

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 (#10-1) 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 situations, 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 team directly led by the Managing Director which is responsible for the achievement of the improvements 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 program 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 step will be to revise the original production system by improving the problems identified at the first step and thereby develop 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.

During the preparatory stage the following basic activities shall be undertaken:

1. Schedule control - progress control

Visualize the progress in such means as indicating it in a bar chart on blackboards.

2. Quality control - prevention of recurrence of defective parts
 - a. Establish a system whereby all of the defective parts including even minor defects such as rust and bruise be reported to the quality control section if they require any work for correction.
 - b. Cause the quality control section to check the products.

- c. Cause the quality control section to analyze the cause of the defective parts, while taking statistics of the rejects, and report these to concerned parties.
3. Facility control - daily inspections
 - a. Cause the operators to make check in accordance with check lists for pre- and post-operation for each machine, and record the check results in the inspection sheets.
 - b. Cause the shop manager to check the inspection sheets and if required to give guidance.
 - c. File all of the breakdown statistics and detailed records of the machines.

Further, the following equipment and services shall be arranged in order to facilitate the implementation of the program.

1. Employment of advisers to assist the project.
2. Full provision of administrative and information equipment such as copy machine, microfilm device, word processor, desk computer and automatic printer, etc.
3. Computerization of the system in future.

4-5 Implementation of the Plan

(1) Implementation Plan

1) Outline of the 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.

The fundamental philosophy in formulating the implementation plan for the Renovation Plan will be presented below. 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.)

Step 1

1. The imports of the component parts for heavy vehicles, including those for engines account for about 50% of the total import of all raw materials and components, 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 sections will be undertaken so as to promote the local production of component parts for vehicles.

In the metal processing sections, 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.

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) Implementation Plans for Specific Projects

The implementation plans for the specific projects are shown in the following diagrams:

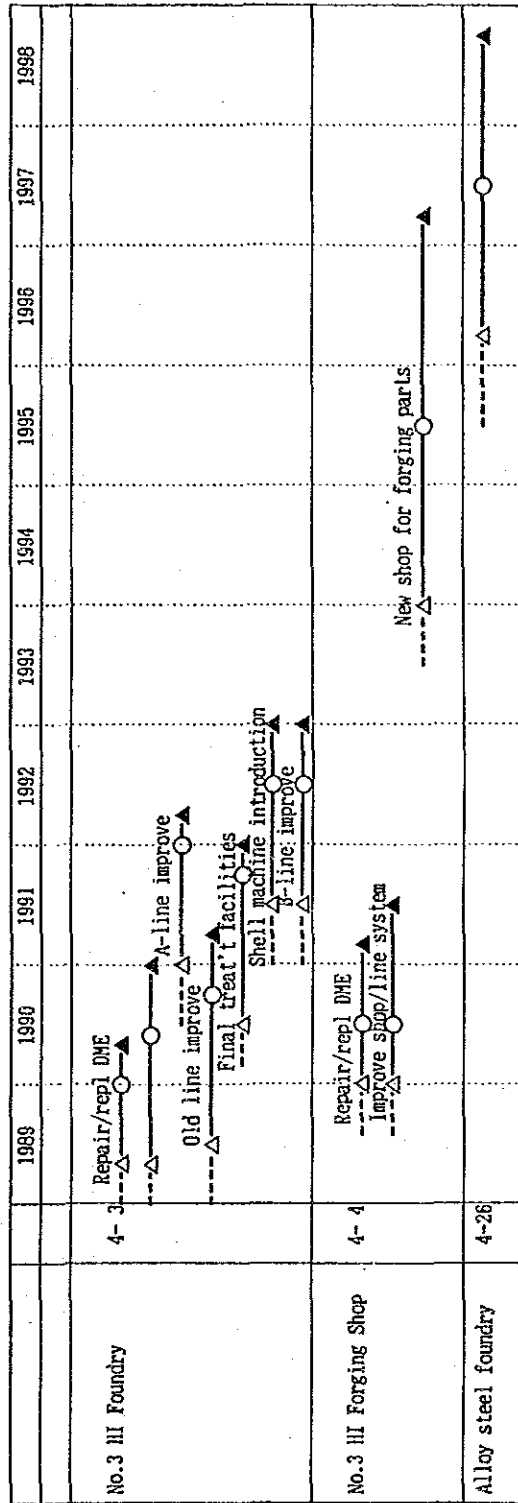
A.	Renovation of production facilities	
A-1	Buildup of the metal processing capacity	
	1. Foundry and forging sections	Fig. 4.5-1
	2. Press section	Fig. 4.5-2
A-2	Development of metal parts machining	Fig. 4.5-3
A-3	Local production of other parts	Fig. 4.5-4
A-4	Renovation of the agricultural machinery production section	Fig. 4.5-5
A-5	Renovation of the vehicle production section	Fig. 4.5-6
A-6	Renovation of the electric products production section	Fig. 4.5-7
B.	Establishment of the auxiliary section to support the renovation of facilities	Fig. 4.5-8
C.	Preparations for future self-sustenance	Fig. 4.5-9
		Fig. 4.5-10

(2) Mode of Implementation

1) The HIC's Preparation for Implementation

The present Renovation Plan, as has already been mentioned in Section 4-5(1), is divided into Step 1 which is scheduled to be completed by the end of 1992, consisting of various projects to be implemented in the schedule individually set, and Step 2 of which the implementation is to continue on the foundation established in the first step. Both steps involve the implementation of a large number of projects widely diverse in detail and nature. Moreover the present Renovation Plan is concerned with a wide range of shops, and it is necessary for implementation to proceed to the extent possible without putting a stop to the operations of each individual shop. In order to carry out such a complicated plan effectively, HIC while preparing a detailed implementation program must also form the particular project management team who is responsible for implementing the plan in accordance with the

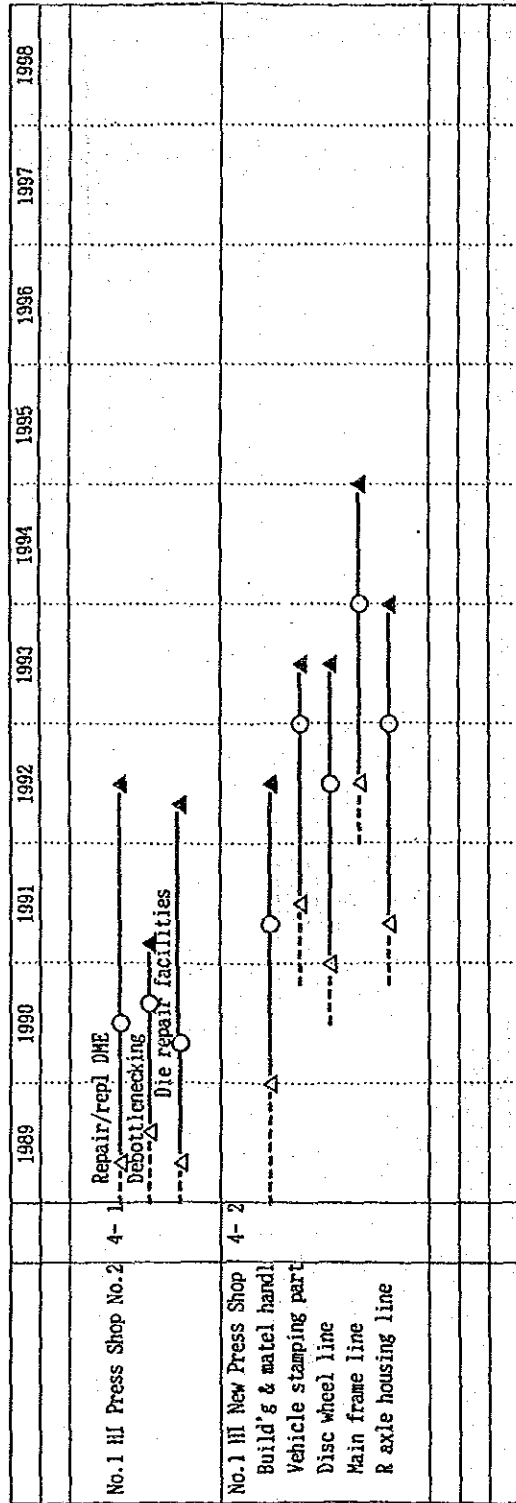
Figure 4.5-1 IMPLEMENTATION SCHEDULE
 - BUILD UP OF METAL PROCESSING CAPACITY -



Notes:

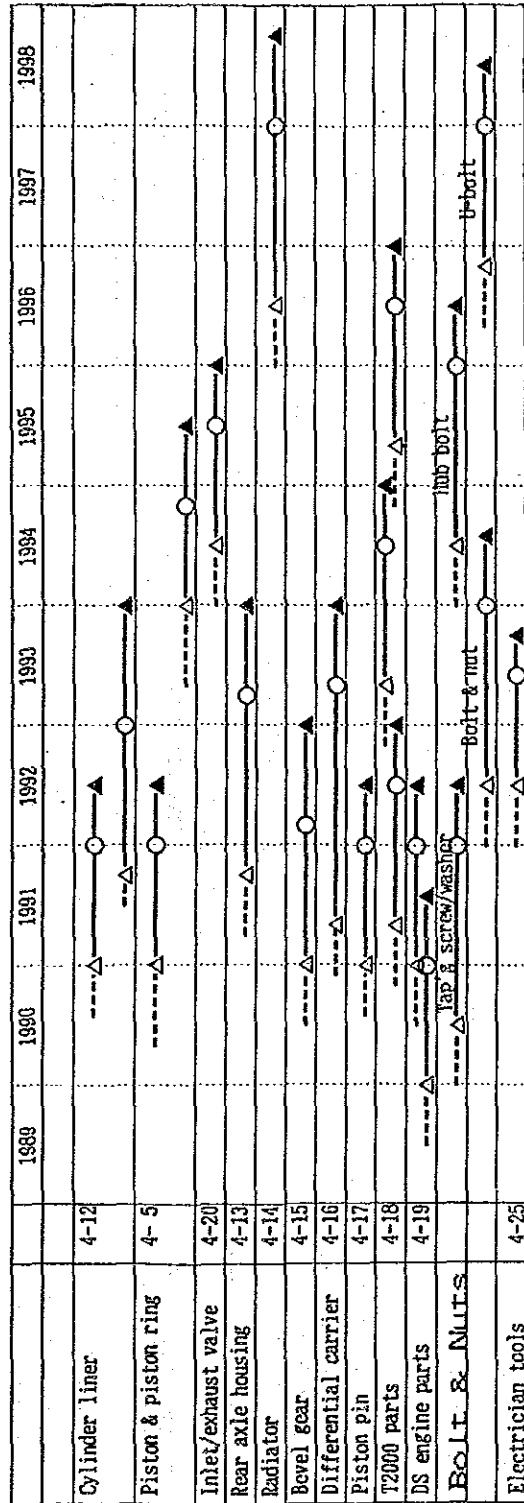
----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4.5-2 IMPLEMENTATION SCHEDULE
 - BUILD UP OF PRESS CAPACITY -



