planning) |
| 3. U Thein Aung | Director (Production) |
| 4. Daw Hta Hta Yee | Director (Finance) |
| 5. Maj. Aung Myint | Deputy Director (Planning) |
| 6. U Aung Soe Win | Assistant Director (Planning) |
| 7. Daw Tin Tin Nu | Deputy Assistant Director (Finance) |
| 8. U Win Tint | Deputy Assistant Director (Planning) |
| 9. U Tin Win Maung | Deputy Assistant Director (Planning) |
| 10. Daw Than SWE | Deputy Assistant Director (Planning) |
| 11. U Aung Min | Deputy Assistant Director (Design) |
| 12. U Myo Aung | Deputy Project Engineer (Design) |
| 13. U Thein Win | Deputy Project Engineer (Planning) |
| 14. Daw Mya Mya Kyaw | Assistant Project Engineer (Planning) |

No.1 H.I.

- | | |
|----------------------|----------------------------------|
| 1. Maj. Maung Kyi | Deputy Factory Superintendent |
| 2. Daw Khin May Than | Deputy Factory Superintendent |
| 3. U Than Htut | Deputy Factory Superintendent |
| 4. U Lone Khain | Assistant Factory Superintendent |

Technical Services Corporation

- | | |
|------------------|---------------------------|
| 1. U Saw Boiteau | Deputy Assistant Director |
| 2. U Kyaw Soe | Head of Department |

LIST OF COUNTERPARTS H.I.C HEAD OFFICE

<u>Name</u>	<u>Designation</u>	<u>Office Phone No.</u>
1. Lt. Col. Than Shwe	- Managing Director	60721/62863
2. Lt. Col. Sein Htoon	- Director (Planning)	61769/62579
3. Daw Hta Hta Yee	- Director (Finance)	62865
4. U Thein Aung	- Director (Production)	62883
5. U Tin Kyi	- Director (Administration)	62879
6. U Zaw Win	- Deputy Director (Planning)	62869
7. Maj: Aung Myint	- Deputy Director (Planning)	62892/62887
8. U Aung Soe Win	- Assistant Director (Planning)	62892/62887
9. U Win Tint	- Deputy Assistant Director (Planning)	62892/62887
10. U Tin Win Maung	- Deputy Assistant Director (Planning)	62892/62887
11. U Thein Win	- Deputy Project Engineer (Planning)	62892/62887
12. Maj. Tin Aung	- Assistant Director (Design)	62892/62887
13. U Aung Min	- Deputy Assistant Director (Design)	62892/62887
14. U Myo Aung	- Deputy Project Engineer (Design)	62892/62887

LIST OF COUNTERPARTS No.(1) H.I.

<u>Name</u>	<u>Designation</u>	<u>Office Phone No.</u>
1. Maj: Maung Kyi	- Deputy Factory Superintendent	62872
2. Daw Khin May Than	- Deputy Factory Superintendent	
3. U Than Htut	- Deputy Factory Superintendent	
4. Capt. Aung Lwin	- Assistant Factory Superintendent (Production. 1)	
5. Daw Kyin Htay	- Assistant Factory Superintendent (Production. 2)	
6. U Thein Zaw	- Assistant Factory Superintendent (Production. 3)	
7. Capt. Kyaw Soe	- Assistant Factory Superintendent (Electric & Service)	
8. U Aung Thaw	- Assistant Factory Superintendent (Manufacturing Store)	
9. Daw Tin Tin Hla	- Assistant Factory Superintendent (Finance)	
10. U Htay Lwin	- Assistant Factory Superintendent (Administration)	
11. U Lone Khaing	- Assistant Factory Superintendent (Inspection Dept.) (Coordinator for the diagnosis of No.(1) Factory).	

LIST OF COUNTERPARTS - No.(3) H.I.

<u>Name</u>	<u>Designation</u>	<u>Office Phone No.</u>
1. Maj. The Tun Aung	- Factory Superintendent	053-21182/21572
2. U Kye Shwe	- Advisor	
3. U Thein Ngwe	- Deputy Factory Superintendent	
4. Maj.Khin Mg Tun	- Assistant Factory Superintendent (Production)	
5. Daw Mya Mya Lwin	- Assistant Factory Superintendent (Finance)	
6. U Kyaw Myo Win	- Plant Manager	
7. U Htay Kyu	- Plant Manager	
8. U Zaw Oo	- Plant Manager	
9. U Ko Ko Gyi	- Assistant Factory Superintendent (Planning) (Coordinator for the diagnosis of No.(3) Factory)	

LIST OF COUNTERPARTS No.(4) H.I.

