

**FINAL REPORT  
FOR  
THE STUDY  
ON  
THE RENOVATION OF  
THE FOUR INDUSTRIAL PROJECTS  
IN  
THE UNION OF BURMA  
(Volume V)**

**Annex 3  
DETAILS OF  
INDIVIDUAL RENOVATION SUBJECTS**

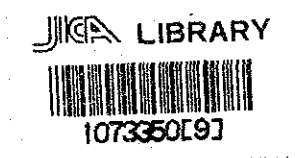
**April 1989**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
Tokyo, Japan**



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19060

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国際協力事業団

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LIST OF VOLUMES

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VOLUME II MAIN REPORT

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VOLUME V ANNEX 3: DETAILS OF INDIVIDUAL RENOVATION SUBJECTS





# ASSUMPTIONS ON CALCULATION FACTORS

Following assumptions were applied throughout the financial calculations of individual renovation subjects:

## A. Import Duty (in % of CIF cost)

1. Machines & equipment	15%
2. Building materials	15%
3. Rawmaterials	
a. Metal materials	15%
b. Other materials	20%
4. Component parts	
a. Heavy vehicles	20%
b. Light truck	20%
c. Light passenger vehicles	50%
d. Unspecified vehicle parts	40%
e. Agricultural machineries	20%
5. Products	
a. Agricultural machineries	15%
b. Home electric products	85%
c. Industrial electric products	15%

## B. Excise Tax (in % of production cost of the products/parts to be marketed)

1. Vehicle parts	
a. Heavy vehicle	30%
b. Light truck	30%
c. Light passenger vehicle	60%
2. Motors, pumps, generators	20%
3. Engines	30%
4. Agricultural machineries	20%
5. Electric products	
a. Electric fan	60%
b. Electric accessories	30%
c. Lamps and lighting fixtures	30%
d. Watt-hour meter	30%
e. Dry battery	50%
6. Electrician tools	10%

## C. Exchange Rates: 1 Kyat=20.28 Yen

## D. Raw Maaterials Cost for Metal Parts (in % of the parts price)

1. Forged parts	50%
2. Casted parts	30%
3. Press parts	80%
4. Mchining parts	80%
5. Set of agricultural machineries parts	40%

## E. Production Cost Factors

1. Depreciation period:	15 years with 10% of salvage value
2. Maintenance cost:	3% of initial M/E cost
3. Mark-up:	3% of production cost for products/parts to be marketed
3. Overhead & Administration cost (in % of production cost)	
	Electric products    Agric machineries    Heavy vehicles    Light vehicles    Metal working
a. Overhead	0.5-10.7%    2.5%    1.3%    1.9%    4.7%
b. Admin cost	0.9- 1.4%    0.6%    0.4%    1.2%    4.5%



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#1-1 Shop Rehabilitation

Repair/Replacement: Deteriorated M/E

- No.2 HI: Dry Cell Battery Shop -

(1) Objectives and Outline of the Plan

In order to deal with the wear on equipment of dry cell battery shop in the No.2 HI repair and replacement of existing machinery is planned.

(2) Details of the Plan

Replacement of can trimming machine, can flaring machine, the mixing machine, and 250 ton press, etc. with new equipment.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-1 Shop Rehabilitation  
 - No.2 HI: Dry Cell Battery Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repr/repl:deteriorated ME		
1 1	Paper pipe rim curing machine	Set	1
1 2	Barrel mixer	Set	1
1 3	Can trimming machine	Set	1
1 4	Can flaring machine	Set	1
1 5	Mixer 0.43 m3	Set	1
1 6	Mixer 0.28 m3	Set	1
1 7	Air compressor vs-37 w/cooler	Set	1
1 8	Paste pouring machine	Set	1
1 9	Bottom insulator insertion machine	Set	1
110	V.A. tester (measuring box)	Set	1
111	Gas burner for crucible furnace	Set	1
112	Vertical press (250 ton)	Set	1
113	Air conditioner (15 hp)	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-1)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	133.3	-	133.3
2 Freight & Insurance	11.2	-	11.2
Sub-total	144.5	-	144.5
3 Import Duty	-	21.7	21.7
4 Unloading	-	2.0	2.0
5 Installation Cost	-	4.7	4.7
Imported M/E Total	144.5	28.4	172.9
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	5.4	-	5.4
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	5.4	-	5.4
Total Investment	149.9	28.4	178.3

#1-2 Lighting Fixture Line Rehabilitation

- No.1 HI: Lighting Manufacturing Facilities

(Press shop No.1, Bakelite Molding Shop, Coating Shop and Electric Home Appliances Plant) -

(1) Objectives and Outline of the Plan

Repair or replacement of deteriorated or worn out working machinery and equipment which might lead to problems with regard to the quality of products manufactured is to take place. Further, those pieces of equipment, etc. which have a low breakdown rate or show only slight deterioration and can therefore be repaired by the HIC are excepted from the present plan.

(2) Details of the Plan

1) The winding device for ballast wire

This has deteriorated and as irregularities in the number of turnings and unevenness in the turnings themselves were observed and replacement is required. Introduction of a similar type of machine to that in current use is planned.

2) Measurement bench

The measurement bench for the completed lighting fixtures, shows deterioration and require replacement and should be placed so as to be easily seen by the measuring operator and installation of a voltage resistance meter should be included.

3) Iron core blanking dies for GZ40122 mB-1

It is necessary to replace these because of deterioration. As they will be used with the current press the dies of the same type and form as those in current use are to be introduced.

4) Resin molds for sockets

At present there are cases of bad moldings with flashes which are shaped or corrected after molding and then used. These molds need to be replaced one by one.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-2 Lighting Fixture Line Rehabilitation  
 - No.1 HI: Coating Shop, Electr. Home Appliance Plant,  
 Press Shop No.1 & Bakelite Molding Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repl:winding M/C for light'g fixture		
1 1	Winding M/C for FL plant	Set	1
2	Repl:torch lamp & dynamo lamp inspect'n table		
2 1	Inspection table for lighting fixture No.1 HI	Set	1
3	Repl:iron core blanking dies		
3 1	Iron core blanking dies for GZ40122MB-1	Set	1
4	Repl:dies for light'g fixture socket		
4 1	Dies for each socket of lighting fix. no.1HI (L231,L227,G41)	Set	1



Attached Table 3-2: REQUIRED INVESTMENT (#1-2)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	13.1	-	13.1
2 Freight & Insurance	1.1	-	1.1
Sub-total	14.2	-	14.2
3 Import Duty	-	2.1	2.1
4 Unloading	-	0.2	0.2
5 Installation Cost	-	0.4	0.4
Imported M/E Total	14.2	2.7	16.9
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	14.2	2.7	16.9

#1-3 Lighting Fixture Line Rehabilitation  
- No.3 HI: Lighting Fixture shop -

(1) Objectives and Outline of the Plan

Repair or replacement of worn out working machinery and equipment which might lead to problems with regard to the quality of products manufactured is to take place. Further, those pieces of equipment, etc. which have a low breakdown rate or show only slight deterioration and can therefore be repaired by the HIC are excepted from the present plan.

(2) Details of the plan:

1) The winding device for ballast wire

This has deteriorated and as irregularities in the number of turnings and unevenness in the turnings themselves were observed and replacement is required. Introduction of a similar type of machine to that in current use is planned.

2) Measuring devices

The measuring bench for the completed lighting fixtures, measurement devices for the light intensity and light distribution of the torch lamp, and the rotation meter for the dynamo lamp all show deterioration and require replacement. With regard to the measuring device for the torch lamp the measurement devices (meters) should be placed so as to be easily seen by the measuring operator and installation of a voltage resistance meter should be included.

3) Resin molds for sockets

At present there are cases of bad moldings with flashing which are shaped or corrected after molding and then used. These molds need to be replaced one by one.

#### 4) Plating devices

There is a nickel plating device for all general plating of the No.3 HI in the Torch and Dynamo Lamp Shop. Its auxiliary facilities are worn a little so need replacement.

### (3) Estimated Capital Requirement

#### 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

#### 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-3 Lighting Fixture Line Rehabilitation  
- No.3 HI: Lighting Fixture Shop & Plating Shop No.2 -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repl:winding M/C for light'g fixture		
1 1	Winding M/C for FL plant	Set	1
2	Repl:inspect'n tables L/F etc.		
2 1	Inspection table for torch, dynamo lamp	Set	1
2 2	Inspection table for lighting fixture	Set	1
3	Repl:dies for light'g for socket		
3 1	Dies for each socket of lighting fixture no.3 HI (1201,g3)	Set	1
4	Repl:apparatus for Ni plat'g		
4 1	Repair of plating auxiliary accessories	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-3)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	11.8	-	11.8
2 Freight & Insurance	1.0	-	1.0
Sub-total	12.8	-	12.8
3 Import Duty	-	1.9	1.9
4 Unloading	-	0.2	0.2
5 Installation Cost	-	0.4	0.4
Imported M/E Total	12.8	2.5	15.3
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	12.8	2.5	15.3

#### #1-4 Improvement of Shop/Line System

- No.1 HI: Bus Assembly Plant(Htaukkyant Bus Shop) -

##### (1) Objectives and Outline of the Plan

At present, all component parts used for bus production are imported on a knock down method and are weld assembled using assembling jigs. The operators are all experienced in the handling and hand working of the parts. The shop has been expanded as a specialist bus production shop to twice the size of the former area. However, the shop equipment has not been well maintained, and there are problems in productivity and products quality.

The present plan proposes the local bus body assembly capacity increase in accordance with manufacturing parts currently dependent on imports. To this end local production of the now imported pressed parts, and installation of an integrated bus production line to include machine working and welding of the parts, painting equipment, and provision for bus body inspection equipment are planned. Further, transfer to this shop of the production equipment used for production of the dump truck, wrecker and tanker currently produced in the No.1 HI Heavy Vehicle Assembly Shop.

##### (2) Details of the Plan

In order to change over to local production of the pressed parts a BX use press die must be purchased (#4-2-2) and machining and welding carried out after press molding is done in No.1 HI Press Shop No.2.

At present, the painting of the bus body takes place outside but a painting booth should be installed inside the shop to improve product quality and for environmental hygiene.

Up to now sufficient provision for the testing equipment needed to inspect vehicles as assembled has not been available. Therefore, installation of the inspection equipment necessary to assuring product quality must be undertaken.

At the same time as the production equipment for the upper body of the dump truck, wrecker and tanker are transferred expansion of the production equipment for the tanker should be undertaken.

Attached Figure 2-1 shows the layout of the shop after the plan is implemented.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

(4) Recommendations on Implementation of the Plan

The present plan requires the expansion of the Press Shop No.2 (#4-1) and the purchase of press dies for bus parts use(#4-2-2). Technical supervision is required for the installation of equipment, trial runs, operational methods, confirmation of product quality and equipment maintenance, etc.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-4 Improvement of Shop/Line System  
- No.1 Bus Assembly Plant (Htauk Kyant) -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Painting equipment	Lot	1
2	Shower testing booth	Set	1
3	Brake tester	Set	1
4	Speed meter tester	Set	1
5	Side slip tester	Set	1
6	Turning radius gauge	Set	1
7	Headlight tester	Set	1
8	Traverser	Set	1
9	Electric hoist 2 ton w/accessories	Set	2
10	Raw material for electric hoist	Lot	1
11	Piping material for factory extension	Lot	1
12	Electric material for factory extension	Lot	1
13	Stretch forming machine	Set	1
14	Plasma cutting machine	Set	3
15	Electric nibbler	Set	3
16	Electric disc grinder	Set	3
17	Roll forming M/C	Set	1
18	Arc welding M/C	Set	3
19	ME for bulk tank	Lot	1
20	Press dies and assembly jigs for front construction	Set	1
21	Press dies and assembly jigs for rear construction	Set	1
22	Press dies and assembly jigs for side construction	Set	1
23	Press dies and assembly jigs for roof construction	Set	1
24	Press dies and assembly jigs for 3rd stage parts	Set	1
25	Press die for front bumper	Set	1

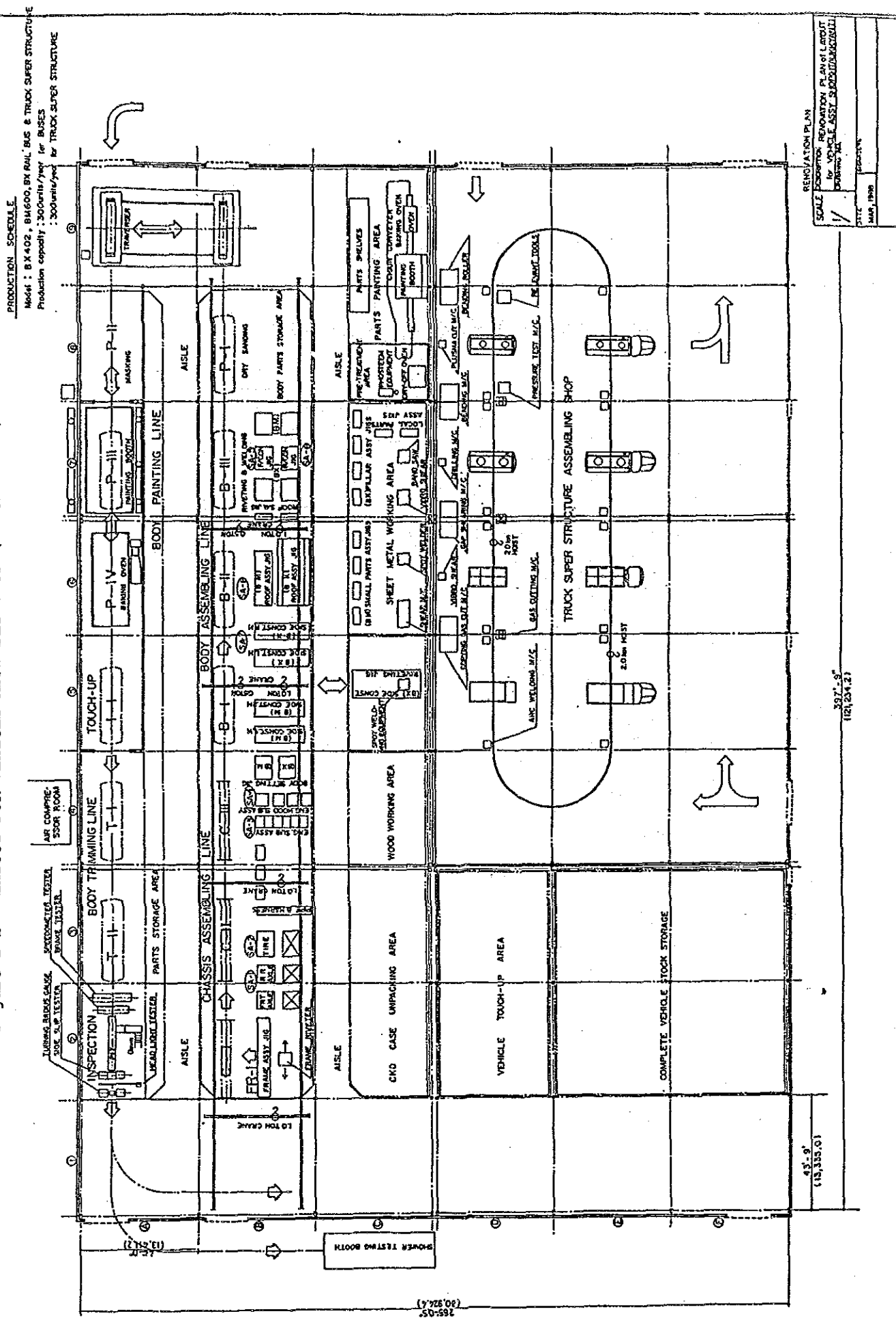


Attached Table 3-2: REQUIRED INVESTMENT (#1-4)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)			
2 Freight & Insurance	1149.1	-	1149.1
Sub-total	127.5	-	127.5
3 Import Duty	1276.6	-	1276.6
4 Unloading	-	191.5	191.5
5 Installation Cost	-	17.9	17.9
Imported M/E Total	-	11.0	11.0
3 Local M/E	1276.6	220.4	1497.0
4 Other Costs			
A License Fee	-	0.0	0.0
B Eng Fee	0.0	-	0.0
C Software	43.2	-	43.2
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	43.2	-	43.2
Total Investment	1319.8	220.4	1540.2

Attached Figure 2-1 LAYOUT FOR VEHICLE ASSEMBLY SHOP (HTAUK KYANT)



## #1-5 Rehabilitation of Worn Out M/E

### - No.1 HI Heavy Vehicles Assembly Shop -

#### (1) Objectives and Outline of the Plan

The following problems are currently observed with the equipment of the Heavy Vehicle Assembly shop:

- a) The welder and car vehicle inspection equipment of the above shop is beyond repair due to deterioration
- b) There are problems with the line balancing of the frame assembly line which result in production bottlenecks.
- c) Securing of necessary areas for improvement of the inconvenient layout of equipment in parts of the line, space for component parts handling and operational surface area for the domestication of parts production is needed.

In order to remedy the above problems the following headings are planned. Attached Figure 1-1 shows the layout of the shop after the plan is implemented.

#### (2) Details of the Plan

##### 1) Repair and Replacement of the Welding Equipment

###### 1. Projection Welder NP-135

Two of this model are installed and both show serious wear to the laminated copper conductor and chip holder. Further, the timer is inoperative due to breakdown, and replacement of these welders is necessary.

###### 2. Spot Welder ND-25 (In use for more than 25 years)

There are 6 of the Dengen Co. model ND-25 welder, and 2 of National Co. model installed, making a total of 8 welders altogether. All of these show deterioration, and one of the Dengen models and two of the

National models are now beyond repair, and it is necessary to replace the two Dengen welders.

3. Seam Welder UC-1204 (In use for more than 25 years)

There are two of the present machine in operation, and both of these show wear to the resistant and roller. There is no replacement program for the eventuality of a breakdown and this leads to line stoppages. It is necessary to replace one of these.

4. GAJ-31D (A modified model of the GHJ-350 Model)

The present device is a gun for portable spot welder and four of these are employed. All four are deteriorated and it is therefore necessary to replace one of these with a new gun.