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

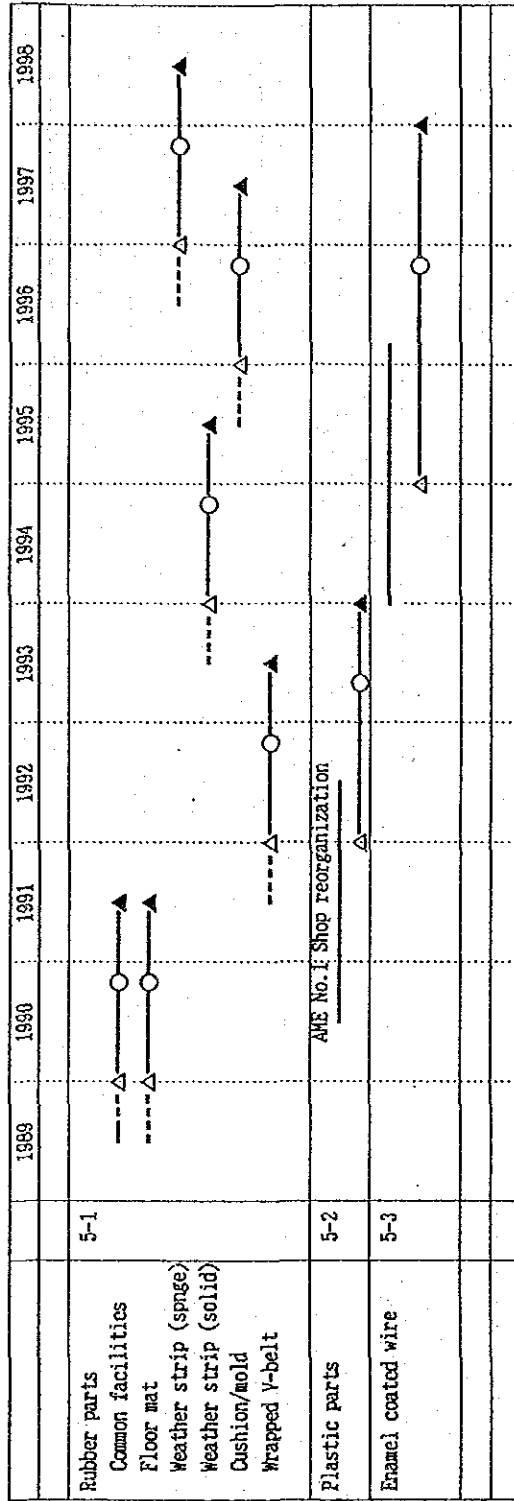
Figure 4.5-3 IMPLEMENTATION SCHEDULE
- VEHICLE METAL PARTS PRODUCTION -



Notes:

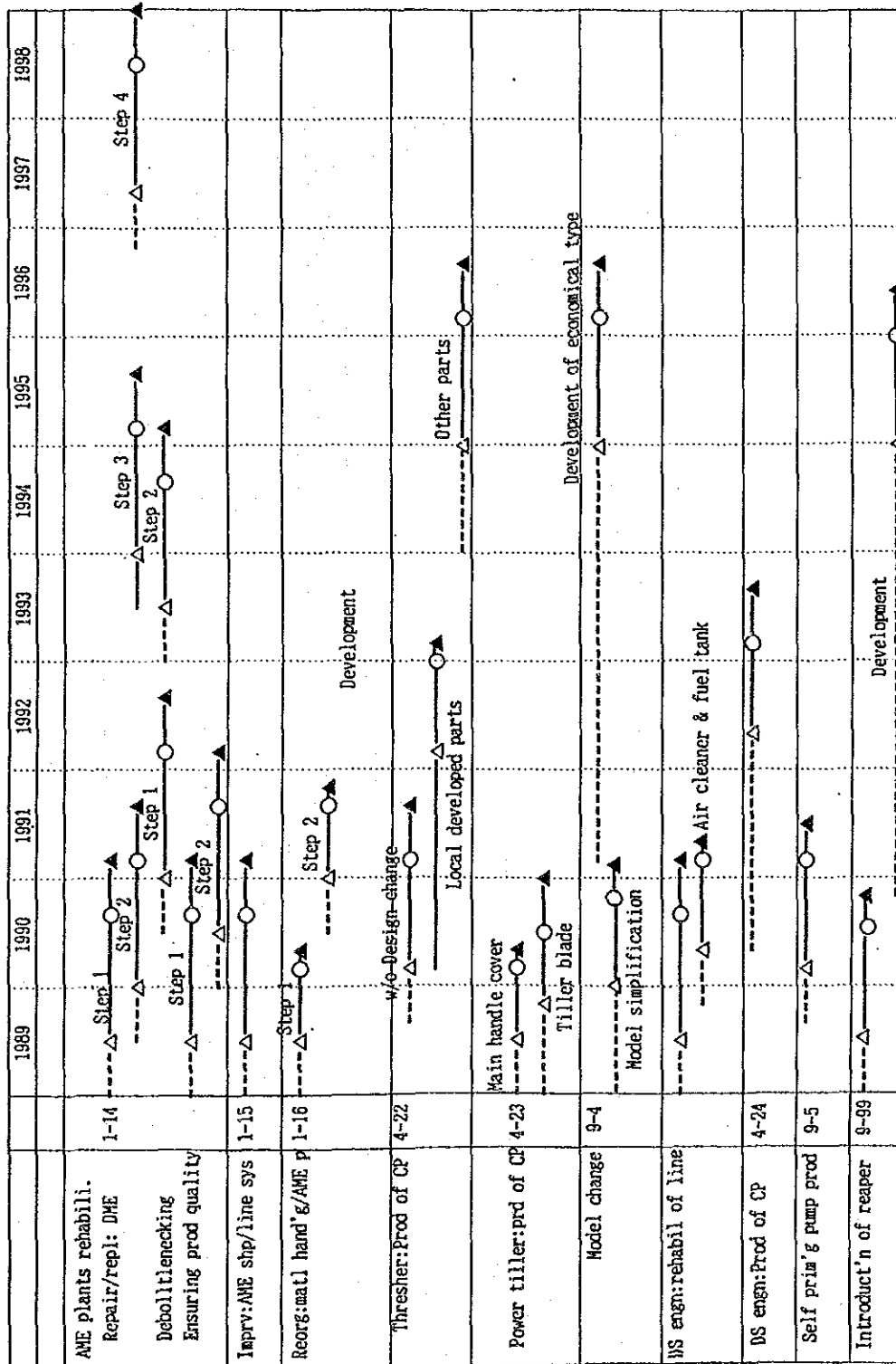
----- Preparation Δ Contract ○ Delivery ▲ Commencement of operation

Figure 4.5-4 IMPLEMENTATION SCHEDULE
 -- PRODUCTION OF OTHER PARTS --



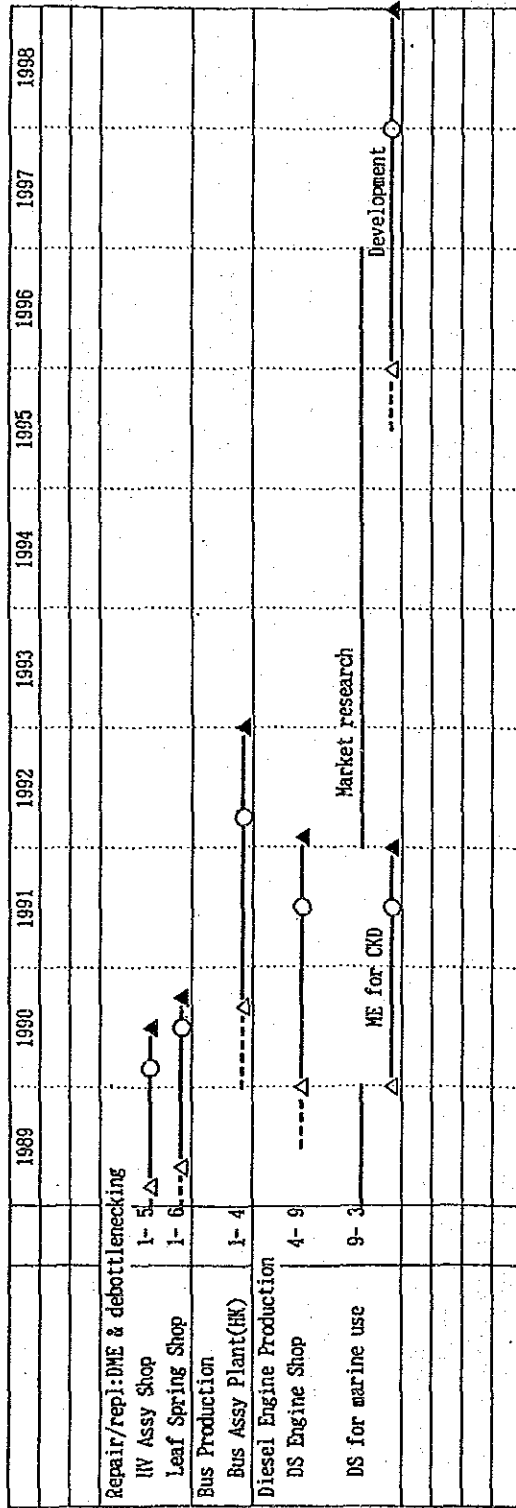
Notes:
 ----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4.5-5 IMPLEMENTATION SCHEDULE
 - AGRICULTURAL MACHINE & EQUIPMENTS PRODUCTION -



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

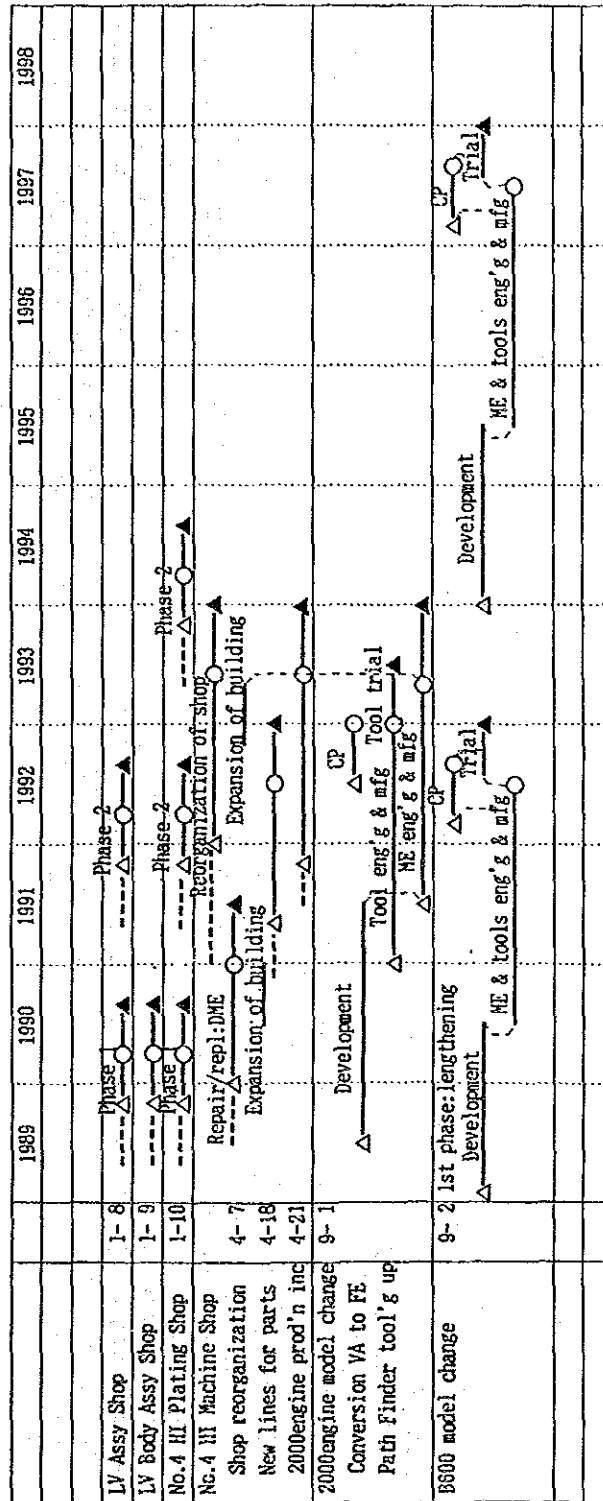
Figure 4.5-6(1) IMPLEMENTATION SCHEDULE
 - VEHICLE PRODUCTION/HEAVY VEHICLE -