<u>Name</u>	<u>Designation</u>
1. Maj: Nelson Khaing	- Deputy Factory Superintendent
2. U Hla Shwe	- Assistant Factory Superintendent (Production)
3. U Tin Shein	- Assistant Factory Superintendent
4. U Khin Maung Htwe	- Plant Manager (Battery Plant).
5. U Myint Thein	- Plant Manager (Inspection Dept.)
6. Capt. Kyaw Htun	- Plant Manager (Vehicle Assembly and Painting)
7. U Kyaw Lwin	- Shop Manager (Diesel Engine Plant)
8. U Soe Myint	- Shop Manager (Piston & Piston Ring Shop)
9. U Thaung Htun	- Shop Manager (Battery Container Plant).
10. U Ngwe Soe	- Shop Manager (Machine Shop)
11. U Kyaw Kyaw	- Shop Manager (Machine Shop)
12. U Myint Aung	- Shop Manager (Body Assembly Shop)
13. U Win Maung	- Shop Manager (Light Alloy Foundry Shop)
14. Daw Toe Toe San	- Shop Manager (Light Alloy Foundry Shop)
15. U Myo Minn	- Assistant Factory Superintendent (Planning). (Coordinator for the diagnosis of No.(4) Factory).

LIST OF COUNTERPARTS - No.(5) H. I.

<u>Name</u>	<u>Designation</u>
1. Maj. Htun Win	- Factory Superintendent
2. U Win Kyaing	- Deputy Factory Superintendent
3. Daw Thet Thet Thein	- Assistant Factory Superintendent (Finance)
4. U Kyi Win	- Assistant Factory Superintendent (Production)
5. Daw Than Than Aye	- Plant Manager (Planning)
6. Daw Tin Myo Khaing	- Shop Manager (Planning)
7. U Myo Hlaing	- Shop Manager (Production)
8. U Khin Maung Cho	- Plant Manager (Planning) (Coordinator for the diagnosis of No.(5) Factory).

LIST OF COORDINATORS.

1. Coordinator for the entire team - U Thein Win
Deputy Project Engineer (Planning)
HIC Head Office.
(Phone No. 62887/62892)
2. Coordinator for the diagnosis of each factory -
 1. U Lone Khaing
Assistant Factory Superintendent
(Inspection Dept).
No.(1) H.I. Phone No. 62872
 2. U Ko Ko Gyi
Assistant Factory Superintendent.
(Planning)
No.(3) H.I. Phone No.053.21182/21572
 3. U Myo Min
Assistant Factory Superintendent.
(Planning)
No.(4) H.I.
 4. U Khin Maung Cho
Plant Manager (Planning)
No.(5) H.I.
3. Coordinator for market Study -
 1. U Thein Aung
Director (Production)
HIC Head Office
Phone No. 62883/62880
 2. U Khin Maung Myint
Manager. (Sale Dept)
HIC Head Office
(Phone No. 62883/62880)
4. Coordinator for collecting local factors for cost estimate -
 1. Daw Hta Hta Yee
Director (Finance)
HIC Head Office (Phone No.62865)
 2. Daw Tin Tin Nu
Deputy Assistant Director (Finance)
HIC Head Office
(Phone No. 62865).

Feb. 10 (Wed)	PC1	No. 3	Discussion with No. 3	
	PC2	No. 4	Discussion with No. 4	
	PC3	RGN	Discussion with No. 1	
	EP	No. 3	Discussion with No. 3	
	AM	No. 3	Discussion with No. 3	
	LV	No. 4	Discussion with No. 4	
	HV1	RGN	Discussion with No. 1	
	HV2	No. 4	Discussion with No. 4	
	MW	No. 3	Discussion with No. 3	
	MA	RGN	Discussion with Corps	
	Feb. 11 (Thu)	PC1	No. 3	Travel from No. 3 to No. 5 and Discussion with No. 5
		PC2	No. 4	Discussion with No. 4
PC3		RGN	Discussion with No. 1	
EP		No. 3	Discussion with No. 3	
AM		No. 3	Discussion with No. 3	
LV		No. 4	Discussion with No. 4	
HV1		RGN	Discussion with No. 1	
HV2		No. 4	Discussion with No. 4	
MW		No. 3	Discussion with No. 3	
MA		RGN	Discussion with Corps.	
Feb. 12 (Fri)		PC1	No. 3	Travel between No. 3 to No. 4 and Discussion with No. 4
		PC2	No. 4	Discussion with No. 4
	PC3	No. 4	Travel from RGN to No. 4	
	EP	No. 3	Discussion with No. 3	
	AM	No. 3	Discussion with No. 3	
	LV	No. 4	Discussion with No. 4	
	HV1	RGN	Discussion with No. 1	
	HV2	No. 4	Discussion with No. 4	
	MW	No. 3	Discussion with No. 3	
	MA	RGN	Summary of Field Study	
	Feb. 13 (Sat)	PC1	No. 4	Internal Meeting
		PC2	No. 4	Internal Meeting
PC3		No. 4	Internal Meeting	
EP		No. 3	Travel between No. 3 and No. 4 and Internal Meeting at No. 4	
AM		No. 3,	Travel between No. 3 and No. 4 and Internal Meeting at No. 4	
LV		No. 4	Internal Meeting	
HV1		RGN	Summary of Field Study	
HV2		No. 4	Internal Meeting	
MW		No. 3	Travel between No. 3 and No. 4 and Internal Meeting at No. 4	
MA		RGN	Summary of Field Study	

