

④ Also, the field processing and installation amounts of plant equipment and basic load were determined. Due attention was paid to calculate the number of machine tools and workers which may be required by the field work.

⑤ Table 3-1 shows the results of the preceding paragraphs from ② to ④ classified into three types of products forms of steel structure, plate and site works with particulars of each item. The factory product capacity has been designed for accomplishment of these values.

(2) Factory load planning and required facilities

The production capacity of Jakarta factory is set to 10,737 t/y on the basis of the average demand forecast from 1988 to 1993, as stated in 2)-⑤.

The demand forecast is made on the basis of the following three factors.

(i) Cement plant equipment: local content ratio - average 60%
BABIBO's share - 60%

(ii) Sugar plant equipment: local content ratio - average 71.5%
BABIBO's share - 100%

(The objective plants account for 25% of the total plants)

(iii) Basic load: -100%

As a result, the average forecast value of demand covering from 1988 to 1993 is calculated to be 12,570 t/y, which may satisfy the factory load. The required facilities are calculated based on the following criteria:

- 1) Review on whether the existing facilities can be diverted to new factory. In accordance with the newly established product mix and its production plan, investigations were made in regard to the machine facilities belonging to the fabrication division of Jakarta factory for determining the facilities that can be diverted to then new factory.

The selection criteria applied were as follows:

① Items to be investigated

Loading percentages tolerance, workability, maintenance and modernization.

② The classification of items were made according to the following standard:

Class I - Can produce to the required condition without further improvement to the existing conditions.

Class II - Could possibly produce to the required condition with some rebuild/modernization.

Class III - Cannot produce to the required condition with any other rebuild/modernization.

③ The facilities judged to be applicable shall be transferred to the new factory as its part of productive capacity. However, even if the facilities were to be applicable, those that appear to have insufficient capability in terms of productive capacity and function shall not be applied.

2) **Review on new facilities**

Although the factory productive capacity was determined according to the applicable product mix and its production plan, the following selection criteria were used in selecting the required facilities:

① Setting the following items on each product mix

i) Standard model, weight, materials and contents of work (Product model is determined).

ii) Standard operation, process and work time (Product time is set).

iii) Estimated technical level after five years.

② Next, the criteria were determined

i) Principal scale of the man power and calculation of the amount of production time.

ii) Decision of the type and number of the required facilities.

③ Setting off the applicable existing facilities against the required new facilities.

④ In determining the above, the values obtained through our experience were implemented.

(3) Plan for the improvement of the existing factory and construction of a new factory.

As a result of survey on the Jakarta factory, the factory was recognized to be too small to attain the newly set product mix and its production plan. In order to solve this problem, both Barata head office and Jakarta factory agreed that a new factory be constructed adjoining on both sides of existing shop subject to the approval of the Indonesian Government. This clause describes the new factory layout with the production of plate works and steel structure as its nucleus, and partial usable existing equipment.

1) Basic plan of factory layout

Factory site area = 25,000 m²

Total material storage area = 400 m²

Building space area = 6,000 m²

Layout = Refer to the attached drawing Fig. 3-1.

Annual production = 10,373 t/y

In the preceding paragraph 4.3.3-(2), 2), the facilities and their number of units required to attain the production plan were determined. The factory layout was determined based on these data, and general procedures taken in this respect have been to:

- ① Secure the required work area.
- ② Determine optimum equipment arrangement and manufacturing process flow.
- ③ Determine the building shape.
- ④ Give consideration to material storage yard and products carrying out route.
- ⑤ Minimize material handling.

2) **Production and inspection facilities**

① **Production facilities**

The following six items have been reviewed in accordance with the preparation, machining, forming, welding and assembly procedures which constitute the product manufacturing process. The specifications applicable to the equipment have been determined under this clause pursuant to the equipment model and their number of units determined in the preceding paragraph 2), and manufacturing process flows reviewed in paragraph 1) -

②:

- i) Facilities and attached equipment for use in preparation
- ii) Facilities for use in the processing of machine
- ii) Facilities for use in forming

- iv) Facilities for use in welding
- v) Assembling tools
- vi) Overhead traveling crane

Note: As for i) and v), the existing equipment of Jakarta factory applicable to the new factory is included.

② Inspection facilities

Inspection plays a vital role in making most of the qualification system. In view of this fact, it is recommended that the inspection works which have so far been performed on the basis of subcontractor be taken into the inside work of the factory.

The inspection facilities consist of the following items :

- i) Equipment for use in the non-destructive examination for the inspections centering around the welded portion.
- ii) Equipment for use in the material test.
- iii) Equipment for use in measurement.

3) Basic plan for the attached facilities

Various attached facilities may be required according to the characteristics of products. The following four items have been reviewed with respect to Jakarta factory. These facilities have been designed considering an optimum capacity to the type of each facility:

- ① Heat treatment facility Plate works
- ② Shot blast facility Plate works
 Steel structure

- ③ Acid-cleaning facility Plate works
- ④ Painting facility Plate works
 Steel structure

4) Basic plan for utility

① The following electrical facilities shall be installed:

- i) The transformer used in the existing factory shall be used in the new factory, and new service station is constructed.
- ii) Telephone facilities (60 telephones)
- iii) Paging device
- iv) Broadcast facilities
- v) Illumination facilities for the inside and outside of premises.
- vi) Fire alarms (for office only)
- vii) Emergency generator (for emergency lights only)
- viii) Air-conditioning facilities for office.

② Piping to the following items shall be provided for use with the machinery and attached facilities:

- i) Propane gas
- (ii) Oxygen
- iii) Acetylene
- iv) Argon

- v) Co₂
- vi) Air
- vii) Industrial water
- viii) Drinking water (City water)

Note: No drinking water producing facility shall be provided.

③ Sewage and waste water disposal systems.

- i) Dirty water from toilet flows into the sewage disposal system.
- ii) Acid-cleaning facility includes the neutralization equipment.

(4) Factory construction work and installation plan

New bays are to be built on both sides of present Jakarta factory and to be installed new equipment. Construction period is to be separated into two to minimize effect on present production.

1) Preparation of land

This paragraph shall be regarded as a key point to determine whether the smooth accomplishment of factory construction and operation along the predetermined process table is possible:

- ① Assuming that the table plant site area would be 25,000 m², the land preparation shall be performed in 12,100 m² area.
- ② Then the land will be raised by 1 m.

2) The ground and pile

After land preparation, PC piles should be piled. Pile should be $\phi 35$ cm and 10 or 15 m in length. They are used as pillars and foundation for equipment.

3) Building

The building main body shall be of a steel-frame building. The concrete construction shall be applied to the X-Ray room, and stress relief furnace, heating furnaces and sewage disposal facilities. Offices are also included in the scope of construction.

4) Installation plan of equipment

① First, the cable laying under the ground for electrical wiring shall be performed along the building construction schedule.

Next, the overhead traveling crane shall be installed and power sources shall be connected along the roof work completion plan.

② In installing the equipment, the shortening of installation processes shall be attempted by grouping the equipment into large, medium and small in size. Equipment should be delivered upon completion of test run which is to be performed after installation.

③ As shown in the Table 3-2, the total installation may complete in October 1988. The development of the processes in the preparation of land, and performing civil engineering and building construction works smoothly may greatly affect the accomplishment of the project.

5) Visiting supervisor

① A foreign visiting supervisor or an Indonesian supervisor shall be considered with respect to the following items:

- i) Civil engineering work, including land preparation.
- ii) Building construction work.
- iii) Equipment installation work.
- iv) Electrical wiring work.
- v) Piping work inside the building.

The duty of supervisor shall terminate upon completion of the construction work. Although the dispatch of a supervisor from the machine suppliers may sometimes be required for conducting a test run of equipment of special importance, generally only the submission of English manuals will be required.

4.3.4 Renovation Promotion Program

In accordance with the basic plan described in the foregoing clause, this clause describes the hardware section of the renovation program, namely, the various technical data related to the promotion program in moderate detail.

(1) Outline and designing conditions of the renovation program

1) Outline of renovation program at Jakarta factory

As shown in the attached table 3-1, titled Forecast of product mix, the factory has been designed so that it can attain the annual production of 10,737 tons centering around plate works and steel structure.

Existing factory shall be extended to the north and south.

In pursuing quality products, special emphasis has been placed on improving the present levels of quality and dealing with the manufacturing of products entailing a higher level of technology.

2) Factory design conditions

The design conditions are decided on the basis of the product mix, considering the weights, sizes, quantities and production processes of the products and reflecting the shop areas, the heights and widths of the buildings and the lifting capacities and quantities of the overhead traveling cranes to be provided in the shops.

① Setting of product model

The product model (Refer to Table 4-1.) has been derived from the product mix to determine the specifications of the production facilities.

② Setting of the lifting capacities of overhead traveling cranes

The lifting capacities of the overhead traveling cranes are set on the basis of the product model. (Refer to Fig. 3-1)

③ Setting of the heights of overhead traveling cranes

The overhead traveling crane rail heights are set on the basis of the product model, considering the effective lifting heights of the overhead traveling cranes.

④ Setting of the specifications of major production facilities

The specifications of major production facilities are set on the basis of the product model. (Refer to List 4-1.)

⑤ Calculation of production time

The production time per operation unit is calculated, extracting the typical products of each plant from the product mix.

⑥ Calculation of the required numbers of production facilities

Based on the production time required for each operation unit, the necessary man-power and the necessary numbers of production facilities are calculated. (Refer to Table 4-7 and List 4-1.)

⑦ Calculation of factory area

i) Work floor area of fixed facilities

The floor area of fixed facilities after taking the scope of work into consideration was integrated by the number of facilities computed in the preceding ⑥.

ii) Required size, of assembly area

The required size of assembly area was computed based on the production time computed in previous ⑤ by adding the manufacturing process flow and original unit which we know through our experience. The results are shown in Table 4-2 Necessary area of each shop.

⑧ Endurance of the floor

For long-sized product - The endurance of the bay shall be 10 t/m².

The endurance of other size product of the bays shall be 5 t/m².

3) Comparison before and after the renovation

In order to study the improvement degree resulting from the

renovaton, comparison has been made between the existing factory and new factory in regard to the production per unit area and direct worker. The results of the comparison are shown in the table below:

| | <u>Before</u> <u>renovation (a)</u> | <u>After</u> <u>renovation</u> | <u>Ratio</u> <u>(%)</u> |
|---|--|-----------------------------------|----------------------------|
| Production per unit area (ton/y/m ²) | 0.38 | 0.88 | 2.32 |
| Production per direct worker (ton/y/man) | 13.9 | 32.5 | 2.34 |

4) Factory layout

New factory is extended one bay (24m × 79m) on the north side and two bays (24m × 79m × 2 bays) on the south side of existing factory to obtain new factory area calculated in 4-3-4-(1) 6). Existing factory equipment which is to be used continually should be used without being removed from where it is now in existing shop if possible. In arranging equipment, manufacturing flow and economics (Return of investment for equipment) were most considered.

① Description of each bay

A-Bay: For the prefabrication area for structure, parts and nozzle etc. It is arranged in the area near the outdoor assembly area and material storage yard.

B-Bay: For the preparation of plate works and forming assembly of unit cylinder.

C-Bay: For the machine shop and heat exchanger assembly area.

D-Bay: For the assembly and testing of heavy vessel, structure and heat exchanger.

② Storage area

A raw material storage area is arranged in the open side by side with the prefabrication, blasting and painting areas. For the handling of material, a gantry crane (25t/5t) is arranged as well.

③ Layout of equipment

- i) The exclusive machines are scattered to each bay so that they can be optimized with respect to the manufacturing process flow of the objective products.
- ii) A.F.C. are concentrated in A-Bay and B-Bay according to corresponding manufacturing process flow.
- iii) Machines for light structure were installed in C-Bay.
- iv) General purpose machine tools were concentrated in E-Bay which is now machine works.
- v) Heating furnace for Plate works and intermediate X-ray room are located in F-Bay, and X-ray room and stress relief furnace for after-assembly are located outside F-Bay, all according to corresponding manufacturing flow.
- vi) Materials testing equipment which is indispensable for plate works was placed to the west of D-Bay.
- vii) Blasting, painting and packing for plate works and water gate should be performed in F-Bay.
- viii) Although acid cleaning equipment is required for the processing of stainless steel, this equipment is arranged in a separate building because its installation in the shop is unsuitable due to the waste water disposal problem.

ix) The existing bay transfer will be reused.

5) Equipment list and manufacturing process flow

① Equipment list

The content of equipment is shown in the "New and usable existing machine/tool list" List No. 4-1. Note that this list of equipment includes those that are to be diverted to the new factory.

② Manufacturing process flow

A representative manufacturing process flow is shown in Fig. 4-1.

(2) Construction cost

Attached Table 4-3, Summary of investment cost shows the detailed investments necessary for this renovation. Description of detail design, supervising and training fee is shown in Table 4-6. However, the following cost or expenditure is not included in the investments: 1) the cost to use the existing organization during the term of renovation and, 2) personal expenditure for trainees during the term of skill training.

(3) Implementation project system to promote renovation program

Where the promotion of this project is determined, the Shop is under obligation to perform the following items so as not to cause trouble in the course of the breakthrough and to prevent problems.

- 1) Design of new Shop and determination of parts to purchase.
- 2) Control, supervision of construction process such as land preparation, civil engineering works, building construction, machine installation, etc.

- 3) Preparation and implementation of personnel training program for managers, engineers, and operators to ensure smooth startup and operation.

Attached Table 4-4 details the Implementation project system to promote renovation program.

(4) Content of work

1) Work item

As shown in Table 3-2 Construction schedule, the actual work is classified as follows; (1) Land preparation (2) Civil works (3) Building construction (4) Purchase and erection of machine & equipment, electricity and instrument and piping works (5) Arrangement of the total project and detailed design (6) Supervision of the all works mentioned and (7) Training on the special equipment.

2) Content of work

The items stated in 1) above may be otherwise subdivided into domestic portion work and foreign portion work.

- ① Domestic portion work covers the following main items.

Labor service, materials available in Indonesia, inland transportation, import duty, a part of supervision, lease for construction equipment, etc.

- ② The main foreign portion work covers the coordination of the whole project, details design and supervision of each item as well as purchase of machines and equipment, and ocean freight and insurance premium.

(5) Supervision of work and training plan

- 1) The work items requiring supervisors are as shown below.
(Refer to Table 3-2 and Table 4-6.)**

- | | |
|--|--|
| 1. Land preparation | 5. Erection of electricity and instruments |
| 2. Civil works | 6. Piping work |
| 3. Building works | 7. Operation instructions on main machine and equipment |
| 4. Erection of machines and equipment | |

2) Training plan

The plan of shop worker training is implemented for the following machines as a minimum requirement. The purpose of the training plan is to familiarize workers with machines of which they are in charge during the term from completion of installation of shop machines and equipment to startup. Voluntary training in shop is recommended during the considerably long time until October in 1988. The training fee is refer to Tabl 4-6.