Notes:

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

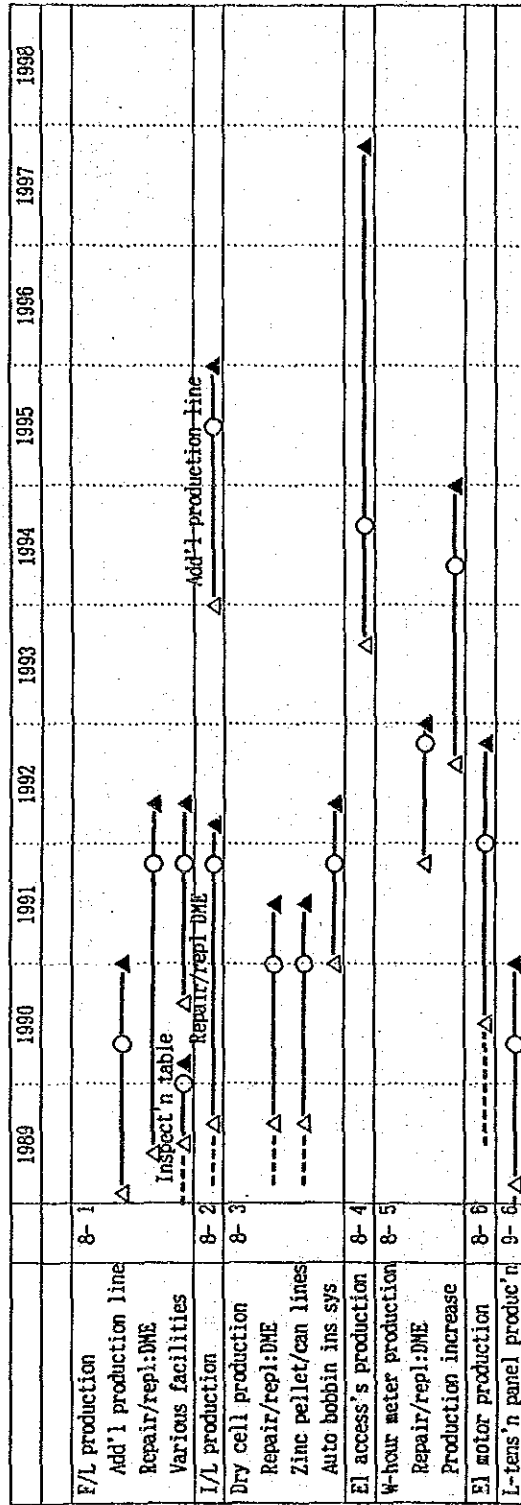
Figure 4.5-6(2) IMPLEMENTATION SCHEDULE
 - VEHICLE PRODUCTION/LIGHT VEHICLE -



Notes:

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

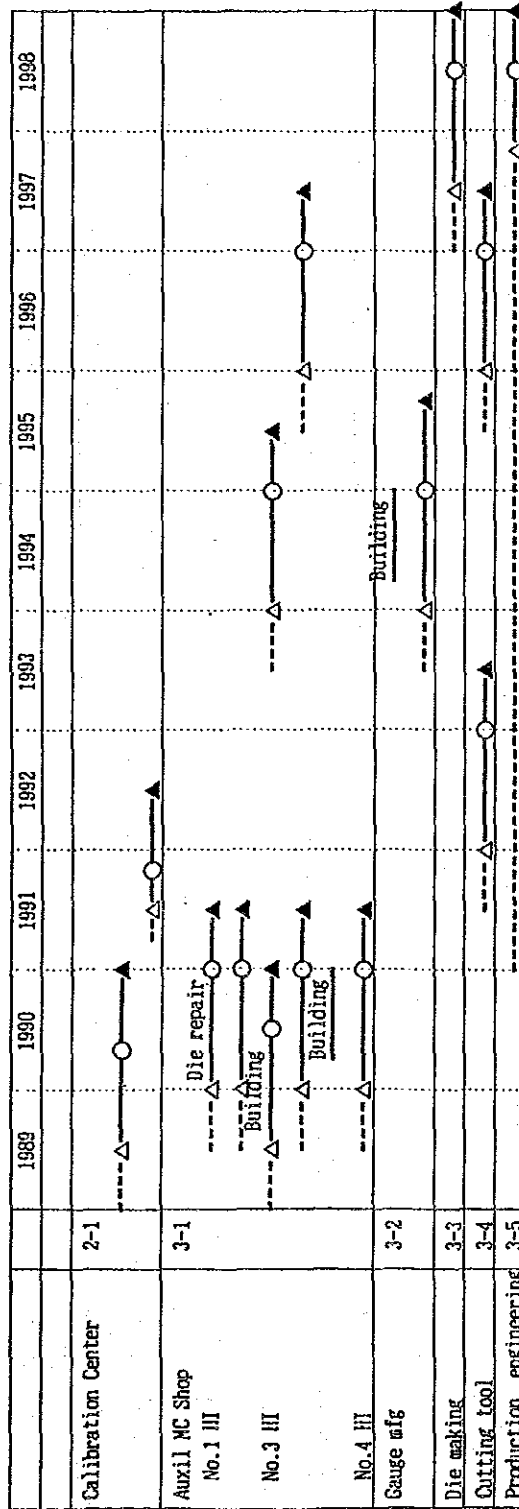
Figure 4.5-7 IMPLEMENTATION SCHEDULE
- ELECTRIC PRODUCTS PRODUCTION -



Notes:

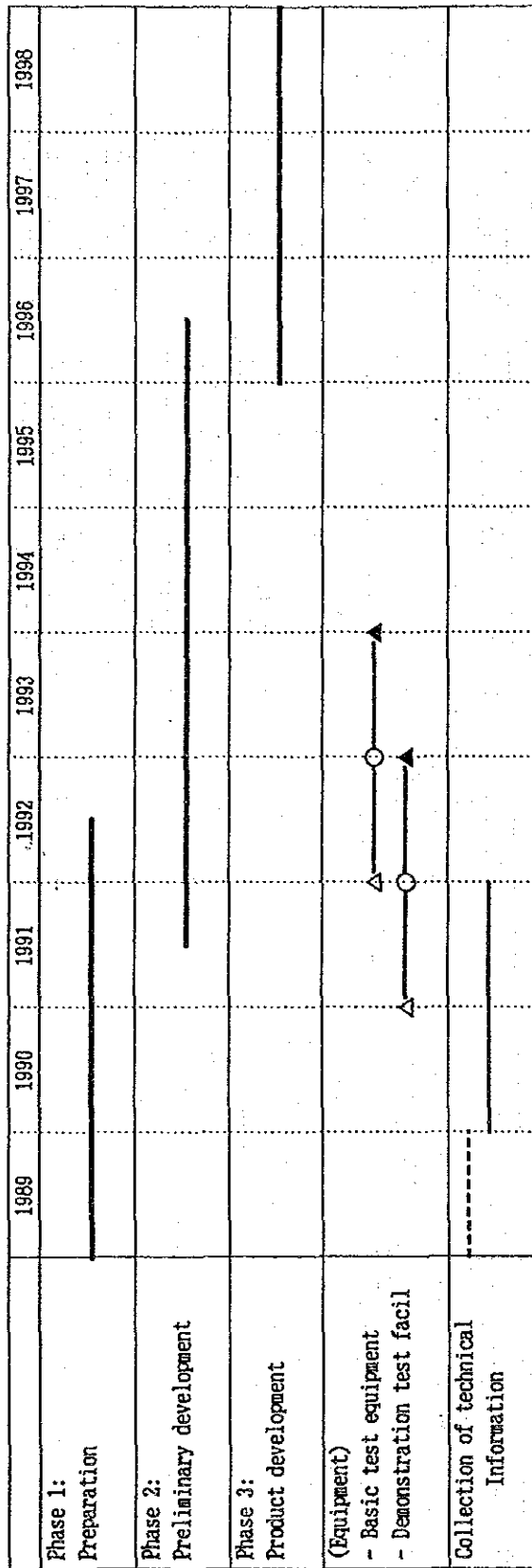
----- Preparation △ Contract ○ Delivery ▲ Commencement of operation

Figure 4.5-8 IMPLEMENTATION SCHEDULE
- AUXILIARY SECTOR -



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

Figure 4.5-9 PRODUCT DEVELOPMENT SYSTEM



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

Figure 4.5-10 SCHEDULE FOR INTRODUCTION OF PRODUCTION SYSTEMS

Year	89	90	91	92	93	94	95	96	97	98
system computerization										
Training	<ul style="list-style-type: none"> 1. Staff training 2. PJ member training 3. Manager training 4. Supervisor training 									
Plan	<ul style="list-style-type: none"> 1. Identification of problems 2. Improvements for these problems and system development 									
Implementation	<p>(Daily schedule, quality control, equipment plan, purchase, material, information)</p> <p>Model factory (No.1 HI)</p> <ul style="list-style-type: none"> 1. System introduction, phase I 2. System introduction, phase II <p>Other factories (No.2 HI ... No.6 HI)</p> <ul style="list-style-type: none"> 1. System introduction, phase I 2. System introduction, phase II 									
Computerization	<ul style="list-style-type: none"> 1. Preparation for computerization 2. Computerization 									

detailed implementation program thus prepared. In order to serve the basis for HIC to examine the detailed implementation program, this section describes an outline of the main tasks and various methods for realizing the effective implementation of the plan clarifying the range of activities which should be undertaken by HIC. Based on the above factors, examination is made on the project management organization which is to be set up to carry out these activities.

1)-1 Main Projects to be Implemented as Part of the Renovation Plan

The main individual projects to be realized in Step 1 and Step 2 can be categorized by content as follows ;

Step 1

1. Renovation and expansion of the metal processing sector centered on the following.
 - a. Expansion of the No.3 HI Foundry equipment - repair of deteriorated equipment and expansion in a part of the equipment.
 - b. Removing of the bottlenecks of equipment in the No.1 HI press shop - repair of deteriorated equipment - addition to a part of the equipment.
 - c. Removing of the bottlenecks of equipment affecting the forging shop of No.3 HI - repair of deteriorated equipment and addition to a part of the equipment.
2. Repair and replacement of worn-out equipment and removing the bottlenecks in the various production sections other than the above. The main work involved in this will be as follows:
 - a. Repair of equipment which can be repaired.
 - b. Replacement of equipment beyond repair with new equipment.
 - c. Supplementing of equipment in areas with bottlenecks.
3. Construction of the A/M Shops (No.1 HI, No.3 HI, No.4 HI), and the Dies Repair Shops (No.1 HI, No.3 HI) - transfer of part of existing machinery (including repairs and adjustments for the transferred machinery), and installation of new equipment.

4. Establishment of the production systems involved in Item 1 above.
5. Establishment of the local production of component parts which can be produced by the use of the existing production equipment.
6. Establishment of an equipment maintenance system.
7. Preparatory activities for the introduction of a modern production control system.