2) Repair of the Rear Body Shop Planer

One of the three available three side planers for woodwork use in the Rear Body Shop is out of order and inoperative and requires repair. As repair work can be carried out on the shop site expendable and missing parts and a bench drilling machine should be imported and repairs undertaken.

3) Replacement of Vehicle Inspection Devices

- a) Heavy trucks and buses are currently dispatched without any inspection using the carriage inspection devices taking place. These same inspection devices were located in the present service shop at the time of initial installation of the present line. However, due to the low level of the floor in that shop and flooding with rain water these devices have been damaged to the extent that they are presently inoperative and beyond repair.

In order to ensure the safety of the vehicles and improve in product quality it is necessary to install vehicle inspection devices at the final line off point of the final assembly line of the Heavy Vehicle Shop, and to undertake inspections of all vehicles using these.

- b) Transfer of the engine dynamometer and other engine repair equipment which has deteriorated to the service shop where car inspection equipment is located. By this transfer the components parts area can

be expanded and used for storage of packing cases or for unpacking. Further, the fuel tank and muffler area should be moved to the north-east area of the Assembly Shop.

- c) Working areas for the upper parts of the special vehicles such as the dump truck, wrecker, lorry, etc. should be relocated at Htaukkyaant and the resulting free area be used for installation of car inspection equipment and touching up areas. As the change over to domestic production of sheet metal parts will proceed a location in the vicinity to Press Shop No.2 is considered an appropriate area for this.
- d) The Working areas for sheet metal parts is to be expanded for uses of the changeover to future local production of small steel sheet parts.

#### 4) Replacement of Painting and Drying Equipment

Currently there are paint booths for vehicle use and for cab use. Since the cab paint booth is of the open type there are problems of pollution of surroundings and of the operational environment. As the vehicle paint booth is not constructed to allow the through passage of carriages being painted one carriage at a time, but efficiency is further reduced in cases where carriage painting is done in conjunction with the cab painting and this results in bottlenecks. Further, wear to the accessory devices of the vehicle use booth is evident. For these reasons, together with replacement of the paint booth for the cab painting area, repair of the worn accessories of the vehicle booth is to be undertaken.

#### 5) Overcoming Bottlenecks in Production

- a) The side frame drilling in the frame assembly processing is performed by two radial drilling machines and jigs placed to the left and right hand sides of the line. As the production capacity of the drilling machines is smaller than that of the assembly line capacity this results in bottlenecks occurring. Further, it is difficult to set up replacement measures to meet the eventuality of a breakdown of one of these radial drilling machines. In order to ensure line balancing and to improve the operating rates equipment should be increased by the addition of one radial drilling machine and one hole opening jig.

- b) One riveting generator and two riveting guns are employed for assembling in the frame assembly processing. When two of the guns are simultaneously employed problems of product quality arise because of insufficient electric generating capacity. In order to assure product quality addition of one riveting generator for each gun should be made.
- c) The cross member area should be relocated to the east side of the frame painting booth, and the radial drilling machines, column drilling machines and also the various types of processing jigs should be relocated.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-5 Rehabilitation of Worn Out M/E  
- No.1 HI: HV Assembly Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair and replacement welders		
1 1	Projection welder NP-135	Set	2
1 2	Spot welder ND-25	Set	2
1 3	Seam welder UC-1206	Set	1
1 4	Gun for spot welder GAJ-31D	Set	1
2	Repair and replacement of deteriorated ME for rear body shop		
2 1	1Repair parts of three side planer:under roller	Lot	2
2 1	2Repair parts of three side planer:bevel gear for up-down	Lot	1
2 2	Bench drilling machine	Set	1
3	Repair and replacement of deteriorated ME		
3 1	Cab paint booth	Set	1
3 2	Other parts:air filter of body paint booth	Pcs	200
3 3	Other parts:infrared-ray bulve 250W for dry oven	Pcs	200
3 4	Water pump for frame paint booth 125 SEM	Set	1
3 5	Packing for water pump	Set	1
4	Repair and replacement of measuring equipment		
4 1	Brake tester	Set	1
4 2	Side slip tester	Set	1
4 3	Turning radius gauge	Set	1
4 4	Head light tester	Set	1
4 5	Speed meter tester	Set	1
4 6	Miscellaneous	Lot	1
5	To solve production bottleneck		
5 1	Radial drilling machine	Set	2
5 2	Drilling jig LH/RH	Set	2
5 3	Generator for riveter w/hydraulic pipe & hose	Set	2
5 4	Miscellaneous	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-5)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	96.4	-	96.4
2 Freight & Insurance	8.1	-	8.1
Sub-total	104.5	-	104.5
3 Import Duty	-	15.7	15.7
4 Unloading	-	1.5	1.5
5 Installation Cost	-	0.7	0.7
Imported M/E Total	104.5	17.9	122.4
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	10.8	-	10.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	10.8	-	10.8
Total Investment	115.3	17.9	133.2



Attached Figure 1-1 LAYOUT FOR VEHICLE ASSEMBLY SHOP (NO.1 HI)

# 1-6 Rehabilitation of Worn Out M/E

- No.1 HI Leaf Spring Shop -

(1) Objectives and Outline of the Plan

Production of leaf springs for heavy vehicles and light vehicles use is concentrated in the Leaf Spring Shop. Because there is a large amount of hot working and heat treatment involved in the processing handling of the equipment tends to be rough and deterioration of the equipment is advance. There is equipment requiring replacement and supplementary equipment to overcome bottlenecks and the present plan takes these into account.

(2) Details of the Plan

a) Replacement of the Drilling Machine

The wear on the drilling machine used for drilling of the center bolt is very bad and therefore should be replaced by a machine with an automatic cutting lubricator.

b) In order to solve bottlenecks addition of a crank power press for cutting blanks and a friction press for assembly of leaf spring to reinforce existing equipment should take place.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-6 Rehabilitation of Worn Out M/E  
- No.1 HI: Leaf Spring Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Friction press	Set	1
2	Upright drilling machine w/cutting oil pump	Set	1
3	Crank power press	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-6)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	36.5	-	36.5
2 Freight & Insurance	4.0	-	4.0
Sub-total	40.5	-	40.5
3 Import Duty	-	6.1	6.1
4 Unloading	-	0.6	0.6
5 Installation Cost	-	0.1	0.1
Imported M/E Total	40.5	6.8	47.3
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	1.8	-	1.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	1.8	-	1.8
Total Investment	42.3	6.8	49.1

# 1-7 Rehabilitation of Worn Out Materials Handling Equipment  
- No.1 HI: Heavy Vehicles Project Plants -

(1) Objectives and Outline of the Plan

Since loading and unloading equipment is not available for each of the individual shops relating to the production of heavy vehicle carriages in No.1 HI and No.4 HI, materials handling within the shops and between shops is not smooth, and further there are safety problems with operations involving the handling of heavy objects. In order to remedy this state of affairs provision for loading, transportation and unloading equipment is planned.

(2) Details of the Plan

Loading/unloading and transportation equipment is to be placed in the individual shops relating to production of heavy vehicle carriages of No.1 HI and No.4 HI so as to enable loading, unloading and transportation operations within the individual shops and between these. Provision of fork lifts, crane trucks, and tractors is to be made, and an overhead crane installed in the spring shop for loading and unloading of materials.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-7 Rehabilitation of Worn Out Materials Handling Equipment  
- No.1 HI: @ HV Project Plants -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Forklift truck (3.5 ton) for assembly shop	Set	1
2	Forklift truck (3.5 ton) for machine shop	Set	1
3	Forklift truck (3.5 ton) for spring shop	Set	1
4	Forklift truck (3.5 ton) for engine shop	Set	1
5	Forklift truck (2.0 ton) for press shop	Set	1
6	7 ton crane truck (FD152SA)	Set	4
7	15 ton crane truck (NS270SA)	Set	4
8	20 ton crane truck (TL200-E)	Set	4
9	Tructer with 25 ton low bed type semi trailer (SS633SA)	Set	2
10	Material handling crane for spring shop (3 ton, 13m x 35m)	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-7)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	289.9	-	289.9
2 Freight & Insurance	32.2	-	32.2
Sub-total	322.1	-	322.1
3 Import Duty	-	48.3	48.3
4 Unloading	-	4.5	4.5
5 Installation Cost	-	11.9	11.9
Imported M/E Total	322.1	64.7	386.8
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	322.1	64.7	386.8

#1-8 Rehabilitation of Worn Out M/E  
- No.4 HI: Light Vehicles Assembly Shop -

(1) Objectives and Outline of the Plan

Assembly and painting of the car body for the B600, X2000, T2000 and Path Finder models are done in this shop. The shop suffers from various problems including deterioration of equipment, insufficiency and deterioration of working tools and inspection devices, and bottlenecks occurring during processing, and the deterioration of painting equipment, etc. These problems result in a reduction in productivity and product quality achieved. The present plan aims to remedy these above-mentioned problems through the implementation of the individual measures listed below, with the objective of improving productivity and product quality levels.

(2) Details of the Plan

1) Repair and Replacement of Deteriorated Equipment and Tools

The inadequacy and deterioration of general purpose tools, air tools, measuring devices and lubricating devices used on the car body assembly line and inspection line of this shop are generally evident. These tools are handled in a rough way and this hinders productivity.

Moreover, cases were even observed of equipment which had simply been laid to the side in a state of deterioration or breakdown. Among such items were the wheel balancer and various types of testing devices essential to the assurance of the product quality of the car bodies produced.

- a) The supplementing and replacement of the various types of inadequate working tools or deteriorated working equipment on the car body assembly line must be undertaken and measures to promote the improvement of productivity and product quality taken.



1. Main general purpose tools which are lacking

the various types of screwdriver  
the various types of socket  
mechanical tools kits, etc.

2. Main air tools which are lacking or deteriorated

impact wrench  
air drill  
air driver, etc.

3. Main measuring devices which are lacking or deteriorated

scales  
torque wrench  
thickness gauge  
spring balance  
timing light, etc.

4. Main lubricating devices which are lacking or deteriorated

grease gun  
oil pump  
high pressure grease pump, etc.

5. Working equipment in state of deterioration

wheel balancer	one unit
motor and pump for shower tester	one unit each
hoist (0.5 tons four units, one ton seven units, 3 tons one unit)	
sewing machine for sheet use	three units

- b) Replacement of the following inspection equipment which has an adverse effect on product quality because of deterioration.

1. headlight tester one device
2. brake tester one device
3. speedometer tester one device
4. dynamic toe-in tester one device

## 2) Solution of Bottlenecks

- a) The toe-in, camber and caster adjustments and measurements for the three models of the B600L, X2000 and T2000L are carried out using the turning radius gauge installed on the test line. In addition to the obsolescence of the aforesaid tester adjustment of the device to the construction of the camber and castor of the B 600L model is time consuming (and adjustment operations require technical expertise). This state of affairs is due to the insufficient capacity of the gauge involved and counter measures are required.

Time needed for adjustment and measurement of the toe-in, caster and camber:

B600L : 30 minutes per vehicle (readjustment, 30 minutes per vehicle)

X2000L: 10 minutes per vehicle

T2000L: 10 minutes per vehicle

Endeavor to solve the inadequacy of capacity by stopping the re-entry to the test line of B600L vehicles with defective adjustment of camber and caster, by installing a new turning radius gauge of portable type at the retouching area for completed vehicles, and by undertaking modifications in the readjustment and measurement processes of the retouching area.

- b) There is a high paint retouching rate for the assembly complete vehicles which leads to a shortage of capacity of the existing drying machines for touch up use (two infrared drying devices are installed). In particular drying takes a long time during the rainy season or when external temperatures fall and it is necessary to increase the installation of the same type of drying device.

The fundamental improvement measure would be to effect a reduction in the painting touch up rate for completed vehicles, but considering the advance of deterioration of the infra-red drying equipment, an increase in productivity is to be effected by the introduction of two infrared drying devices to new specifications (for positioning one each to the left and right of the line).

3) Repair and Replacement of Deteriorated Devices and Equipment of the Painting Process Stage

- a) Deterioration of the hot air ventilation duct for the painting dryer is very bad and the device has reached the limits of its endurance. The plan for changing the heat fuel source of the present equipment (from diesel oil to LPG) should be accompanied by removal of the existing hot air two way ventilation filter and replacement with an LPG duct.
- b) As the air supply and exhaust ventilator for the vibration coat spraying booth is deteriorated and as the functioning of the mixing pump and control panel is also impaired a thoroughgoing renovation is required.

Replacement of the vibration coat spraying booth and the following equipment is to be undertaken

1. ventilating device
2. control panel
3. mixing pump
4. spraying booth

- c) The outer shell of the body of the drying furnace has developed holes due to rusting  
(drying, baking and minibus use....total 3 devices)

Repair of the rusted section of the outer plate with zinc plating

- d) Changing of the filters for the paint spraying booth and for the drying furnace ventilator has not been carried out and the equipment is not functioning.

Changing of the roll filter

- e) Inadequacy and deterioration of painting tools, air tools, and general operating tools is evident and this has an adverse effect on productivity and product quality.

Replacement and supplementing of inadequate and deteriorated tools, etc.

- f) Loading and unloading of parts is hindered because of the deterioration and breakdowns of the hoist equipment.

Spare parts should be imported and on site repairs be undertaken

4) Increase in Waste Water Treatment Equipment for the Painting Process

Installation of the coagulator originally planned as part of the initial construction program of HIC has not been carried out, and consequently untreated waste liquids are simply ejected from the factory as tail water. However, currently water is not employed in the paint spraying booth, and since frame coating is not performed by the dipping method the volume of waste water involved for use with the liquid of the synthetic film liquid for pre-coating treatment and for rinsing water is very small.

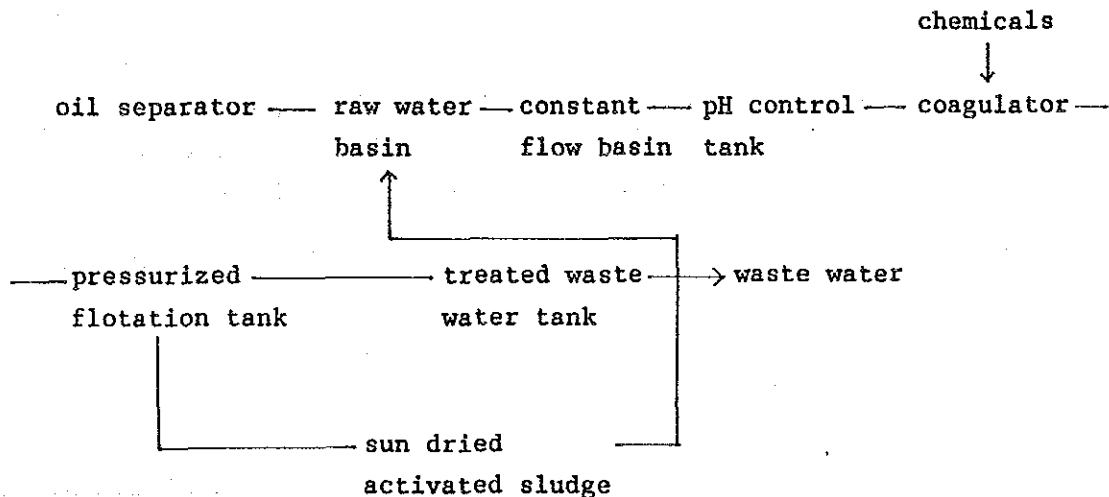
Realization of the waste water treatment of synthetic film waste water and painting waste water.

Number of produced car bodies for treatment: 10 per day

#### Waste water standards

PH	5 - 9	
Dissolved Solids	less than 2000	ppm
Suspended Solids	less than 30	ppm
Permanganate Value	less than 60	ppm
COD	less than 100	ppm
BOD	less than 60	ppm
Oil and Grease	less than 5	ppm
Zinc	less than 0.3	ppm

#### Outline of Waste Water Treatment Flow



Location for installation of the treatment equipment: outside of the painting shop to the north side.

An area available of some 5 m x 20 m surface is required. However, the coagurator requires some 3m x 7 m surface area under roofing.

### 5) Improvement of Accessory Painting Equipment

The paint mixing room included in the initial plan of HIC has not been implemented and paint cans are brought into the paint spraying room and mixing and painting takes place there. This state of affairs presents problems with regard to productivity and product quality as well as for safety.

As counter measures to this situation it is necessary to improve the supply method for paint to the Paint spraying booth, as follows:

Install a new mixing room near to the paint spraying booth.  
Paints to be sent pressurized.

Installation of a particular spray gun in the paint spraying booth, as follows:

undercoat (one color) airless handgun	1 device
middle coat (one color) airless handgun	1 device
finishing coat (six colors) air handgun	6 devices

### (3) Estimated Capital Requirement

#### 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

#### 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-8 Rehabilitation of Worn Out M/E  
- No.4 HI: LV Assembly Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair and replacement of deteriorated ME		
1 1	Hand tools,air tools,measuring tools,oiling/greasing devices	Lot	1
1 2	Sewing M/C	Set	3
1 3	Headlamp tester	Set	1
1 4	Brake tester	Set	1
1 5	Speedometer tester	Set	1
1 6	Dynamic toe-in tester	Set	1
1 7	Wheel balancing M/C	Set	1
1 8	Miscellaneous		
1 8 1	Pump motor for shower tester	Set	1
1 8 2	Hoist (0.5ton, 1ton, 2ton)	Set	12
2	Debottlenecking		
2 1	Turning radius gauge	Set	1
2 2	Infrared heating dryer	Set	2
3	Painting waste water treatment		
3 1	Pressurized floc separator	Set	1
4	Repair/replacement, worn out equipment		
4 1	Phosphating device	Set	3
4 2	Repair, drying oven	Set	1
4 3	Improvement, painting booth for vibration coat	Set	1
4 4	Repair, paint baking oven	Set	2
4 5	Repair, painting booth	Set	2
4 6	Supplement, painting tools	Set	1
4 7	Repair, hoist	Set	2
4 8	Miscellaneous		
5	Rehabilitation of paint spraying M/C		
5 1	Paint mixing room	Set	1
5 2	Airless spray gun	Set	2
5 3	Degreasing tank	Set	2
5 4	Parts transfer equipment	Set	1
5 5	Drying oven	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-8)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	243.4	-	243.4
2 Freight & Insurance	28.5	-	28.5
Sub-total	271.9	-	271.9
3 Import Duty	-	40.8	40.8
4 Unloading	-	4.1	4.1
5 Installation Cost	-	8.6	8.6
Imported M/E Total	271.9	53.5	325.4
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	25.2	-	25.2
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	25.2	-	25.2
Total Investment	297.1	53.5	350.6



#1-9     Rehabilitation and Shop/Line System Improvement  
       - No.4 H1: LV Body Assembly Shop -

(1) Objectives and Outline of the Plan

Vehicle assembly for the B-600, X-2000, and HIC developed Path Finder models (a modified X-2000 model) takes place in the Light Vehicles Body Assembly Shop. At present, there are problems in this shop of deterioration of equipment and working tools, bottlenecks in production processes, and disorder in the process flow due to layout changes after commencement. The following repairs and improvements are planned in order to remedy these above problems.