- ① Boring & turning mill
- ② Boring & milling machine
- ③ Planer
- ④ Press
- ⑤ Bending roller
- ⑥ Flanging machine
- ⑦ Furnace

(6) Construction schedule of renovation

The renovation schedule of this project is shown in Table 3-2, which includes the content described in (4) and (5).

4.3.5 Production Control and Training

This chapter describes the basic items on software section necessary for accomplishing the promotion plan stated in the foregoing chapters. The production control system, quality control system, training shown below are the basic conditions to be satisfied in order to accomplish the purpose of the promotion plan.

(1) Production control system

The technical diagnosis shown in 4.3.1 (4), 2) has proven that the following countermeasures should be taken,

- 1) The production control system should be established to control products so that they are manufactured as planned. This system should include checks for the progress schedule in each production step and for the delivery date of parts to be purchased. This system should also include such a sub-system that, if any delay occurs in the progress schedule, a countermeasures (such as overtime service) is taken in time.
- 2) A pile-up plan is a means to prevent delay in the time of delivery; the plan should be laid out to grasp work quantity for the Shop in total or for each job. This pile-up plan permits checking in earlier stages a machine or work that may form a bottleneck of the process, thus making it easy to take countermeasures without delay.

- 3) Fig. 5-1 shows the PDCA managerial circle. Particular care should be taken in emphasizing item C, Check or Follow-up, and item A, Action, both of which may be neglected in the course of production control.

In the second, attention is drawn to production technology. Change in the product mix causes the use of thick plates. This makes important the technology to make forming and heat-treatment, to select welding methods and welding materials and to prevent cracks during welding.

Enhancement of production control and production technology require increase and training of staff. The training and instructions should be given by supervisors sent by overseas manufactures. Expenses for the supervisor are stated in (9).

(2) Quality control system

As stated in 4-3-1 (4) 3), Jakarta factory has already prepared a quality control manual. Managers should make every worker be informed of content of the manual. In the second, technical review proves that use of thick plates involves the following important countermeasures.

- 1) Countermeasures against increased non-destructive examination.
- 2) Countermeasures against preventing weld defects such as weld cracks.

For increased non-destructive examination, inspection service should be performed in the Shop in lieu of the present sub-contractors, that is, qualified inspectors should be increased and trained.

For prevention of weld defects, quality controllers are required who must be acquainted with materials and fabrication to assure the quality of products before shipment.

In addition, data on defective products and claims filed by customers are very important information and should therefore be collected and assorted with particular care for the purpose of quality assurance.

Instructions for quality assurance engineers and necessary cost are as stated in (9).

(3) Safety control system

The capacity of the overhead traveling crane in Jakarta factory is increased to 25 tons in excess of 10 tons. The special piping in Shop is required by increase in flammable gas consumption, thereby requiring safety control with more importance. Therefore, the safety control system must place emphasis on the following points.

- 1) The basis of safety is to put in order and keep clean what is related to production. Unfortunately, the present situation in Jakarta factory is not necessarily satisfactory. First of all, all persons including workers should realize the importance of putting their work conditions in order.
- 2) Prevention of accidental injury or death requires training for crane operators and slinging workers, and educational instruction for prevention of gas explosion.

(4) Maintenance

The maintenance system shown below should be established on the basis of maintenance techniques in Jakarta factory and be exercised.

- 1) A maintenance system should be prepared to ensure that machines, equipment and instruments are subject to routine checks and periodical inspections by type.
It is important for the maintenance manual to identify check items and the period of checks and to specify a system including repair of failure.

- 2) Servicing and checking devices, tools, and jigs result in improved product quality and enhanced efficiency. Workers should therefore be trained and instructed to perform routine checks with care.

(5) After-sales service

In the light of sales business, after-sales service results in:

- 1) Order of repair and reform work.
- 2) Order of additional and new work.

In the light of production technology, after-sales service results in:

- 1) Feedback to design and engineering departments.
- 2) Feedback to quality control and fabrication departments.

The above feedbacks lead to improvement in technical capacity through grasping problems in quality control and fabrication as well as to improvement in engineering capacity. The business department should train sales engineers who have product knowledge enough to be engaged in sales business including after-sales business.

(6) Engineering

Jakarta factory will have larger shops and more machines and equipment. At this point, the following items are proposed to smoothly expand production items.

- 1) New technology such as those for heat exchangers and pressure vessels should be strengthened through the technical assistance agreement with overseas enterprises having wide experience in this field.
- 2) New technology, including production technology, should be introduced even for the products produced at present in order to strengthen technical capacity.

- 3) Design capacity including production design should be enhanced to develop less expensive and facilitated production methods.
- 4) Design engineers should be trained and given instructions to the extent that they can decide proper product quality and specify in drawings the dimensional accuracy required for products.

The cost relevant to the above is stated in (9).

(7) Training

Capacity improvements for controllers and engineers are stated in (1) through (6).

The training plan shown in Table 4-5 and Table 5-1 is recommended for workers. It is urgently required to level up worker's skill in order to meet increase in production and to have a perfect command of new equipment.

(8) Organization and personnel

1) Organization

Table 5-2 shows the organization and personnel plan in Jakarta factory.

The organization is based on 4.3.1 (4), Technical diagnosis (for the organization and personnel in Jakarta factory), and previous Table 1-1, with the following points emphasized.

- ① Vicinity to Head Office enables Jakarta factory to depend on Head Office for the organization of the general affair department, which is extremely simplified.
- ② Quality control section now belongs to marketing department. However, since more heat exchangers and pressure vessels are to

be manufactured, quality control will be important and quality control department should be separated.

2) Personnel

The personnel plan is laid out as shown below.

- ① The number of direct workers is determined as shown in 4.3.3 (2) 2).
- ② The number of indirect workers is determined from our experience. The number should be limited to a minimum by depending on assistance given by Head Office as is the case with general affair department, whose indirect workers are decided by assumption.

(9) Training cost

Fig. 5-2 shows the training cost and period on the production control and technique in item (1), (2) and (6), and on the machine works in item 4.3.4 (5) 2). Training should be tackled with complete preparation because they have great influence on the operation of Jakarta factory.

Table 1-1 Existing Organization Chart of P.T. Barata Surabaya Factory

AUG. 1984

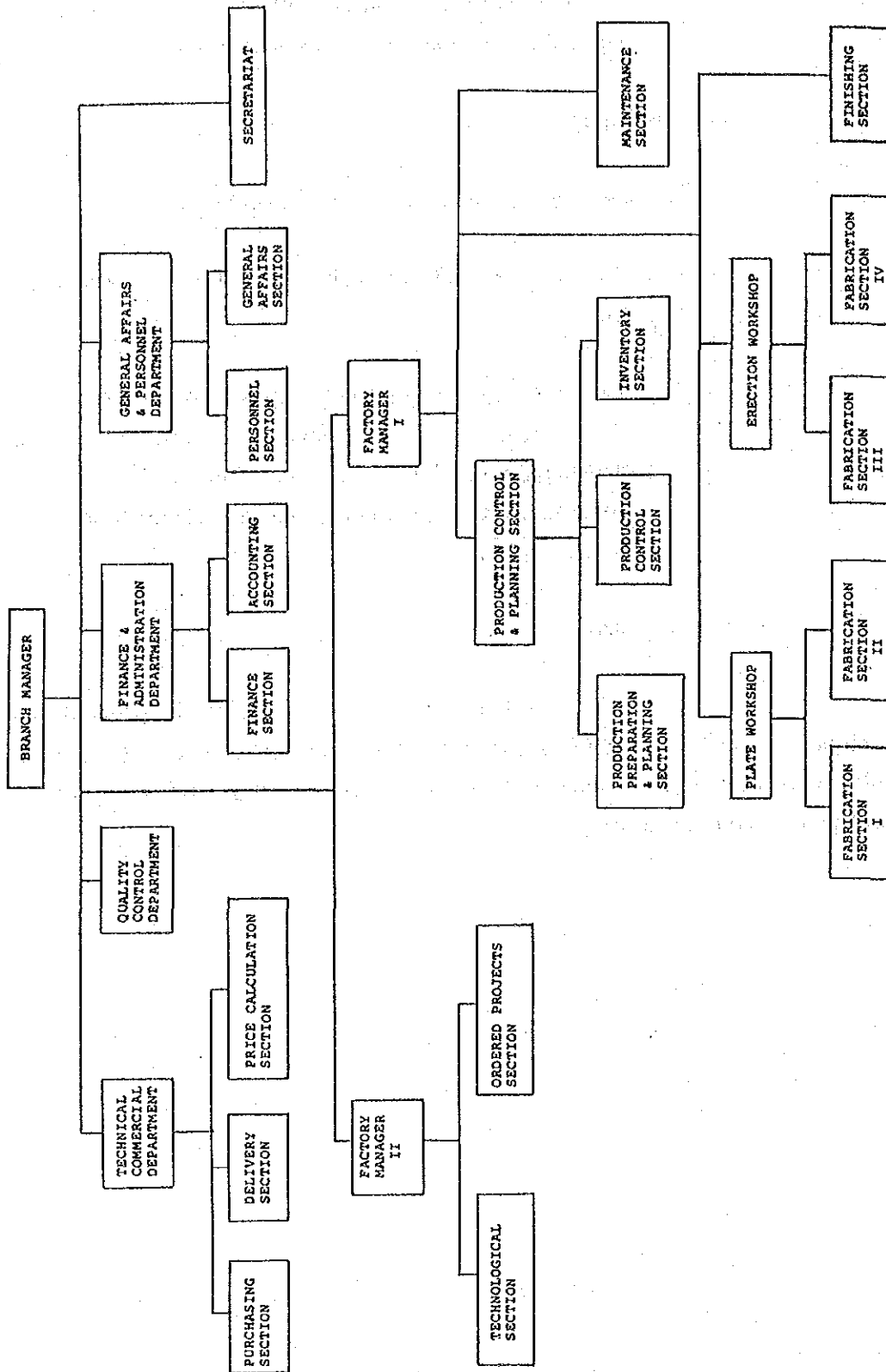


Table 1-2 Existing Number of Employees for P.T. Barata Jakarta Factory

Aug. 1984

| | NO. OF PERSONNEL |
|---|---------------------|
| 1. ENGINEERS | |
| DESIGN | 2 |
| MECHANICAL | 1 |
| METALLURGICAL | - |
| WELDING | 1 |
| OTHERS (SCHEDULE CONT., QC, ETC.) | - |
| SUB-TOTAL | 4 |
| 2. DRAFTMAN | 6 |
| 3. DIRECT WORKERS | |
| WELDERS (QUALIFIED) | 25 (16) |
| IRON WORKERS | 72 |
| FITTERS | 20 |
| MECHANICIANS | 8 |
| INSPECTORS | 4 |
| OTHERS | 15 |
| SUB-TOTAL | 144 |
| 4. INDIRECT WORKERS | 34 |
| SUCH AS CRANE OPERATORS WAREHOUSE KEEPERS, MECHANICIANS FOR SHOP FACILITIES MAINTENANCE, ETC. | |
| 5. OTHER STAFFS AND CLERKS | 37 |
| <hr/> | |
| TOTAL EMPLOYEES | 225 |

TABLE 3-1 FORECAST OF PRODUCT MIX

P. T. BARATA: JAKARTA FACTORY

ANNUAL PRODUCT CONDITION IN 1989 - 1993

UNIT: TON/YEAR

| TYPE OF PRODUCT | | STEEL CONSTRUCTION | PLATE WORK | TOTAL | BASIC LOAD | SUGAR PLANT | CEMENT PLANT |
|-----------------|--|--------------------|------------|--------|------------|-------------|--------------|
| a. | a.1 General structures | 1,000 | 50 | 1,050 | 1,050 | | |
| | a.2 Bridges and similar structures | 960 | 48 | 1,008 | 1,008 | | |
| | a.3 Industrial structures | 355 | 0 | 355 | | 355 | |
| | a.4 Water gates and structures for water engineering | 500 | 500 | 1,000 | 1,000 | | |
| | a.5 Conveyors | 500 | 500 | 1,000 | 1,000 | | |
| b. | b.1 Palm oil plant equipment | 800 | 1,000 | 1,800 | 1,800 | | |
| | b.2 Sugar plant equipment | 0 | 1,400 | 1,400 | | 1,397 | |
| | b.3 Fertilizer and petrochemical industry | 374 | 600 | 974 | 974 | | |
| PLATE WORKS | b.4 Power plant equipment | 50 | 1,000 | 1,050 | 1,050 | | |
| | b.5 Air fin cooler | 50 | 1,050 | 1,100 | 1,100 | | |
| | b.6 | | | | | | |
| | b.7 | | | | | | |
| SUB TOTAL | | 4,589 | 6,148 | 10,737 | 8,982 | 1,752 | |
| c. | c.1 General industries | 2,600 | 0 | 2,600 | | 2,600 | |
| | c.2 Vessels (pressure and atmospheric, vacuum) | 0 | 90 | 90 | | 91 | |
| | c.3 Tanks of different design. | 0 | 300 | 300 | 180 | 122 | |
| | c.4 Silos, bins, containers hoppers, ducts, chutes, etc. | 50 | 450 | 500 | 500 | | |
| | c.5 Pipe works | 0 | 210 | 210 | | 207 | |
| SUB TOTAL | | 2,650 | 1,050 | 3,700 | 680 | 3,020 | |
| TOTAL | | 7,239 | 7,198 | 14,437 | 9,662 | 4,772 | |

Table 3-2
Construction Schedule

| ITEM. | 1985 | | | 1986 | | | 1987 | | | 1988 | | | | | | | | | | |
|----------------------------------|---------------|---|---|------|---|----|------|---|---|------|---|----|----|---|---|---|---|----|----|--|
| | YEAR MONTH | 2 | 4 | 6 | 8 | 10 | 12 | 2 | 4 | 6 | 8 | 10 | 12 | 2 | 4 | 6 | 8 | 10 | 12 | |
| PROJECT ENGINEERING | | | | | | | | | | | | | | | | | | | | |
| LAND PREPARATION | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN | | | | | | | | | | | | | | | | | | | | |
| SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| CIVIL WORKS | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| BUILDING WORKS | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| MACHINE EQUIPMENT & FACILITIES | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| ELECTRICITY & INSTRUMENT | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| PIPING | | | | | | | | | | | | | | | | | | | | |
| DETAIL DESIGN SUPERVISORS WORKS | | | | | | | | | | | | | | | | | | | | |
| TRAINING FOR TEST RUN | | | | | | | | | | | | | | | | | | | | |
| SUPERVISING FOR LAND PREPARATION | | | | | | | | | | | | | | | | | | | | |
| CIVIL WORKS | | | | | | | | | | | | | | | | | | | | |
| BUILDING WORKS | | | | | | | | | | | | | | | | | | | | |
| ERECTION TRAINING | | | | | | | | | | | | | | | | | | | | |

Table 4-1 Max. Product Model for P.T. Barata Jakarta

| TYPE OF PRODUCT | THICK- NESS (mm) | PRODUCT SIZE (ID x LENGTH WIDTH x LENGTH)(mm) | | | DESIGN PRESSURE (kg/cm ²) | MATERIAL | WEIGHT (Ton) |
|---|------------------------|---|-------|--------|---|-----------------|-----------------|
| | | W | H | L | | | |
| 1 GENERAL STRUCTURE | 6-50 | 500 | 2,000 | 10,000 | - | C.S. | 25 |
| 2 BRIDGES | 6-50 | 500 | 2,000 | 10,000 | - | C.S. | 25 |
| 3 INDUSTRIAL STRUCTURE | 6-50 | 500 | 2,000 | 10,000 | - | C.S. | 25 |
| 4 WATER GATES AND STRUCTURE FOR WATER ENGINEERING | 6-30 | 3,000 | 4,000 | | - | C.S | 25 |
| 5 CONVEYORS | 6-12 | 2,000 | 1,500 | 10,000 | - | C.S | 5 |
| 6 PALM OIL PLANT EQUIPMENT | 4-12 | 2,000 | 3,000 | | 10 | C.S SUS | 10 |
| 7 SUGAR PLANT EQUIPMENT | 4-12 | 2,000 | 3,000 | | 10 | C.S SUS | 10 |
| 8 FERTILIZER AND PETROCHEMICAL INDUSTRY | 6-38 | 3,000 | 6,000 | | 50 | C.S SUS CLAD | 25 |
| 9 POWER PLANT EQUIPMENT | 6-30 | 2,400 | 6,000 | | 50 | C.S | 30 |
| 10 AIR FIN COOLERS | 6-30 | 4,000 | 1,000 | 1,200 | 50 | C.S. | 15 |

Note: The above table shows the major specifications of the products selected per type of plant equipment from the product mix to determine the specifications of the production facilities. Therefore, this table provides an effective guideline for the approximate production capacities of the shops.