Step 2

1. The following expansion activities concentrating chiefly of the metal processing sector.
 - a. Installation of a new centrifugal mold casting equipment.
 - b. Construction of a new press shop in No.1 HI.
 - c. Installation of forging equipment capable of forging large sized articles.
2. Expansion of production equipment of the production sections not included in the above.
3. Installation of production equipment for jigs, gauges and tools - transfer of a part of existing machinery (including repair and adjustments of the transferred equipment), and installation of new equipment.
4. Installation of equipment which is required in order to expand the local production of parts.
5. Establishment of production systems involved in 1 to 4 above.
6. Establishment of a modern production control system, and computerization of the production control system.

1)-2 Outline of the Main Activities Involved in the Projects and Mode of Implementation for Those Projects

Outline of the main activities involved in the above projects and the mode of implementation for those projects are as follow:

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 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 ser-

VICES 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 Dies Repair Shops to be constructed.

a-3) Establishment of a maintenance system for equipment

This task is to establish a 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 con-

sultants 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.

and gauges.

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)-3 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)-4 Outline of Project Management Organization

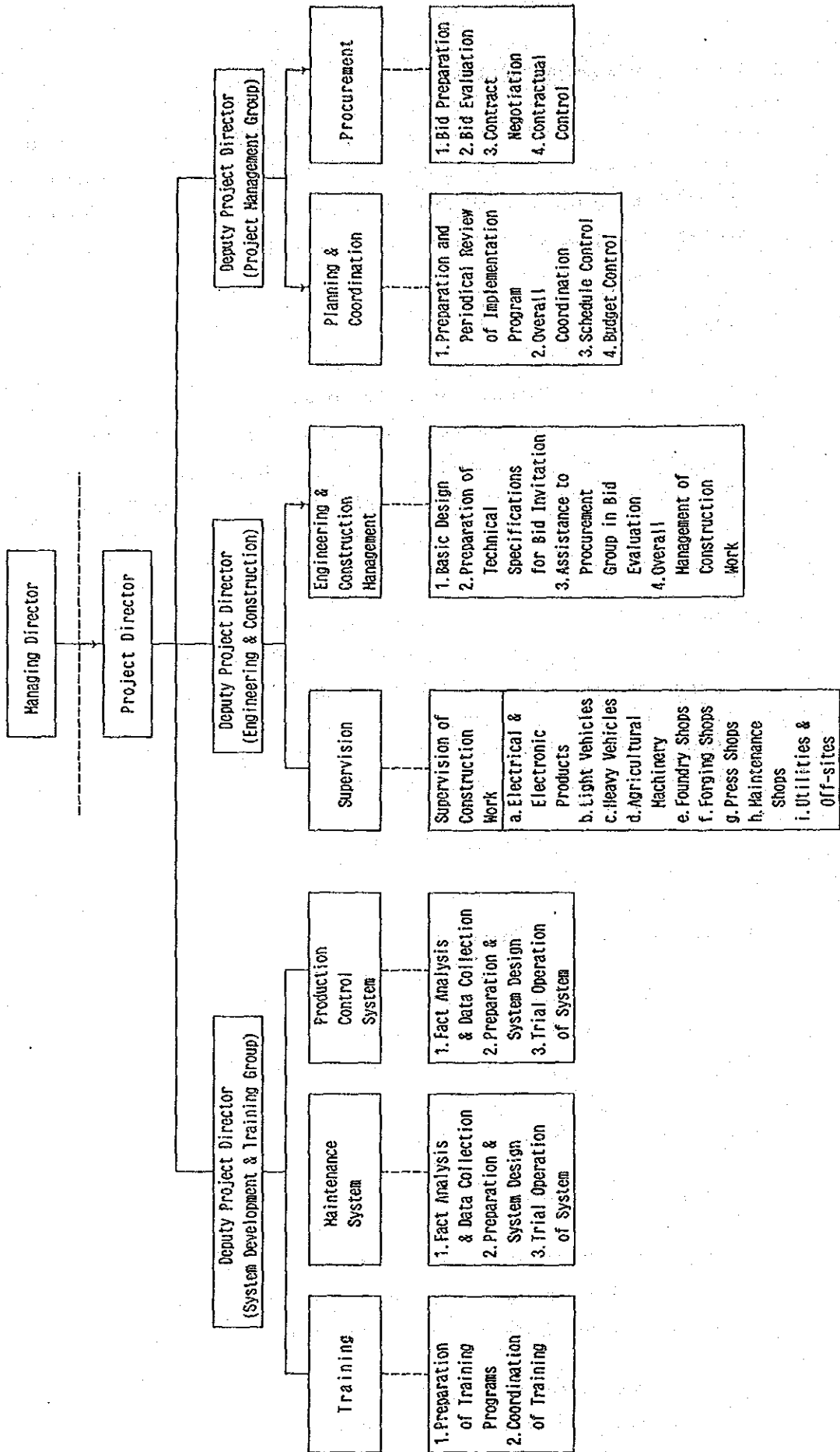
Figure 4.5-11 is a chart showing the organizational structure and framework of the project management organization. On the basis of this chart the organization of project management is outlined below. However, the given project management organization is only one example and is not to be taken as an absolute case.

1. Project Director and Deputy Directors

A project director is appointed who is fully responsible for the overall management. 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.

Figure 4.5-11 ORGANIZATION OF PROJECT MANAGEMENT FOR IMPLEMENTATION OF RENOVATION PLAN



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.

Planning/Co-ordination

- a) Formulation of the details of the implementation program and periodical reviews.
- b) Overall coordination.
- c) Schedule control.
- d) Project cost (budget) control.

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) As preparation for the establishment of maintenance systems, basic surveys of the sites and data gathering are carried out.
- 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

Training of personnel is necessary for the efficient implementation of the Plan and to realize the results contemplated by it.

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)

In the Renovation Plan, new machinery and equipment will be installed and new methods of control centered on production control will be adopted. Until the Plan is implemented and well rooted the ability to control, technical expertise and skills exceeding the present level will be demanded. 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 (See ANNEX 3 #11-2 for details.)

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. The scope of the training is shown in Table 4.5-1. Also, the man-months of technical services estimated for outside experts to be engaged in the implementation of this Program for training of the basic technical items, are shown in Table 4.5-2.

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-

Table 4.5-1 TRAINING PROGRAM FOR THE RENOVATION PLAN:
BASIC TECHNICAL ITEMS

-
1. Structure and principles of manufacturing facility
 2. Briefing and lecture on standards and instructions
 - 2-1 Production process and equipment layout
 - 2-2 Instructions for installation and for use
 - 2-3 Operation manual instruction
 - 2-4 Maintenance and inspection instruction
 - 2-5 Process specification and technical standards
 - 2-6 Products inspection manual
 - 2-7 Safety rules and instructions
 - 2-8 Drawings of building, foundation, wiring and piping
 - 2-9 Lists of process equipment, spare parts, transportation facilities and tools
 3. Preoperational training
 - 3-1 Transportation and installation of equipment
 - 3-2 OJT, adjustment and trial run of equipment
 4. Operational training
 - 4-1 Equipment operation (incl. of materials handling)
 - 4-2 Standard operational procedure
 - 4-3 Quality control
 - 4-4 Check on equipment operation
 5. Equipment maintenance
 - 5-1 Preventive maintenance activities/equipment repair
 6. Safety
 - 6-1 Operational safety
 7. Construction of building
-

Table 4.5-2 (1) REQUIRED MAN-MONTH FOR TECHNICAL SERVICES

(Unit:Man-month)

No.	Project	RI	Shop/plant	Man-month requirement		
				Basic items	Special items	of which overseas
1- 1	Shop rehabilitation	No.2	Dry Cell Battery Shop	3.0	0.0	0.0
1- 4	Improvement of shop/line system	No.1	Bus Assy Plant (Htauk Kyant)	16.0	0.0	0.0
1- 5	Rehabilitation of worn-out ME	No.1	HV Assy Shop	4.0	0.0	0.0
1- 8	Rehabilitation of worn-out ME	No.4	LV Assy Shop	10.0	0.0	0.0
1- 9	Rehabilitation & shop improvement	No.4	LV Body Assy Shop	17.0	0.0	0.0
1-10	Improvement of shop system	No.4	Plating shop	23.0	0.0	0.0
1-11	Rehabilitation of worn-out ME	No.4	Compressor Room	5.0	0.0	0.0
1-12	Rehabilitation of worn-out ME	No.4	Chem Analysis Room	0.5	2.0	0.0
1-14	AME plants rehabilitation	No.3	@AME project plants	72.0	19.0	0.0
1-15	Improvement of AME shop system	No.3	Plating Shop No.1	6.0	0.0	0.0
1-16	Reorganization of metal handling	No.3	@AME Project Plants	0.0	0.0	0.0
1-17	Rehabilitation of worn-out ME	No.3	Chem Analysis Room	0.5	0.0	0.0
2- 1	Establishment of calibration system	No.5	#Calibration center	42.0	0.0	0.0
3- 1	Construction of auxiliary MC shop	No.1	#Auxiliary machine shop	78.5	126.0	0.0
3- 2	Gauge manufacturing	No.5	#Gauge mfg shop	65.0	0.0	0.0
3- 3	Die repair & making	No.5	#Die repair/making shop	40.0	528.0	0.0
3- 4	Cutting tool manufacturing	No.5	#Cutting tool mfg shop	21.0	36.0	36.0
4- 1	Buildup of press capacity	No.1	Press Shop No.2	47.5	0.0	0.0
4- 2	Construction of new press shop	No.1	#Press shop	239.0	0.0	0.0
4-3	Buildup of casting capacity	No.3	Foundry	102.0	0.0	0.0
4- 4	Buildup of forging capacity	No.3	Forging Shop	26.0	0.0	0.0
4- 5	Improvement of piston & ring line	No.4	Light alloy foundry	5.5	0.0	0.0
4- 6	Improvement of shop/line system	No.1	M/C & H/Tr shop	2.0	0.0	0.0
4- 7	Improvement of shop/line system	No.4	Machine Shop	25.0	0.0	0.0
4- 9	Improvement of shop/line system	No.4	Diesel Engine Shop	6.5	6.0	6.0
4-10	Cylinder liner production	No.3	#foundry (Centrifugal)	77.0	9.0	9.0
4-11	Bolt & nut production	No.1	Bolt & Nut Shop	32.5	0.0	0.0
4-12	U-bolt production	No.1	Leaf Spring Shop	6.0	0.0	0.0

Table 4.5-2 (2) REQUIRED MAN-MONTH FOR TECHNICAL SERVICES

(Unit:Man-month)