(2) Details of the Plan

1) Repair and Replacement of Deteriorated Devices and Equipment

a) Arc Welder

The deterioration of the 14 available welders is very bad and must be replaced since spare parts are not easily accessible. Together with this in order to ensure improvement of productivity 10 CO2 gas shielded arc welding machines and 4 MIG welders are to be installed.

b) Spot welder

i) Since 29 of the existing portable spot welders are deteriorated and it is difficult to get spare parts, these need to be replaced. When replacement takes place an increase of the welding capacity from 75 KVA to a capacity between 100 and 175 KVA should also be carried out.

ii) At present 5 of the dual head spot welders are undergoing repair. The following necessary spare parts are to be imported as part of the present plan:

electrodes, ion/copper plates, transformers, timer-conductors, and accessory units.

- iii) 5 of the single head spot welders are deteriorated, and as spare parts are difficult of access it is necessary to replace these.

c) Drilling Machine

The following need to be replaced because of deterioration and frequent breakdowns:

upright drill 2UD	2 machines
bench drill BD	3 machines

- d) One of the pipe benders is deteriorated and needs replacing since spare parts are not easily obtained.

e) Electric hoist

Needing replacement because spare parts not easily obtained  
...one machine

Spare parts (cable, various conductors, brake coil) to be imported and on the site repairs undertaken ... 5 machines

2) Maintenance of Working Tools and Inspection Devices

a) Supplementing of Working Tools

There is a severe shortage of air drills, air grinder, hammer, files, and chisel, etc. and those available have to be share used amongst operators, and because of improper usage a lowering of precision in the finishing of products results.

It is necessary to supplement the supply of air tools and general purpose tools in order to ensure the improvement of the precision of product finishing and better product quality.

b) Maintenance of Inspection Devices

Shortage of measuring devices necessary for inspection purposes such as measuring tapes, scales, vernier calipers, etc. means that inspections are largely done on the basis of visual observation

checks.

Measuring devices must be supplemented and it is necessary that exact measurement inspections take place.

### 3) Overcoming Bottlenecks in the Path Finder Processing

#### a) Replacement of the Shearing Machine

The shearing machine employed in processing has been in use more than 25 years since manufacture and deterioration is advanced, and operational performance unsatisfactory. As it is difficult to obtain spare parts, replacement by a similar new machine is required in order to raise productivity.

- b) Since the body parts of the Path Finder are all produced by hand the model fails to meet the needs of the market in terms of both product quality and productivity. In order to increase productivity and parts precision production using a press should be introduced and therefore of one press brake machine should be newly installed to this end.

### 4) Provisions for Systems Rehabilitation

- a) Changes to the initial layout of equipment and operational areas have been made because of installation of the body assembly, frame assembly and painting shop equipment needed for production of the Path Finder which is a locally modified model of the X2000, and also because of in operation of deteriorated equipment. These changes in layout have resulted in complications in assembling processes and material handling and a reduction in efficiency.

The following two headings contained the counter measures proposed to the above:

- i) Re-location of the frame assembly area for the B-600L and X-2000L to the north corner of the shop and introduction of the following equipment for line production system in order to increase productivity:

gantry crane	1 machine
rotary bench frame welder	3 machines
cross member bench	6 benches
rack carts	12 machines
hoists(0.5 tons)	3 machines
wide member straightener	1 machine
frame assembly bench	1 bench
assembly bench	1 bench
frame assembly straightener	1 machine

ii) Increase in the Productivity of the Path Finder and promotion of the changeover to domestic production of the T2000L Truck

By using the currently idle gantry destined for mini-bus use and by new installation of jigs for the body assembly of T-2000L Trucks and welding equipment both increase in productivity and promotion of domestic production can be carried out.

- a) remodeling of the idle gantry 1 set
- b) welding and accessory equipment
  - welding gun 6 items
  - transformer 6 items
  - timer 6 items
- c) body assembly jigs 1 set
- d) front window insertion jig 1 set
- e) roller conveyer (20M/set) 3 sets

- b) packing work of sealer is not done sufficiently and rapid rusting and water leak from outside car are resulted.

In order to undertake an increase in operating efficiency three new sealing packer machines are to be installed so that in addition to ensuring reliable packing operations prevention of rusting and damage by water is achieved and product quality improved.

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES.

: 1-9 Rehabilitation and Shop/Line System Improvement  
- No.4 HI: LV Body Assembly Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair and replacement of deteriorated ME		
1 1	CO2 gas shielded arc welding M/C	Set	10
2	Metal inert gas welding M/C	Set	4
1 3	Portable spot welding M/C	Set	29
1 4	Single head spot welding M/C	Set	5
1 5	Drilling M/C (2UD)	Set	2
1 6	Drilling M/C (BD)	Set	3
1 7	Pipe bender	Set	1
1 8	Miscellaneous		
1 9	Spot welder: repair	Set	5
110	Hoist (0.5ton, 1ton) R/R	Set	6
2	Supplement of Tools and measuring tools		
2 1	Air tools	Lot	1
2 2	Hand tools	Lot	1
2 3	Measuring tools	Lot	1
3	Debottlenecking		
3 1	Shearing M/C	Set	1
3 2	Press brake	Set	1
3 3	Miscellaneous		
3 4	Accessories	Lot	1
3 5	Wiring Piping	Lot	1
4	Improvement of line system		
4 1	Frame ass'y line	Set	1
4 2	Body ass'y line	Set	1
4 3	Sealer charging M/C	Set	3
4 4	Miscellaneous	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-9)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	248.6	-	248.6
2 Freight & Insurance	29.1	-	29.1
Sub-total	277.7	-	277.7
3 Import Duty	-	41.7	41.7
4 Unloading	-	4.2	4.2
5 Installation Cost	-	0.8	0.8
Imported M/E Total	277.7	46.7	324.4
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	32.4	-	32.4
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	32.4	-	32.4
Total Investment	310.1	46.7	356.8

#1-10 Improvement of the Shop/Line System  
- No.4 HI: Plating Shop -

(1) Objectives and Outline of the Plan

At present the special-purpose equipment for tin plating of the piston and chrome plating of the piston ring operates in this particular shop. Currently there are problems with the quality of the plating fluids and water used for plating, and zinc plating is necessary. In order to overcome these problems the following headings have been planned.

(2) Details of the Plan

1) Introduction of an Iron Removing Device

During the chrome plating process iron constituents dissolve and accumulated in the plating liquid. When the volume of iron contained in the plating liquid it becomes impossible to assure the product quality and consequently the liquid has to be thrown away.

By installing an iron removing device to remove iron in the plating liquid the service life of the plating liquid can be extended and also product quality be improved.

Method of the iron removing: use of diaphragm cell

Outline of devices:

iron removing device	one machine
rectifier	one machine
ventilator	one machine
dialite tank	one machine

treatment capacity (tank): 1,000 liters



(2) Increase in Water Supply Facilities

There are problems of quality with the water used for the plating. The soft water intake distribution pipes from the water reservoir situated in the mountain behind which were initially planned to be installed in HIC's construction plan have not been realized. Water is brought by truck from the Irrawaddy river during the dry season but during the rainy monsoon season rain water is employed and no problem of water supply arises.

As in the initial plan water should be obtained from the reservoir of the mountain behind the factory during the dry season. Installation of a water pump at the side of the reservoir and positioning of a receiver tank control panel at the factory would make possible a convenient supply of water available during the dry season.

(3) Additional Zinc Plating Equipment

As there are only specialist equipment facilities for tin plating of the piston and chrome plating of the piston ring available in the No.4 HI. Parts requiring other kinds of plating are sent to the No.1 and No.3 HI for plating processing. This causes wasteful material handling, impairs product quality and causes delays in production. It is desirable to carry out a concentration of production.

In order to centralize production the following equipment should be newly installed:

The zinc plating equipment used for a large variety of parts should be set up in the No.4 HI.

Number of parts concerned:

B-600 model use	76 parts
X-2000 model use	193 parts

Location for plating process equipment:

Inside the piston and piston ring plating shop. However, the waste water treating equipment for this plating shop should be placed outside on the north side of the shop. Required surface area inside the shop is 90 square meters.

Zinc plating process:

immersion degreasing - washing - pickling - washing - plating - activation - washing - chromate treatment - washing - washing with hot water - centrifugal de watering

Two plating processes, barrel type and suspended type are to be installed and use of each is selected according to usage of the plated product.

Waste water treatment:

Chromate treatment and acid treatment are diverted to the existing water treatment equipment used for plating of the piston and piston ring. New equipment needs to be installed for the treatment of cyanic. Considering the difficulty of the control of the chemicals used in the alkaline chloride method of treatment the activated sludge method is preferred.

### (3) Estimated Capital Requirement

#### 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

#### 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-10 Improvement of Shop/Line System  
- No.4 HI: Plating Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Introduction of deironing device		
1 1	Iron removal equipment	Set	1
2	Introduction of water supply system		
2 1	Control panel	Set	1
2 2	Receiving tank	Set	1
2 3	Submerged pump	Set	1
2 4	Miscellaneous	Lot	1
3	Introduction of zinc plating facilities		
3 1	Water washing basin	Set	1
3 2	Centrifuge	Set	1
3 3	Rectifier	Set	1
3 4	Distribution Board	Set	1
3 5	Cyanides treatment equipment	Set	1
3 6	Miscellaneous	Lot	1
4 1	Rack, cage	Lot	1
4 2	Filter	Set	2
4 3	Hoist	Set	3
4 4	Hand tools	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-10)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	131.6	-	131.6
2 Freight & Insurance	15.4	-	15.4
Sub-total	147.0	-	147.0
3 Import Duty	-	22.1	22.1
4 Unloading	-	2.2	2.2
5 Installation Cost	-	4.5	4.5
Imported M/E Total	147.0	28.8	175.8
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	41.4	-	41.4
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	41.4	-	41.4
Total Investment	188.4	28.8	217.2

#1-11 Rehabilitation of Worn Out M/E

- No.4 HI: Compressor Room -

(1) Objectives and Outline of the Plan

- 1) The following air compressors have been used for more than 23 years since introduction in 1964 and are in a state of deterioration.

No.4 HI BTD Model (150 kw) for the central compressor room

4 machines

The air pressure in the No.4 HI sometimes falls below 3 kg per square cm and this leads to stoppage of the operations of the equipment.

In order to assure the supply of compressed air so important for production purposes the repairs as noted in the next paragraph (2) are planned.

- 2) The compressed air which is sent from the central compressor room of No.4 HI to production equipment is contaminated with oil and water removal of these is necessary.

(2) Details of the Plan

- 1) Dispatch of spare parts for the air compressor and on site overhaul under the direction of dispatched engineers is to be undertaken.

Main spare parts:

Suction valve

Discharge valve

P Shaft Metal

Large End Metal

Small End Metal

Drive Shaft Liner

Cylinder Gasket, etc. making some 30 items.

- 2) One dryer and filter should be set to the external compressed air outlet of the central compressor room and dry compressed air be sent to the individual shops. The distribution pipes inside the shop can be used as they exist now. However, as there is a danger of dried iron rust particles contaminating the compressed air after drying filters should be attached at the use outlets.

- (3) Estimated Capital Requirement

- 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

- 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-11 Rehabilitation of Worn Out M/E  
- No.4 HI: Compressor Room -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair of compressors		
1 1	Air compressor BTD type	Set	4
2	Introduction of dehumidification facilities		
2 1	Dryer and outlet filter	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-11)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	48.1	-	48.1
2 Freight & Insurance	5.6	-	5.6
Sub-total	53.7	-	53.7
3 Import Duty	-	8.0	8.0
4 Unloading	-	0.8	0.8
5 Installation Cost	-	1.7	1.7
Imported M/E Total	53.7	10.5	64.2
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	9.0	-	9.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	9.0	-	9.0
Total Investment	62.7	10.5	73.8



#1-12 Rehabilitation of Worn Out M/E  
- No.4 HI Chemical Analysis Room -

(1) Objectives and Outline of the Plan

The following problems exist with the equipment of the Chemical Analysis Room of the No.4 HI.

1. The existing draft chamber for perchloric acids (of a plywood surface with a chemical resistant coating) was imported and been in use for 9 years to date. It is nearing the close of its service life which is estimated at some 10 years. It is necessary to replace this for safety purposes.
2. The carbon analysis chamber and sulfur analysis chamber have been in use for 9 years to date. Breakdown of the electronic accessories is frequent and since spare parts are difficult of access this results in long stoppage periods and hinders the analysis of materials.

As a counter measure to these problems replacement with the new machinery listed under heading No.2 is planned.

(2) Details of the Plan

The following equipment is to be installed in No.4 HI:

1. New model equipment one set to be installed to ensure the safety and increase the life service of the draft chamber.

-One unit of new type draft chamber for perchloric acid with the following specifications

all steel body model (chemical resistant baked coating)  
front panel of transparent reinforced glass (6mm thickness)  
centrifugal operating internal washing device  
electric hot plate accessory

2. Replacement of the carbon dioxide and sulfur analysis chamber in order to remedy problems of material quality instability due to the long stoppages in analysis equipment operations.

1. Carbon dioxide and sulfur analysis devices (model for shared use)

- |  |             |
|--|-------------|
|  | one machine |
| 2. Oxygen carrier gas in 47 liter gas cylinder | one set     |
| 3. Cleaning kit                                | one set     |
| 4. Analysis components for 5000 rotations      | one set     |

- (3) Estimated Capital Requirement

- 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

- 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1. LIST OF REQUIRED FACILITIES

#: 1-12 Rehabilitation of Worn Out M/E  
- No.4 HI: Chemical Analysis Room -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Chem. analysis equipment		
1 1	Carbon and sulfur analyzer	Set	1
1 2	Draft chamber	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-12)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	31.0	-	31.0
2 Freight & Insurance	2.5	-	2.5
Sub-total	33.5	-	33.5
3 Import Duty	-	5.0	5.0
4 Unloading	-	0.4	0.4
5 Installation Cost	-	1.1	1.1
Imported M/E Total	33.5	6.5	40.0
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.9	-	0.9
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.9	-	0.9
Total Investment	34.4	6.5	40.9

#1-13 Rehabilitation of Worn Out Materials Handling Equipment  
- No.4 HI: Light Vehicle Project Plants -

(1) Objectives and Outline of the Plan

There is a shortage in transportation equipment (parts boxes, pallets, hand trucks, hand lifts, fork-lifts, etc.) in all of the various shops related to the No.4 HI light vehicles project plants resulting problems, as follows:

1. Damage caused to finished parts and parts in progress due to direct placing on the floor.
2. Confusion and incorrect placing of parts.
3. Wasteful operation involved in moving of parts.

Further, there is a shortage of transportation equipment and circulating carrier boxes for shop to shop transportation. Direct loading to the transportation jeeps, loading of unseparated lots and other cases of makeshift practices of transportation were evident and a sense of care for the parts handled seems to have been lost. The renovation and improvement of materials handling devices and equipment is one of the most important topics to be dealt with.

(2) Details of the Plan

The expansion of the absolute amount of materials handling equipment in use inside and outside the shops is an urgent task requiring prompt implementation.

Implementation of the following:

1. Expansion of the special-purpose transportation devices and equipment taking the particular character and functions of the parts to be handled into consideration.
2. Program to make full active use of existing or idle transportation devices and equipment through repairs and servicing.
3. Effective use of existing locally produced vehicles

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-13 Rehabilitation of Worn Out Materials Handl'g Equipment  
- No.4 HI: @ LV Project Plants

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Material Handling Equipment		
1 1	Forklift (10 ton)	Set	1
1 2	Forklift (2 ton)	Set	5
1 3	Hand truck	Set	111
1 4	Pallet truck	Set	138
1 5	Materials for maintenance	Set	156
1 6	Miscellaneous	Lot	1
1 7	Container	Set	388
1 8	Carrier	Set	82
1 9	Special container	Set	410
110	Roller conveyor (60m)	Set	1
111	Hand lift	Set	18
112	Bucket	Set	13
113	Pallet (wooden)	Set	170
114	Rim (wooden)	Set	35

Attached Table 3-2: REQUIRED INVESTMENT (#1-13)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	74.5	-	74.5
2 Freight & Insurance	8.7	-	8.7
Sub-total	83.2	-	83.2
3 Import Duty	-	12.5	12.5
4 Unloading	-	1.2	1.2
5 Installation Cost	-	2.6	2.6
Imported M/E Total	83.2	16.3	99.5
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	83.2	16.3	99.5



## #1-14 AME Plants Rehabilitation

### - No.3 HI: AME Project Plants -

#### (1) Objectives and Details of the Plan

##### 1) Deterioration of equipment

Deterioration is generally advanced for the agricultural machinery production equipment, jigs, metal molds, and inspection equipment. This has a detrimental effect on production efficiency and product quality.

According to the HIC data, the above state of deterioration is as shown in Attached Tables 1-2(1) to (4). Besides these, there is a strong possibility that a technical survey would discover a number of potential breakdowns and it is predicted that deterioration will continue to progress.

The present plan proposes the replacement of machinery shown to be in urgent need of this and supply of spare parts and repair parts which it is estimated will be required hereafter.

##### 2) Measures against Bottlenecks

There are a number of bottlenecks in the processes and equipment of the agricultural machinery production line equipment. (refer to Attached Tables 1-3 and 1-4(1),(2) ). Causes are as follows:

###### 1. Breakdown of equipment

Among these some equipment has stopped because of breakdown, and bottlenecks occur with machinery of the same type which is still operating.