Table 4-2 Necessary Area of Each Shop for P.T. Barata Jakarta

| <u>NO</u> | <u>SHOP NAME</u> | <u>AREA</u> |
|-----------|--|-------------|
| 1 | CUTTING PLAN ROOM | 450 |
| 2 | PREPARATION AREA | 1,250 |
| 3 | FORMING AREA | 1,362 |
| 4 | MACHINING AREA | 1,090 |
| 5 | ASSEMBLY AREA (INCLUDED WELDING) | 4,812 |
| 6 | RADIO GRAPHIC EXAMINATION ROOM | 245 |
| 7 | SAND BLASTING PAINTING AND ACID CLEANING ROOM | 900 |
| 8 | RAW MATERIAL STORAGE AREA | 400 |
| 9 | TOOL ROOM | 108 |
| 10 | PARTS STORAGE AREA | 693 |
| 11 | MAIN PASSAGE AND OTHERS | 2,210 |
| Total | | 13,520 |

Table 4-3 Summary of Investment Cost for P.T. Barata Jakarta

UNIT: 1,000,000 YEN

| <u>ITEM</u> | <u>FOREIGN</u> | <u>DOMESTIC</u> | <u>TOTAL</u> |
|---|-----------------|-----------------|-----------------|
| 1. MACHINERY & EQUIPMENT | 3,340.35 | | 3,340.35 |
| 2. ELECTRICITY & INSTRUMENT | 174.32 | 321.54 | 495.86 |
| 3. LAND PREPARATION | 9.96 | 95.79 | 105.75 |
| 4. OCEAN FREIGHT, INSURANCE & LOCAL HANDLING | 217.75 | 51.64 | 269.39 |
| 5. INLAND TRANSPORTATION | | 48.92 | 48.92 |
| 6. CIVIL | 66.91 | 339.33 | 406.24 |
| 7. ERECTION | 13.76 | 261.23 | 274.99 |
| 8. BUILDING (PLANT & OTHERS) | 103.19 | 593.66 | 696.85 |
| 9. BUILDING (OFFICE) | 5.43 | 31.24 | 36.67 |
| 10. OTHERS | 305.43 | 5.38 | 310.81 |
| 11. ENGINEERING FEE | 339.18 | 77.18 | 416.36 |
| 12. CONSTRUCTION EXPENSES | | 126.09 | 126.09 |
| 13. PHYSICAL CONTINGENCIES | 137.29 | 136.64 | 273.93 |
| TOTAL | 4,713.57 | 2,088.64 | 6,802.21 |

- Note: 1. Training fee is not included in this table.
 2. The physical contingency of training fee is not included.

Table 4-4 Implementation Project System for P.T. Barata Jakarta Factory

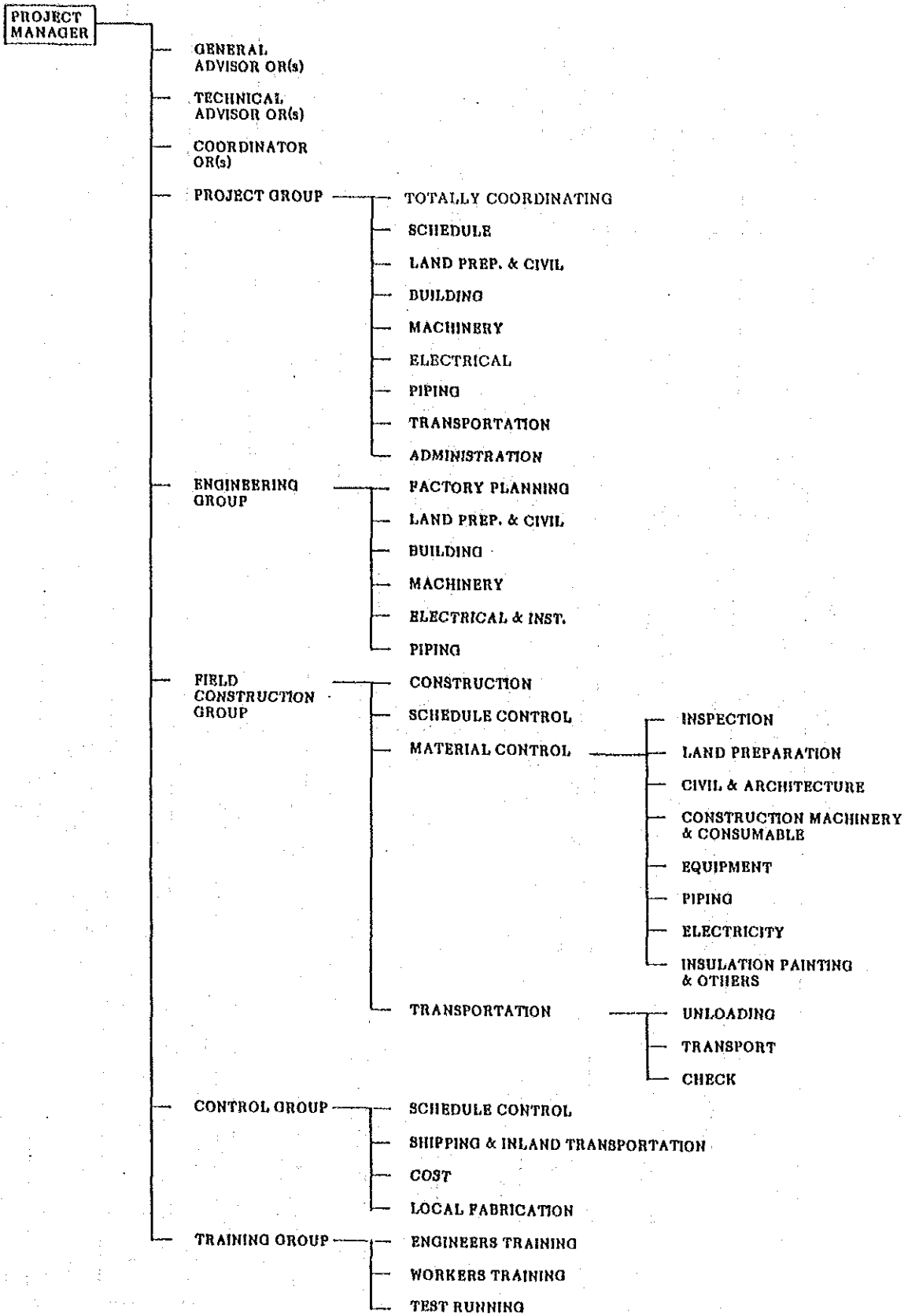


Table 4-5 Training Plan of Worker

| STEP | LATHE MACHINE | MILLING MACHINE | GAS CUTTING | SHIELDED METAL ARC WELDING | GAS-SHIELDED TUNGSTEN ARC WELDING |
|------|--|---|-------------------------|---|-----------------------------------|
| 1 | INTRODUCTION * | INTRODUCTION * | INTRODUCTION * | INTRODUCTION * | INTRODUCTION * |
| 2 | CYLINDRICAL MACHINING * | PLANE MILLING * | MANUAL CUTTING * | BEADS ON PLATE * | BEADS ON PLATE * |
| 3 | MACHINING OF SHOULDER SHAFT * | MILLING TO HEXAGONAL PIECES * | STRAIGHT LINE CUTTING * | FILLET WELDING * | SINGLE VEE-GROOVE BUTT WELDING * |
| 4 | MACHINING OF CURVED SURFACE * | MARKING * | BEVELLING | SINGLE VEE-GROOVE BUTT WELDING (9 mm) * | BUTT WELDING OF PIPE |
| 5 | BORING * | SIDE AND END MILLING * | CIRCLE CUTTING | SINGLE VEE-GROOVE BUTT WELDING (25 mm) * | TEST * |
| 6 | MACHINING OF TAPER * | SLOT MILLING * | GAS CUTTING TEST * | APPLICATION (MIXED TRAINING OF FILLET AND BUTT WELDING) | |
| 7 | THREADING * | CIRCULAR MILLING * | | BUTT WELDING OF PIPE | |
| 8 | FABRICATING COMPULSORY PARTS IN QUALIFICATION TEST | DOVETAIL MILLING | | TEST * | |
| 9 | | DIVIDING | | | |
| 10 | | FABRICATING COMPULSORY PARTS IN QUALIFICATION TEST. | | | |

*: INCLUDED LECTURE (BASIC THEORY)

Table 4-6 Description of Investment Cost for Detail Design, Supervising and Training fee for KARATA JAKARTA Unit: 1,000,000YEN

| Description of Detail Design, Supervising & Training fee | Cost Estimation of Detail Design | Cost Estimation of Supervision and Training fee | Estimated Interval |
|--|--|---|---|
| Project Engineering | Review of F/S, preparation of implementation program, supervision of construction schedule and general consultation to the implementation of the project. F=103.47 D= 5.37 Item 10 of Table 4-3 | | |
| Land preparation | Lay-out planning and designing, preparation of specification both for working and supervision. F= 0.64 D= 0.07 Item 3 of Table 4-3 | F= 33.58 D= - | |
| Civil works | Designing, Preparation of specification for foundation plan of building, machinery, facilities and supervision F= 4.93 D= 0.55 Item 6 of Table 4-3 | Item 11 of Table 4-3 | |
| Building works | Designing, Preparation of specification for procurement of building materials, site fabrication and supervision. F= 16.33 D= 1.82 Item 9 of Table 4-3 | F= 58.91 D= - Item 11 of Table 4-3 | Refer to table 3-2 of Construction schedule |
| Machinery equipment and facilities | Lay-out planning and designing of above mentioned equipment, preparation of specification both for procurement of machinery, equipment, parts and tools, facilities and supervision. F=196.71 D= - Item 10 of Table 4-3 | F= 92.93 D= 39.08 Item 11 of Table 4-3 | |
| Electricities | Lay-out planning and designing of above mentioned equipment, preparation of specification both for procurement of electricities and supervision. F= 26.88 D= - Item 2 of Table 4-3 | F=122.13 D= 38.10 Item 11 of Table 4-3 | |
| Piping works | Designing, Preparation of specification for procurement and supervision. F=104 D= - Item 10 of Table 4-3 | F= 7.72 D= - Item 11 of Table 4-3 | |
| Trainings for testrun | Supervision for machine operators at machinery erecting intervals type of machinery for supervision listed in item. | F= 23.91 D= - Item 11 of Table 4-3 | |

Table 4-7 Equipment Planning Bases (JAKARTA)

| NO. | MACHINE NAME | SELECTION BASE | PRODUCT | LOADING FACTOR(%) |
|------|--|--|---|-------------------|
| 1.1 | HEAVY DUTY UNIVERSAL LATHE MACHINE | TO RENEW OBSOLETE EQUIPMENT | PETROCHEMICAL PLANT, WATER GATES | 52 |
| 1.2 | HEAVY DUTY FACING LATHE MACHINE | TO REINFORCE FACILITIES FOR PRODUCING LARGE PRODUCTS | DITTO | 61 |
| 1.3 | VERTICAL BORING & TURNING MILL MACHINE | TO REINFORCE FACILITIES FOR PRODUCING LARGE PRODUCTS AND INCREASING PRODUCTION | DITTO | 58 |
| 1.4 | HEAVY DUTY RADIAL DRILLING MACHINE | TO REINFORCE FACILITIES FOR INCREASING PRODUCTION | AIR FIN COOLER, GENERAL STRUCTURES | 92 |
| 1.9 | HORIZONTAL BORING & MILLING MACHINE | DITTO | DITTO | 87 |
| 1.10 | UNIVERSAL MILLING MACHINE | TO RENEW OBSOLETE EQUIPMENT | PETROCHEMICAL PLANT | 68 |
| 1.11 | PLANING MACHINE | DITTO | AIR FIN COOLER, PETROCHEMICAL PLANT | 81 |
| 1.23 | HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE | TO STRAIGHTEN CYLINDRICAL SHELLS AFTER LONGITUDINAL WELDING | PETROCHEMICAL PLANT | 58 |
| 1.24 | HEAVY DUTY HEAD FLANGING MACHINE | TO FORM HEADS | PETROCHEMICAL PLANT, SUGAR PLANT | 62 |
| 1.25 | HEAVY DUTY HYDRAULIC PRESS MACHINE | TO DISH HEADS AND TO FORM THICK PLATES | DITTO | 81 |
| 1.26 | MECHANICAL PLATE BEND ROLLING MACHINE | TO REINFORCE FACILITIES FOR PRODUCING LARGE PRODUCTS | DITTO | 61 |
| 1.40 | MECHANICAL TUBE FINNING MACHINE | TO PRODUCE FINNED TUBES FOR AIR FIN COOLERS | AIR FIN COOLER | 93 |
| 1.44 | COPIER GAS CUTTING MACHINE | TO REINFORCE FACILITIES FOR INCREASING PRODUCTION | INDUSTRIAL STRUCTURES, GENERAL STRUCTURES | 75 |
| 3.1 | PORTABLE COBALT UNIT AND PORTABLE IRIIDIUM UNIT | TO DETECT INTERNAL DEFECTS IN THICK-WALL WELDS | PETROCHEMICAL PLANT | - |
| 3.3 | COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT | TO DETECT SURFACE DEFECTS IN RAW MATERIALS AND WELDS | DITTO | - |
| 3.4 | PORTABLE ULTRASONIC TESTING UNIT | TO DETECT INTERNAL DEFECTS IN RAW MATERIALS AND WELDS | DITTO | - |
| 3.5 | RADIOGRAPHIC X-RAY TESTING UNIT | TO DETECT DEFECTS IN WELDS | DITTO | - |
| 3.6 | HIGH PRESSURE WATER PUMP | TO MAKE HYDROSTATIC TEST OF PRESSURE VESSELS | DITTO | - |
| 3.8 | UNIVERSAL TESTING MACHINE | TO CONDUCT MECHANICAL TEST FOR GUARANTEE OF PRODUCTS | DITTO | - |
| 4.1 | BOGIE HEARTH FURNACE | FOR HOT FORMING AND POST-WELD HEAT TREATMENT | DITTO | - |
| 4.2 | SHORT GRIT COMPARTMENT UNIT | TO REINFORCE SURFACE TREATMENT FACILITIES FOR PRODUCING NEW TYPES OF PRODUCTS | PETROCHEMICAL PLANT | - |
| 4.7 | ACID CLEANING EQUIPMENT | TO CLEAN RAW MATERIALS, PARTS AND COMPLETED PRODUCTS | PETROCHEMICAL PLANT | - |
| 4.8 | DRYING CHAMBER | FOR AIR FIN COOLERS | AIR FIN COOLER | - |
| 4.9 | PAINTING CHAMBER | DITTO | DITTO | - |