Annex 3: Record of Field Survey

Date	Group	Place of Stay	Particular
Jan. 29 (Fri)	Team 1	RGN	Arrival from Tokyo
Jan. 30 (Sat)	Team 1	RGN	Inception Meeting with HO
Jan. 31 (Sun)	Team 1	RGN	Internal Meeting
Feb. 1 (Mon)	Team 1	RGN	Discussion on R/P with HO
Feb. 2 (Tue)	Team 1	RGN	Discussion on R/P with HO
Feb. 3 (Wed)	Team 1	RGN	Discussion on R/P with HO
Feb. 4 (Thu)	Team 1	RGN	Discussion on R/P with HO and Arrival of Team No. 2
Feb. 5 (Fri)	All members	RGN	Plant Visit at No. 1 and Internal Meeting
Feb. 6 (Sat)	All members	RGN	Internal Meeting
Feb. 7 (Sun)	PC1	No. 3	Travel from RGN to No. 3
	PC2	No. 4	Travel from RGN to No. 4
	PC3	RGN	Summary of Field Study
	EP	No. 3	Travel from RGN to No. 3
	AM	No. 3	Travel from RGN to No. 3
	LV	No. 4	Travel from RGN to No. 4
	HV1	RGN	Summary of Field Study
	HV2	No. 4	Travel from RGN to No. 4
	MW	No. 3	Travel from RGN to No. 3
	MA	RGN	Summary of Field Study
	Feb. 8 (Mon)	PC1	No. 3
PC2		No. 4	Inception Meeting with No. 4
PC3		RGN	Discussion on R/P with No. 1
EP		No. 3	Meeting with No. 3 and Plant Visit
AM		No. 3	Meeting with No. 3 and Plant Visit
LV		No. 4	Discussion on R/P with No. 4
HV1		RGN	Discussion on R/P with No. 1
HV2		No. 4	Meeting with No. 4
MW		No. 3	Meeting with No. 3 and Plant Visit
MA		RGN	Discussion with HO
Feb. 9 (Tue)		PC1	No. 3
	PC2	No. 4	Discussion with No. 4
	PC3	RGN	Discussion with No. 1
	EP	No. 3	Discussion with No. 3
	AM	No. 3	Discussion with No. 3
	LV	No. 4	Discussion with No. 4
	HV1	RGN	Discussion with No. 1
	HV2	No. 4	Discussion with No. 4
	MW	No. 3	Discussion with No. 3
	MA	RGN	Discussion with HO