2. Blanks are not received at the appropriate time from the other HIs. This causes temporary bottlenecks

3. Due to a lowering in the equipment precision machining allowance in the succeeding step increased and this leads to bottleneck.
4. Increases in local production planned to be handled by existing equipment cannot actually be coped with in terms of equipment capacity and production control and so bottlenecks arise.

It is supposed that the larger part of the bottlenecks mentioned in 1. above can be solved if repairs are progress smoothly in the future. Further, the problems of blanks supplies of 2. above could largely be solved by consultation efforts between the processing schedule and production departments of No. 3 HI. However, bottlenecks mentioned in 3. and 4. above require an immediate increase in equipment in order to maintain existing levels of production. The present plan therefore proposes that measures be taken.

### 3) Assurance of Product Quality

The following problems were noted with quality control in the No.3 HI Production Department for agricultural machinery:

1. It was found that quality inspections of the parts processing line, inspection area and assembly lines were not strictly observed.
2. Defects in precision of the parts processing resulted in increases of the retouching and assembly time, as well as a reduction in product performance. For example, defects in the precision of the processing of the bolt hole of the large end of the connecting rod led to modifications in the processing which required much more time. Further the time required for fitting of the bulb sheets is affected by the concentricity of the bulb hole of the cylinder head and the bulb stem hole and defective precision in the fitting is a cause of cases of gas leakage and results in lowering of engine precision.
3. The number of micrometers and other inspection measuring devices placed at the side of the processing line is small and parts are sent on to following processes without sufficient checks having been made. Problems are discovered during the assembly processes when breakdowns or hindrances arise.

4. The Inspections and Measurements Room in close liaison with the processing lines should carry out prompt and accurate counter measures as required. However this is not implemented due to lack of measuring devices.

5. Attachment of the water pump is done at the outdoors test trial run area for the engines assembled in Assembly Shop No.1 and water circulation checked visually. This method of checking only allows for confirmation of engine operation, and does not confirm either product quality or performance.

6. Painting of products enriches its commercial value and is important as anti-rust measure. However, the painting of agricultural machinery does not reach sufficient levels of film hardness because of insufficient baking temperatures during drying.

We can summarize the above factors as follows:

1. Initial equipment matched processing but process changes have been made since then due to deterioration of equipment.
2. Process changes occurred because local production of parts was expanded without equipment investment.
3. Improvement in the technical level at time of initial installation has not been achieved.

Since a general level of quality control is an intrinsic condition for establishing flow operations of mass produced parts a lowering of precision in important processes is unacceptable. Further, frequent occurrence of defective quality products leads to a lowering of productivity and not only production schedules but effective use of important resources cannot be achieved. The present plan proposes a strengthening and renovation of equipment since this is urgently required for equipment and processes suffering from the inconveniences outlined above which have a direct detrimental effect on the quality and precision of products. Equipment outlined in Attached Tables 1-5 (1) and (2) is required.

(2) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 1-1 SUMMARY OF DETERIORATED EQUIPMENT FOR  
AGRICULTURAL MACHINERY PRODUCTION

(Unit: Sets)

Shop Name	Installed Number	Condition of Equipment		
		To be Re- placed Urgently	In Failure	In Operation
AME Component Shop No.1	60	-	7	53
AME Component Shop No.2	190	9	38	143
AME Component Shop No.3	143	4	8	131
AME Component Shop No.4	92	-	16	76
Assembly Shop No.1	30	-	3	27
Assembly Shop No.2	14	9	-	5
Mamootie Forging Shop	27	-	5	22
Hand Tool Forging Shop	28	-	4	24
Mamootie Finishing Shop	23	-	3	20
Hand Tool Finishing Shop	44	-	8	36
Press and Welding Shop	43	5	5	33
Die Making and Repairing Shop	30	-	1	29
Saw Mill	16	-	-	16
Combine Heat Treatment Shop	100	15	2	83
Plating Shop No.1	78	75	-	3
Wood Working Shop	49	2	11	36
Total	967	119	111	737

Attached Table 1-2 (1) LIST OF EQUIPMENT TO BE RENEWED

Shop Name	No.	Model	Machine Name	Company
<b>Equipment</b>				
-----				
AME Component Shop No.1	-	BT-8DR	Table Type Horizontal Boring & Milling M/C	Toshiba
	-	H-2-8/5	Balancing M/C	Nagahama
	-	-	Reostat for BSK-140	Aida
	-	G-11(IV)	Punching Press	
AME Component Shop No.2				
	47	GPB	Cylindrical Grinder	Okuma
	92	LA	Automatic Copy Lathe	Okuma
	93	LA	Automatic Copy Lathe	Okuma
	142	VLC	Automatic Copying M/C	Yoshikawa
	186	LK	High Speed Lathe	Okuma
	187	3MW	Vertical Milling M/C	Hitachi Seiki
	188	YUD700	Upright Drilling M/C	Yosida
	189	1A1 *	Turret Lathe	Hawai
AME Component Shop No.3				
	6	4A-11	Raw Type Turret Lathe	Hitachi Seiki
	8	LS-T	High Speed Turret Lathe	Okuma
	16	(GX25/50DI)	Cylindrical Grinding M/C	Nippei
	58	7STT	Bench Type Tapping & Drilling M/C	Tokushukoki
			Fine Boring M/C for Cylinder Liner	Toyo
Assembly Shop No.2				
	1		Cleaning Bath	
	2		Infrared Ray Drying Oven	
	3		Under Coating Booth	
	4		Top Coating Booth	
	8		Pre-treatment Equipment	Weidensha
	10		Dry-off Oven	
	11		Under Coating Booth	
	12		Drying Oven for Under Coat	
	13		Drying Oven for Top Coat	
Mamootie Forging Shop				
			Slat Conveyor	Kurimoto
Press and Welding Shop				
	3	SE-UV	Universal Seam Welding M/C	Osaka Denki
	11	SU-A	Rocker Arm Type Spot Welding M/C	Osaka Denki
	13	SU-A	Rocker Arm Type Spot Welding M/C with STC-42212K1 Welder fimer	Osaka Denki
	34	PS-10-2	Single Crank Press	Aida
	35	PS-10-2	Single Crank Press	Aida

Attached Table 1-2 (2) LIST OF EQUIPMENT TO BE RENEWED

Shop Name	No.	Model	Machine Name	Company		
Equipment						
Combine Heat Treatment Shop	Heat Treatment Equipment for Die of Mamotte				Nissin Kanetsu	
	8		Timer Control Box			
	9		Control Box (Air Pre-heating)			
	10		Control Box			
	11		(2nd Pre-heating & Austenizing)			
	12		Control Box for Hot Bath			
	13		Step-Down Transformer			
	14		Step-Down Transformer			
	14		Step-Down Transformer			
	Heat Treatment Equipment for Die of Hand Tool					
	28		Time Control Box			
	29		Control Box			
	Automatic Heat Treatment Equipment, NACHI Salt Bath					Fujikoshi
	44	AEP	Drying Furnace			
45	HC	Heating Furnace				
46	D	No.1 Drawing Furnace				
47	TS	No.2 Drawing Furnace				
50		Transformer Mechanism (Hydraulic)				
51		Control Panel				
Wood Working Shop	1	ALB1000	Copy Milling M/C	Kikukawa Iidakogyo		
	46	ET402	End Tenoner M/C			
Plating Shop No.1	1-76		Plating Equipment	Umemura & Others Kawasaki		
	78					
	77	BS-40	Boiler			

Attached Table 1-2 (3) LIST OF EQUIPMENT TO BE RENEWED

Shop Name	No.	Model	Machine Name	Q'ty
<b>Jigs and Press Dies</b>				
-----				
<b>AME Component Shop No. 2</b>				
			Machining Jig for Crank Shaft for Engine KND5B and KND7	1 Set
			Machining Jig for Cam Shaft for Engine KND5B and KND7	1 Set
			Pressing dies and Welding Jigs for Engine Parts KND5B and KND7	1 Set
			Machining Jigs for Cylinder head for Engine KND5B and KND7	1 Set
<b>AME Component Shop No. 3</b>				
			Machining Jig for Cylinder Liner for Engine KND5B and KND7	1 Set
			Machining Jig for Cylinder Frame for Engine KND5B and KND7	1 Set
			Machining Jig for Connecting Rod for Engine KND5B and KND7	1 Set
			Machining Jig for Fly Wheel for Engine KND5B and KND7	1 Set
<b>AME Component Shop No. 3</b>				
			Machining Jig for Side Cover for Engine, KND5B and KND7	1 Set
<b>AME Component Shop No. 4</b>				
			Machining Jig for Gear for Engine, KND5B and KND7	1 Set
			Machining Jig for Gears for Power Tiller KMB200	1 Set
			Machining Jig for Main Gear Case for Power Tiller KMB200	1 Set
			Machining Jig for Central Gear Case for Power Tiller KMB200	1 Set
			Machining Jig for Auxiliary Gear Case for Power Tiller KMB200	1 Set



Attached Table 1-2 (4) LIST OF EQUIPMENT TO BE RENEWED

Shop Name	No.	Model	Machine Name	Q'ty
Jigs and Press Dies				
Press and Welding Shop			Pressing Dies and Welding Jigs for Engine Parts for KND5B and KND7	1 Set
			Pressing Dies and Welding Jigs for Power Tiller Parts, KMB200	1 Set
Forging Shop			Forging Dies for Crankshaft for Engine, KND5B and KND7	1 Set
			Forging Diastor Cam Shaft for Engine KND5B and KND7	1 Set
			Forging Dies for Connecting Rod for Engine, KND5B and KND7	1 Set
			Forging Dies for Gears for Engine, KND5B and KND7	1 Set
			Forging Dies for Axle and Shafts for Power Tiller KMB200	1 Set
			Forging Dies for Gears for Power Tiller KMB200	1 Set
Measuring Instruments				
All AME Shop			Special Gauges and Inspection Instrument	a Part of 1 Lot
Inspection Room			Special Gauges and Inspection Instrument	a Part of 1 Lot

Attached Table 1-3 SUMMARY OF NO.3 HI BOTTLENECKS

Bldg. No.	Nomenclature	Products										Necessary		
		DE	PT	PH	MH	HT	Sp	Pu	Ge	MC	HE	ST	Debottlenecking	
1	3-05	AME Component Mfg Shop No.1							x					
2	3-17	AME Component Mfg Shop No.2	x	x	x			x						
3	3-18	Die Making and Repairing Shop	x	x	x				x					
4	3-26	Hand Tool Finishing Shop				x								
5	3-44	Wood Working Shop	x		x	x		x						
6	3-03	AME Assembly Shop No.1	x	x	x			x						
7	3-25	Hand Tool Forging Shop	x											
8	3-31	Mamootie Forging Shop				x								
9	3-12	AME Assembly Shop No.2						x						
10	3-18	AME Component Mfg Shop No.3	x	x				x						
11	3-47	AME Component Mfg Shop No.4	x	x				x						
12	3-41	Press and Welding Shop	x	x	x									
13	3-43	Saw Mill	x		x			x						
14	3-30	Mamootie Finishing Shop				x								
15	3-14	Plating Shop No.1	x											
16	3-42	Combined Heat Treatment Shop	x	x				x						
17	3-19	Material Planning Dept. Office & Main Store	x	x	x			x						
18	3-16	Material Store	x	x	x			x						
19	3-50	Transit Store	x	x	x			x						
20	3-28	Store for Paint	x	x	x			x						
21	3-29	Manufactured Component Store	x	x	x			x						
22	3-51	Manufactured Products & Component Shop	x	x	x			x						
23	3-13	Boiler Room	x	x	x			x						
24	3-15	Inspection Room	x	x	x			x						
25	3-04	Painting Shop	x	x	x			x						
26	3-11	Electric & Service Sec. under Technical Planning Dept.	x	x	x			x						
27	3-33	Technical Sec. under Technical Planning Dept.	x	x	x			x						
28	3-	Technical Training School	x	x	x			x						
29	3-	Agriculture Research & Development Farm	x	x	x			x						
30	3-	Motor & Transportation Section (M/T)	x	x	x			x						

Notes: DE: Diesel Engine PT: Power Tiller PH: Power Thresher MH: Mamootie Hoe HT: Hand Tools  
 SP: Sprayer Pu: Pump Gs: Generator MC: Machining Equipment  
 HE: Heat Treatment Equipment ST: Surface Treatment Equipment

Attached Table 1-4 (1) LIST OF BOTTLENECKS AT NO.3 HI AME SHOPS

Shop Name	Equipment	Qt'y	Requirements for Debottlenecking
AME Component Shop No.2	1) Multi-spindle Drill m/c	1 set	All the drilling works are being done by the vertical drill, forming the bottleneck to date. It is recommended to introduce a Multi-spindle Drilling Machine to rationalize works in drilling a lot of holes on items such as KND58 Main Bearing Case.
	2) Facing and Centering m/c	1 set	The machine is used for machining both crankshaft and cam shaft of engine. As the both works are performed at the same time, installation of another facing and centering machine is recommended to eliminate the bottleneck.
	3) Automatic Copying Lathe	2 sets	Same reason as noted in 2).
	4) Crank Pin Lathe	1 set	Accuracy of the both of the existing lathes has been considerably lowered. However, stopping of the operation for maintenance is not possible. Recommended measure is to procure an identical alternative machine and repair the existing machines one by one.
	5) Cylindrical Grinding m/c	2 sets	Machining of many items such as cam shaft, balancer shaft, cam idle gear, ClG shaft and S6 shaft is currently done using the two machines and has caused confusion in the work. To solve the problem a new machine installed specially for machining of cam shaft is required.
	6) Ram-type Turret Lathe	2 sets	This machine is to be added since machining of special bolts and nuts is the bottleneck of the line today. (Uses of 3A111 or STRONG 650 is also feasible.)
AME Component Shop No.3	1) Ram-type Turret Lathe	2 sets	Same reason as above-said. (Uses of 3A111 or STRONG 650 is also feasible.)
	2) Ram-type Turret Lathe	4 sets	Nine different type gear blanks are being machined with 3 lathes. The capacity of these existing lathes are not sufficient and forming a bottleneck. For performing machining conforming to the original technical requirement, installation of 4 sets of machine is necessary.
	3) High Speed Precision Lathe	4 sets	Machining of tappet, main bearing bush, main bearing case, rocker arm and others are being performed with 10 machines, i.e. 4 LSs and 6 STRONG 650s. Since the total capacity is not sufficient an additional installation of 4 machines is required.

Attached Table 1-4(2) LIST OF BOTTLENECKS AT NO.3 HI AME SHOPS

Shop Name	Equipment	Qt'y	Requirements for Debottlenecking
AME Component Shop No.3 (cont'd)	4) Pulley Machining Equipment	1 set	4A-11 Turret Lathe is used to make up capacity shortage of MONFORT pulley machine in the existing cylinder head machining line. This is causing confusion in the works. It is recommended to establish an independent line with the new machine.
Press and Welding Shop	1) Arc Welding m/c	2 sets	Welding work is required for 80% of the forged parts. This welding work is done currently with 3 welding machines but the capacity is not sufficient. New installation of 4 welding machines is recommended.
	2) Pipe Bending m/c	1 set	Bending work of KM200 30" steel wheel is being done with the bending machine located in AME Component Shop No.1. One set bending machine in this shop is necessary since there are problems in transportation, material handling and capacity of the said AME shop No.1 machine.
Combine Heat Treatment Shop	1) Shot Blasting Equipment	1 set	Currently scale removal works on large-sized parts such as crankshaft etc. are performed in Foundry Shop, where a large capacity is available. However, transportation for this work is being done with much difficulty and capacity allowance of the existing blasting machine is short. For these reasons one set of the equipment is to be installed in this shop.
	2) Salt Bath Heat Treatment Equipment	1 set	The existing hardening equipment 1-1, 4-1, 4-5, 4-8 and 4-13 through 16 is highly loaded and is not equipped with enough spare capacity. If this equipment breaks down then the entire production is shut down. Therefore, an additional machine is required. A hand-operated type is acceptable.
Plating Shop No.1	1) Name Plate Photo Printing Facilities	1 set	The existing machine, domestically manufactured, is not suitable for production in a large quantity. Installation of one set machine with apparatus for making negative plates for aluminium name plate is recommended.