Table 5-1 Training Plan

| | | | | | | |
|-------------------|---|--|--|---------------------------------|--------------------|--|
| Purpose | (1) Level up of Quality Assurance (2) Level up of working skill and skill transfer | | | | | |
| Training System | On the Job Training | | | Off the Job Training | | |
| Trainer | SUPERVISOR | FOREMAN | SUPERVISOR | FOREMAN | INSTRUCTOR | |
| Supplier | (1) Machine Supplier (2) Technical Licensor | Company's Own System | (1) Machine Supplier (2) Technical Licensor | Company's Own System | Consulting Company | |
| Training Material | Supplied Equipment | Working Equipment | Paper | Paper | Paper | |
| Manuals | Operation Manual Instruction Manual Their Own Skill | Their Own Skill Production drawing Operation Specification | Operation Manual Instruction Manual Production drawing | Their Own Skill QC Manual | — | |
| Training Schedule | Day by Day | | | 2 - 3 weeks/year & step by step | | |
| Worker | Inspector, Machinist, Fabricator, welder Assembler, Electrician, Maintenance worker, and so on | | | | | |
| Results | Production: up | | Quality: up | | Moral: up | |

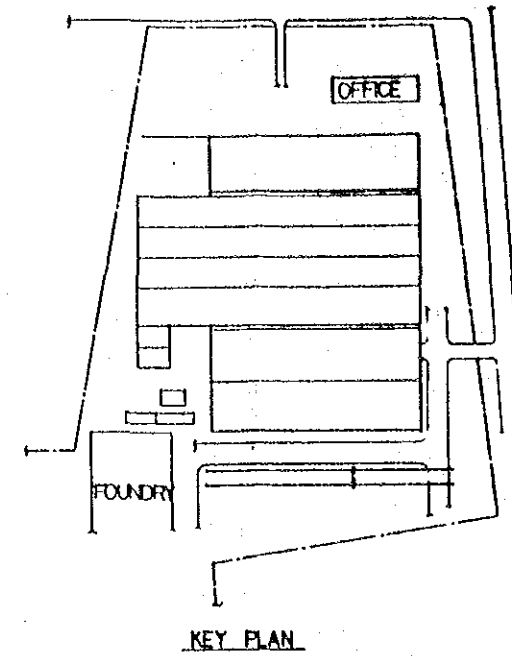
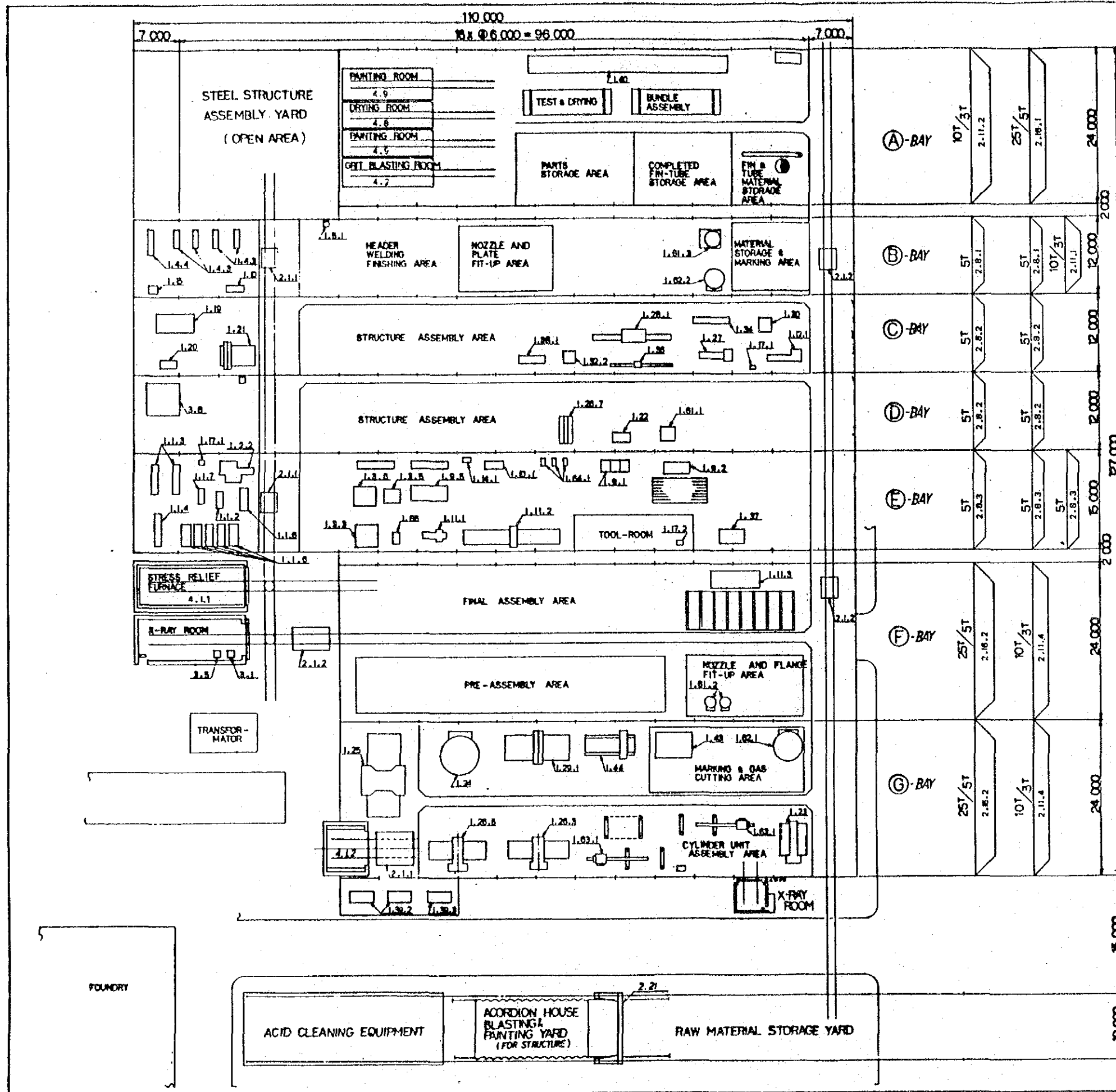
Table 5-2 New Organization and Personnel for P.T. Barrats Jakarta Factory

(EXCEPT FOUNDRY)

| ORGANIZATION | | TOTAL PERSONNEL | SECTION MANAGER | ENGINEER S/V & OFFICER | DIRECT WORKER | INDIRECT WORKER |
|--|---------------------------------------|-----------------|-----------------|------------------------|---------------|-----------------|
| GENERAL AFFAIR DEPARTMENT | PERSONNEL & GENERAL AFFAIR SECTION | 35 | 2 | 21 | | 12 |
| | FINANCE SECTION | | | | | |
| COMMERCIAL DEPARTMENT | SALES & PRICE CALCULATION SECTION | 17 | 2 | 12 | | 3 |
| | PURCHASE & DELIVERY SECTION | | | | | |
| QUALITY CONTROL DEPARTMENT | | 13 | | 3 | | 10 |
| PLANNING & PRODUCTION CONTROL DEPARTMENT | DESIGNING SECTION | 70 | 1 | 18 | | |
| | PLANNING & PRODUCTION CONTROL SECTION | | | | | |
| | PRODUCTION TECHNOLOGY SECTION | | | | | |
| | MAINTENANCE SECTION | | | | | |
| PRODUCTION DEPARTMENT | WORK PROGRAM & MACHINING SECTION | 404 | 1 | 7 | 34 | 24 |
| | PREPARATION SECTION | | | | | |
| | STEEL STRUCTURE SECTION | | | | | |
| | PLATE WORK SECTION | | | | | |
| | ERECTION SECTION | | | | | |
| | | | | | | |
| TOTAL | | 539 | 13 | 98 | 362 | 66 |

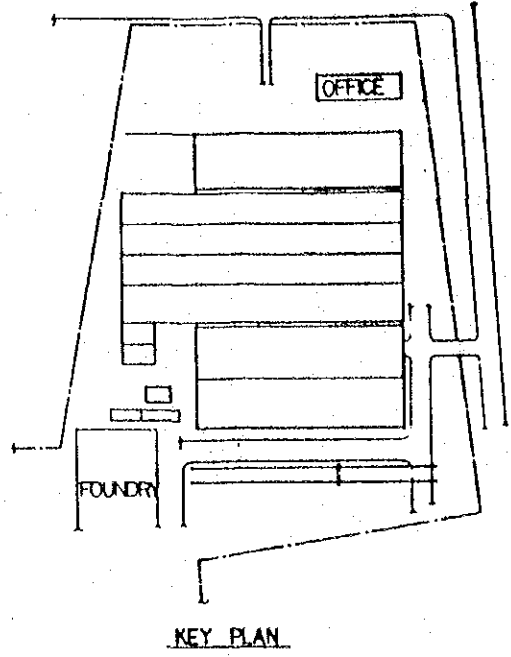
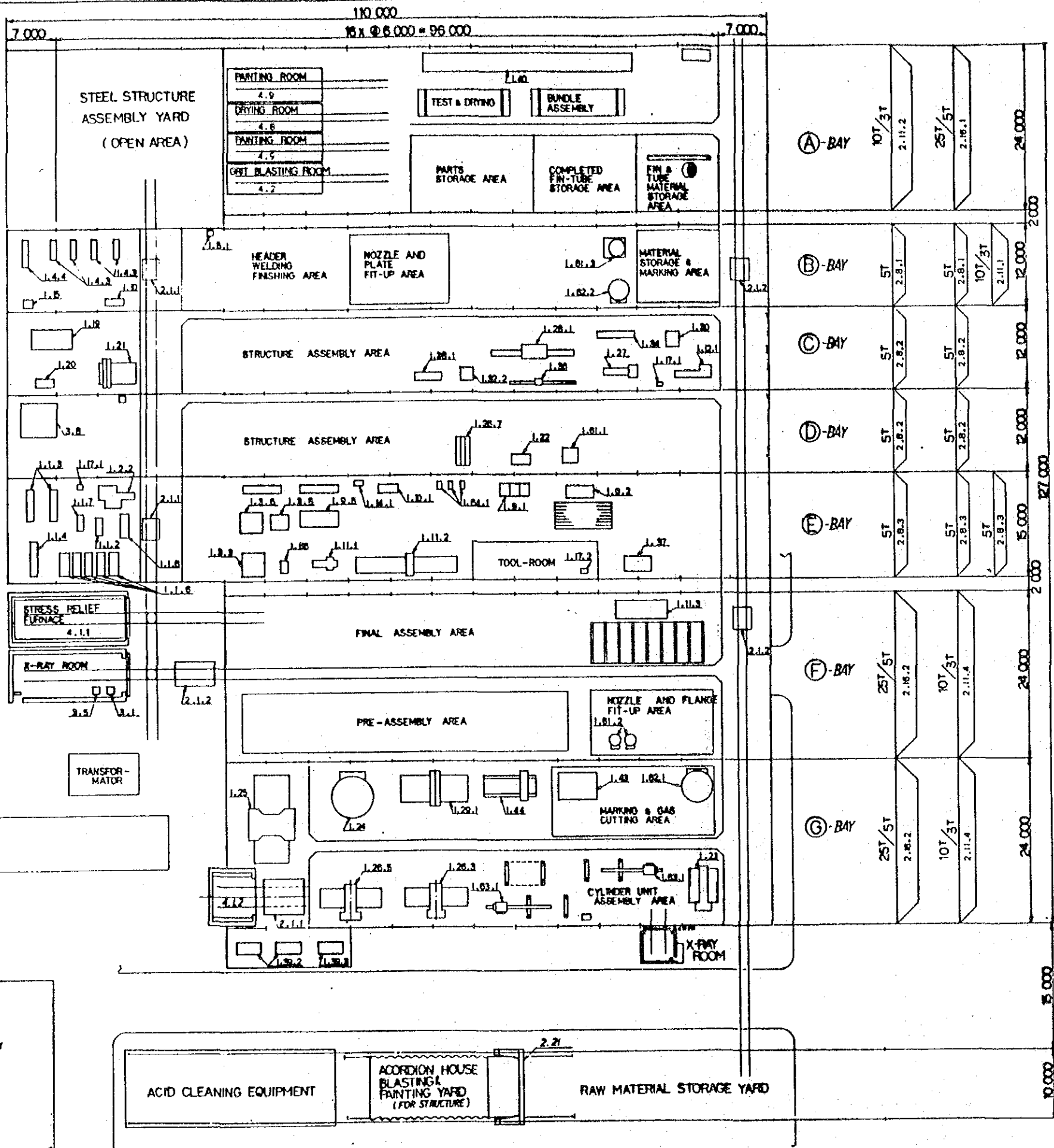
MACHINE NO. AND MACHINE NAME LIST OF FIG. 3-1 LAYOUT PLAN (JAKARTA)