Feb. 14 (Sun)	PC1	No. 4	Travel from No. 4 to RGN
	PC2	No. 4	Summary of Field Study
	PC3	No. 4	Summary of Field Study
	EP	No. 3	Travel from No. 3 to RGN
	AM	No. 3	Summary of Field Study
	LV	No. 4	Summary of Field Study
	HV1	RGN	Summary of Field Study
	HV2	No. 4	Summary of Field Study
	MW	No. 3	Summary of Field Study
	MA	RGN	Summary of Field Study
	Feb. 15 (Mon)	PC1	RGN
PC2		No. 4	Travel from No. 4 to No. 2 and Plant Visit and Discussion
PC3		No. 4	Discussion with No. 4
EP		RGN	Discussion with No. 1
AM		No. 3	Travel from No. 3 to No. 5 Plant Visit and Discussion
LV		No. 4	Discussion with No. 4
HV1		RGN	Discussion with No. 1
HV2		No. 2	Travel from No. 4 to No. 2 Plant Visit and Discussion
MW		No. 3	Travel between No. 3 and No. 5 Plant Visit and Discussion
MA		RGN	Discussion with HO
Feb. 16 (Tue)		PC1	RGN
	PC2	No. 4	Plant Visit and Discussion and Travel from No. 2 to No. 4
	PC3	No. 4	Discussion with No. 4
	EP	RGN	Discussion with No. 1
	AM	No. 3	Discussion with No. 3
	LV	No. 4	Discussion with No. 4
	HV1	RGN	Discussion with No. 1
	HV2	No. 4	Travel between No. 4 and No. 2 and Discussion with No. 2
	MW	No. 3	Discussion with No. 3
	MA	RGN	Discussion with HO
	Feb. 17 (Wed)	PC1	RGN
PC2		No. 4	Travel from No. 4 to No. 3 Plant Visit and Discussion
PC3		No. 3	Visit to ITC/TS and Discussion
EP		RGN	Discussion on R/P with No. 1
AM		No. 3	Plant Visit
LV		No. 4	Discussion on R/P with No. 4
HV1		RGN	Discussion on R/P with No. 1
HV2		No. 4	Discussion on R/P with No. 4
MW		No. 3	Discussion on R/P with No. 3
MA		RGN	Observation of Markets with HO

Feb. 18 (Thu)	PC1	RGN	Discussion on R/P with No.1 Discussion on R/P with No.3 and Travel from No.3 to RGN Visit to ITC/TS and Discussion and Travel from No.3 to RGN Discussion on R/P with No.1 Plant Visit and Travel from No.3 to RGN Discussion on R/P with No.1 Discussion on R/P with No.1 Plant Visit at No.3 and Travel from No.3/4 to RGN Plant Visit and Discussion and Travel from No.3 to RGN Discussion with HO Discussion on R/P with No.1 Discussion on R/P with No.1 Internal Meeting Meeting with No.1 Internal Meeting Plant Visit at No.1 Plant Visit at No.1 Plant Visit at No.1 Plant Visit at No.1
	PC2	RGN	
	PC3	RGN	
	EP	RGN	
	AM	RGN	
	LV	RGN	
	HV1	RGN	
	HV2	RGN	
	MW	RGN	
	MA	RGN	
Feb. 19 (Fri)	PC1	RGN	
	PC2	RGN	
	PC3	RGN	
	EP	RGN	
	AM	RGN	
	LV	RGN	
	HV1	RGN	
	HV2	RGN	
	MW	RGN	
	MA	RGN	
Feb. 20 (Sat)	PC3	RGN	
	LV	RGN	
	HV1	RGN	
	HV2	RGN	
	Others	RGN	
Feb. 21 (Sun)	All members	RGN	Meeting with HO
Feb. 22 (Mon)	All members	RGN	Plant Visit at No.1
Feb. 23 (Tue)	Team 2	RGN	Plant Visit at No.1
Feb. 24 (Wed)	Team 2	RGN	Plant Visit at No.1
Feb. 25 (Thu)	Team 2	RGN	Plant Visit at No.1
	T		Summary of Field Study
			Internal Meeting
			Progress Meeting with HIC

NOTES:

Team 1: Mr. Sakanashi/Mr. H. Sasaki/Mr. Umeoka/Mr. Inooka
Mr. I. Sasaki/Mr. Katoh/Mr. Horiguchi
Mr. Nagatomo/Mr. Maruyama
Team 2: Mr. Sakanashi/Mr. H. Sasaki/Mr. Inooka

Group	Sub-Team
PC	(A) Production & Control System
PC1	Mr. Osawa/Mr. Horiguchi
PC2	Mr. Umeoka
PC3	Mr. I. Sasaki/Mr. Katoh
EP	(B-1) Electric Product Mr. Ochi/Mr. Miyamoto/Mr. Wani/Mr. Sato
AM	(B-2) Agricultural Machineries Mr. Hiratsuka/Mr. Ebina/Mr. Nakamura
HV	(B-3) Heavy Vehicles
HV1	Mr. Yoshida
HV2	Mr. Nakagawa/Mr. Nagatomo
LV	(B-4) Light Vehicles Mr. Ikutoh/Mr. Fukuhara/Mr. Nagatomo
MW	(C) Metal Working & Component Parts Mr. Ohkawa/Mr. Inada/Mr. Baba
MA	(D) Project Background & Market/Cost Analysis Mr. Inooka/Mr. Sakakura/Mr. Maruyama

Abbreviation

R/P : Renovation Plan
RGN : Rangoon
HIC : Heavy Industry Corporation No.n : No.(n) HIC
HO : Head Office
No.n : No.(n) HIC

JICA