Attached Table 1-5 (1) NO.3 HI AME ADDITIONAL INSTALLATIONS REQUIRED FOR ENSURING PRODUCTS QUALITY CONTROL

Facility	Shop Name	Equipment	Qty	Requirements
Machining Facility	AME Component Shop No.3	1) Turret-Head Drilling	1 Set	All type Turret Lathe is being used for machining of models KND5B and KND7 diesel engine cylinder head valve port and valve stem hole. Since the lathe has been deteriorated and ensuring accuracy in the machining is difficult, the change of machining method is necessary.
		2) Equipment for Machining Connecting Rod, Bolt Hole	1 Set	Machining of bolt hole tightening diesel engine connecting rod big end and cap requires a high accuracy. The machining using the existing upright drilling machine and jig is depending on skill of the worker and accuracy of work in this way. Employing an index type borer is recommended to improve the quality of work.
Painting Facility	AME Assembly Shop No.1	1) Painting Equipment for Engine	1 Set	Painting of a product is important not only to enhance its value but also to prevent rust on it. In the existing painting system degreasing is not completely done and hardness of the coat is not sufficient. Therefore, the painting system is to be renewed when the ass'y line layout is remodeled.
	AME Assembly Shop No.2	2) Painting Equipment for Power Tiller Thresher and Reaper	1 Set	The painting facility in this shop is being used for painting pump parts only for Saudi Arabia to date. This equipment needs to be reconditioned and utilized as the shop layout is revised into painting shop of Power Tiller, Thresher and Reaper.
Assembly and Operation Facilities	AME Assembly Shop No.1	1) Testing Equipment for Diesel Engine	1 Lot	The individual engines after assembly are not being tested for the quality and performance. To make sure of testing these items, it is recommended to install newly 2 sets electric cradle dynamometers, 5 sets fan brakes and other measuring instruments required for the quality check.
		2) Leakage Checking Equipment for Diesel Engine	1 Lot	Testing oil leakage of engine after ass'y is required because many of component parts have been nationalized but especially in cast parts some blowholes and cracks are observed.
		3) Special Assembling Jig for Diesel Engine	1 Lot	Tools to insert or set bearings, bushes, plugs, etc. are being used but these are considerably abraded and degraded. This may cause inferior quality and performance of Engine, Power Tiller and Thresher and is not favorable to safety. Therefore, these tools are to be replaced soon.
		4) Special Assembling Jig for Power Tiller	1 Lot	
		5) Special Assembling Jig for Thresher	1 Lot	

Attached Table 1-5. (2) NO.3 HI AME ADDITIONAL INSTALLATIONS REQUIRED FOR ENSURING PRODUCTS QUALITY CONTROL

Facility	Shop Name	Equipment	Qt'y	Requirements
Measuring Instrument	AME Component Shop No.3	1) Special Gauges for Machining Parts for KND5B & KND7	a part of 1 Lot	To add special gauges due to deterioration of existing gauges.
	AME Component Shop No.4	2) Special Gauges for Machining Parts for Power Tiller	a part of 1 Lot	
	Inspection Room	1) Coordinate Measuring Machine	1 Set	To materialize high accuracy and speed in measuring at nationalization of crankcase, crankshaft and transmission case and other large-sized component parts manufacturing. The new instruments are to be utilized also by Auxiliary Machine Shop commonly.
		2) Roundness Measuring Instrument	1 Set	
		3) Surface Roughness Measuring Instrument	1 Set	
		4) Plating Tester	1 Set	
All AME Shops		5) Salt Spray Tester	1 Set	To perform quality check of plated parts or painted parts.
		6) Inspection & Measuring Instrument	1 Lot	
		1) Inspection & Measuring Instrument	1 Lot	To replenish shortage of the existing micrometer, vernier calipers, etc. and eliminate insufficiency in measurement of the products and parts.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-14(1) AME Plants Rehabilitation  
- No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
1 .	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1 1	AME component shop No.2		
1 1 1	Cylindrical grinder	Set	1
1 1 2	Automatic copy lathe	Set	1
1 1 3	Automatic copy lathe	Set	1
1 1 4	Automatic Copying M/C	Set	1
1 1 5	High speed lathe LK	Set	1
1 1 6	Vertical milling M/C	Set	1
1 1 7	Upright drilling M/C	Set	1
1 1 8	Turret lathe IAI	Set	1
1 2	AME component shop No.3		
1 2 1	Ram type turret lathe	Set	1
1 2 2	High speed turret lathe	Set	1
1 2 3	Cylindrical grinding M/C	Set	1
1 2 4	Bench type tapping & drilling M/C	Set	1
1 3	Assembly Shop No.2		
1 3 1	Fine boring M/C for cylinder liner	Set	1
1 3 2	Cleaning booth	Set	1
1 3 3	Infrared ray:drying oven	Set	1
1 3 4	Under coating booth	Set	1
1 3 5	Top coating booth	Set	1
1 3 6	Pretreatment equipment	Set	1
1 3 7	Dry off oven	Set	1
1 3 8	Under coating booth	Set	1
1 3 9	Drying oven for under coat	Set	1
1 3 10	Drying oven for top coat	Set	1
1 4	Mamootie forging shop		
1 4 1	Slat conveyor	Set	1
1 5	Press and welding shop		
1 5 1	Universal seam welding M/C	Set	1
1 5 2	Rocker arm type spot welding M/C	Set	1
1 5 3	Rocker arm type spot welding M/C	Set	1
1 5 4	Single crank press	Set	1
1 5 5	Single crank press	Set	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-14(2) AME Plants Rehabilitation  
- No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
1 6	Combined heat treatment shop		
1 6 1	Timer control box	Set	1
1 6 2	Control box (air pre heating)	Set	1
1 6 3	Control box (2nd pre heating & austenizing)	Set	1
1 6 4	Control box for hot bath	Set	1
1 6 5	Step down transformer	Set	1
1 6 6	Step down transformer	Set	1
1 6 7	Step down transformer	Set	1
1 6 8	Time control box	Set	1
1 6 9	Control box	Set	1
1 6 10	Drying furnace AEP	Set	1
1 6 11	Heating furnace HC	Set	1
1 6 12	No.1 drawing furnace D	Set	1
1 6 13	No.2 drawing furnace TS	Set	1
1 6 14	Transfer mechanism	Set	1
1 6 15	Control pannel	Set	1
1 7	Wood working shop		
1 7 1	Copy milling M/C	Set	1
1 7 2	End tenoner M/C	Set	1
1 8	Plating shop No.1		
1 8 1	Plating equipment	Set	1
1 8 2	Boiler BS-40	Set	1
1 9	AME component shop No.2		
1 9 1	Machining jig for crank shaft for engine, KND5B & KND7	Set	1
1 9 2	Machining jig for cam shaft for engine KND5B & KND7	Set	1
1 9 3	Pressing dies & welding jigs for engine parts, KND5B & KND7	Set	1
110	AME component shop No.3		
110 1	Machining jigs for cylinder head for engine, KND5B & KND7	Set	1
110 2	Machining jig for cylinder liner for engine KND5B & KND7	Set	1
110 3	Machining jig for cylinder frame for engine KND5B & KND7	Set	1
110 4	Machining jig for connecting rod for engine KND5B & KND7	Set	1
110 5	Machining jig for fly wheel for engine KND5B & KND7	Set	1
111	AME component shop No.3		
111 1	Machining jig for side cover for engine, KND5B & KND7	Set	1



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-14(3) AME Plants Rehabilitation  
- No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
112	AME component shop No.4		
112 1	Machining jig for gear for engine, KND5B & KND7	Set	1
112 2	Machining jig for gears for power tiller, KMB200	Set	1
112 3	Machining jig for main gear case for power tiller KMB200	Set	1
112 4	Machining jig for central gear case for power tiller KMB200	Set	1
112 5	Machining jig for auxiliary gear case for power tiller KMB200	Set	1
113	Forging shop		
113 1	Forging dies for crankshaft for engine KND5B & KND7	Set	1
113 2	Forging dies for cam shaft for engine KND5B & KND7	Set	1
113 3	Forging dies for connecting rod for engine KND5B & KND7	Set	1
113 4	Forging dies for gears for engine KND5B & KND7	Set	1
113 5	Forging dies for axle and shafts for power tiller KMB200	Set	1
113 6	Forging dies for gears for power tiller KMB200	Set	1
114	All AME shop		
114 1	Inspection instrument	Lot	1
115	Inspection room		
115 1	Inspection instrument	Lot	1
1 2	Universal facing head	Set	1
1 3	Balancing machine	Set	1
1 4	Pneostat for BSK-140	Set	1
1 5	High-speed notching press	Set	1
2 1	AME component shop No.2		
2 1 1	Multi spindle drilling M/C	Set	1
2 1 2	Facing and centering M/C	Set	1
2 1 3	Automatic copying lathe	Set	2
2 1 4	Crank pin lathe	Set	1
2 1 5	Cylindrical grinding M/C	Set	2
2 1 6	Ram type turret lathe	Set	2
2 2	AME component shop No.3		
2 2 1	Ram type turret lathe	Set	2
2 2 2	Ram type turret lathe	Set	4

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-14(4) AME Plants Rehabilitation  
 - No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
2 2 3	High speed precision lathe	Set	4
2 2 4	Pulley machining equipment	Set	1
2 3	Press & welding shop		
2 3 1	Arc welding M/C	Set	2
2 3 2	Pipe bending M/C	Set	1
2 4	Combine heat treatment shop		
2 4 1	Shot blasting equipment	Set	1
2 4 2	Salt bath heat treatment equipment	Set	1
2 5	Plating shop No.1		
2 5 1	Name plate photo printing facilities	Set	1
2 6	Table type horizontal boring & milling machine		
3 1	AME component shop No.3		
3 1 1	Turret head drilling	Set	1
3 1 2	Connecting rod machining equipment	Set	1
3 2	AME assembly shop No.1		
3 2 1	Painting equipment for engine	Set	1
3 3	AME assembly shop No.2		
3 3 1	Painting equipment for power tiller and thresher	Set	1
3 4	AME assembly shop No.1		
3 4 1	Testing equipment for diesel engine	Lot	1
3 4 2	Leakage checking equipment for diesel engine	Lot	1
3 4 3	Special assembling jig for diesel engine	Set	1
3 4 4	Special assembling jig for power tiller	Set	1
3 4 5	Special assembling jig for thresher	Set	1
3 5	Inspection room		
3 5 1	Coordinate measuring machine	Set	1
3 5 2	Roundness measuring instrument	Set	1
3 5 3	Surface roughness measuring instrument	Set	1
3 5 4	Plating tester	Set	1
3 5 5	Salt spray tester	Set	1
3 5 6	Inspection & measuring instrument	Lot	1
3 6	All AME shops		
3 6 1	Inspection & measuring instrument	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-14)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	5252.5	-	5252.5
2 Freight & Insurance	420.2	-	420.2
Sub-total	5672.7	-	5672.7
3 Import Duty	-	850.9	850.9
4 Unloading	-	79.4	79.4
5 Installation Cost	-	0.4	0.4
Imported M/E Total	5672.7	930.7	6603.4
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	166.5	-	166.5
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	166.5	-	166.5
Total Investment	5839.2	930.7	6769.9

#1-15 Improvement of AME Shop Systems

- No.3 HI: Plating Shop No.1 and Press & Welding Shop -

(1) Objectives and Outline of the Plan

The shop layout of the No.3 HI agricultural machinery production department has been unchanged for a long period in service since initial installation. During this time changes in conditions of production have meant that operating space has been taken up and this has rendered the production lines cramped.

No.1 shop undertakes the assembly of the engine, tiller, thresher and pump and space inside the shop is very cramped. In the No.2 Shop a large area is taken up by the painting and drying equipment and operations in the shop include the painting black of export items destined for Saudi Arabia and assembly of the sprayer device. These operations are on a small scale. For this reason there are problems of balancing between No.1 and No.2.

These imbalances and irregularities should be corrected and restructured in due order together with formation of the future layout policy for the entire shop. Consideration should be given to the forecast future production output and particularities of finished products and component parts when the general future layout is evaluated.

- 1) Production of agricultural machinery tends to be of a wide range of differing products on small scale production.

Finished products currently are:

1. Engine: These are almost all from cast iron and steel parts
2. Pump: Mainly made up from cast parts
3. Power Tiller: Besides cast steel parts there are a large number of pressed and welded parts. Many of the auxiliary parts are pressed or welded.
4. Thresher: Mostly made up from steel plates.
5. Electric generator: Made up from large steel pipes and steel plates involving a lot of welding operations.

Since there are a wide variety of particularities involved in these materials and operations when layout is changed in the future consideration must be given to the number and type of equipment involved in the shop so that the most effective management can be achieved.

- 2) At present the work allotment for each of the shops is generally divided. However, when layout is re-considered in the future the following points need to be borne in mind in order to permit a further clarification of responsibilities;
  - a) AME No.2 Shop: Forging and steel material parts processing mainly for the engine and pump (redesigned as special-purpose line). It is advisable to set up a separate shop for equipment repairs to the west side of the shop.
  - b) AME No.3 Shop: Cast parts and casing parts processing (re-designed as a special-purpose line). It is advisable to merge the present metal molds repair area with the equipment repair area of No.2 shop and to reform these as a separate shop.
  - c) AME No.4 Shop: Processing of the tiller transmission related parts (case, gear, shaft parts, shifter, etc.)
  - d) Besides these AME Nos.2, 3, and 4 shops have three to five similar small parts processing lines each with main equipment consisting of lathes, drilling machines, and tapping machines.
  - e) Press and Welding Shop: This is very cramped at present, and this is undesirable both from productive efficiency and safety. Space for keeping the metal molds and jigs which take up so much room is needed. Further, should local production of the thresher be realized it will be necessary to substantially increase production of the metal plates of which this is largely composed. This will have to take place in the present shop. The above reasons indicate the urgent need to implement an expansion of the shop to include an area for placing the metal molds and jigs. When expansion takes place the shop should be divided by operations as follows:

1. Press section
  2. Metal plate assembly by spot welding
  3. Welding section mostly for arc welding
  4. Cutting and drilling sections
- f) AME No.1 Shop: Since the machining processes involved for the large-diameter-pipe shaped items of the electric generator yoke are complicated the process lines should be of a direct line type to allow for suitable flow of materials handling. Use of palettes on conveyers to realize flow of line production is required.
- g) Plating Shop No.1: Space is cramped in this shop. In principle line flow should be arranged efficiently but since plating operations of lots of small production parts of a wide type range forms the main work done here equipment would be excessive. A stock area at the side of process areas for materials and parts in progress should be set up and equipment used as at present with the same hand working processes. Since deterioration of the plating equipment is bad replacement of all of the equipment is required. Expansion of the shop is to be undertaken at the time of replacement.
- h) It is necessary to re-consider the entire layout of the assembly shops promptly. Assembly shop No.1 is cramped and process layout badly organized. It is necessary to undertake a thorough and overall re-arrangement to include the activities of shop No.2 to set up a balanced and orderly general layout.
- Shop No.1 is to be re-arranged on a direct conveyer line method as the assembly shop for engines and pumps. Painting and washing equipment is to be placed on the line and the work areas streamlined. At the same time the engine trial run area is to be moved indoors. No.2 is to have the assembly lines for the sprayer, power tiller and thresher set up.
- 3) The following points are to be borne in mind for arrangement of working equipment in each of the shops:
- a) Since there are few parts which can be completed by one machine a line flow arrangement is to be adopted. The process lines for the engine cylinder frame fly wheel, etc. are to be used as models and similar developments applied to the various working areas.

- b) Simplification to respond to increases and changes in production is to be undertaken and adoption in the future of the U-shape production line to deal with production load changes without difficulty by means of the multiple assignment of a worker. Given existing low production outputs the initial target is to ensure that equipment is operating 100%.
- c) The processing line for simple parts which can be completed by a single machine is to be set up in a location separately from these shops in question.
- d) Transportation of parts inside the shops is to take place using roller conveyers and other transportation equipment or hand trucks. Only operators are to handle these. Moreover in order to avoid their unnecessary excess work it is advisable that those in charge of transportation only carry out the carrying of materials and finished goods to and from the work areas.
- e) Orderly arrangement and storage of the jigs and metal molds of the work areas. It is especially desirable considering the operating efficiency and safety of operators and maintenance of product quality and precision that storage methods and areas for these be decided.

## (2) Details of the Plan

Considering the needs improvement as aforesaid the revision in the equipment layout is to be implemented. The following two building extension works are carried out in advance to the implementation of layout change.

- 1) To extend Plating Shop No.1 by 30 m X 9 m.
- 2) To extend Press & Welding Shop by 54 m X 18 m.

Further this plan does not include relocation of machinery and equipment.

Equipment requiring the repair and replacement is listed in Attached Figure 3-1.

**(3) Estimated Capital Requirement**

**1) Required Facilities**

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

**2) Estimated Capital Requirement**

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-15 Improvement of AME Shop Systems  
 - No.3 HI: Plating Shop No.1 and Press & Welding Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Building materials	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-15)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	112.1	107.0	219.1
2 Freight & Insurance	9.0	-	9.0
Sub-total	121.1	107.0	228.1
3 Import Duty	-	18.2	18.2
4 Unloading	-	1.7	1.7
Building Total	121.1	126.9	248.0
Bldg & Land Total	121.1	126.9	248.0
2 1 Imported M/E (FOB)	0.0	-	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	-	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
5 Installation Cost	-	1.7	1.7
Imported M/E Total	0.0	1.7	1.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	10.8	-	10.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	10.8	-	10.8
Total Investment	131.9	128.6	260.5

#1-16 Reorganization of Materials Handling Equipment and Stores  
- No.3 HI: AME Project Plants -

(1) Objectives and Outline of the Plan

Transportation, materials handling and storage equipment are severely lacking in the agricultural machinery production section of No.3 HI.

- 1) The roller conveyer which was installed at the founding of the factory. This was already insufficient, further has been removed because of damage. During the survey transportation carts were hardly seen in the shop. In these conditions the production output scheduled cannot be reached and working conditions involve dangers.
- 2) Production losses occur because carriage by hand takes place due to lack of conveyance equipment, in particular fork-lifts. In addition to the initial lack of fork-lifts and trailers in No.3 HI breakdowns have further reduced the number of these in operating condition.
- 3) The layout for the production of the main parts of the engine and tractor is line planified and roller conveyers are used to increase the operational efficacy and safety but since conveyance between processes is insufficient the lines do not satisfactorily function.
- 4) The jigs and metal molds which are detached during the preparation stage changing in each shop are placed haphazardly and soiled with trimmings and dust. Further, the machine face to be prepared is placed touching the floor. As this equipment is vital to assurance of machined part precision and quality storage racks must be set up and the equipment stored in orderly fashion.
- 5) Parts inside the shop are placed machine worked side face down on the floor and are piled in high stacks without supporting frames, or thrown in disorderly manner into drum cans cut into halves. Storage equipment is needed in order to assure the quality of machined parts and to improve the storage maintenance of the present shop.

- 6) The warehouse has the essential function of maintaining the property of the public corporation and yet the consigned packages are stored as they are received and those which can not be accommodated and steel materials are simply left outside. Inconvenience arises when these parts and materials are to be used and are unpacked because of defective quality due to rust, or because personnel are inadequate for unpacking. These are major factors upsetting production schedules. Measures must be taken so that not only storage of items but also the positioning, quantity and conditions of storage can be seen at a glance. To this end it is necessary to provide for storage and maintenance equipment and devices.

The present plan proposes the immediate provision and implementation of conveyance, materials handling and warehouse maintenance equipment and devices in view of the above.

- (2) Details of the Plan

Installation of the conveyance, material handling and storage facilities and equipment indicated in Attached Tables 2-1(1) and (2).