| NO. | MACHINE NAME | NO. | MACHINE NAME |
|------|---|------|--|
| 1.1 | HEAVY DUTY UNIVERSAL LATHE MACHINE | 1.40 | MECHANICAL TUBE FINNING MACHINE |
| 1.2 | HEAVY DUTY FACING LATHE MACHINE | 1.43 | SURFACE PLATE FOR MARKING |
| 1.3 | VERTICAL BORING & TURNING MILL MACHINE | 1.44 | COPIER GAS CUTTING MACHINE |
| 1.4 | HEAVY DUTY RADIAL DRILLING MACHINE | 1.61 | WELDING POSITIONER |
| 1.5 | VERTICAL DRILLING MACHINE PILLAR TYPE | 1.52 | TURNING TABLE FOR GAS CUTTING |
| 1.8 | PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH SWIVEL RAM AND HEAD | 1.53 | BOOM TYPE WELDING MACHINE |
| 1.9 | HORIZONTAL BORING & MILLING MACHINE | 1.64 | SHAPING MACHINE |
| 1.10 | UNIVERSAL MILLING MACHINE | 1.66 | SLOTING MACHINE |
| 1.12 | HEAVY DUTY HYDRAULIC HACKSAW MACHINE | 2.1 | BAY TRANSFER CAR |
| 1.14 | UNIVERSAL TOOL & CUTTING GRINDING | 2.5 | 30 TONS HYDRAULIC TELESCOPIC TRUCK CRANE |
| 1.15 | SEMI-AUTOMATIC GRINDER FOR SHARPENING TWIST DRILL & CORE DRILL | 2.8 | OVERHEAD TRAVELLING CRANE 5 TONS |
| 1.17 | PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS) | 2.11 | OVERHEAD TRAVELLING CRANE 10/3 TONS |
| 1.19 | HEAVY DUTY HYDRAULIC PRESS MACHINE | 2.16 | OVERHEAD TRAVELLING CRANE 25/5 TONS |
| 1.20 | HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT | 2.21 | GANTRY CRANE 25/5 TONS |
| 1.21 | HYDRAULIC PRESS BRAKE MACHINE | 2.39 | PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR |
| 1.22 | HORIZONTAL PROFILE STRAIGHTENING MACHINE | 2.40 | PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR |
| 1.23 | HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE | 3.1 | PORTABLE COBALT UNIT AND PORTABLE IODIUM UNIT |
| 1.24 | HEAVY DUTY HEAD FLANGING MACHINE | 3.3 | COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT |
| 1.25 | HEAVY DUTY HYDRAULIC PRESS MACHINE | 3.4 | PORTABLE ULTRASONIC TESTING UNIT |
| 1.26 | MECHANICAL PLATE BEND ROLLING MACHINE | 3.5 | RADIOGRAPHIC X-RAY TESTING UNIT |
| 1.27 | HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE | 3.6 | HIGH PRESSURE WATER PUMP |
| 1.28 | HYDRAULIC BENDING MACHINE | 3.8 | UNIVERSAL TESTING MACHINE |
| 1.29 | MECHANICAL PLATE SEARING MACHINE | 4.1 | BOGIE HEARTH FURNACE |
| 1.30 | MECHANICAL UNIVERSAL STEEL WORKER MACHINE | 4.2 | SHOT GRIT COMPARTMENT UNIT |
| 1.32 | PUNCHING MACHINE | 4.3 | SAND BLASTING MACHINE |
| 1.34 | MECHANICAL PLATE FORMING MACHINE | 4.7 | ACID CLEANING EQUIPMENT |
| 1.36 | UNIVERSAL FILLING AND BAND SAW MACHINE | 4.8 | DRYING CHAMBER |
| 1.37 | KEY SEATING MACHINE | 4.9 | PAINTING CHAMBER |
| 1.38 | PIPE BEVELLING/EDGING MACHINE | | |
| 1.39 | AIR COMPRESSOR | | |



| NO. | MACHINE NAME | NO. | MACHINE NAME |
|------|---|------|---|
| 1.1 | HEAVY DUTY UNIVERSAL LATHE MACHINE | 1.61 | WELDING POSITIONER |
| 1.2 | HEAVY DUTY FACING LATHE MACHINE | 1.62 | TURNING TABLE FOR GAS CUTTING |
| 1.3 | VERTICAL BORING & TURNING MILL MACHINE | 1.63 | BOOM TYPE WELDING MACHINE |
| 1.4 | HEAVY DUTY RADIAL DRILLING MACHINE | 1.64 | SHAPING MACHINE |
| 1.5 | VERTICAL DRILLING MACHINE PILLAR TYPE | 1.65 | SLOTTING MACHINE |
| 1.6 | PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH SWIVEL RAM AND HEAD | 2.1 | BAY TRANSFER CAR |
| 1.7 | HORIZONTAL BORING & MILLING MACHINE | 2.5 | 30 TONS HYDRAULIC TELESCOPIC TRUCK CRAN |
| 1.8 | UNIVERSAL MILLING MACHINE | 2.8 | OVERHEAD TRAVELLING CRANE 5 TONS |
| 1.9 | HEAVY DUTY HYDRAULIC HACKSAW MACHINE | 2.11 | OVERHEAD TRAVELLING CRANE 10/3 TONS |
| 1.10 | UNIVERSAL TOOL & CUTTING GRINDING | 2.16 | OVERHEAD TRAVELLING CRANE 25/5 TONS |
| 1.11 | SEMI-AUTOMATIC GRINDER FOR SHARPENING TWIST DRILL & CORE DRILL | 2.21 | CANTRY CRANE 25/5 TONS |
| 1.12 | FEDESTAL GRINDING MACHINE, (DOUBLE GRINDING WHEELS) | 2.29 | PAIR OF BRUM ROTATOR WITH DRIVE MOTOR & IDLER ROTATOR |
| 1.13 | HEAVY DUTY HYDRAULIC PRESS MACHINE | 2.40 | PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR |
| 1.14 | HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT | 3.1 | PORTABLE COBALY UNIT AND PORTABLE IDIOL |
| 1.15 | HYDRAULIC PRESS BRAKE MACHINE | 3.3 | COMPLETE SET PORTABLE MAGNETIC PARTICL INSPECTION EQUIPMENT |
| 1.16 | HORIZONTAL PROFILE STRAIGHTENING MACHINE | 3.4 | PORTABLE ULTRASONIC TESTING UNIT |
| 1.17 | HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE | 3.5 | RADIOGRAPHIC X-RAY TESTING UNIT |
| 1.18 | HEAVY DUTY HEAD FLAMING MACHINE | 3.6 | HIGH PRESSURE WATER PUMP |
| 1.19 | MECHANICAL PLATE BEW ROLLING MACHINE | 3.8 | UNIVERSAL TESTING MACHINE |
| 1.20 | HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE | 4.1 | BOGIE HEARTH FURNACE |
| 1.21 | HYDRAULIC BENDING MACHINE | 4.2 | SHOPT GRIT COMPARTMENT UNIT |
| 1.22 | MECHANICAL PLATE BEARING MACHINE | 4.3 | SAND BLASTING MACHINE |
| 1.23 | MECHANICAL UNIVERSAL STEEL WORKER MACHINE | 4.7 | ACID CLEANING EQUIPMENT |
| 1.24 | PUNCHING MACHINE | 4.8 | DRYING CHAMBER |
| 1.25 | MECHANICAL PLATE FORMING MACHINE | 4.9 | PAINTING CHAMBER |
| 1.26 | UNIVERSAL MILLING AND BAND SAW MACHINE | | |
| 1.27 | KEY SEATING MACHINE | | |
| 1.28 | PIPE BEVELLING/EDGING MACHINE | | |
| 1.29 | AIR COMPRESSOR | | |
| 1.30 | MECHANICAL TUBE FIRING MACHINE | | |
| 1.31 | SURFACE PLATE FOR MARKING | | |
| 1.32 | COPYER GAS CUTTING MACHINE | | |

Fig. 3-1 LAYOUT PLAN (JAKARTA)



| NO. | MACHINE NAME | NO. | MACHINE NAME |
|------|---|------|--|
| 1.1 | HEAVY DUTY UNIVERSAL LATHE MACHINE | 1.81 | WELDING POSITIONER |
| 1.2 | HEAVY DUTY FACING LATHE MACHINE | 1.82 | TURNING TABLE FOR GAS CUTTING |
| 1.3 | VERTICAL BORING & TURNING MILL MACHINE | 1.83 | BOOM TYPE WELDING MACHINE |
| 1.4 | HEAVY DUTY RADIAL DRILLING MACHINE | 1.84 | SHAPING MACHINE |
| 1.5 | VERTICAL DRILLING MACHINE PILLAR TYPE | 1.85 | SLOTING MACHINE |
| 1.6 | PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH SWIVEL RAM AND HEAD | 2.1 | RAY TRANSFER CAR |
| 1.7 | HORIZONTAL BORING & MILLING MACHINE | 2.2 | 30 TONS HYDRAULIC TELESCOPIC TRUCK CRANE |
| 1.8 | UNIVERSAL MILLING MACHINE | 2.3 | OVERHEAD TRAVELLING CRANE 5 TONS |
| 1.9 | HEAVY DUTY HYDRAULIC BACKRAN MACHINE | 2.4 | OVERHEAD TRAVELLING CRANE 10/3 TONS |
| 1.10 | UNIVERSAL MILLING MACHINE | 2.5 | OVERHEAD TRAVELLING CRANE 25/5 TONS |
| 1.11 | HEAVY DUTY HYDRAULIC BACKRAN MACHINE | 2.6 | GANTRY CRANE 25/5 TONS |
| 1.12 | UNIVERSAL TOOL & CUTTING GRINDING | 2.21 | PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR |
| 1.13 | SEMI-AUTOMATIC CRINDER FOR SHARPENING TWIST DRILL & CORE DRILL | 2.22 | PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR |
| 1.14 | PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS) | 2.23 | PORTABLE CORALY UNIT AND PORTABLE IODIUM UNIT |
| 1.15 | HEAVY DUTY HYDRAULIC PRESSES MACHINE | 2.24 | COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT |
| 1.16 | HYDRAULIC STRAIGHTENING PRESSES MACHINE FOR SHAFT | 2.25 | PORTABLE ULTRASONIC TESTING UNIT |
| 1.17 | HYDRAULIC PASSES BRAKE MACHINE | 2.26 | RADIOGRAPHIC X-RAY TESTING UNIT |
| 1.18 | HORIZONTAL PROFILE STRAIGHTENING MACHINE | 2.27 | HIGH PRESSURE WATER PUMP |
| 1.19 | HORIZONTAL CYLINDRICAL SWELL STRAIGHTENING MACHINE | 2.28 | UNIVERSAL TESTING MACHINE |
| 1.20 | HEAVY DUTY HEAD FLANGING MACHINE | 2.29 | BOGIE HEARTH FURNACE |
| 1.21 | HEAVY DUTY HYDRAULIC PRESSES MACHINE | 2.30 | SHOPT GRIT COMPARTMENT UNIT |
| 1.22 | MECHANICAL PLATE BEND ROLLING MACHINE | 2.31 | SAND BLASTING MACHINE |
| 1.23 | HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE | 2.32 | ACID CLEANING EQUIPMENT |
| 1.24 | HYDRAULIC BENDING MACHINE | 2.33 | DRYING CHAMBER |
| 1.25 | MECHANICAL PLATE BEARING MACHINE | 2.34 | PAINTING CHAMBER |
| 1.26 | MECHANICAL UNIVERSAL STEEL WORKER MACHINE | | |
| 1.27 | PUNCHING MACHINE | | |
| 1.28 | MECHANICAL PLATE FORMING MACHINE | | |
| 1.29 | UNIVERSAL FILLING AND SAND RAM MACHINE | | |
| 1.30 | KEY SEATING MACHINE | | |
| 1.31 | PIPE BEVELLING/EDGING MACHINE | | |
| 1.32 | AIR COMPRESSOR | | |
| 1.33 | MECHANICAL TUBE FINNING MACHINE | | |
| 1.34 | SURFACE PLATE FOR MARKING | | |
| 1.35 | COPIER GAS CUTTING MACHINE | | |

Fig. 3-1 LAYOUT PLAN (JAKARTA)