No.	Project	HI	Shop/plant	Man-month requirement		
				Basic items	Special items	of which overseas
4-13	Rear axle housing production	No.1	#Rear axle housing mfg shop	6.0	2.0	6.0
4-14	Radiator production	No.1	Press Shop No.2	6.0	2.0	0.0
4-15	Bevel gear production	No.1	M/C & H/Tr shop	9.0	0.0	0.0
4-16	Diff carrier production	No.1	M/C & H/Tr shop	26.0	6.0	6.0
4-17	Piston pin production	No.4	Machine shop	1.0	1.0	0.0
4-18	T2000 parts production	No.4	Machine Shop	94.0	0.0	0.0
4-19	DS parts production	No.4	Diesel Engine Shop	31.0	6.0	6.0
4-20	Exhaust & inlet valve production	No.3	#Exhaust & inlet valve line	28.0	0.0	0.0
4-21	Increase of 2000cc engine production	No.4	Machine Shop	70.0	75.0	0.0
4-22	Production of CP of thresher	No.3	Press & Welding Shop	15.0	4.0	0.0
4-23	Production of CP of power-tiller	No.3	Press & Welding Shop	16.0	12.0	0.0
4-24	Production of diesel engine CP	No.3	AME Component Shop No.1	20.5	6.0	0.0
4-25	Electrician tool production	No.3	@Hand tool shops	12.0	0.0	0.0
4-26	Construction of alloy steel foundry	No.3	@Alloy steel foundry	118.0	0.0	0.0
5- 1	Rubber parts production	No.6	#Rubber parts production plant	63.0	45.0	45.0
5- 2	Plastic parts production	No.3	AME Component Shop No.1	12.0	2.0	0.0
5- 3	Enamel coated wire production	No.5	#Enamel coated wire shop	36.0	0.0	0.0
6- 1	Conversion of furnace fuel	No.1	Leaf spring Shop	15.5	0.0	0.0
7- 1	Coated sand reclaiming/recycling	No.3	Foundry	4.0	0.0	0.0
7- 3	Reclamation of aluminum chip	No.4	Piston Mfg Shop	0.5	0.0	0.0
8- 1	Increase of F/L production	No.1	Lamp Manufacturing Plant	27.0	6.0	6.0
8- 2	Increase of I/L production	No.1	Lamp Manufacturing Plant	4.0	0.0	0.0
8- 3	Increase of dry cell production	No.1	Dry Battery Plant	27.0	6.0	0.0
8- 4	Increase of electric accessories production	No.1	Bakelite Molding Shop	15.0	5.0	0.0
8- 5	Increase of watt-hour meter production	No.3	Watt Hour Meter Shop	18.0	0.0	0.0
8- 6	Increase of electric motor production	No.3	AME Shop No.1	0.0	47.0	15.0
9- 1	2000cc engine model change	No.3	Foundry	4.0	0.0	0.0
9- 2	B600 pick-up model change	No.4	LV Assy Shop	24.0	0.0	0.0
9- 4	Model change of power tiller	No.3	@AME project plants	30.0	0.0	0.0
9- 5	Self-priming pump production	No.3	@AME project plants	1.0	0.0	0.0
9- 6	Low-tension panel production	No.1	#n.a.	6.0	0.0	0.0
9-99	Introduction & development of reaper	No.3	@AME project plants	51.0	6.0	6.0
10- 1	Establishment of production development system	No.1	#Product development center	14.0	210.0	0.0
Total				1,777.0	1,167.0	141.0

mentioned. The projects that require special technical items, the special training items, and the man-months of technical services estimated for outside experts to be engaged in the implementation of this Program are shown in Table 4.5-3.

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

HIC has a technical assistance agreement made, respectively, with the four Japanese companies involved in the Four Industrial Projects. Under this agreement, the Technical Advisory Teams of these companies are stationed in the HIC's factories. The objective of the Technical Advisory Teams is to render technical assistance relating to the operation and control of the relevant shops by residence or visitations by the Teams. Problems, however, are indicated from the viewpoint of the utilization of the Technical Advisory Teams.

1. At the time of the installation of new equipment, there exists the role of assistance, but it is not clear what theme is expected of the Technical Advisory Teams thereafter, and the Technical Advisory Teams are rendering assistance on themes the team themselves picked up. The assistance, however, becomes fragmentary, hence, it is difficult to gain results except in the field of manufacturing skills.
2. As many of the operational problems raised are derived from a wide scope of aspects which require the improvement of technical bases, production control system and operation statistics, there is a limit to the results to be gained by the scope of the assistance of the Technical Advisory Teams.
3. The recipients of the assistance of the Technical Advisory Teams consist mainly of personnel up to the shop and plant manager level, and therefore, problems rooted in fundamental causes cannot be resolved.

Burdened with many problems as explained above, the effects of utilizing the Technical Advisory Teams are substantial because they have stayed at the factory for a long period to give assistance. In implementing the Plan, many experts will be engaged in technical assistance

Table 4.5-3(1) TRAINING PROGRAM FOR THE RENOVATION PLAN:
SPECIAL TECHNICAL ITEMS

#1-12 and 1-17 : Rehabilitation of Worn Out M/E <Training in Burma> - Chemical analysis	2 M/M
#1-14 : AME Plants Rehabilitation <Overseas Training> - Equipment operation	19 M/M
#3-1-2 : Establishment of Maintenance System <Training in Burma> 1. Equipment repair 2. Jigs and dies repair	120 M/M
#3-1-3 : Establishment of Maintenance System <Training in Burma> - Operation of numerically controlled lathe	6 M/M
#3-3 : Die Making <Training in Burma> 1. Design of jigs and dies 2. Manufacturing of jigs and dies	528 M/M
#3-4 : Cutting Tool Manufacturing <Overseas Training> 1. Manufacturing of drills 2. Manufacturing of taps 3. Heat treatment 4. Inspection and QC of products	36 M/M
#4-9 : Improvement of Shop/Line System <Training in Burma> - Structure of robot	2.5 M/M
	6 M/M
<Overseas Training> - Operation of numerically controlled machine tools	
#4-10 : Cylinder Liner Production <Overseas Training> 1. Operation of centrifugal casting machine 2. Maintenance of centrifugal casting machine	9 M/M

Table 4.5-3(2) TRAINING PROGRAM FOR THE RENOVATION PLAN:
SPECIAL TECHNICAL ITEMS

#4-13	: Rear Axle Housing Production <Overseas Training> - Operation of numerically controlled machine tools	6 M/M
#4-16	: Differential Carrier Production <Overseas Training> - Operation of numerically controlled machine tools	6 M/M
#4-19	: DS Parts Production <Overseas Training> - Numerically controlled machine tools	6 M/M
#5-1	: Rubber Parts Production <Overseas Training> 1. Compounding of new rubber product 2. Operation of equipment 3. Maintenance of equipment	45 M/M
#8-1	: F/L Production Increase <Overseas Training> 1. Production and equipment management 2. Technology and quality control	6 M/M
#8-6	: Electric Motor Production Increase <Overseas Training> 1. Production management 2. Maintenance of electrical equipment 3. Repair of dies 4. Product design and quality control	6 M/M
#10-1	: Establishment of Product Development Center <Training in Burma> 1. Handling of test devices and data taking 2. Vehicles maintenance 3. Model making Metal sheet working Mock-up Clay	30 M/M

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.

The Technical Advisory Teams will provide the routine assistances required at the factory level, but also the assistance on the tasks formulated by the Headoffice to comply with the needs at the different stages of the implementation of the Renovation Plan. The Technical Advisory Teams will periodically report to the Headoffice on the assistance activity and the achievements of the specific tasks. Should there be obstacles to achievement of the tasks, both parties will confer to work out a solution.

Thus, to what extent the Technical Advisory Teams are utilized and the transfer of technology is successful depends on how well HIC can conceive the plan to mobilize the Technical Advisory Teams. If it is difficult for HIC to execute these activities within the framework of its ordinary activities, HIC should consider to organize a special task force for this purpose including the engagement of outside consultants.

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 (see Figure 4.5-11):

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 fid 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 sec-

tion 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 2).

Therefore, the required expenses are also included in the expenses
for the training program.

The man-months estimated for the consultant services relating to 1.
and 2. above are shown in Table 4.5-4.

Table 4.5-4 ADVISORY SERVICES

	Nos.	M/M	Total M/M	Nos.	M/M	Total M/M
1. Advisory service for project management						
a) Project management expert (1)	1	36	36	1	24	24
Project management expert (2)	1	24	24	1	18	18
b) Procurement advisor	1	12	12	1	12	12
2. Advisory service for engineer'g & construction						
a) Industrial engineer	1	12	12	1	12	12
b) Production line specialist						
- Electric products production (1)	1	12	12	1	9	9
Electric products production (2)	1	6	6	1	6	6
- Heavy vehicle production (1)	1	12	12	1	9	9
Heavy vehicle production (2)	1	6	6	1	6	6
- Light vehicle production (1)	1	12	12	1	9	9
Light vehicle production (2)	1	6	6	1	6	6
- Agricultural machineries production	1	6	6	1	3	3
- Maintenance facilities (1)	1	12	12	1	3	3
Maintenance facilities (2)	1	6	6	1	3	3
- Foundry/forging facility (1)	1	12	12	1	3	3
Foundry/forging facility (2)	1	6	6	1	3	3
- Press facility (1)	1	12	12	1	3	3
Press facility (2)	1	6	6	1	3	3
Total M/M requirement			198			132

4-6 Capital Requirement Plan

(1) Total Capital Requirement

The estimated capital requirements for the implementation of the Renovation Plan is shown in Table 4.6-1. The following tables show the details of the capital requirements:

1. Estimated Capital Requirements by Year; Table 4.6-2
2. Estimated Capital Requirements by Year and Step; Table 4.6-3(1) and 4.6-3(2)
3. Estimated Capital Requirements by Plan Category; Table 4.6-4
4. Estimated Capital Requirements by Individual Projects; Tables 4.6-5(1) to 4.6-5(7)

The following conditions were assumed in the computation of the capital requirements.

1. Form of contract: The contract shall be on a lump sum basis by projects. The costs of machinery and equipment shall be FOB prices at shipping port, and include the fees or costs for design, engineering, fabrication, adjustment, packaging, and freight to the port of shipment. The erection at the site will be done by HIC, and the supplier of the machinery and equipment shall provide technical supervision for the erection, test run and training of the basic technical items and special technical items of the personnel training referred to in 4-5 (1) 2).
2. The base year of the price computation: Computations were based on prices effective at the beginning of July, 1988. (As for the price escalation, see condition 9.)
3. Currency and rate of exchange: Both the local and the foreign exchange portions were estimated on a yen basis. The rate of 1 Kyat = 20.28 yen was used to convert the local currency.
4. Level of the estimate of the capital requirement: The capital requirements for most of the projects were estimated by totalling the market prices of the main machinery and equipment according to the flow-sheet, layout and the machinery and equipment list. In a

Table 4.6-1 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 4.6-2 ESTIMATED CAPITAL REQUIREMENTS

(Million Yen)

Year	1	2	3	4	5	6	7	8	9	10	Total
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	482.8	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 4.6-3 (1) 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	15,536.4	3,449.7	1,103.1	34,352.0

Table 4.6-3 (2) ESTIMATED CAPITAL COSTS
(Step 2)

(Million Yen)

Year	2	3	4	5	6	7	8	9	10	Total
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	489.2	372.9	334.7	305.2	2,993.7
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	4,760.9
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	586.6	105,246.7

Table 4.6-4 ESTIMATED CAPITAL REQUIREMENTS BY PROJECT CATEGORY

(Million Yen)

Project Category	Foreign currency costs				Local currency costs	Total
	Bldg matl & M/E	Freight/ insurance	Technical services manage't	Project system develop't		
1 Rehabilitation & modernization of facilities	72,851.4	7,197.9	4,146.6		84,195.9	102,281.2
1 Rehabilitation & prepar'n for future develop't	16,139.3	1,533.1	961.6		18,634.0	21,842.3
- Rehabilitation & shop/line improvement	15,403.3	1,463.2	880.0		17,746.5	20,793.2
- Furnace conversion to ensure supply of fuel	427.2	40.5	57.6		525.3	605.2
- Recycling/reclaiming wasted resources	308.8	29.4	24.0		362.2	443.9
2 Buildup of production capacity	56,712.1	5,664.8	3,185.0		65,561.9	80,438.9
- Conversion of parts import to dom product'n	48,045.7	4,855.4	2,884.2		55,785.3	68,569.2
- Production increase to meet demand	3,174.7	256.5	150.4		3,581.6	4,268.2
- Product improvement/development to meet mkt	5,491.7	552.9	150.4		6,195.0	7,501.5
2 Establishment of auxiliary department	9,473.0	836.2	2,026.5	1,052.5	13,388.2	16,280.5
3 Improve:production control/product develop't	1,704.1	135.3	2,129.4	2,449.9	6,418.7	7,237.3
4 Project implementation/training				968.0	1,108.8	1,108.8
Total	84,028.5	8,169.4	8,302.5	968.0	3,643.2	105,111.6
					21,796.2	126,907.8