- (3) Estimated Capital Requirement

- 1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

- 2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 2-1(1) LIST OF MATERIALS HANDLING EQUIPMENT TO BE INSTALLED

Ser. No.	Description	05	17	18	26	44	03	25	31	12	18	47	41	43	30	14	42	19	16	50	28	29	51	13	15	04	11	33	TT	RD	MT	C Total	
1	Plastic Pallet: A	10	10	10							30	30									20	20	10	20							190		
2	Plastic Pallet: B						310			50																						388	
3	Palletainer: A			10	5	20				90																						155	
4	Palletainer: B	5	50				60	40	60	50	30	50																				955	
5	Palletainer: C						10		90																							130	
6	Palletainer (Iron Sheet)	10					10	10		5	30																					65	
7	Palletainer for Tempering																															50	
8	Carriage for Tempering																															10	
9	Hand Pallet Track: A	1	2	1	1	1	4	1	1	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
10	Hand Pallet Track: B																															10	
11	Electric Pallet Track																															1	
12	Stacker (Battery)																															1	
13	Stacker (Manual): A	1									1	1	1	1	1	1	1															3	
14	Stacker (Manual): B	1	1	1							1	1	1	1	1	1	1															8	
15	Hand Track: A										2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	
16	Hand Track: B	5	5	1	2		20	3	1	2	2	5	5	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	46
17	Roller Conveyor: 3 m										70	40																				130	
18	Roller Conveyor: 90°										2	8	4																			14	
19	Stand for Roller Conveyor																															308	
20	Korokon Carrier: 2.4 m	5					70				150	80																				10	
21	Korokon Carrier: 90°	2									2																					4	
22	Stand for Korokon Carrier	21									21																						42
23	Carriage for Palletainer	3	10				3	8	3	10	6	10			8	5	20															86	
24	Container (Parts Box): A	100					210			290	50	50						100															1,840
25	Container (Parts Box): B									50	50	50						100															460
26	Container (Parts Box): C	50									100							100															380
27	Container (Parts Box): D									260	200																						670
28	Container (Parts Box): E																																
29	Container (Parts Box): F									330	200																						880
30	Container (Parts Box): G																																
31	Container (Parts Box): H	30									30	30						100															210
32	Container (Parts Box): I	10								30	30	50						100															220
33	Container (Parts Box): J										50																						50
34	Container (Parts Box): K																																
35	Drum Pump																																1
36	Oil Measure	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
37	Yielding Sheet: A																																
38	Yielding Sheet: B																																
39	Yielding Sheet: C																																
40	Fork Lift (1.5 ton)	1								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12

Attached Table 2-1(2) LIST OF MATERIALS HANDLING EQUIPMENT TO BE INSTALLED

Ser. No.	Description	Shop No:	05	17	18	26	44	03	25	31	12	18	47	41	43	30	14	42	19	16	50	28	29	51	13	15	04	11	33	TT	RD	MT	C Total
41	Hoist Crane (1.5 ton)		1	1							2		1																			5	
42	Motor Block (1/4 ton)		2				4																									6	
43	Vacuum Car for Waste Water																															1	
44	Rack for Pallettainer						60				15																					165	
45	Slide Rack for Jig & Die: A		10	18	15	3	3	7											50		10	10	10	10							91		
46	Slide Rack for Jig & Die: B							4	3																							7	
47	Rack for Parts Box						15				17								10		10	5	10								67		
48	Rack for Small Parts: A						10				10								5		5										38		
49	Rack for Small Parts: B																															38	
50	Cabinet for Tools		3	5	3	3	3					5	5	2	3																	40	
51	Free Balancer											2																				2	
52	Slide Bar Rack (Single)												2						80													82	
53	Slide Bar Rack (Double)		3	1				6	1					1					20													32	
54	Lifter											4																				4	
55	Tractor																															5	
56	Trailer for Tractor																															5	
57	4WD Type Trailer																															5	
58	Transport Vehicle																															5	
59	3-Wheel Motor Cart																															5	
60	Auto Carry: A																															5	
61	Auto Carry: B																															5	
62	Tilt Truck for Chip																															5	
63	Fork Lift (5 ton)																															5	
64	Fork Lift (2 ton)																															5	
			36	47								36	26																				145

Note: Shop numbers and shop names:

No.	Shop Name	No.	Shop Name
05	AME CP MFG Shop No.1	42	Combined Heat Treat
17	AME CP MFG Shop No.2	19	Main Store
18	Die Make & Repair	16	Material Store
26	Hand Tool Finishing	50	Transit Store
44	Wood Working Shop	28	Store for Paint
03	AME Assy Shop No.1	29	MFG CP Store
25	Hand Tool Forging	51	Products & CP Store
31	Mamootie Forging	13	Boiler Room
12	AME Assy Shop No.2	15	Inspection Room
18	AME CP MFG Shop No.3	04	Painting Shop
47	AME CP MFG Shop No.4	11	Electric & Service
41	Press & Welding Shop	33	Technical Section
43	Saw Mill	TT	Technical Training
30	Mamootie Finishing	RD	Agriculture R&D Farm
14	Plating Shop No.1	MT	Motor & Transport

At the d Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-16(1) Reorganization of Materials Handling and Stores  
- No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Plastic pallet: A	Set	1
2	Plastic pallet: B	Set	1
3	Palletainer: A	Set	1
4	Palletainer: B	Set	1
5	Palletainer: C	Set	1
6	Palletainer (iron sheet)	Set	1
7	Palletainer for tempering	Set	1
8	Carriage for tempering	Set	1
9	Hand pallet truck: A	Set	1
10	Hand pallet truck: B	Set	1
11	Electric pallet truck	Set	1
12	Stacker (battery)	Set	1
13	Stacker (manual): A	Set	1
14	Stacker (manual): B	Set	1
15	Hand Truck: A	Set	1
16	Hand Truck: B	Set	1
17	Roller conveyor: 3m	Set	1
18	Roller conveyor: 90 degree	Set	1
19	Stand for roller conveyor	Set	1
20	Korokon carrier: 2.4m	Set	1
21	Korokon carrier: 90 degree	Set	1
22	Stand for korokon carrier	Set	1
23	Carriage for palletainer	Set	1
24	Container (parts box): A	Set	1
25	Container (parts box): B	Set	1
26	Container (parts box): C	Set	1
27	Container (parts box): D	Set	1
28	Container (parts box): E	Set	1
29	Container (parts box): F	Set	1
30	Container (parts box): G	Set	1

Atthe d Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-16(2) Reorganization of Materials Handling and Stores  
- No.3 HI: @ AME Project Plants -

No	Items	Unit	No.
31	Container (parts box): H	Set	1
32	Container (parts box): I	Set	1
33	Container (parts box): J	Set	1
34	Container (parts box): K	Set	1
35	Drum pump	Set	1
36	Oil measure	Set	1
37	Yielding sheet: A	Set	1
38	Yielding sheet: B	Set	1
39	Yielding sheet: C	Set	1
40	Fork lift (1.5 ton)	Set	1
41	Hoist crane (1.5 ton)	Set	1
42	Motor block (1/4 ton)	Set	1
43	Vacuum car for waste water	Set	1
44	Rack for palletainer	Set	1
45	Slide rack for jig & die: A	Set	1
46	Slide rack for jig & die: B	Set	1
47	Rack for parts box	Set	1
48	Rack for small parts: A	Set	1
49	Rack for small parts: B	Set	1
50	Cabinet for tools	Set	1
51	Free balancer	Set	1
52	Slide bar rack (single)	Set	1
53	Slide bar rack (double)	Set	1
54	Lifter	Set	1
55	Tractor	Set	1
56	Trailer for tractor	Set	1
57	4WD type trailer	Set	1
58	Transport vehicle	Set	1
59	3-wheel motor cart	Set	1
60	Auto carry: A	Set	1
61	Auto carry: B	Set	1
62	Tilt truck for chip	Set	1
63	Fork lift (5 ton)	Set	1
64	Fork lift (2 ton)	Set	1



Attached Table 3-2: REQUIRED INVESTMENT (#1-16)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	447.7	-	447.7
2 Freight & Insurance	35.8	-	35.8
Sub-total	483.5	-	483.5
3 Import Duty	-	72.5	72.5
4 Unloading	-	6.8	6.8
5 Installation Cost	-	15.4	15.4
Imported M/E Total	483.5	94.7	578.2
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	483.5	94.7	578.2

#1-17 Rehabilitation of Worn Out M/E  
- No.3 HI Chemical Analysis Room -

(1) Objectives and Outline of the Plan

The following problems exist with the equipment of the Chemical Analysis Room of the No.3 HI.

- 1) The existing draft chamber for perchoric acids (of a plywood surface with a chemical resistant coating) was imported and been in use for 9 years to date. It is nearing the close of its service life which is estimated at some 10 years. It is necessary to replace this for safety purposes.
- 2) The carbon analysis chamber and sulfur analysis chamber have been in use for 9 years to date. Breakdown of the electronic accessories is frequent and since spare parts are difficult of access this results in long stoppage periods and hinders the analysis of materials.

As a counter measure to these problems replacement with the new machinery listed under heading No.2 is planned.

(2) Details of the Plan

The following equipment is to be installed in No.3 HI:

- a) New model equipment one set to be installed to ensure the safety and increase the life service of the draft chamber.

all steel body model (chemical resistant baked coating)  
front panel of transparent reinforced glass (6mm thickness)  
Centrifugal operating internal washing device  
Electric hot plate accessory

- b) Replacement of the carbon dioxide and sulfur analysis chamber in order to remedy problems of material quality instability due to the long stoppages in analysis equipment operations, as follows:

- |  |             |
|--|-------------|
| 1. Carbon dioxide and sulfur analysis devices (model for shared use) | one machine |
| 2. Oxygen carrier gas in 47 liter gas cylinder                       | one set     |
| 3. Cleaning kit  | one set     |
| 4. Analysis components for 5000 rotations                            | one set     |

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-17 Rehabilitation of Worn Out M/E  
- No.3 HI: Chemical Analysis Room -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Chem. analysis equipment		
1 1	Carbon and sulfur analyzer	Set	1
1 2	Draft chamber	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-17)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	31.0	-	31.0
2 Freight & Insurance	2.9	-	2.9
Sub-total	33.9	-	33.9
3 Import Duty	-	10.3	10.3
4 Unloading	-	0.7	0.7
5 Installation Cost	-	0.1	0.1
Imported M/E Total	33.9	11.1	45.0
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.9	-	0.9
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.9	-	0.9
Total Investment	34.8	11.1	45.9

#1-18 Water Intake/ Treatment Facility Rehabilitation  
- No.3 HI: Water Intake and Water Treatment Facility -

(1) Objectives and Outline of the Plan

The machinery and piping of the river water intake and water treatment facilities is badly deteriorated due to the long period of operation since initial pipe installation. As almost no spare parts have been obtained the system operates in its present state of wear.

In order to assure the supply of a water source and industrial use water the present plan proposes the repair and replacement of deteriorated equipment.

(2) Details of the Plan

The equipment requiring replacement and equipment parts requiring replacement as under heading (1) are as follows:

- water intake pump and spare parts for electrical equipment
- vertical mixer, blower for air bubbling and accessories, chloride injecting equipment

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-18 Water Intake/Treatment Facility Rehabilitation  
 - No.3 HI: Water Intake and Water Treatment Facilities -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Spare parts for intake pumps	Lot	1
2	Vertical type flash mixer	Set	2
3 1	Rotary air blower	Set	1
3 2	Bottom drain system	Set	1
3 3	Pipe and valves	Set	1
4	Chlorination equipment for prechlorination	Set	2
5	Electrical spare parts	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-18)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	266.3	-	266.3
2 Freight & Insurance	31.2	-	31.2
Sub-total	297.5	-	297.5
3 Import Duty	-	44.6	44.6
4 Unloading	-	4.5	4.5
5 Installation Cost	-	9.4	9.4
Imported M/E Total	297.5	58.5	356.0
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	297.5	58.5	356.0



#1-19 Water Intake/ Treatment Facility Rehabilitation

- No.4 HI: Water Intake and Water Treatment Facility -

(1) Objectives and Outline of the Planning

During the dry season use of the river water intake equipment of No.4 HI is not possible and this has a direct effect on factory operations. Further, the river water intake equipment and water treatment facilities are badly deteriorated due to the long period of operation since initial pipe installation. As almost no spare parts have been obtained the equipment operates in its present state of wear. In order to assure the supply of a water source and industrial use water the present plan proposes the repair and replacement of deteriorated equipment.

(2) Details of the Plan

The equipment requiring replacement and equipment parts requiring replacement as under heading (1) are as follows:

- extension of water intake pipe (to be used when change in water intake point is made)
- water intake pump and spare parts for electrical equipment
- water supply pump and electric motor (with spare parts )
- vertical mixer, blower for air bubbling and accessories, chloride injecting equipment

(3) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 3-2.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-19 Water Intake/Treatment Facility Rehabilitation  
- No.4 HI: Water Intake and Water Treatment Facilities -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1 1	400Dmm DCI pipe, accessories & fitting jig G5526 & 5527	Set	1
1 2	300Dmm DCI pipe, accessories & fitting jig G5526 & 5527	Set	1
2	Pump SVJA-207AK with motor and spare parts	Lot	1
3	Pump DVL-406FK with motor and spare parts	Lot	1
4	Vertical type flash mixer	Set	2
5 1	Rotary air blower for backwashing	Set	1
5 2	Under drain system for air scouring	Set	1
5 3	Pipe and valves	Lot	1
6	Electrical spare parts	Lot	1
7	Chlorination equipment for prechlorination	Set	2

Attached Table 3-2: REQUIRED INVESTMENT (#1-19)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	135.2	-	135.2
2 Freight & Insurance	15.8	-	15.8
Sub-total	151.0	-	151.0
3 Import Duty	-	22.7	22.7
4 Unloading	-	2.3	2.3
5 Installation Cost	-	4.7	4.7
Imported M/E Total	151.0	29.7	180.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	151.0	29.7	180.7

## #1-20 Improvement of Inter-HI Transportation System

### (1) Objectives and Outline of the Plan

The means of transportation between Rangoon and the plants (HI) consist of boats, trucks and railways; the transportation record is shown in the followings.

Transported Tonnage		1981-82 Record	1988-89 Forecast
Form of Transportation			
Boat Transportation	300 ton boats chartered from IWTC and others	16,600 ton	12,000 ton
	100 ton boats possessed by HIC	2,700	3,000
5 ton truck transportation		2,000	No data available
30 ton freight car railway transportation		6,000	No data available

Source: HIC

Boats account for 70% of the total transportation volume, with 85% shared by IWTC (Inland Water Transport Corp.) etc., whereas boats possessed by HIC account for barely 15%.

The following sections examine the required measures to take to cope with the future increase in transportation demand. Truck and railway transportation are not examined in this study by assuming that their transportation capacities will be increased sufficiently to cope with the transportation demand.

#### 1) HIC Fleet and its Transportation Capacity

The fleet possessed by HIC consists of one 50 ton Z-Craft and four 100 ton Z-Crafts. Of the said fleet the 50 ton Z-Craft is used exclusively as ferry boat between Prome and Sinde, and the four 100 ton Z-Crafts are used for the transportation between Rangoon and No.2 HI, No.3 HI and No.4 HI.

The annual transportation record of the HIC Z-Craft mounted to 2,700 tons with 43 trips.

Htonbo (No.4 HI)	20 trips
Sinde (No.3 HI)	11 trips
Malun (No.2 HI)	12 trips
<hr/>	
Total	43 trips
	(63 ton/trip)

The annual transportation capacity of the 4 vessels is estimated in the following with each vessel making 2 trips a month:

$$4 \text{ vessels} \times 2 \text{ trips/months.vessel} \times 12 \text{ months} = 96 \text{ trips/year}$$

Assuming an average loading of 63 tons per trip the annual transportation capacity will mount to 6,000 tons.

## 2) Increase in the Transportation Demand

Assuming that the inter-HI transportation volume is proportional to the production volume, the transportation volume is estimated to double within approximately 10 years. At present vessels chartered from IWTC, etc., account for the transportation of 12,000 tons whereas the Z-craft fleet possessed by HIC accounts for the transportation of 3,000 tons. Assuming that the assignment rate of transportation volume will remain unchanged for the chartered vessels and HIC's vessels, the two fleets are estimated to increased to 24,000 tons and 6,000 tons respectively in 10 years.

The vessels chartered from IWTC, etc., are assumed to be capable to cope with the growing transportation demand. In such case, the Z-Craft fleet possessed by HIC consisting of four 100 ton vessels are expected to be capable to cope with the future demand. The operation rate, however, is estimated to become extremely high and it is desirable to build one more vessel when taking into account the maintenance period.

(2) Details of the Plan

One vessel (Z-Craft) will be built to transport cargo from Rangoon to Malun, Sinda and Htonbo to cope with the increasing demand of inter-HI transportation.

The specifications of the vessel are shown in the followings.

Principal Particulars

Length over all	: 32.00 m
Length, bp	: 28.40 m
Breadth (mld)	: 10.60 m
Depth (mld)	: 3.00 m
Draft, full load	: 2.10 m
Gross tonnage	: abt. 110 tons
Main engine	: Vertical, 4-cycle, turbo charged diesel engine
No. of engine	: 1 set
Engine output	: 350 ps
No. of propeller	: 1 set
Service speed	: abt. 8 kts
Endurance	: abt. 600 sea miles
Fuel oil tank capacity	: abt. 15 cub. m
Car-loading capacity	: 2 Trucks (9 m in length) 10 Passenger cars (4.5 m in length)
Complement	: Crew 7 persons
Accommodation	: To be provided for crews

(3) Estimated Capital Requirement

1) Required Facilities

The detailed list of machine and equipments required in the present plan is shown in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement is shown in Attached Table 3-2.



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 1-20 Improvement of Inter-HI Transportation System

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Z-craft	Unit	1

Attached Table 3-2: REQUIRED INVESTMENT (#1-20)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	180.0	-	180.0
2 Freight & Insurance	20.0	-	20.0
Sub-total	200.0	-	200.0
3 Import Duty	-	30.0	30.0
4 Unloading	-	2.8	2.8
5 Installation Cost	-	0.0	0.0
Imported M/E Total	200.0	32.8	232.8
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	0.0	-	0.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	0.0	-	0.0
Total Investment	200.0	32.8	232.8





## #2-1 Establishment of Calibration Center

- No.5 HI: Calibration Center -

### (1) Objectives and Outline of the Plan

At each plant, production facilities and equipment have become obsolete and their working accuracy has dropped. This has resulted in lowered product quality and production loss.

In addition, the lowered accuracy of measuring instruments made it impossible to perform adequate quality inspection of parts and product assemblies. Most measuring instruments are being used without check for their accuracy. Of these instruments, those which are too worn to be fit for use amount to a substantial number of units.