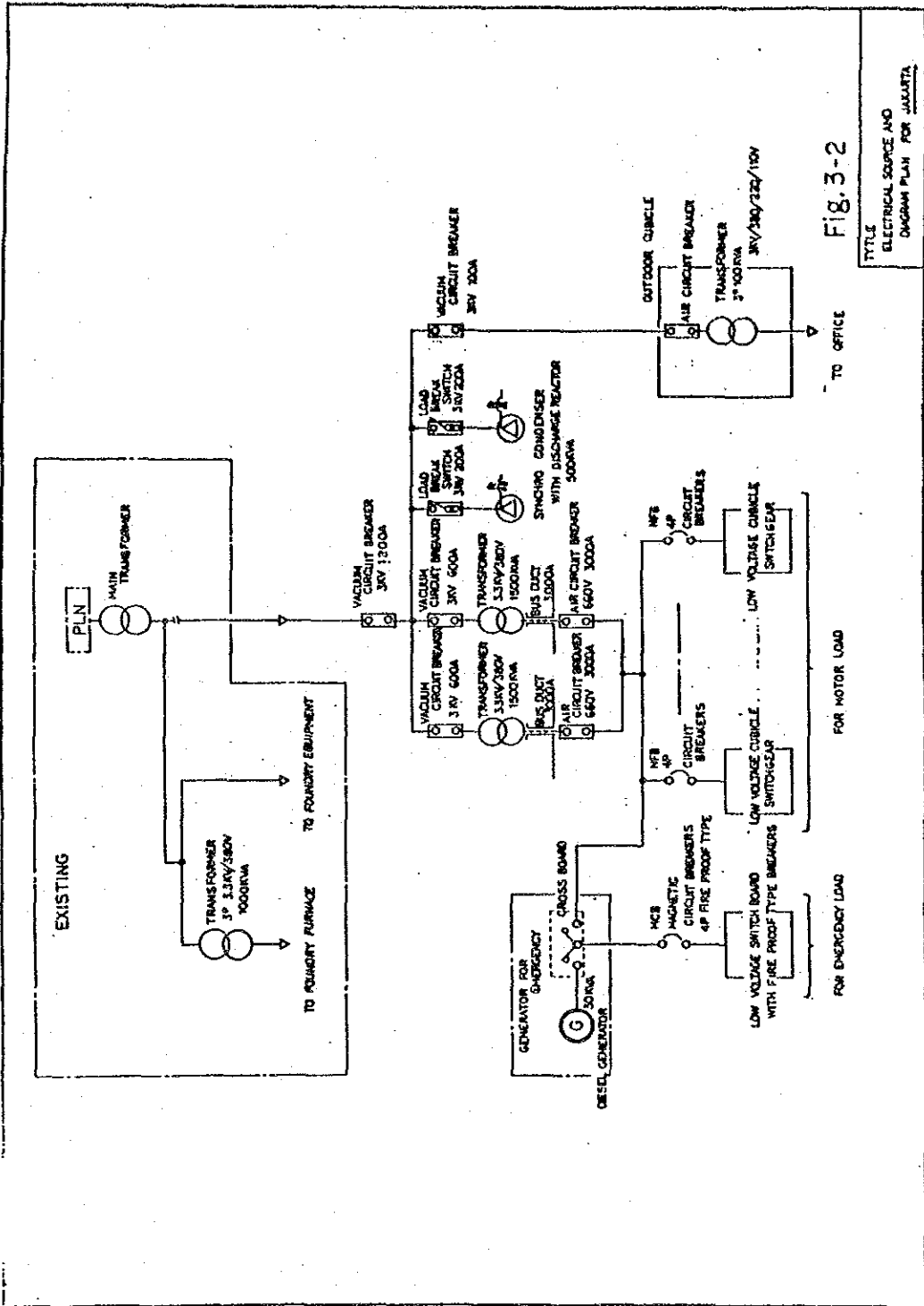


Fig.3-2

TITLE
ELECTRICAL SOURCE AND
DIAGRAM PLAN FOR JAKARTA

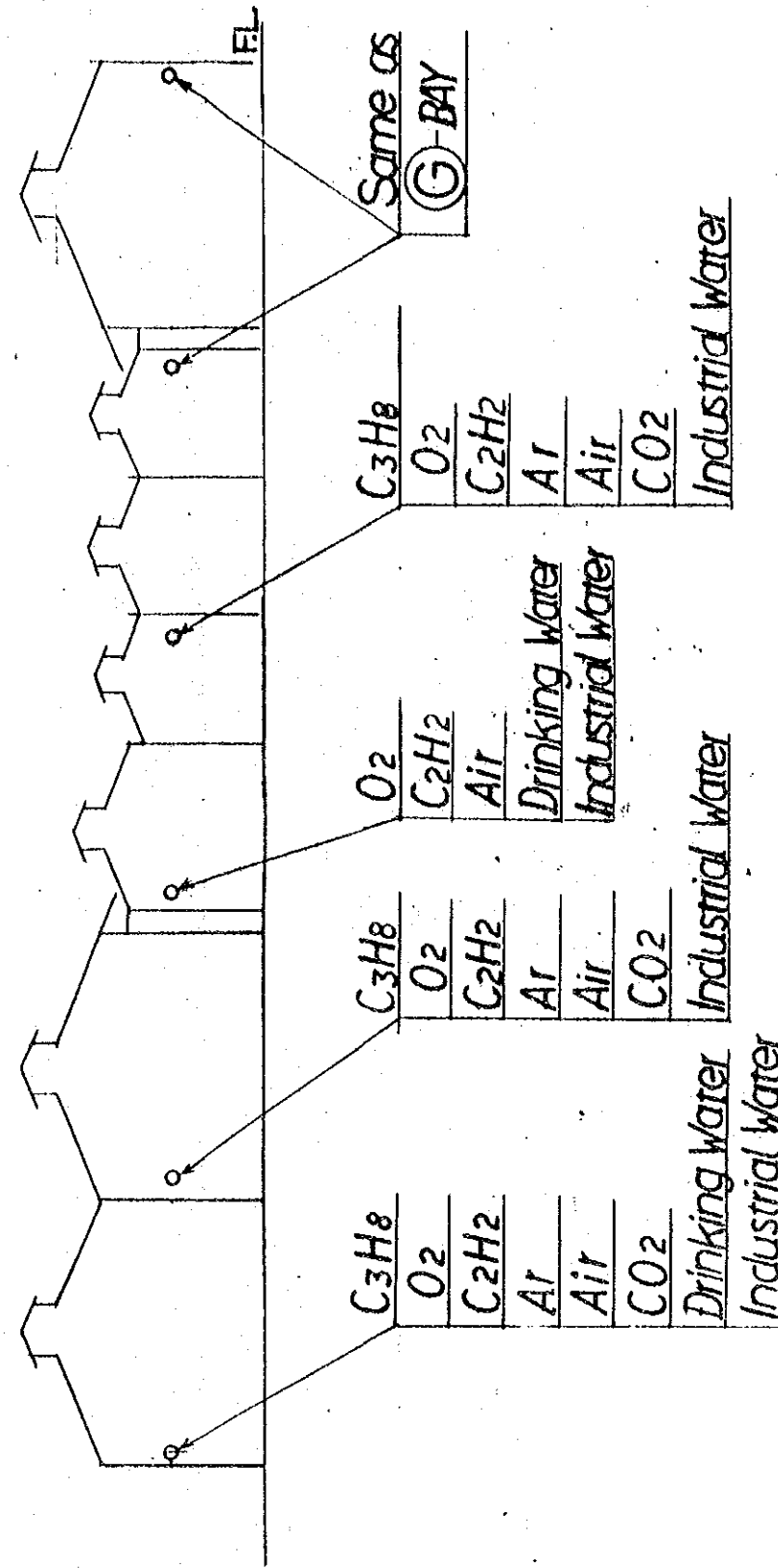
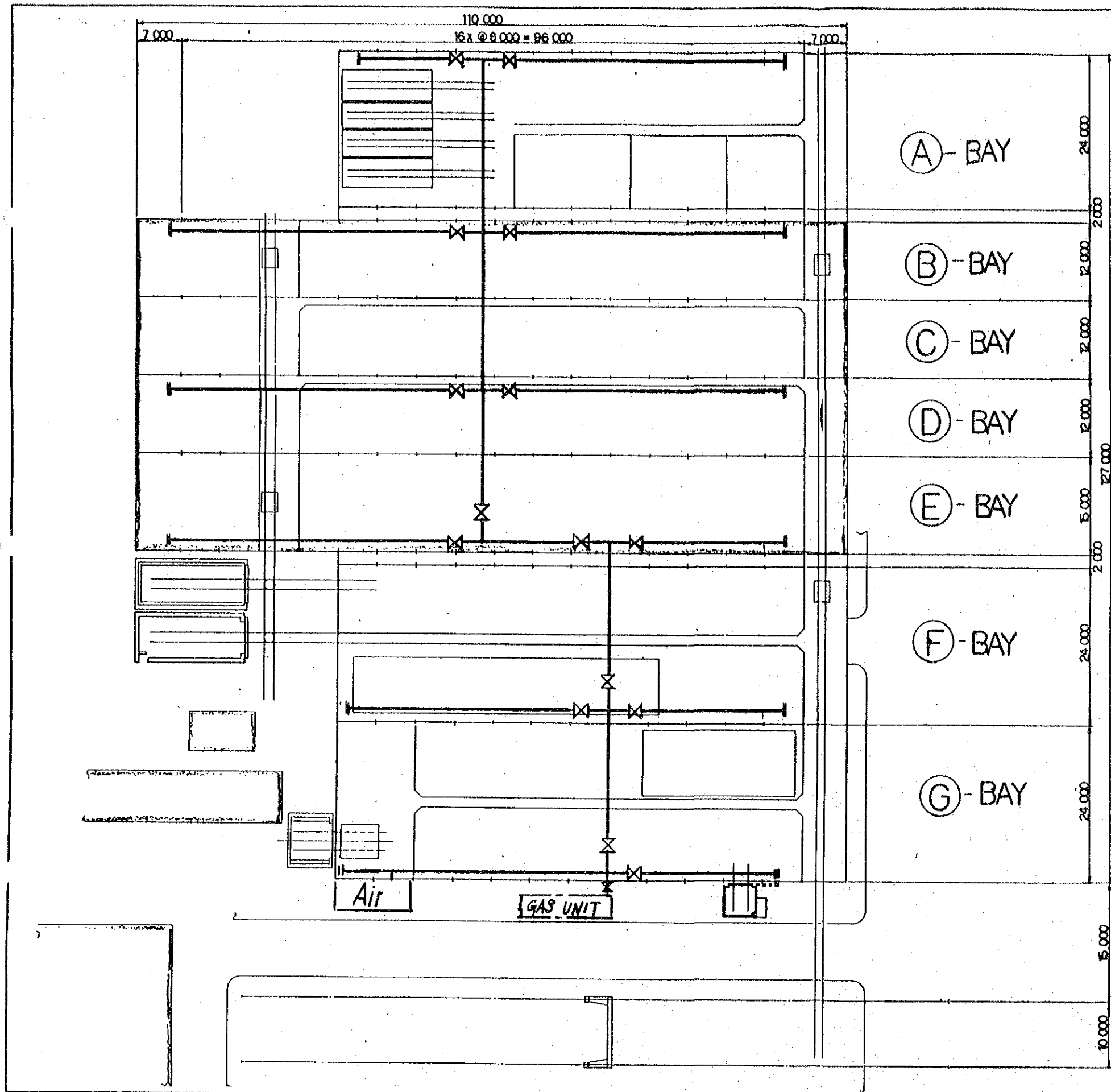


Fig.3-4 UTILITY PIPING

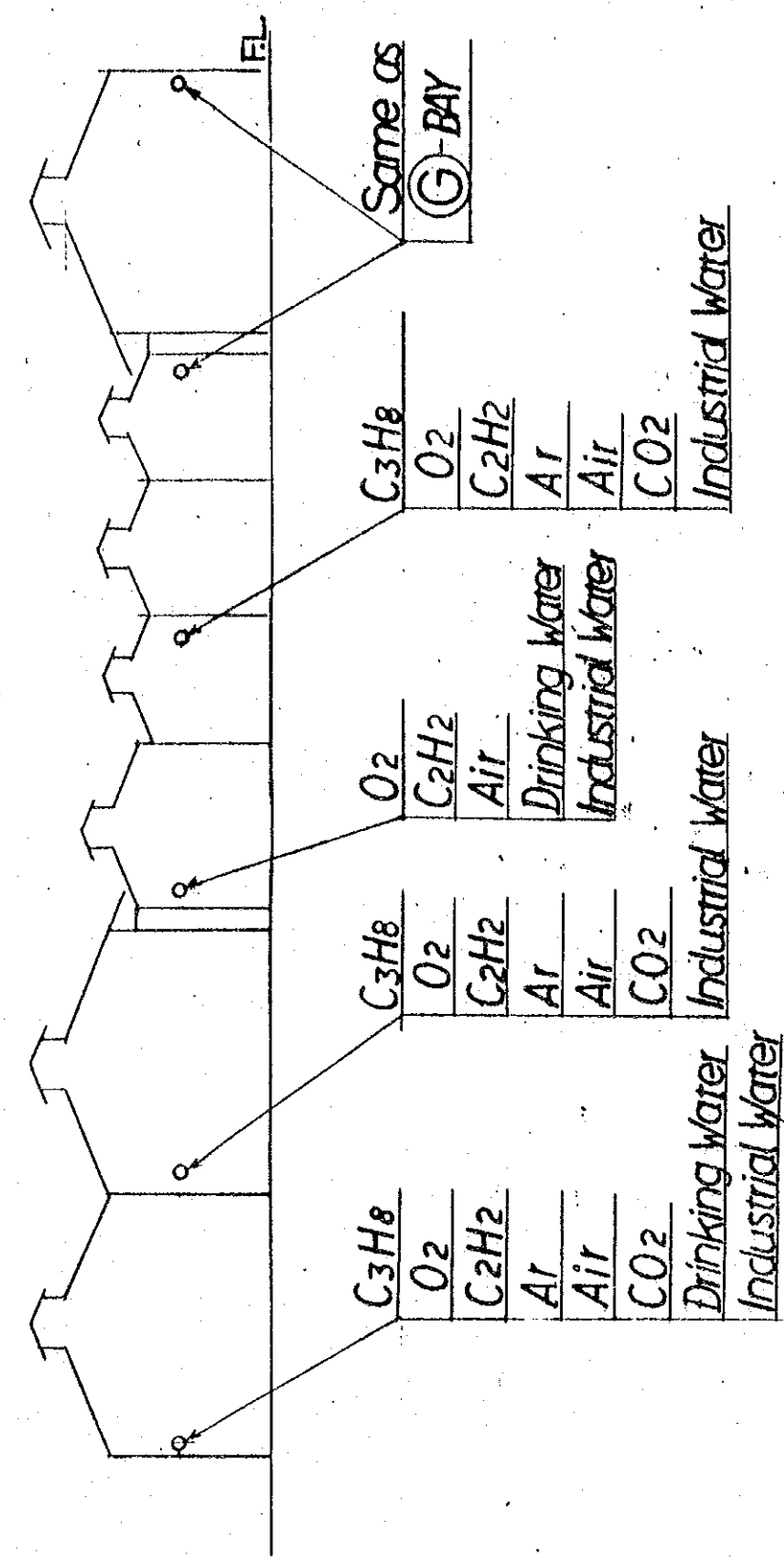
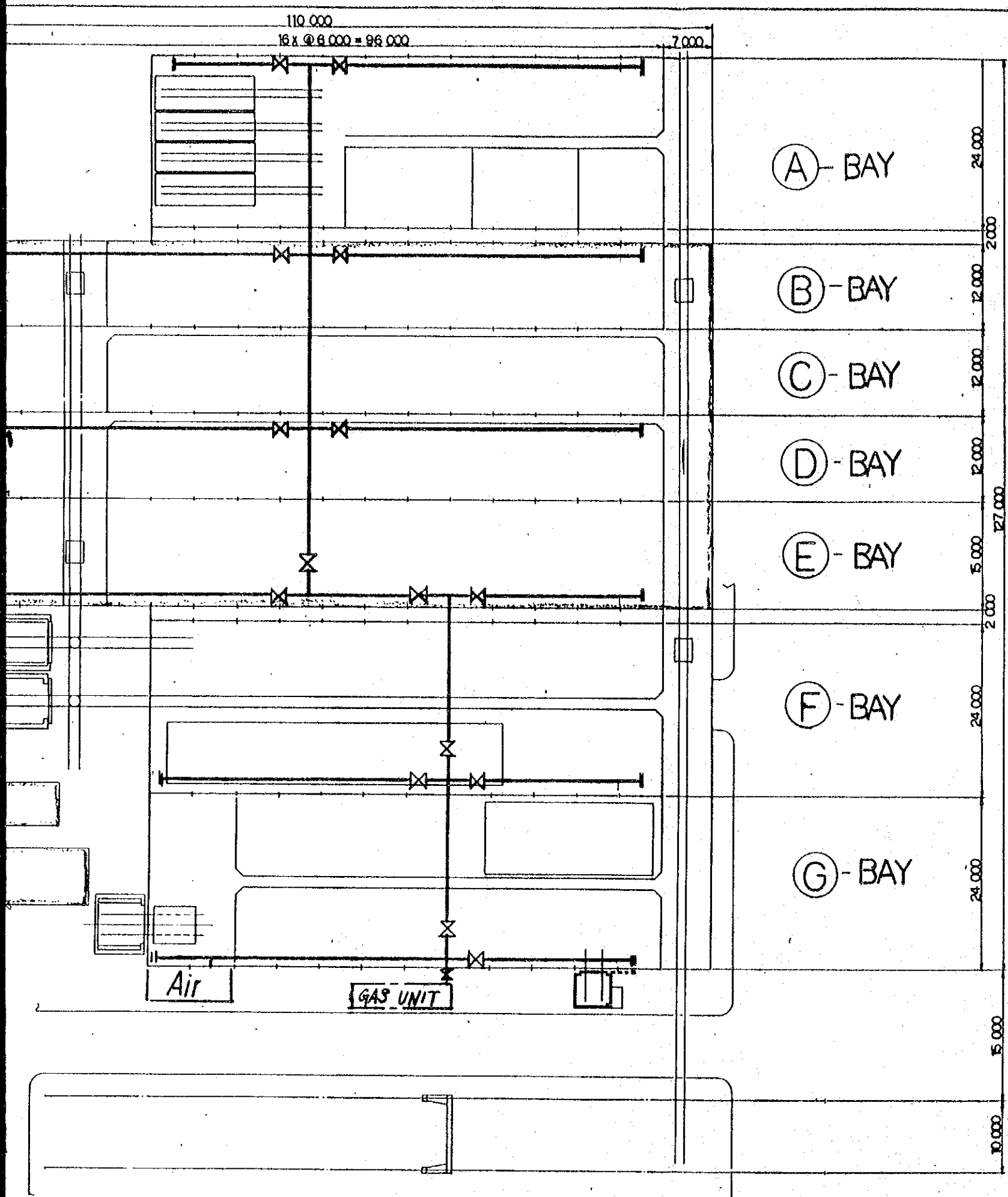