Table 4.6-5 (1) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
- Vehicle and AME parts production -

(Million Yen)

Project No.	Imple- ment'n year	Project	HI	Shop/plant	Foreign currency costs				Total	
					Bldg mat'l & M/E	Freight/ insurance	Technical services	Local currency costs		
4-5 1	3 R	Improve piston & ring line	No.4	Light alloy foundry	3.1	0.3	0.2	3.6	0.5	4.1
4-5 2	6	Improve piston & ring line	No.4	Light alloy foundry	76.5	7.3	5.4	89.2	14.3	103.5
4-5 3	3 R	Improve piston & ring line	No.4	Piston mfg. Shop	112.0	10.7	7.8	130.5	21.0	151.5
4-5 4	6	Improve piston & ring line	No.4	Piston mfg. Shop	14.0	1.3	1.0	16.3	2.6	18.9
4-6 1	2 R	Improve shop/line system	No.1	M/C & H/Tr shop	16.1	1.8	0.2	18.1	3.0	21.1
4-6 2	2 R	Improve shop/line system	No.1	M/C & H/Tr shop	262.9	29.2	3.4	295.5	48.7	344.2
4-10 1	3	Cylinder liner production	No.3	#foundry (Centrifugal)	790.0	87.7	136.0	1,013.7	242.4	1,256.1
4-10 2	3	Cylinder liner production	No.4	Machine Shop	481.0	53.4	78.8	613.2	98.1	711.3
4-13	3	Rear axle housing production	No.1	#Rear axle housing mfg shop	2,348.5	260.7	34.2	2,643.4	869.6	3,513.0
4-14	8	Radiator production	No.1	Press Shop No.2	638.2	70.8	21.6	730.6	120.1	850.7
4-15	3	Bevel gear production	No.1	M/C & H/Tr shop	1,001.0	111.1	16.2	1,128.3	186.6	1,314.9
4-16	3	Diff carrier production	No.1	M/C & H/Tr shop	1,323.6	146.9	57.6	1,528.1	248.7	1,776.8
4-17 1	3	Piston pin production	No.4	Machine shop	495.0	55.0	27.0	577.0	104.2	681.2
4-19 1	2	DS parts production	No.4	Diesel Engine Shop	312.2	34.7	27.8	374.7	56.8	431.5
4-19 2	2	DS parts production	No.4	Diesel Engine Shop	105.9	11.8	9.4	127.1	19.4	146.5
4-19 3	3	DS parts production	No.4	Diesel Engine Shop	191.2	21.2	17.0	229.4	34.9	264.3
4-19 4	3	DS parts production	No.4	Diesel Engine Shop	131.8	14.6	11.7	158.1	24.1	182.2
4-19 5	2	DS parts production	No.4	Diesel Engine Shop	8.0	0.9	0.7	9.6	1.4	11.0
4-20	6	Exhaust & inlet valve prod'n	No.3	#Exhaust & inlet valve line	1,203.6	133.6	118.8	1,456.0	224.5	1,680.5
Total					9,514.6	1,053.0	574.8	11,142.4	2,320.9	13,463.3
of which:										
Rehabilitation & shop/line development (R)					394.1	42.0	11.6	447.7	73.2	520.9
Conversion of parts import to domestic production					9,120.5	1,011.0	563.2	10,694.7	2,247.7	12,942.4

Table 4.6-5 (2) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
 - Light vehicles and vehicle parts production -
 (Million Yen)

Imple- ment year	Project	HI	Shop/plant	Foreign currency costs			Local currency costs	Total
				Bldg mat'l & M/E	Freight/ insurance	Technical services		
1-8 1	3 R Rehabilitation of worn out ME	No.4 LV Assy Shop		152.1	17.8	15.7	185.6	219.1
1-8 2	1 R Rehabilitation of worn out ME	No.4 LV Assy Shop		91.3	10.7	9.5	111.5	131.5
1-9 1	1 R Rehabilitation & shop improve	No.4 LV Body Assy Shop		74.5	8.7	9.7	92.9	107.0
1-9 2	1 R Rehabilitation & shop improve	No.4 LV Body Assy Shop		79.6	9.3	10.4	99.3	114.2
1-9 3	1 R Rehabilitation & shop improve	No.4 LV Body Assy Shop		94.5	11.1	12.3	117.9	135.6
1-10 1	1 R Improvement of shop system	No.4 Plating shop		37.9	4.4	12.0	54.3	62.5
1-10 2	3 R Improvement of shop system	No.4 Plating Shop		10.0	1.2	3.1	14.3	16.5
1-10 3	5 R Improvement of shop system	No.4 Plating Shop		83.7	9.8	26.3	119.8	138.2
1-11 1	2 R Rehabilitation of worn out ME	No.4 Compressor Room		13.5	1.6	2.5	17.6	20.5
1-11 2	6 R Rehabilitation of worn out ME	No.4 Compressor Room		34.6	4.0	6.5	45.1	52.7
1-13	2 R Rehabilitation of worn out ME	No.4 6LV project plants		74.5	8.7	0.0	83.2	99.5
4-7 1	2 R Improvement:shop/line system	No.4 Machine Shop		1,210.0	134.3	27.7	1,372.0	1,602.9
4-7 2	2 R Improvement:shop/line system	No.4 Machine Shop		0.0	0.0	0.0	0.0	0.0
4-7 3	4 Improvement:shop/line system	No.4 Machine shop		757.0	84.0	17.3	858.3	1,002.8
4-7 4	4 Improvement:shop/line system	No.4 Machine shop		0.0	0.0	0.0	0.0	0.0
4-8	2 R Improvement:shop/line system	No.4 H/Tr Shop		3.9	0.4	1.8	6.1	6.8
4-18 1	3 T2000 parts production	No.4 Machine Shop		454.2	53.1	32.4	539.7	654.3
4-18 2	3 T2000 parts production	No.4 Machine Shop		299.0	35.0	21.4	355.4	430.9
4-18 3	5 T2000 parts production	No.4 Machine Shop		477.2	55.8	34.1	567.1	687.6
4-18 4	5 T2000 parts production	No.4 Machine Shop		150.5	17.7	10.8	179.0	217.0
4-18 5	7 T2000 parts production	No.4 Machine Shop		387.3	45.3	27.7	460.3	558.1
4-18 6	7 T2000 parts production	No.4 Machine Shop		409.4	47.9	29.2	486.5	589.8
4-18 7	2 T2000 parts production	No.4 Machine Shop		190.8	22.3	13.6	226.7	274.9
4-21	3 2000engine production increase	No.4 Machine Shop		6,281.6	735.0	261.0	7,277.6	8,927.3
9-1 1	3 2000 engine model engine	No.3 Foundry		318.0	37.1	5.5	360.6	428.8
9-1 2	3 2000 engine model engine	No.3 Forging Shop		100.0	11.7	1.7	113.4	134.9
9-1 3	3 2000 engine model engine	No.4 Light Alloy Foundry		233.0	27.3	4.0	264.3	314.2
9-1 4	1 2000 engine model engine	No.4 Machine Shop		610.0	71.4	10.4	691.8	822.6
9-2 1	2 B600 Pick-up model change	No.4 LV Assy Shop		413.0	48.3	9.9	471.2	553.2
9-2 2	6 B600 Pick-up model change	No.4 LV Body Assy Shop		1,395.0	163.2	33.3	1,591.5	1,868.4
Total				14,436.1	1,677.1	649.8	16,763.0	20,171.8
				1,960.1	222.0	137.5	2,319.6	2,707.0
				9,407.0	1,096.1	447.5	10,950.6	13,342.7
				3,069.0	359.0	64.8	3,492.8	4,122.1

of which: Rehabilitation & shop/line improvement (R)
 Conversion of parts import to domestic production
 Product improvement/development

Table 4.6-5 (3) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
 - Heavy vehicles and vehicle parts production -

(Million Yen)

Project No.	Year	Imple- ment'n Project	HI	Shop/plant	Foreign currency costs			Local currency costs		Total
					Bldg mat'l & M/E	Freight/ insurance services	Technical	Total	Total	
1-4	2 R	Improvement:shop/line system	No.1	Bus Assy Plant (Htauk Kyant)	1,149.1	127.5	43.2	1,319.8	220.4	1,540.2
1-5	1 R	Rehabilitation of worn out ME	No.1	HV Assy Shop	67.5	5.7	7.6	80.8	12.5	93.3
1-5	2 R	Rehabilitation of worn out ME	No.1	HV Assy Shop	28.9	2.4	3.2	34.5	5.4	39.9
1-6	1 R	Rehabilitation of worn out ME	No.1	Leaf Spring Shop	36.5	4.0	1.8	42.3	6.8	49.1
1-7	1 R	Matel handl'g eq rehabilita'n	No.1	@HV project plants	72.4	7.9	0.0	80.3	16.1	96.4
1-7	2 R	Matel handl'g eq rehabilita'n	No.1	@HV project plants	72.5	8.1	0.0	80.6	16.2	96.8
1-7	3 R	Matel handl'g eq rehabilita'n	No.1	@HV project plants	72.5	8.1	0.0	80.6	16.2	96.8
1-7	4 R	Matel handl'g eq rehabilita'n	No.1	@HV project plants	72.5	8.1	0.0	80.6	16.2	96.8
4-9	1 R	Improvement:shop/line system	No.4	Diesel Engine Shop	8.3	0.9	0.3	9.5	1.5	11.0
4-9	2 R	Improvement:shop/line system	No.4	Diesel Engine Shop	388.5	43.1	14.9	446.5	71.9	518.4
4-9	3 R	Improvement:shop/line system	No.4	Diesel Engine Shop	112.5	12.5	4.3	129.3	20.8	150.1
4-9	4 R	Improvement:shop/line system	No.4	Diesel Engine Shop	165.5	18.4	6.3	190.2	30.7	220.9
4-9	5 R	Improvement:shop/line system	No.4	Diesel Engine Shop	39.0	4.3	1.5	44.8	7.2	52.0
4-9	6 R	Improvement:shop/line system	No.4	Diesel Engine Shop	38.0	4.2	1.5	43.7	7.0	50.7
9-3		Convrs'n of DS for marine use	No.4	Diesel Engine Shop	0.0	0.0	0.0	0.0	0.0	0.0
Total (Rehabilitation & shop/line improvement only)					2,323.7	255.2	84.6	2,663.5	448.9	3,112.4

Table 4.6-5 (4) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
- Metal processing -