Needless to say, production equipment and machines must be either repaired or replaced without delay. At the same time, it is urgently required that measuring instruments and inspection tools be checked for accuracy and be calibrated.

At present, no facilities to check measuring instruments for accuracy are available at HIC. Since no outside institutes equipped with such HIC. It is also necessary to establish a system for periodical inspection so that measuring instruments and inspection tools be maintained to a required accuracy at all times.

### (2) Details of the Plan

#### 1) Items for Calibration

Calibration of measuring instruments for length, angle, surface roughness, mass, force, pressure, volume, specific gravity, flow rate, hardness, temperature, torque, mechanical power, revolution, light, DC voltage and current, AC voltage and current, frequency, electric power, electric resistance, capacitance, inductance, etc.

#### 2) Location and Functions of Calibration Facilities

All these necessary calibration facilities should be concentrated at one location and be operated as HIC's Calibration Center. This Center

should be not only equipped with calibration and adjustment facilities but also given functions to control the accuracy of measuring instruments and gauges of each plant of HIC. Because no such facilities exist in Burma, this Center should not be operated exclusively for HIC but instead made to extensively extend its service to other industries and corporations as Burma's calibration center.

As the location of the Center, No.5 HI in Nyaungchidaik will be suitable because of its nature as a plant to manufacture products requiring high precision (the manufacture of machine tools) and because of the close proximity to Sinda and Htonbo.

### 3) Steps for Implementation of the Plan

Items for calibration should be divided by urgency into the two groups of Priority 1 and 2.

Priority 1: Measuring instruments of which calibration frequency is considered relatively higher will be included in the group of Priority 1. Calibration systems for these instruments are normally installed at in-house calibration centers. These systems are equivalent in accuracy to those generally known as "Tertiary Standard" in other countries.

Priority 2: Measuring instruments with one step higher in accuracy, which are known as "Secondary Standard" and will serve as the mother instrument of above "Tertiary Standard". These calibration instruments will be introduced in this second stage, along with equivalent systems and items not included in the systems introduced under Priority 1.

The plan should be implemented by the following steps;

#### a) Establishment of Calibration System

Provisions applicable to the whole of HIC, defining calibration methods, organization, personnel and required technical qualifications, periodical inspection, etc.

#### b) Decision of location, construction of the Center and installation of the calibration facilities under Priority 1.

- c) Installation of the calibration facilities under Priority 2.
- d) Complete application of the operating system.

(3) Points to be Heeded in Operation of Calibration Center

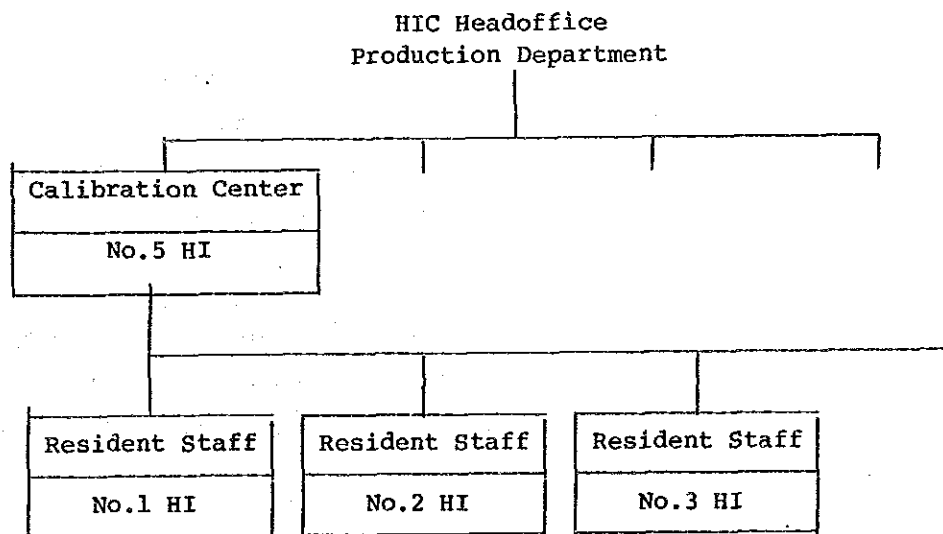
Following are specific points for the operation of Calibration Center to be installed at No.5 HI as well as for functions that this Center will perform:

1) Object of Operation

This Calibration Center will calibrate measuring instruments and gauges for all the plants of HIC and also function as the center of promotion activities for accuracy control of measuring instruments. The object of this operation is to support one aspect of quality control, thereby contributing to improve the product reliability.

2) Full-time Staff and Organization

The Calibration Center will be newly established in the premises of No.5 HI and its organization will be subordinated to Production Department of the Headoffice.



The Center will initially be assigned with full-time staff and commence his duty.

3) Training of Full-Time Staff and Preparations

a) Preparatory Stage for Opening of the Calibration Center

Technical and junior technical staff members will learn the following subjects, using instruction manuals of calibration facilities to be introduced and other technical literature as textbooks:

- An introduction to measurement control
- Measurement technique
- Calibration technique

This preparatory instructions before the actual operation should be given by HIC himself without inviting any instructor from abroad. Technical literature and required instruction manuals should be obtained beforehand. The person appointed the Manager of Center should prepare their curriculum and make a plan so that all staff members can receive instructions.

b) Training During Construction and Commissioning of the Calibration Center

As the imported calibration facilities begin to arrive at site, HIC should invite foreign instructors and the staff members should learn the operation and calibration methods from these instructors for measuring instruments that require particular skills or techniques.

A control master register should be prepared for calibration facilities to be installed at the Calibration Center so that the Center itself will be ready to properly maintain and control the facilities.



4) Establishment of HIC Measuring Instrument Control Provisions

HIC should establish in-house provisions governing maintenance and control of the accuracy of measuring instruments throughout its entire organization.

The full-time staff of the Calibration Center should prepare the draft of these provisions. This draft should be finalized under the supervision of Quality Control Subcommittee (provisional name) of HIC's Production Control Project Team and should be finally issued in the name of the Managing Director of HIC.

The provisions should include the following:

- Object of HIC's measurement control
- Full-time organization and its role
- Part-time measurement control organization to be set up at each plant and its role
- Details of measurement control activities

5) Role of Full-Time Organization

- a) To prepare the draft of the measurement instrument control provisions and revise contents of the provisions as required.
- b) To perform calibration of measuring instruments
  - To calibrate measuring instruments and gauges brought in and issue the accuracy tables and the certificates
  - To make a tour of each plant and perform the above work
- c) To maintain master registers and historical records of measuring instruments and gauges used at HIC's plants and perform clerical work required in updating these masters and records for calibration purposes.

To perform audit of measuring instruments at each plant once a year based on these masters, thereby preventing the omission of required calibration.

- d) To hold lecture meetings for part-time measurement control personnel appointed at each plant. Also, to give technical and calibration control instructions on measuring instruments through resident staff dispatched to each plant.
- e) To support each plant in finalizing specifications of measuring instruments they plan to purchase and in applying for the required budgets. However, actual application for purchasing budget and request for placing orders should be made at the responsibility of the plant's production line involved.

f) Functions Considered Necessary in Future

- Work for qualifying in-house measurement control inspector
- Coordination with Burmese Governmental Agencies regarding measurement control activities
- Training of measurement control inspectors and education activities on measurement control toward employees in general

6) Measurement Control Organization of Part-Timers to be set up at Each Plant and its Role

- a) To make each plant's Quality Control Section the central office responsible for measurement control at the plant side.
- b) To appoint one (1) person each from sections which own or regularly use tooling and measuring instruments as staff responsible for measurement control.
- c) To form a measurement control organization with the above office and part-time staff members at each plant and have this organization maintain contact with the Calibration Center at No.5 HI through the Center's resident staff.

- d) To have this organization at each plant prepare a master register of measuring instruments and gauges requiring calibration as its initial task.
- e) To make it obligatory that all measuring instruments and gauges registered with this master be calibrated usually once a year at the Calibration Center and their calibrated tables and certificates be preserved as historical records.

The plant's central office (Quality Control Section) will compile these calibration results so that the results can be reported to the Headoffice through the plant's superintendent once a year.

- f) To coordinate calibration schedules throughout the year so that calibration of measuring instruments and gauges will neither interfere with work at each shop nor overload service activities of the Calibration Center at No.5 HI.
- g) To perform self-examination and guidance on correct handling, maintenance and control of measuring instruments.
- h) To have persons appointed as measurement control inspector attend lecture meetings organized by the Calibration Center at least once a year.

7) Temporary Schedule until the Measurement Control Activities will be Officially Executed

It is recommended that, until this system is established, measuring instruments be calibrated as much as practicable by utilizing measuring instruments available at Shop No. 133, "Precision Service Shop," of No.1 HI.

8) Importance and Priority of Measuring Instruments and Gauges

Even if there is the need to strengthen measurement control, it is impossible to introduce this system at once across the board. It is thus desirable that control activities be started by determining which items at the shop or on the line should be given priority.

For example, following measuring instruments, fixtures, and gauges are considered the most important to production lines:

- Measuring instruments for adjusting and inspecting watt-hour meters
- Measuring instruments for adjusting frequency of communication transmitters and receivers
- Fixtures and gauges for precision machining, and measuring instruments for measuring these fixtures and gauges.

Generally, these will concern with bearing and gear cutting sections.

(4) Estimated Capital Requirement

1) Required Facilities

Refer to the Attached Table 3-1 showed the detail of facilities required for this project.

2) Estimated Capital Requirement

Refer to the Attached Table 3-2.

(5) Expected Effects

Measuring instruments, special-purpose gauges, fixtures, etc., which are used for inspection and measurements in production process can be maintained to a required accuracy. This will contribute to improved quality and reliability of parts and products.

Furthermore, HIC can take the initiative in Burma in calibration of measuring instruments and extend calibration service to other industries as well.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 2-1 Establishment of Calibration System  
- No.5 HI: # Calibration Center -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Tertiary standards		
1 1	Comparator	Set	1
1 2	Roundness measuring M/C	Set	1
1 3	Optical index head	Set	1
1 4	Standard voltage generator	Set	1
1 5	Coordinate measuring M/C	Set	1
1 6	Electrical equipment	Set	1
1 7	Miscellaneous	Lot	1
2	Secondary Standards		
2 1	Block gauge	Set	1
2 2	Electric micrometer	Set	1
2 3	Standard manometer	Set	1
2 4	Electrical items	Set	1
2 5	Miscellaneous	Lot	1
2 6	Length standard	Set	1
2 7	Angle/roughness standard	Set	1
2 8	Mass/force/torque/pressure standard	Set	1
2 9	Hardness/volume/flow/density standard	Set	1
210	Temperature standard	Set	1
11	Air conditioning equipment	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#2-1)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	24.9	34.8	59.7
2 Freight & Insurance	2.1	-	2.1
Sub-total	27.0	34.8	61.8
3 Import Duty	-	4.1	4.1
4 Unloading	-	0.4	0.4
Building Total	27.0	39.3	66.3
Bldg & Land Total	27.0	39.3	66.3
2 1 Imported M/E (FOB)	416.9	-	416.9
2 Freight & Insurance	35.1	-	35.1
Sub-total	452.0	-	452.0
3 Import Duty	-	67.8	67.8
4 Unloading	-	6.3	6.3
5 Installation Cost	-	13.8	13.8
Imported M/E Total	452.0	87.9	539.9
3 4 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	75.6	-	75.6
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	75.6	-	75.6
Total Investment	554.6	127.2	681.8

### #3 Establishment of Auxiliary Functions to Support Modernization of Facilities

#### (1) Objectives

Many of machines and equipment at every factory have become inoperable due to overall worn out and/or shortage of spare parts. This has crippled the production lines and caused the production capacity to decline markedly.

Repair and replacement of those worn-out machines and equipment are urgently required, but at the same time, the establishment of maintenance system of machines and equipment thus repaired or replaced is essential for modernization. The establishment of maintenance system consists of establishment of maintenance shops and the system.

Shortage of spare parts which are not being supplied smoothly due to the limited availability of foreign currency, and the prolonged suspension of operation due to breakdown of machinery are exerting a serious impact on production. Such a situation equally applies to dies, jigs, gauges and cutting tools for which Burma has been depending heavily on imports.

In order to break away from the current situation as described above, it is necessary to establish a system of internally fabricating spare parts, jigs, dies, gauges, cutting tools and others. In order to realize this end, fostering of designing and machinery working technologies along with the installation of relevant machines and equipment is necessary.

These technologies should be obtained through operation of the maintenance shops initially, and accumulated to a production engineering center which will be established at HIC. The center is in charge of promoting improvements in production equipment, dies, jigs, gauges and cutting tools, and improvements in machining method, machine working technology and production line.

(2) Outline of the Plan

1) Establishment of Auxiliary Machine Shop and Internal Fabrication of Spare Parts (#3-1)

An auxiliary machine shop will be established at each of No.1 HI, No.3 HI and No.4 HI for maintenance and repair of production machinery and equipment, for custody and supply of spare parts and for manufacturing of spare parts.

2) Repair and Fabrication of Gauges (#3-2)

As repair and fabrication of gauges is closely related to the instrument calibration facilities (#2-1), its fabrication facilities will be installed at No.5 HI which is close to the planned calibration center.

3) Production Shop of New Dies and Jigs (#3-2)

Production of new dies and jigs will be carried out at No.5 HI with a view to utilize its existing machine tools. This shop will be responsible for manufacturing new dies and jigs, while the planned Production Engineering Center will be in charge of technological accumulation of dies and jigs production.

4) Cutting Tool Production Shop (#3-4)

As it requires advanced technique, production of cutting tools will be planned at the No.5 HI in two stages; for a. drill group and b. tap group.

5) Establishment of Production Engineering Center (#3-5)

The various maintenance facilities and repairing and manufacturing equipment for dies, jigs, gauges, cutting tools, etc., should be operated under the integrated and unified engineering control with collected production engineering including design and the like for dies, jigs, and tools.

For this reason, the Production Engineering Center will be placed at No.5 HI to plan and design the dies, jigs and tools and also to guide and cooperate with maintenance shops at each HI in order to improve the entire HI's production engineering and make progress.



The Production Engineering Center, however, cannot be established immediately, but design and manufacture can be performed only after repairing technique for dies and jigs has been acquired and accumulated. Therefore, a Production Engineering Team will be formed at first in the auxiliary machine shop directly connected to each HI to allow the team to acquire various production engineering. After training the team to some extent, establishment of the Production Engineering Center which is the final target will be performed.

(The establishment of improved maintenance system will be planned in #11-1.)







#3-1 Establishment of Auxiliary Machine Shop and Internal Manufacture of Spare Parts

- No.1, No.3 and No.4 HI -

(1) Details of the Plan

(For details, see Attached Tables 1-1 and 1-2, and Attached Figures 1-1 through 1-3.)

- 1) At No.1 HI, the existing building will be used for the auxiliary machine shop by installing new machinery and equipment. Temporary repairs for the existing press die at No.1 HI will be performed by a die repairing equipment to be installed in Press Shop No.2. Another die repairing equipment will be additionally installed in a new Press Shop (#4-2) where the press capacity is to be increased in order to expand the domestic production of parts.
- 2) As none of the buildings of the existing factory at No.3 HI can be utilized, a new building will be constructed. The die repair facilities will also install these die repair facilities within the said new auxiliary machine shop building.
  - a) The auxiliary machine shop handles repairs of machinery and equipment, jigs and dies as well as simple repair of fork lift trucks and the like. Furthermore, the shop has a role to produce the trial machines for local application of agricultural machinery and for the research and development department.
  - b) Scope of work: Broken-down portion will be overhauled and the faulty parts will be corrected. The machinery will then be reassembled, inspected and adjusted.
  - c) The dies and jigs at No.4 HI will be repaired in the auxiliary machine shop at No.3 HI.
- 3) At No.4 HI, its existing buildings will be utilized for the auxiliary machine shop. The shop will consist of three job shops: namely for mechanical and electrical maintenance shop, for sheet metal/steel frame mending shop, and for woodwork mending shop.
  - a) The mechanical and electrical maintenance shop will be housed in Bldg. No.2 of No.4 HI, while the sheet metal/steel frame mending

and the wood work mending shops will be both housed in Bldg. No.9B of No.4 HI.

b) The auxiliary machine shop will be made capable of coping with the following matters.

1. Planning and promoting a preventive maintenance program.
2. Strengthen capability to design and manufacture repair parts for machines
3. Supply control of repair parts for machines
4. Strengthen capability for maintenance of control systems (excluding, however, maintenance and repair of NC machines)
5. Strengthen capability for maintenance of buildings and utilities installations.

(2) Estimated Capital Requirement

1) Required Facilities

Machinery and equipment required for the plan is indicated in Attached Table 2-1.

2) Estimated Capital Requirement

The estimated capital requirement for the plan is as indicated in Attached Table 2-2.