Fig.3-4 UTILITY PIPING PLAN
(JAKARTA)

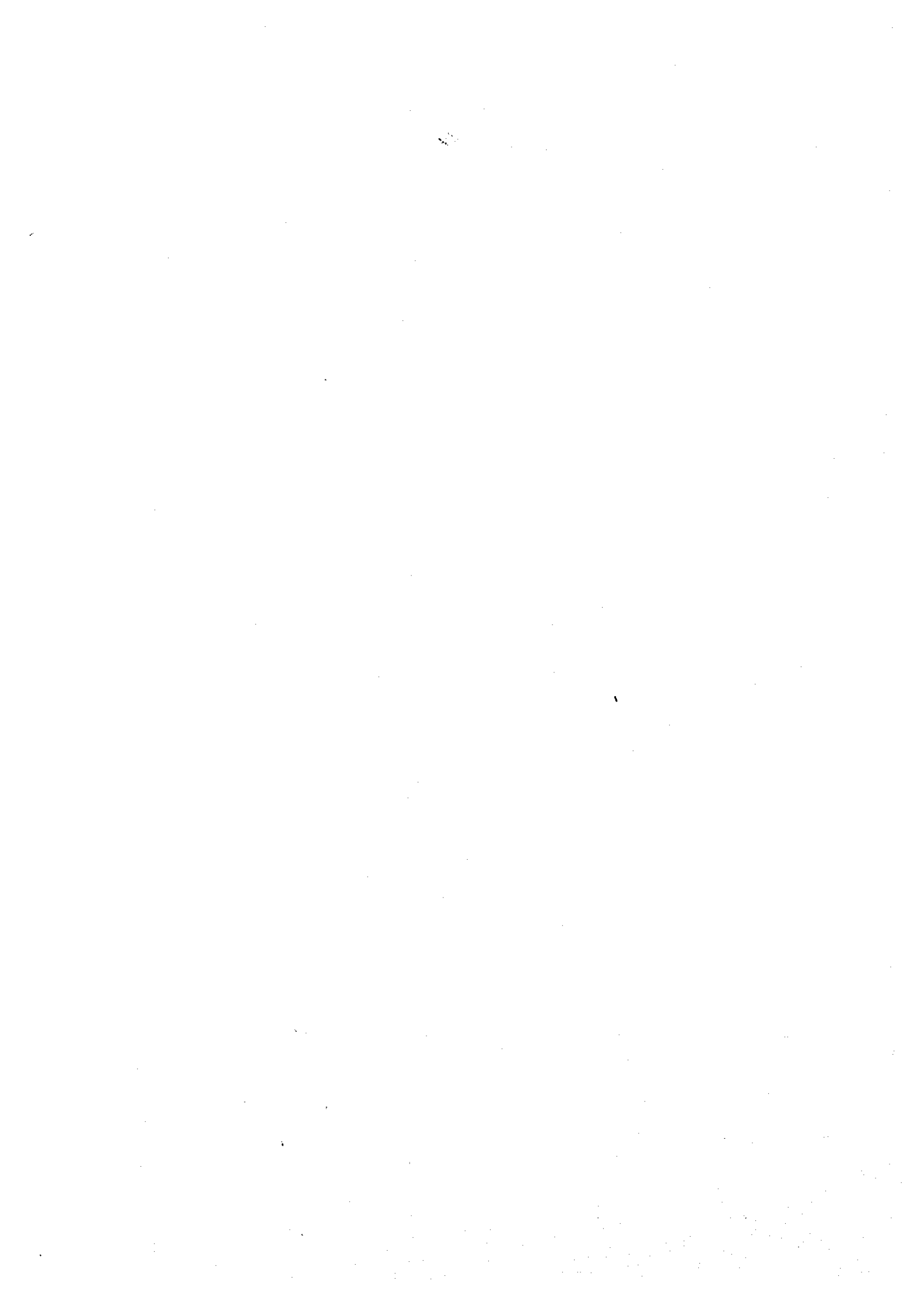
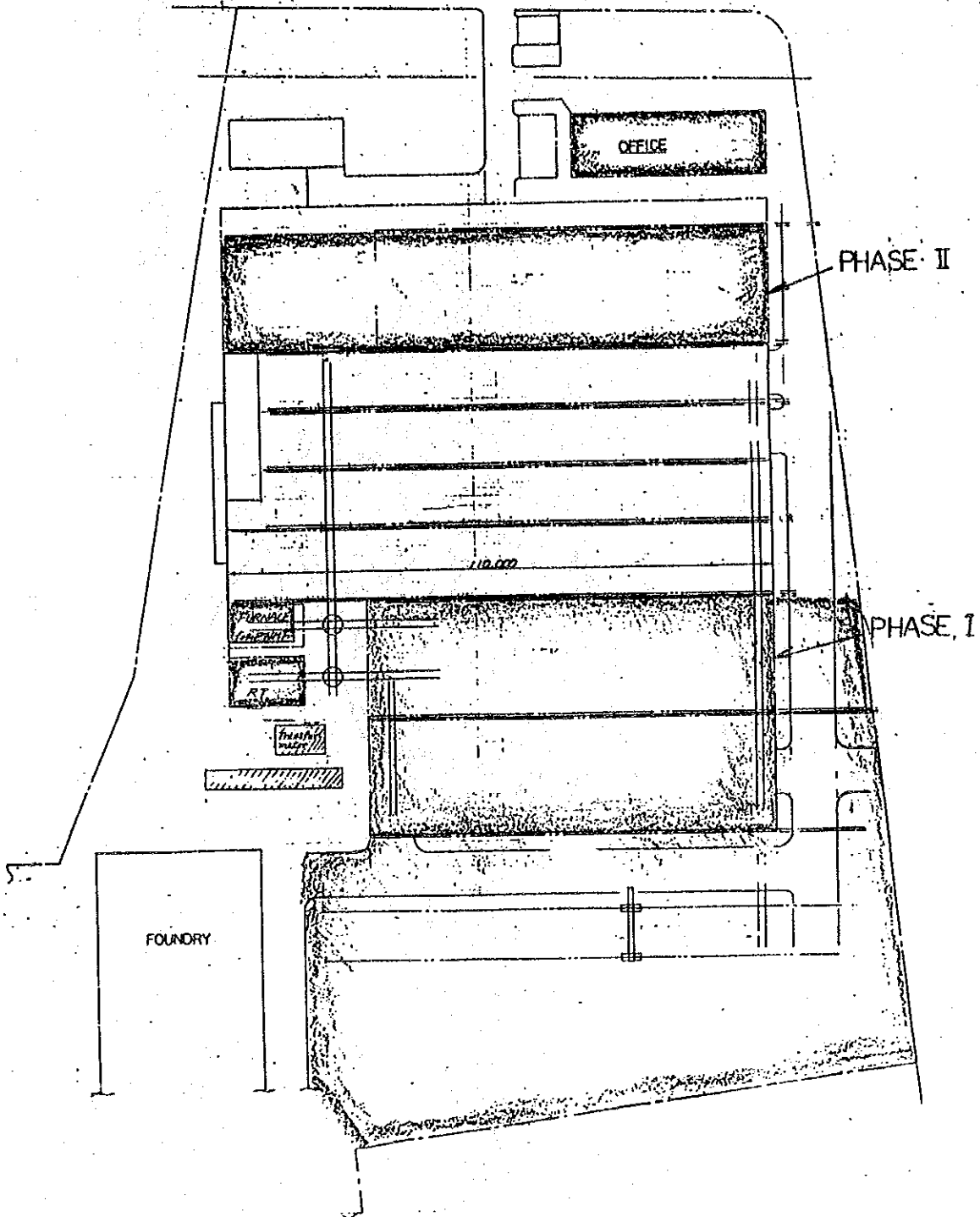


Fig.3-5 LAND PREPARATION PLAN
(JAKARTA)



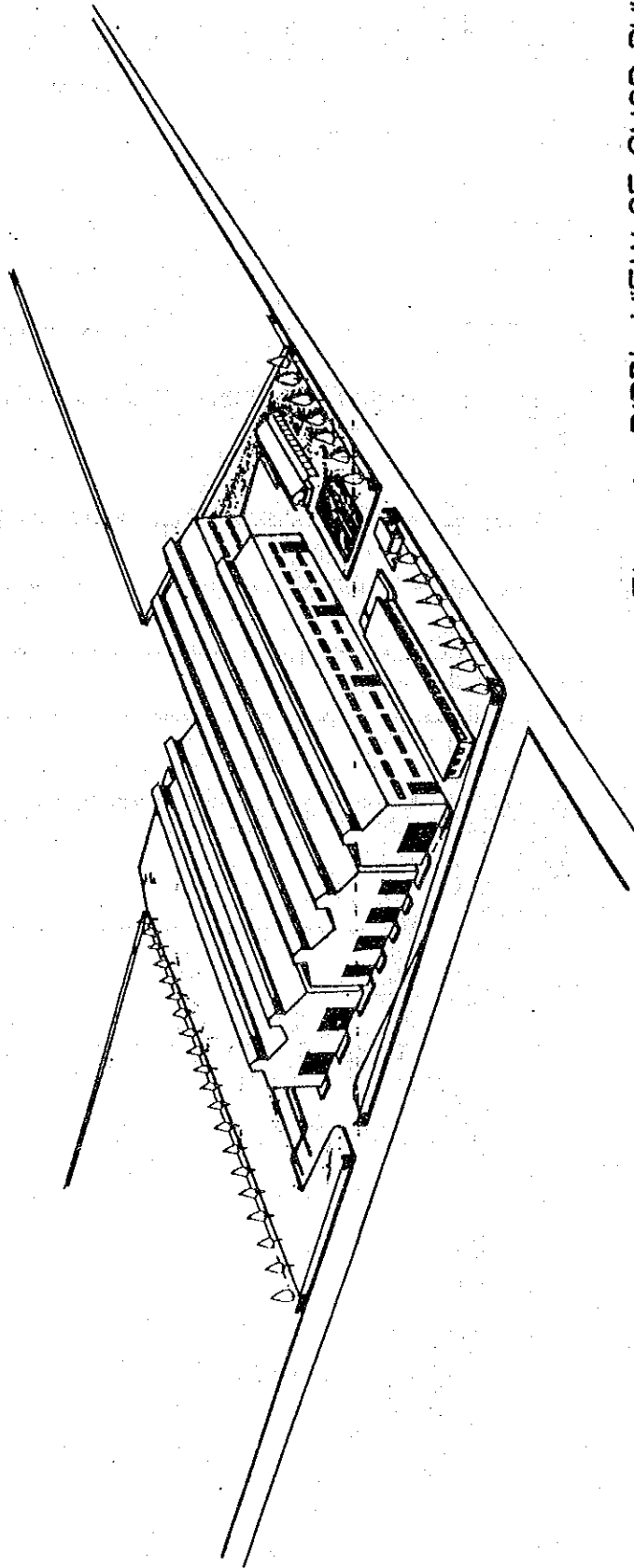
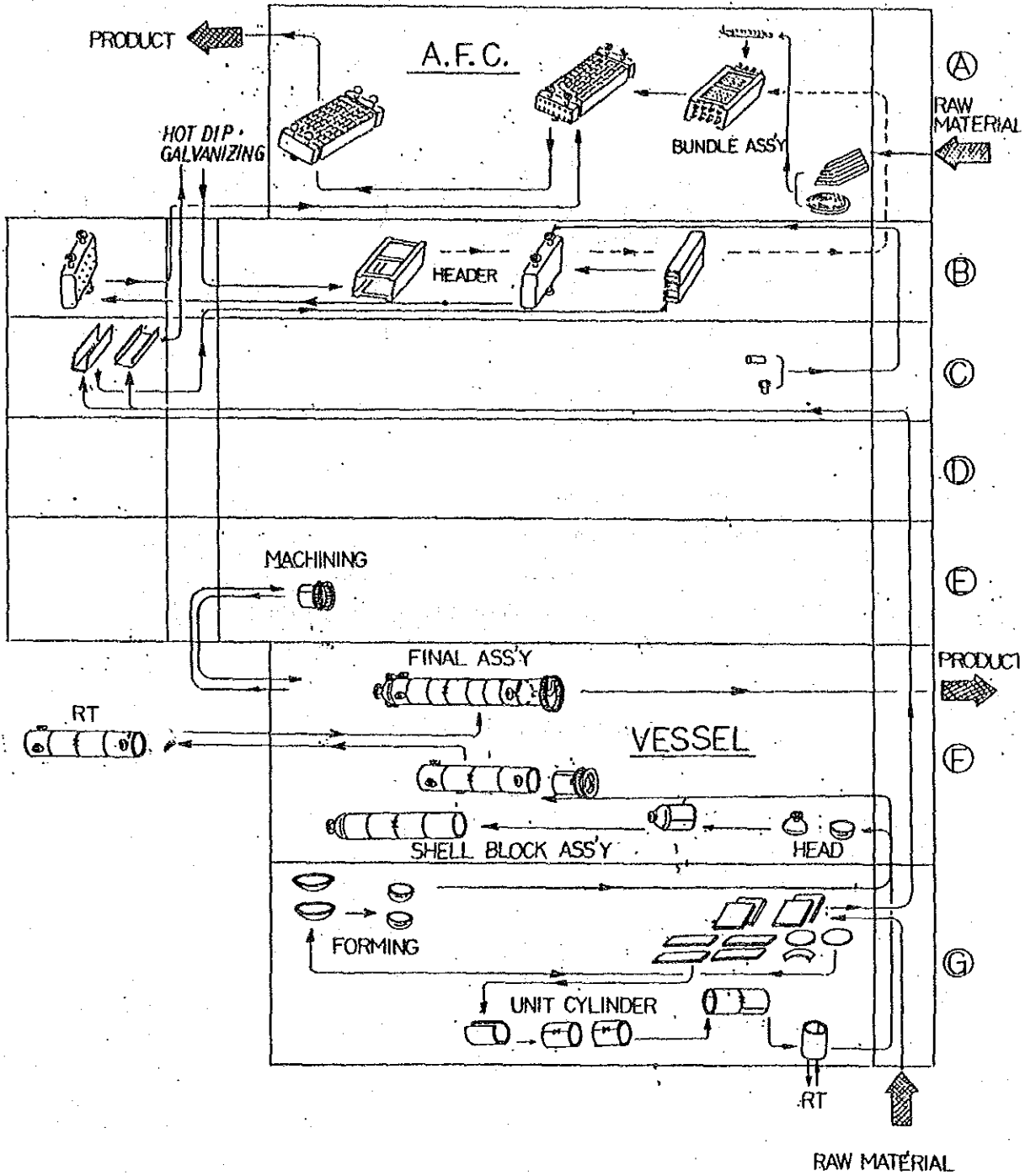
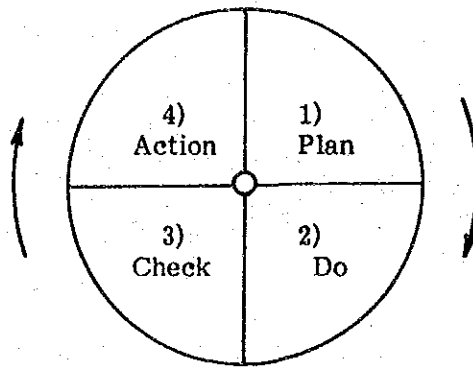


Fig. 3-6 BIRD'S VIEW OF SHOP BUILDING
(JAKARTA)

Fig.4-1 MANUFACTURING PROCESS FLOW

(JAKARTA)





- (1) Plan a job. (Plan)
- (2) Do the job as planned. (Do)
- (3) Check the job for result done. (Check)
- (4) Based on the result, correct the plan. (Action)

Fig. 5-1 P.D.C.A Managerial Circle.