Implement'n Project No. year	Project	HI	Shop/plant	Foreign currency costs			Local currency costs		Total
				Bldg mat'l & M/E	Freight/ insurance	Technical services	Total	Total	
1-12	2 R Rehabilitation of worn out ME	No.4	Chem Analysis Room	31.0	2.5	0.9	34.4	6.5	40.9
1-17	2 R Rehabilitation of worn out ME	No.3	Chem Analysis Room	31.0	2.9	0.9	34.8	11.1	45.9
4-1 1	1 R Buildup of press capacity	No.1	Press Shop No.2	148.9	15.6	10.2	175.7	29.1	204.8
4-1 2	1 R Buildup of press capacity	No.1	Press Shop No.2	6.5	0.7	0.4	7.6	1.3	8.9
4-1 3	1 R Buildup of press capacity	No.1	Press Shop No.2	418.2	46.4	28.4	493.0	81.7	574.7
4-1 4	1 R Buildup of press capacity	No.1	Press Shop No.2	74.9	8.3	5.1	88.3	14.7	103.0
4-2 1	2 Construction of new press shop	No.1	#Press shop	1,444.8	137.2	93.1	1,675.1	460.4	2,135.5
4-2 2	3 Construction of new press shop	No.1	#Press shop	1,217.3	115.7	78.4	1,411.4	388.0	1,799.4
4-2 3	3 Construction of new press shop	No.1	#Press shop	397.3	37.8	25.6	460.7	126.6	587.3
4-2 4	3 Construction of new press shop	No.1	#Press shop	89.7	8.6	5.7	104.0	28.4	132.4
4-2 5	3 Construction of new press shop	No.1	#Press shop	6,446.4	612.4	415.2	7,474.0	2,054.8	9,528.8
4-2 6	4 Construction of new press shop	No.1	#Press shop	2,731.3	259.5	175.9	3,166.7	870.6	4,037.3
4-2 7	3 Construction of new press shop	No.1	#Press shop	256.3	24.3	16.5	297.1	81.7	378.8
4-2 8	3 Construction of new press shop	No.1	#Press shop	361.8	34.3	23.3	419.4	115.4	534.8
4-3 1	1 R Build up of casting capacity	No.3	Foundry	22.8	2.3	5.5	30.6	4.3	34.9
4-3 2	1 R Build up of casting capacity	No.3	Foundry	20.0	2.0	4.5	26.5	3.7	30.2
4-3 3	1 R Build up of casting capacity	No.3	Foundry	259.4	25.9	59.1	344.4	49.1	393.5
4-3 4	3 R Build up of casting capacity	No.3	Foundry	139.7	14.0	31.8	185.5	26.5	212.0
4-3 5	1 R Build up of casting capacity	No.3	Foundry	604.5	60.5	137.8	802.8	114.5	917.3
4-3 6	3 R Build-up of casting capacity	No.3	Foundry	153.8	15.4	35.0	204.2	29.2	233.4
4-3 7	3 Build-up of casting capacity	No.3	Foundry	108.2	10.8	24.6	143.6	20.6	164.2
4-3 8	2 R Build up of casting capacity	No.3	Foundry	92.1	9.2	21.0	122.3	17.4	139.7
4-4 1	2 R Build-up of forging capacity	No.3	Forging Shop	201.1	18.1	12.8	232.0	47.9	279.9
4-4 2	2 R Build-up of forging capacity	No.3	Forging Shop	250.1	22.4	16.0	288.5	59.4	347.9
4-4 3	6 Build-up of forging capacity	No.3	Forging Shop	4,042.6	363.7	81.0	4,487.3	984.7	5,472.0
4-26	8 Const'n of alloy steel foundry	No.3	#Alloy steel foundry	1,311.0	124.5	329.2	1,764.7	247.9	2,012.6
Total				20,850.7	1,976.0	1,637.9	24,474.6	5,875.5	30,350.1
of which:									
Rehabilitation & shop/line improvement				2,454.0	247.2	369.4	3,070.6	496.4	3,567.0
Conversion of parts import to domestic production				18,406.7	1,728.8	1,268.5	21,404.0	5,379.1	26,783.1

Table 4.6-5 (5) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
 - Metal tools/materials & other parts/materials production -

(Million Yen)

Imple- ment 'n Project No.	Year	Project	RI	Shop/plant	Foreign currency costs			Local currency costs	Total
					Bldg mat'l & M/E	Freight/ insurance	Technical services		
4-11	1	2 R Bolt & nut production	No.1 Bolt & Nut Shop	75.9	8.3	1.6	85.8	16.9	102.7
4-11	2	2 R Bolt & nut production	No.1 Bolt & Nut Shop	10.2	1.1	0.2	11.5	2.2	13.7
4-11	3	4 Bolt & nut production	No.1 Bolt & Nut Shop	2,108.7	234.0	45.7	2,388.4	464.4	2,852.8
4-11	4	6 Bolt & nut production	No.1 Bolt & Nut Shop	732.9	81.4	15.9	830.2	161.4	991.6
4-11	5	6 Bolt & nut production	No.1 Bolt & Nut Shop	78.1	8.7	1.7	88.5	17.1	105.6
4-11	6	8 Bolt & nut production	No.1 Bolt & Nut Shop	551.0	61.2	11.9	624.1	121.4	745.5
4-11	7	2 Bolt & nut production	No.1 Bolt & Nut Shop	170.0	18.9	3.7	192.6	37.4	230.0
4-11	8	2 Bolt & nut production	No.1 Bolt & Nut Shop	95.0	10.6	2.1	107.7	20.9	128.6
4-12	8	U-bolt production	No.1 Leaf Spring Shop	172.4	19.1	16.2	207.7	33.7	241.4
4-25	4	Electrician tool production	No.3 eHand tool shops	183.4	15.4	34.6	233.4	34.2	267.6
				4,177.6	458.7	133.6	4,769.9	909.6	5,679.5
Total for metal tools/materials									
of which:									
Rehabilitation & shop/line improvement				86.1	9.4	1.8	97.3	19.1	116.4
Conversion of parts import to domestic production				4,091.5	449.3	131.8	4,672.6	890.5	5,563.1
5-1	1	2 Rubber parts production	No.6 #Rubber parts production plant	262.0	20.5	18.4	300.9	78.1	379.0
5-1	2	2 Rubber parts production	No.6 #Rubber parts production plant	104.8	8.1	7.3	120.2	31.2	151.4
5-1	3	9 Rubber parts production	No.6 #Rubber parts production plant	551.8	43.0	38.8	633.6	164.3	797.9
5-1	4	6 Rubber parts production	No.5 #Rubber parts production plant	166.8	13.0	11.7	191.5	49.8	241.3
5-1	5	8 Rubber parts production	No.6 #Rubber parts production plant	579.6	45.2	40.8	665.6	172.6	838.2
5-1	6	4 Rubber parts production	No.6 #Rubber parts production plant	1,883.3	147.0	132.4	2,162.7	551.2	2,723.9
5-2	4	4 Plastic parts production	No.3 AWE Component Shop No.1	835.9	65.2	25.2	926.3	175.6	1,101.9
5-3	7	7 Enamel coated wire production	No.5 #Enamel coated wire shop	1,548.5	120.8	64.8	1,734.1	384.9	2,119.0
5-4	4	4 Manganese dioxide production	No.1 #n.a.	0.0	0.0	0.0	0.0	0.0	0.0
Total (Conversion of parts import to domestic production)				5,932.7	462.8	339.4	6,734.9	1,617.7	8,352.6

Table 4.6-5(6) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
- Agricultural machineries and equipments production -

(Million Yen)

Imple- Project No.	Year	Project	HI	Shop/plant	Foreign currency costs			Local currency costs	Total		
					Bidg matl & M/E	Freight/ insurance	Technical services				
1-14	1	R	AME plants rehabilitation	No.3 @AME	project plants	976.4	78.1	31.0	1,085.5	173.1	1,258.6
1-14	2	R	AME plants rehabilitation	No.3 @AME	project plants	976.4	78.1	31.0	1,085.5	173.1	1,258.6
1-14	3	R	AME plants rehabilitation	No.3 @AME	project plants	976.4	78.1	30.9	1,085.4	173.1	1,258.5
1-14	4	R	AME plants rehabilitation	No.3 @AME	project plants	976.4	78.1	30.9	1,085.4	173.1	1,258.5
1-14	5	R	AME plants rehabilitation	No.3 @AME	project plants	431.0	34.5	13.7	479.2	76.3	555.5
1-14	6	R	AME plants rehabilitation	No.3 @AME	project plants	431.0	34.5	13.7	479.2	76.3	555.5
1-14	7	R	AME plants rehabilitation	No.3 @AME	Project Plants	242.5	19.4	7.7	269.6	43.0	312.6
1-14	8	R	AME plants rehabilitation	No.3 @AME	Project Plants	242.5	19.4	7.7	269.6	43.0	312.6
1-15	1	R	Improv't of AME shop system	No.3	Plating Shop No.1	112.1	9.0	10.8	131.9	128.6	260.5
1-16	1	R	Reorganization of matl handl'g	No.3 @AME	Project Plants	291.0	23.3	0.0	314.3	61.5	375.8
1-16	2	R	Reorganization of matl handl'g	No.3 @AME	Project Plants	156.7	12.5	0.0	169.2	33.2	202.4
4-22	1	2	Production of CP of thresher	No.3	Press & Welding Shop	106.0	8.5	23.4	137.9	20.3	158.2
4-22	2	4	Production of CP of thresher	No.3	Press & Welding Shop	40.0	3.2	18.0	61.2	7.6	68.8
4-23	1	1	Production of CP of p-tiller	No.3	Press & Welding Shop	43.2	3.5	23.1	69.8	8.0	77.8
4-23	2	1	Production of CP of p-tiller	No.3 @AME	project plants	46.4	3.7	1.8	51.9	9.9	61.8
4-23	3	7	Production of CP of p-tiller	No.3 @AME	project plants	299.0	23.9	27.0	349.9	54.6	404.5
4-24	1	1	Production of diesel engine CP	No.3	AME Component Shop No.1	153.4	17.9	7.2	178.5	28.9	207.4
4-24	2	2	Production of diesel engine CP	No.3	AME Component Shop No.1	484.3	56.6	35.5	576.4	137.2	713.6
4-24	3	4	Production of diesel engine CP	No.3	AME Component Shop No.1	68.4	8.0	5.0	81.4	19.2	100.6
9-4	1	1	Model chg of power tiller	No.3 @AME	project plants	11.9	1.0	0.0	12.9	2.2	15.1
9-4	2	6	Model chg of power tiller	No.3 @AME	project plants	1,807.9	144.6	64.0	2,016.5	661.4	2,677.9
9-5	2	2	Self priming pump production	No.3 @AME	project plants	390.0	31.2	10.8	432.0	70.8	502.8
Total						9,262.9	767.1	393.2	10,423.2	2,174.4	12,597.6
of which:											
Rehabilitation & shop/line improvement						5,965.8	482.9	184.6	6,633.3	1,183.2	7,816.5
Conversion of parts import to domestic production						1,087.3	107.4	133.8	1,328.5	256.8	1,585.3
Product improvement/development						2,209.8	176.8	74.8	2,461.4	734.4	3,195.8

Table 4.6-5 (7) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
- Electric products production -

(Million Yen)