Attached Table 1-1 CONTENTS OF THE PROJECT FOR AUXILIARY MACHINE SHOP OF EACH HI

Auxiliary Machine Shop	No.1 HI	No.3 HI	No.4 HI
Description			
Building	1) Bldg. area 128.5m x 19.0m x 6m (below beam) 2,441.5m <sup>2</sup> 2) Existing factory will be utilized.	1) Bldg. area 90m x 40m x 8m 3,600m <sup>2</sup> (juxtaposed with die repairing facilities) 2) Steel framed, slate roofed. Overhead travelling crane will be installed for carrying heavy goods.	1) No.4 HI Bldg. No.2 will be utilized. Auxiliary machine shop: 648m <sup>2</sup> on 1st floor, 405m <sup>2</sup> on 2nd floor. 2) No.4 HI Bldg. No. 9 B will be utilized. Steel framed sheet metal mending shop 324m <sup>2</sup> , woodwork products mending shop 162m <sup>2</sup> x 2.
Outline of machinery and equipment	1) Major machine tools: 2) Welding machine, various electrically driven tools: 3) Various measuring instruments: 4) Various electrical measuring instruments: 5) Tools, etc.: 6) Expansion and improvement of existing painting shop	1) Machining facilities 2) Heat treatment facilities 3) Welding facilities 4) Inspection facilities 5) Hauling and material handling equipment 6) Drawing equipment 7) Power facilities 8) Building materials 9) Piping and wiring materials 10) Air conditioning equipment	1) Ordinary lathe 2) Universal milling machine 3) Cylindrical grinder 4) Surface grinder 5) Bore grinder 6) Other M/E 7) Piping and wiring materials
Technical data & technical guidance	1) Technical guidance 1 man x 3 months = 3 man-month	1. Technical data (software) 1) Data & drawings for building, wiring & piping 2) Equipment repair manual 3) Drawings of equipment components 4) Documents on technical standards 5) Equipment layout drawing  2. Technical guidance (license & service fee) 1) Building construction guidance: 6 man-month 2) Guidance on equipment installation & test operation: 34 man-month 3) Guidance on equipment repairs: 60 man-month 4) Acceptance of trainees for equipment repair in abroad : 60 man-month	1) Technical guidance 3 men x 12 months = 36 man-month
Major components & materials	1) One-year supply of spare parts 2.7 thousand yen (including major equipment)	1) Imported-goods: steel materials, cutting tools, materials and standard parts for electric, pneumatic and hydraulic sequential equipment and machinery, maker's special parts	
Operating expenses	1) Electric power 30kVA	1) Electric power 230kW 2) Water 0.1 m <sup>3</sup> /hr 3) Compressed air 1.2 m <sup>3</sup> /hr	
Remarks			



Attached Table 1-2 BASIC FUNCTIONS FOR AUXILIARY MACHINE SHOP

Scope of technologies covered			Repairing of machinery and equipment	Control of spare parts	Jig repairing	Die repairing	Fork lift truck repairing	Development and trial fabrication of agricultural machinery products
Contents of Technology			Machine tools, press machines, mechanical systems, others in general	Machine tools, press machines, mechanical systems, others in general	Processing jigs, assembling jigs, welding jigs	Forging dies, pressing dies, casting patterns	Fork lift trucks	Components of products to be developed will be fabricated on a trial basis
Production lines covered	Agricultural machinery (AM)		•	•	•	•	•	•
	Electrical appliances (EP)		•	•	•	•	•	
	Automobiles (LV)		•	•	•	•	•	
Functions and systems	Development and design	New product technology						
		Modification technology						
		Repairing technology	•	•	•	•	•	
	Drafting	Specification						
		Assembling and completed product drawings						
		Drawings of all components						
		Sequential diagram						
		Drawings of repair parts	•	•	•	•	•	
	Manufacture	All components						
		Certain specific parts	•	•	•	•	•	•
		Assembling and adjusting	•	•	•	•	•	
	Inspection	Equipment performance						
		Restoration performance	•	•	•	•	•	
Specifications of factory facilities	Size of machinable parts:	Large						
		Medium	•	•	•	•	•	•
		Small	•	•	•	•	•	•



Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1 (1)  
Auxiliary machine shop's for No. (1) factory

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Auxiliary machine shop, No.1 HI		
1 1	Bench drilling machine	Set	1
1 2	Lathe	Set	1
1 3	Universal milling machine	Set	1
1 4	High-speed cutting machine	Set	1
1 5	Square shear	Set	1
1 6	Bender	Set	1
1 7	Radial drilling machine	Set	1
1 8	Surface grinding machine	Set	1
1 9	Cylindrical grinding machine	Set	1
110	Internal grinding machine	Set	1
111	Slotting machine	Set	1
112	Miscellaneous	Lot	1
2	Electric tools		
2 1	Arc welding machine	Set	2
2 2	Bench grinder	Set	1
2 3	Magnetic drilling machine	Set	1
2 4	Electric drill	Set	2
2 5	Electric disc grinder	Set	3
2 6	Hammer drill	Set	1
2 7	Jig saw	Set	1
2 8	Extension cord	Set	3
2 9	Band grinder	Set	1
210	Soldering irons	Set	3
211	Electric handy tool set	Set	2

Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1 (2)  
Auxiliary machine shop's for No. (1) factory

No	Items	Unit	No.
3	Measuring tools		
3 1	Iron surface plate	Set	1
3 2	V-block (A)	Set	1
3 3	V-block (B)	Set	1
3 4	Block gauge	Set	1
3 5	Cylinder gauge (0-250)	Set	8
3 6	Micrometer (0-100)	Set	4
3 7	Height gauge	Set	1
3 8	Leveler	Set	1
3 9	Vernier calipers set (150-300)	Set	3
310	Depth gauge	Set	1
311	Thickness gauge	Set	3
312	Measuring tape, 2M	Set	5
4	Electric measuring tools		
4 1	Circuit tester	Set	3
4 2	Megger tester	Set	1
4 3	Gauss meter	Set	1
4 4	Swinging meter	Set	1
4 5	Synchroscope	Set	1
4 6	Ampere meter	Set	1

Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1 (3)  
Auxiliary machine shop's for No. (1) factory

No	Items	Unit	No.
5	Others tools		
5 1	Hydraulic jack	Set	1
5 2	Lever block	Set	1
5 3	Chain block	Set	1
5 4	Pipe thread cutting tools	Set	1
5 5	Vice	Set	3
5 6	Vice for bench drilling machine	Set	1
5 7	Gear puller	Set	1
5 8	Tool carry	Set	5
5 9	Gas bonbe truck	Set	2
510	Socket wrench set	Set	2
511	Parts cleaner	Set	1
512	Parts rack	Set	2
513	Tachometer	Set	1
514	Hand truck	Set	3
515	Hand pallet truck	Set	2
516	Small size hand fork lift	Set	1
517	Drill set	Set	2
518	Tap set	Set	1
519	Round dies set	Set	1
520	Hand saw	Set	3
521	Hand file set	Set	3
522	Wire rope set	Set	1
523	Hand tool set	Set	3
524	Tubing tool set	Set	1
6	Auxiliary facilities for old paint shop		
6 1	Electric materials	Lot	1
6 2	Auxiliary facilities (air compressor, piping matrl's, etc.)	Lot	1
6 3	Miscellaneous	Lot	1

Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1(4)  
Auxiliary machine shop's for No. (3) factory

No	Items	Unit	No.
7	Auxiliary machine shop No.3 HI		
7 1	Band sawing M/C	Set	1
7 2	Precision turning lathe (swing over bed 1,120mm)	Set	1
7 3	Precision turning lathe (swing over bed 540mm)	Set	1
7 4	Vertical lathe with copying device	Set	1
7 5	Universal milling M/C (working surface 575x2500mm)	Set	1
7 6	Universal milling M/C (working surface 310x1370mm)	Set	1
7 7	Vertical milling M/C (knee type)	Set	1
7 8	Deviding head & circular plate	Set	1
7 9	Horizontal boring & milling M/C	Set	1
710	Planer (working area 1600x4000mm)	Set	1
711	Jig boring & milling M/C	Set	1
712	Radial drilling M/C (dist spindle 455-1710mm)	Set	1
713	Radial drilling M/C (dist spindle 210-860mm)	Set	1
714	Upright drilling M/C	Set	1
715	Layout M/C	Set	1
716	Shaper with copying device	Set	1
717	Slotting M/C with cerular table	Set	1
718	Center hole grinder	Set	1
719	Precision surface grinding M/C (width 700mm)	Set	1
720	Precision surface grinding M/C (width 235mm)	Set	1
721	Rotary surface grinder	Set	1
722	Universal grinding M/C	Set	1
723	Cylindrical grinding M/C	Set	1
724	Internal grinding M/C	Set	1
725	Band sawing M/C (for contour)	Set	1
726	Profile projector	Set	1
727	Automatic copy milling M/C (table area 2500x800mm)	Set	1
728	Automatic copy milling M/C (table area 1500x500mm)	Set	1
729	Engraving M/C (for naming)	Set	1
730	Electrical discharge M/C	Set	2

Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1(5)  
Auxiliary machine shop's for No. (3) factory

No	Items	Unit	No.
731	EDM-wire cutting M/C	Set	1
732	Manual straightening press	Set	1
733	Single action hydraulic press with die cushion	Set	1
734	Bench type foot operating press	Set	1
735	Muffle furnace with control atmosphere	Set	1
736	Die pre heating furnace	Set	1
737	Automatic gas cutting M/C	Set	1
738	Gear hobbing M/C	Set	1
739	AC arc welding M/C	Set	1
740	Gas welding equipment	Set	2
741	AC DC multi mode arc welding M/C	Set	1
742	Cut off M/C	Set	1
743	Pipe bending M/C	Set	1
744	Pipe threading M/C	Set	1
745	Cast iron surface plate (2000x1000x270mm)	Set	1
746	Cast iron surface plate (1500x1000x250mm)	Set	1
747	Tungsten carbide tool grinder	Set	1
748	Universal cutter & tool grinder	Set	1
749	Diamond tool grinder	Set	1
750	3 dimension coordinate measuring M/C	Set	1
751	Granite surface plate	Set	1
752	Inspection & measuring instrument	Lot	1
753	Working tools for assembling & finishing	Lot	1
754	Cutting tools	Lot	1
755	2ton overhead crane	Set	2
756	5ton overhead crane	Set	1
757	Material handling equipment	Lot	1
758	Equipment for design room	Lot	1
759	Air compressor	Set	1
760	Building materials	Lot	1
761	Wiring & piping material	Lot	1
762	Air conditioning equipment	Lot	1

Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1(6)  
Auxiliary machine shop's for No.3, No.4 factory

No	Items	Unit	No.
8	Auxiliary machine shop, No.4 HI		
8 1	Lathe	Set	1
8 2	Universal milling M/C	Set	1
8 3	External cylindrical grinding M/C	Set	1
8 4	Surface grinding M/C	Set	1
8 5	Internal cylindrical grinding M/C	Set	1
8 6	Other machines	Set	49
8 6 1	Lathe 4'	Set	1
8 6 2	Lathe 6'	Set	2
8 6 3	lathe 8'	Set	1
8 6 4	Plain milling M/C	Set	1
8 6 5	Vertical milling M/C	Set	1
8 6 6	Universal milling M/C	Set	2
8 6 7	Upright drilling M/C	Set	3
8 6 8	Bench drilling M/C	Set	3
8 6 9	Cylindrical grinding M/C	Set	1
8 610	Internal grinding M/C	Set	1
8 611	Surface grinding M/C	Set	1
8 612	Dual hand bench grinding M/C	Set	2
8 613	Tool grinding M/C	Set	1
8 614	Shaping M/C	Set	1
8 615	Sawing M/C	Set	1
8 616	Gear cutting M/C	Set	1
8 617	Surface plate	Set	5
8 618	Bending M/C	Set	1
8 619	Air grinder	Set	1
8 620	Electric drill	Set	1
8 621	Washing equipment	Set	2
8 622	Hand press	Set	4
8 623	Drying oven	Set	1
8 624	Electric welder	Set	3
8 625	Gas welder	Set	3
8 626	Shearing M/C	Set	1



Attached Table 2-1 LIST OF REQUIRED FACILITIES

#: 3-1(7)  
Auxiliary machine shop's for No.4 factory

No	Items	Unit	No.
8 627	Roll press	Set	1
8 628	Pipe bender	Set	1
8 629	Pipe threading m/c	Set	1
8 630	Mixer	Set	1
8 631	Pitch dissolution oven	Set	1
8 632	Rock drill	Set	1
8 633	Tamping m/c	Set	1
8 634	High speed cutting m/c	Set	1
8 635	Fork lift (2 ton)	Set	1

# Detail List of Imported ME  
3-1(1)

Cap:

Items	Unit	No.
2 1 Band sawing machine (capacity:700mm d., sq. 700mm)	1	1
2 2 Precision turning lathe (swing over bed:1,120mm, distance between centers:2,000mm)	1	1
2 3 Precision turning lathe (swing over bed:540mm, distance between centers:2,000mm)	1	1
2 4 Vertical lathe (max. turning:900mm, turning height above table:1,285mm)	1	1
2 5 Universal milling machine (working surface:575x2,500mm, max. longitudinal travel:1,400mm)	1	1
2 6 Universal milling machine (working surface:310x1,370mm, max. longitudinal travel:870mm)	1	1
2 7 Vertical milling machine (knee type, working surface:420x2,100mm, max. longitudinal travel:1,100mm)	1	1
2 8 Deviating head and circular plate (deviating head:swing 300mm, circular plate:table 500mm d.)	Set	1
2 9 Horizontal boring and milling machine (table size:1,800x2,200mm)	1	1
210 Planer (working area of table:1,600x4,000mm, planing width:2,200mm)	1	1
211 Jig boring and milling machine (working table surface:960x1,280mm, longitudinal table travel:1,020mm)	1	1
212 Radial drilling machine (dist. spindle center to column sleeve side 455-1,710mm, base plate:1,825x1,180mm)	1	1
213 Radial drilling machine (dist. spindle center to column side:210-860mm, working surface area of table:510-1,280mm)	1	1
214 Upright drilling machine (drilling capacity:40 d. (steel), swing:550mm)	1	1
215 Layout machine (vertical stroke:1,830mm, horizontal stroke:1,170mm)	1	1
216 Shaper with copying device (max. stroke:650mm, max. shaping width:650mm)	1	1
217 Slotting machine with circular table (max. stroke:230mm, table:460 d.)	1	1
218 Center hole grinder (max. swing over column slides:280mm, max. length of workpiece on dead center stock:1,300mm)	1	1
219 Precision surface grinding machine (max. grinding length:1,550mm, max. grinding width:700mm)	1	1
220 Precision surface grinding machine (max. grinding length:450mm, max. grinding width:235mm)	1	1
221 Rotary surface grinder (magnetic chuck:500mm d., max. working height under a new wheel:150mm)	1	1
222 Universal grinding machine (max. swing over bed table:200mm, max. distance between center:1,000mm)	1	1
223 Cylindrical grinding machine (swing over table:320mm, distance between center:1,000mm)	1	1
224 Internal grinding machine (hole dia. that can be ground:dia. 4-100, max. hole length that can be ground:75mm)	1	1
225 Band sawing machine (for contour, capacity:height 300mm, throat:500mm)	1	1
226 Profile projector (inclination:30° from vertical, effective 400mm d.)	1	1
227 Automatic copy milling machine (table area:2,500x800mm, distance main spindle to table:max. 800mm)	1	1
228 Automatic copy milling machine (table area:1,500x500mm, distance main spindle to table:max. 700mm)	1	1
229 Engraving machine (for naming, cutting area:200 d. or 120x300mm, working table area:200x350mm)	1	1
230 Electrical discharge machine (work tank internal dimension:1,300x830x500mm, table travel:cross 400mm, longitudinal 550mm)	2	2
231 E.D.M.-wire cutting machine (workpiece dimension:550x600x150mm, table travel:cross 300mm, longitudinal 450mm)	1	1
232 Manual straightening press (max. pressing capacity:10ton, ram stroke:150mm)	1	1
233 Single action hydraulic press with die cushion (pressing capacity:300ton, stroke:800mm)	1	1
234 Bench type foot operating press (table:370x165mm, stroke:60mm)	1	1
235 Muffle furnace with control atmosphere (inner size:800x600Hx1,200mm d., max. temp.:1,200°C, power:80KVA, for quenching and tempering)	1	1

# Detail List of Imported ME  
3-1(2)

Cap:

Items	Unit	No.
236 Die pre-heating furnace (inner size:800x600x1,200mm, max. temp.:1,200 C, power:80KVA)	1	1
237 Automatic gas cutting machine (effective cutting area:1,500x3,000mm, cutting thickness:6-60mm)	1	1
238 Gear hobbing machine (max. workpiece:200mm d., max. workpiece module:4)	1	1
239 AC arc welding machine (frequency:50Hz, power voltage:400V)	1	1
240 Gas welding equipment (acetylene regulator, oxygene regulator, medium-sized welding torch, etc.)	Sets	2
241 AC, DC multi mode arc welding machine (DC out put:5-300 amp., AC out put:200-300 amp., for die and general repair)	1	1
242 Cut off machine (capacity:50 d.)	1	1
243 Pipe bending tool set (pipe bender:6-19 d. 6 pce/set, pipe cutter:10.5-42.7 d., etc.)	Set	1
244 Pipe threading machine (capacity:1/4"-4" gas pipe)	1	1
245 Cast iron surface plate (class 1, 2,000x1,000x270mm)	1	1
246 Cast iron surface plate (class 1, 1,500x1,000x250mm)	1	1
247 Tungsten carbide tool grinder (wheel size:dia.255x90xdia.178, spindle speed:1,850 rpm)	1	1
248 Universal cutter and tool grinder (swing over table:250mm, distance between center:700mm)	1	1
249 Diamond tool grinder (grinding capacity: max. 25mm sq. bit)	1	1
250 3 dimension cordinate measuring machine (measuring range:X800xY500xZ400, resolution:0.001mm)	1	1
251 Granite surface plate (class 0, 1,500x1,000x200mm)	1	1
252 Inspection and measuring instruments (micrometer, vernier callipers, block gauge, etc.)	Lot	1
253 Working tools for assembling and finishing (socket wrench set, open end spanner, combination plier, etc.)	Lot	1
254 Cutting tools	Lot	1
255 2 ton over head crane	2	2
256 5 ton over head crane	1	1
257 Material handling equipment	Lot	1
258 Equipment for design room (drafter, drafting instruments, cabinet for documents, etc.)	Lot	1
259 Air compressor (water cooled type, air pressure:7kg/cm2, capacity:12.4m3/min., motor out put:75kw)	1	1
260 Building materials (for 99mx40.5mx8m building, including gutter for over head crane, lighting and fixture)	Lot	1
261 Wiring and piping material (for power line)	Lot	1
262 Air conditioning equipment	Lot	1

Attached Table 2-2: REQUIRED INVESTMENT (#3-1)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	314.1	313.7	627.8
2 Freight & Insurance	25.1	-	25.1
Sub-total	339.2	313.7	652.9
3 Import Duty	-	50.9	50.9
4 Unloading	-	4.7	4.7
Building Total	339.2	369.3	708.5
Bldg & Land Total	339.2	369.3	708.5
2 1 Imported M/E (FOB)	2847.9	-	2847.9
2 Freight & Insurance	227.8	-	227.8
Sub-total	3075.7	-	3075.7
3 Import Duty	-	461.3	461.3
4 Unloading	-	43.0	43.0
5 Installation Cost	-	85.6	85.6
Imported M/E Total	3075.7	589.9	3665.6
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	368.1	-	368.1
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	368.1	-	368.1
Total Investment	3783.0	959.2	4742.2