Imple- ment'n Project No.	year	Project	HI	Shop/plant	Foreign currency costs			Local currency costs	Total	
					Bldg.matl & M/E	Freight/ insurance	Technical services			
1-1	4	R Shop rehabilitation		No.2 Dry Cell Battery Shop	133.3	11.2	5.4	149.9	28.4	178.3
1-2	1	R Lighting fix line rehabilita'n		No.1 Coating Shop	13.1	1.1	0.0	14.2	2.7	16.9
1-3	1	R Lighting fix line rehabilita'n		No.3 Lighting Fixture Shop	11.8	1.0	0.0	12.8	2.5	15.3
8-1	1	R F/L production increase		No.1 Lamp Manufacturing Plant	636.9	53.5	53.3	743.7	116.6	860.3
8-1	2	R F/L production increase		No.1 Lamp Manufacturing Plant	80.7	6.8	6.8	94.3	14.7	109.0
8-1	3	R F/L production increase		No.1 Lamp Manufacturing Plant	264.0	22.2	22.0	308.2	48.2	356.4
8-1	4	R F/L production increase		No.1 Lamp Manufacturing Plant	1.6	0.1	0.1	1.8	0.3	2.1
8-1	5	R F/L production increase		No.1 Lamp Manufacturing Plant	25.3	2.1	2.1	29.5	4.6	34.1
8-2	6	I/L production increase		No.1 Lamp Manufacturing Plant	507.8	42.7	7.2	557.7	105.3	663.0
8-3	1	R Dry cell production increase		No.1 Dry Battery Plant	215.5	18.1	0.0	233.6	45.7	279.3
8-3	2	R Dry cell production increase		No.1 Dry Battery Plant	134.2	11.3	0.0	145.5	28.4	173.9
8-3	3	R Dry cell production increase		No.1 Dry Battery Plant	104.8	8.8	0.0	113.6	22.2	135.8
8-3	4	R Dry cell production increase		No.1 Dry Battery Plant	235.1	19.7	0.0	254.8	49.9	304.7
8-3	5	R Dry cell production increase		No.1 Dry Battery Plant	57.3	4.8	0.0	62.1	12.2	74.3
8-4	5	El accessories prod'n increase		No.1 Bakelite Molding Shop	354.2	27.6	27.0	408.8	73.9	482.7
8-5	1	3 R Watt-hour meter prod'n increase		No.3 Watt Hour Meter Shop	5.2	0.4	0.3	5.9	1.0	6.9
8-5	2	3 R Watt-hour meter prod'n increase		No.3 Watt Hour Meter Shop	11.6	0.9	0.5	13.0	2.2	15.2
8-5	3	4 Watt-hour meter prod'n increase		No.3 Watt Hour Meter Shop	693.2	55.5	31.6	780.3	128.9	909.2
8-6	2	El motor production increase		No.3 A/E Shop No.1	1,327.1	106.2	84.6	1,517.9	316.4	1,834.3
9-6	1	Low-tension panel production		No.5	212.9	17.1	10.8	240.8	42.8	283.6
Total					5,025.6	411.1	251.7	5,688.4	1,046.9	6,735.3
of which:										
Rehabilitation & shop/line improvement					1,638.0	137.5	90.5	1,866.0	317.5	2,183.5
Product improvement & development					212.9	17.1	10.8	240.8	42.8	283.6
Production increase					3,174.7	256.5	150.4	3,581.6	686.6	4,268.2

Table 4.6-5(8) ESTIMATED CAPITAL REQUIREMENTS (Excl. Contingency)
- Other projects -

Imple- ment'n Project No.	Project	HF	Shop/plant	Foreign currency costs			Local currency costs	Total	
				Bldg mat'l & M/E	Freight/ insurance	Technical services			
1-18	6 R Water intake/treat rehabili'n	No.3	Water Treatment Plant	266.3	31.2	0.0	297.5	58.5	356.0
1-19	6 R Water intake/treat rehabili'n	No.4	Water Treatment Plant	135.2	15.8	0.0	151.0	29.7	180.7
1-20	7 R Improve inter-HI transp system (Total: other rehabilitation)	No.0	OHIC	180.0	20.0	0.0	200.0	32.8	232.8
6-1 1	5 Conversion of furnace fuel	No.1	Leaf spring Shop	581.5	67.0	0.0	648.5	121.0	769.5
6-1 2	4 Conversion of furnace fuel	No.3	Combined H/Tr Shop	73.6	7.0	10.0	90.6	13.8	104.4
6-1 3	3 Conversion of furnace fuel (Total: furnace fuel conversion)	No.4	H/Tr Shop	194.3	18.4	26.2	238.9	36.3	275.2
7-1 1	10 Coated sand reclaim'g/recycl'g	No.3	Foundry	159.3	15.1	21.4	195.8	29.8	225.6
7-2 1	4 Cutting tips/oil recovery	No.1	#Cutt'g tips/oil recover plant	427.2	40.5	57.6	525.3	79.9	605.2
7-2 2	6 Cutting tips/oil recovery	No.3	#Cutt'g tips/oil recover plant	162.8	15.5	19.0	197.3	30.8	228.1
7-3 5	Reclamation of aluminum chip (Total: recycling/reclaiming)	No.4	Piston Mfg Shop	20.5	1.9	2.0	24.4	3.7	28.1
2-1 1	1 Establish:Calibration system	No.5	#Calibration center	105.0	10.0	0.9	115.9	43.2	159.1
2-1 2	3 Establish:Calibration system	No.5	#Calibration center	308.8	29.4	24.0	362.2	81.7	443.9
3-1 1	2 Construction of auxil MC shop	No.1	#Auxiliary machine shop	402.8	33.9	68.9	505.6	115.9	621.5
3-1 2	1 Construction of auxil MC shop	No.3	#Auxiliary machine shop	39.0	3.3	6.7	49.0	11.3	60.3
3-1 3	2 Construction of auxil MC shop	No.3	#Auxiliary machine shop	293.7	23.7	34.4	351.8	88.4	440.2
3-1 4	4 Construction of auxil MC shop	No.3	#Auxiliary machine shop	469.3	37.5	54.6	561.4	142.5	703.9
3-1 5	6 Construction of auxil MC shop	No.3	#Auxiliary machine shop	469.3	37.5	54.6	561.4	142.5	703.9
3-1 6	8 Construction of auxil MC shop	No.3	#Auxiliary machine shop	469.3	37.5	54.6	561.4	142.5	703.9
3-1 7	2 Construction of auxil MC shop	No.4	#Auxiliary machine shop	469.3	37.5	54.6	561.4	142.5	703.9
3-2 5	Gauge manufacturing	No.5	#Gauge mfg shop	521.8	41.7	60.7	624.2	156.3	782.5
3-3 9	Die repair & making	No.5	#Die repair/making shop	1,219.6	115.8	117.0	1,452.4	277.2	1,729.6
3-4 4	Cutting tool manufacturing	No.5	#Cutting tool mfg shop	3,884.7	369.1	1,298.6	5,552.4	1,107.7	6,660.1
3-4 8	Cutting tool manufacturing	No.5	#Cutting tool mfg shop	427.9	34.2	52.0	514.1	177.0	691.1
3-5 9	Establish:prd'n eng'g system (Total: auxiliary department)	No.5	#Production engineering center	273.7	21.9	115.2	410.8	48.5	459.4
10-1 1	1 Establish:Product deveip't sys	No.1	#Product development center	63.3	5.1	0.0	68.4	195.4	263.8
10-1 2	3 Establish:Product deveip't sys	No.1	#Product development center	9,473.0	836.2	2,026.5	12,335.7	2,892.3	15,228.0
11-1 1	1 Improve:Production control sys			702.0	56.3	1,181.7	1,940.7	424.2	2,364.9
11-1 2	3 Improve:Production control sys			468.6	37.4	787.7	1,293.7	282.7	1,576.4
11-1 3	5 Improve:Production control sys (Total: production control/product development)			213.2	16.6	64.0	293.8	44.5	338.3
				159.8	12.5	48.0	220.3	33.6	253.9
				159.8	12.5	48.0	220.3	33.6	253.9
				1,704.1	135.3	2,129.4	3,968.8	818.6	4,787.4

part of the projects, however, the above computation was not possible because the contents of the project was not definite or because of the confidentiality of the know-how. In such projects the estimate is no more than referential. Referential estimates are so indicated.

The machinery and equipment list on which the estimates were based are shown in ANNEX 3.

(2) Conditions for Computing the Expenses

1. Costs of acquisition of land and development: It was assumed that all projects will be implemented on land owned by HIC and the respective land is in a developed state for use as factory land. Therefore, no land acquisition cost or development cost were added.
2. Construction cost of plant buildings: When new shop buildings or extension of buildings were needed, the construction costs of such buildings costs were included. The construction costs were based on the average construction cost per square meter estimated by HIC. In a project where the costs of foreign exchange portion are required because of special specifications, the required capital costs for the foreign exchange portion were computed for the special specification part and added.

Moreover, the average construction costs per square meter estimated by HIC was as follows:

Local currency portion	70,108 yen/m2 (3,457 K/m2)
Foreign exchange portion	57,622 yen/m2 (US\$453/m2)
<hr/> Total	<hr/> 127,730 yen/m2

3. Cost of the machinery and equipment: The costs of imported machinery and equipment were estimated on a FOB shipping port basis. The cost of spare parts required during a one year period is included in the cost of machinery and equipment.

4. For ocean freight, marine insurance, cost of unloading at the arrival port and inland freight, the averages of the past import records of HIC were used, as follows:
 - a) Ocean freight and marine insurance 8.0% - 11.7% of FOB price
 - b) Unloading at arrival port and inland freight 1.3% - 2.0% of the sum of FOB price and the cost indicated in a) above. (The above percentage figures indicate the range of the result of the computation. In the actual computation individual rates were applied.)
5. Cost of erection of machinery and equipment: The cost of erection of machinery and equipment was assumed to be 1,750 K per ton of machinery and equipment based on the past record of HIC.
6. License Fee: License fees were added for projects that require license fees.
7. Cost of technical assistance: This is the cost of technical assistance for training, engineering and operation. Engineering fees (home office costs) relating to design, engineering, and adjustments of machinery and equipment were included in the cost of machinery and equipment.
8. Fees for software: For projects that require software, the software fee was added.
9. Contingency: An amount equivalent to ten per cent was added to cover the physical contingency and the price contingency.
10. Interest during construction: For most of the projects estimate, the construction period from the date of shipment (date of disbursement) to commencement of operation is estimated for six months to one year. Therefore, no interest during construction was added.

11. Import duties: The import duties in Burma were computed by using the rates which were applicable as of the date of the field survey and were included.

The rate applied for machines and equipment is as follows:

Import duty rate: 15% of the total of the FOB price, the ocean freight, and the marine insurance premium.

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 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 4.7-1. 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 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

Table 4.7-1 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							
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

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 recommended 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 4-7.2. 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.

(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.

Table 4.7-2 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.).

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. SHINNOSUKE 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.

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	Hyaungchidauk

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 LFG 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

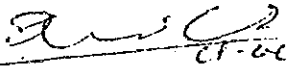
The JICA Survey Team (the Team) headed by Mr. Masayasu Sakanashi had a meeting with the Heavy Industries Corporation (HIC) chaired by Lt. Col. Than Shwe, Managing Director and attended by other HIC officers at HIC Head Office in Rangoon on February 22, 1988 in order to discuss on the Progress Report 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:

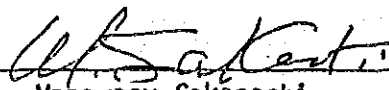
1. Both sides agreed in principle to proceed with the succeeding work of the Study in accordance with the approach and schedule stated in Chapters 3, 4 and 5 of the Progress Report.
2. HIC requested the Team to consider the following points:
 - 1) Investigation on steps to be taken by HIC if it undertakes 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 SWA | 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
Feb. 5 (Fri)	All members	RGN	and Arrival of Team No.2 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 Summary
Feb. 8 (Mon)	PC1	No.3	Meeting with No.3 and Plant Visit
	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	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 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	Discussion with No. 1
	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	Discussion with No. 1
	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	Discussion on R/P with No. 1
	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 Meeting with HO Plant Visit at No.1 Plant Visit at No.1 Plant Visit at No.1 Summary of Field Study Internal Meeting Progress Meeting with HIC
	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	
Feb. 22 (Mon)	All members	RGN	
Feb. 23 (Tue)	Team 2	RGN	
Feb. 24 (Wed)	Team 2	RGN	
Feb. 25 (Thu)	Team 2	RGN	

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