UNIT: 1,000,000 YEN

Fig. 5-2 TRAINING COST FOR P. T. BARATA INDONESIA JAKARTA FACTORY

| TRAINING ITEM | YEAR | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|--|----------|------|------|------|------|------|------|
| FOR ENGINEER 1. PRODUCTION CONTROL 2. PRODUCTION TECHNIQUE 3. QUALITY CONTROL | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| FOR WORKER 1. MACHINE WORKER 2. WELDING 3. FORMING 4. INSPECTION, ETC | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| TRAINING COST | FOREIGN | | | | | | |
| | DOMESTIC | | | | | | |

↑ INTO OPERATION

SUPERVISOR BY TECHNICAL LICENSE 2 YEARS

F: 56.85 F: 47.38
 D: 43.15 D: 35.95

F: 9.48 F: 11.09
 D: 7.19 D: -

SUPERVISOR BY MACHINE SUPPLIER

F: 12.82
 D: -

BY COMPANY'S OWN SYSTEM

FOREIGN

DOMESTIC

LIST I-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 5 Cutting Equipment

| No. | Code | Machine Item | Qty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion | | | |
|-----|---------|-----------------------------|-----|--|--|---------------------|-------------------|-----------|-------------|-------------|------------|---------------|---|---|
| | | | | | | | Loading % | Tolerance | Workability | Maintenance | | Modernization | | |
| 1 | MEL. 84 | PLATE CUTTING MACHINE | 1 | - Efreast - Germany | Max. plate thickness : 3 mm Max. length of plate : 2500 mm | 3 HP | 70 | II | II | II | | | 0 | |
| 2 | MEL. 80 | CIRCULAR SAWING MACHINE | 1 | - Heller Hydraulic | Saw. blade diameter : ø770 mm Max. sawing capacity : 230 mm Vertical moving : 250 mm | 10,8 HP 1440 RPM | 40 | III | II | III | | | | x |
| 3 | MFF. 85 | PROFILE CUTTING MACHINE | 1 | - Warszowa fabryka Polandia. - Warszowa Wlochy - N.V.13. - No. Serie 61460 - 1960 | Max. Cutting capacity : ø100 mm (rotary saw) | 25,8 HP | 80 | II | II | III | | 0 | | 0 |
| 4 | MGR. 81 | HACK SAWING MACHINE | 1 | - Rumania - No. Serie 1171 - 1963 | Blade size : 370 mm Max. cutting capacity : 5 inch | 2,5 HP 1500 RPM | 40 | III | II | II | | | | 0 |
| 5 | MGR. 82 | HACK SAWING MACHINE | 1 | - Rumania - No. Serie 1172 - 1963 | Blade size : 370 mm Max. cutting capacity : 5 inch | 2,5 HP 1500 RPM | 40 | III | II | II | | | | 0 |
| 6 | MGR. 83 | HACKSAWING MACHINE | 1 | - Rocine | Max. cutting capacity : ø200 mm Max. hack moving : 150 mm | 1 HP 920 RPM | 0 | III | III | III | | x | | x |
| 7 | MPP 87 | ROLLING CUTTING MACHINE | | | | | 10 | III | II | II | | | | x |
| 8 | MP 55 | PRESS STRAIGHTENING MACHINE | | | | | 30 | III | III | III | | | | x |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAWARTA Machine Item: 6 Forming Machine

| No. | Machine Item | Qty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion | |
|-----|----------------------------------|-----|--|---|--------------------|-------------------|-----------|-------------|-------------|------------|---------------|
| | | | | | | Loading | Tolerance | Workability | Maintenance | | Modernization |
| 1 | NRL. PLATE ROLLING 50 MACHINE | 1 | - Donald Johns - Lone - No. 38/72. | Max. plate thickness : 1 inch Max. length of plate : 2500 mm | 35 HP 485 RPM | 30 | III | III | II | | x |
| 2 | NRL. PLATE ROLLING 51 MACHINE | 1 | - Plate Frons | Max. plate thickness : 0.5 inch Max. length of plate : 2000 mm | 7.5 HP 1450 RPM | 70 | III | II | II | O | O |
| 3 | NRL. PLATE ROLLING 52 MACHINE | 1 | - | Max. plate thickness : 3/8 mm Max. length of plate : 2000 mm | 3 HP | 20 | III | II | III | | x |
| 4 | NRL. ZINC ROLLING 53 MACHINE | 1 | - | Max. plate thickness : 2 mm Max. length of plate : 2500 mm | 5.5 HP 710 RPM | 5 | III | II | II | | x |

LIST I-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 10 Machinery - 1

| No. | Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | | |
|-----|----------|---------------|------|---|--|---------------------|-------------------|-----------|-------------|-------------|---------------|------------|
| | | | | | | | Loading % | Tolerance | Workability | Maintenance | Modernization | Conclusion |
| 1 | B. 10 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - No. Serie 635088 - 1963 | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : ϕ 50 mm | 10.2 HP 1500 RPM | 50 | III | II | II | 0 | 0 |
| 2 | B. 11 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - No. 635084 - 1963. | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : ϕ 50 mm | 10.2 HP 1500 RPM | 50 | III | II | II | 0 | 0 |
| 3 | B. 12 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - No. serie 635079 - 1963 | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : ϕ 50 mm | 10.2 HP 1500 RPM | 50 | III | II | II | 0 | 0 |
| 4 | B. 13 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - No. 635092 - 1963 | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : ϕ 50 mm | 10.2 HP 1500 RPM | 50 | III | II | II | 0 | 0 |
| 5 | B. 14 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - NO. 635082 - 1963 | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : ϕ 50 mm | 10.2 HP 1500 RPM | 50 | III | II | II | 0 | 0 |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JASARTA Machine Item: 10 Machinery - 2

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion | |
|------------|---------------|------|--|---|---------------------|-------------------|-----------|-------------|-------------|------------|--------------------|
| | | | | | | Loading % | Tolerance | Workability | Maintenance | | Moderni- zation |
| 6 B. 15 | LATHE MACHINE | 1 | - Bulgaria - 3 MM Sofia - C.S.B.No.170 - 1965 | Max. centre distance : 1000 mm Centre height above machine bed : 215 mm Centre height above gap: 330 mm Centre height above carriage : 160 mm Spindle bore : - | 5.5 HP 1440 RPM | - | - | - | - | - | x |
| 7 B. 16 | LATHE MACHINE | 1 | - Rumania - S.N. 400 - No. 635087 - 1963 | Max. centre distance : 1500 mm Centre height above machine bed : 200 mm Centre height above carriage : 110 mm Spindle bore : 450 mm | 10.2 HP 1500 RPM | 50 | III | III | II | O | O |
| 8 B. 17 | LATHE MACHINE | 1 | | Max. centre distance : 1380 mm Centre height above machine bed : 185 mm Centre height above gap: 325 mm Centre height above carriage : 135 mm Spindle bore : 452 mm | 2 HP 1500 RPM | 0 | III | III | III | x | x |
| 9 B. 18 | LATHE MACHINE | 1 | | Max. centre distance : 1380 mm Centre height above machine bed : 185 mm Centre height above gap: 325 mm Centre height above carriage : 135 mm Spindle bore : 452 mm | 3 HP 950 RPM | 0 | III | III | III | x | x |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 10 Machinery - 3

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | | |
|----------|---------------|------|--|---|-------------------|-------------------|-----------|-------------|-------------|---------------|------------|
| | | | | | | Loading % | Tolerance | Workability | Maintenance | Modernization | Conclusion |
| 10 B. 19 | Turret lathe | 1 | - Cleveland Ohio - Warner & Seasey - Lot NO. 195 | Distance chuck to the turret end : 490 mm Centre height above machine bed : 225 mm Centre height above carriage : 120 mm | 3 HP 1000 RPM | 10 | III | II | II | O | O |
| 11 B. 21 | LATHE MACHINE | 1 | - Nederland (Den Haag) | Max. centre distance : 1360 mm Centre height above machine bed : 230 mm Centre height above gap: 430 mm Centre height above carriage : 150 mm Spindle bore : 633 mm | 3 HP 950 RPM | 0 | III | III | III | x | x |
| 12 B. 22 | LATHE MACHINE | 1 | - Ikegai | Max. centre distance : 3000 mm Centre height above machine bed : 390 mm Centre height above gap: - Centre height above carriage : 250 mm Spindle bore : 6100 mm | 25 HP | 30 | III | II | II | | O |
| 13 B. 23 | LATHE MACHINE | 1 | - R.S. Stockvis & Zonen - Rotterdam - Lodge & Ship ley 25" lathe | Max. centre distance : 2860 mm Centre height above machine bed : 340 mm Centre height above carriage : 250 mm Spindle bore : 670 mm | 25 HP 1465 RPM | 70 | III | II | III | | O |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 10 Machinery - 4

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion |
|---------------|-------------------------------------|------|-------------------------|--|-------------------|-------------------|-----------|-------------|-------------|------------|
| | | | | | | Loading % | Tolerance | Workability | Maintenance | |
| 14 B. 24 | LATHE MACHINE | 1 | | Max. centre distance : 2500 mm Centre height above machine bed : 285 mm Centre height above gap: 445 mm Centre machine above carriage : 215 mm Spindle bore : 654 mm | 4 HP 960 RPM | 30 | III | II | III | x |
| 15 BB. 43 | FACING LATEE MACHINE | 1 | | Max. centre distance : 2400 mm Centre height above machine bed : 950 mm | 10 HP 250 RPM | 5 | III | III | III | o |
| 16 KES. 41 | VERTICAL BORING MILL MACHINE | 1 | | Table diameter : 1200 mm Max. turning diameter : 1270 mm Max. turning height : 900 mm | 6 HP 1440 RPM | 25 | III | III | III | o |
| 17 KES. 42 | VERTICAL BORING MILL MACHINE | 1 | - O.M. Ltd. | Table diameter : 1250 mm Max. turning diameter : 1600 mm Max. turning height : 1030 mm Max. loading weight : 4000 Kgs | 24 HP 1450 RPM | Full | II | I | I | o |
| 18 K. 36 | HORIZONTAL BORING & MILLING MACHINE | 1 | - Lucas Preise - | Max. head travel : na. Max. table long. travel: Max. workpiece width : 1850 mm Max. spindle travel : | 10 HP 1465 RPM | 80 | III | II | III | o |
| 19 SKR. 39 | PLANING MACHINE | 1 | | Table length : 2860 mm Table width : 800 mm Max. planing height : 1000 mm Max. planing length : 2620 mm Max. planing width : 1200 mm | 5 HP | 80 | III | II | II | o |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 10 Machinery - 5

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Loading % | Tolerance | Machine Condition | | | Conclusion |
|------------------|-------------------------|------|---|---|-------------------|-----------|-----------|-------------------|-------------|---------------|------------|
| | | | | | | | | Workability | Maintenance | Modernization | |
| 20 SKR. 40 | PLANING MACHINE | 1 | | Table length : 3300 mm Table width : 760 mm Max. planing height : 780 mm Max. planing length : 3000 mm Max. planing width : - | 3 HP | 30 | III | II | III | | x |
| 21 SKR. 32 | SHAPING MACHINE | 1 | - Bucharest masine - Rumania - Infracirea - 1963 | Table length : 420 mm Table width : 310 mm Max. tool-head travel : 420 mm Max. table vertical travel : 280 mm Max. table longitudinal travel : 480 mm | 2.2 KW 940 RPM | 90 | III | II | I | O | O |
| 22 SKR. 31 | SHAPING MACHINE | 1 | - Bucharest masine - Rumania - Infracirea - No. Setie 2015 - 1963 | Table length : 420 mm Table width : 310 mm Max. tool-head travel : 420 mm Max. Table vertical travel : 280 mm Max. table longitudinal travel : 480 mm | 2.2 KW 940 RPM | 90 | III | II | I | O | O |
| 23 SKR. 30 | SHAPING MACHINE | 1 | - Bucharest masine - Rumania - Infracirea - No. Setie 2015 | Table length : 420 mm Table width : 310 mm Max. tool-head travel : 420 mm Max. Table vertical travel : 280 mm Max. table longitudinal travel : 480 mm | 2.2 KW 940 RPM | 90 | III | II | I | O | O |
| 24 BOR. 59 | COLDEN DRILLING MACHINE | 1 | - Carl schlipfer - Ramscheld | Table length : 240 mm Table width : 230 mm Max. drilling height : 160 mm | | - | III | II | I | | x |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 10 Machinery - 6

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion | |
|---------------|----------------------------|------|---|---|-------------------|-------------------|-----------|-------------|-------------|------------|--------------------|
| | | | | | | Loading % | Tolerance | Workability | Maintenance | | Moderni- factor |
| 25 BOR. 63 | RADIAL DRILLING MACHINE | 1 | - Cincinnati Ohio - U.S.A. - The Cincinnati - Bickford Tool & Co. | Table length : 850 mm Table width : 660 mm Max. drilling height : 330 mm Max. distance spindle to column : 1860 mm Max. vertical travel of head : 1180 mm | 7.5 HP 970 RPM | 0 | III | III | III | x | x |
| 26 BOR. 64 | COLUMN DRILLING MACHINE | 1 | - Rotterdam - Blau & Co. | Table diameter : Ø750 mm Max. drilling height : 260 mm Distance spindle to column : 400 mm Table vertical travel : 540 mm | 3 HP 700 RPM | 20 | III | II | III | | O |
| 27 BOR. 65 | COLUMN DRILLING MACHINE | 1 | - Bulgaria - Kazanlik B.Y.20 - No. Serie 2449 - 1965 | Table length : 350 mm Table width : 300 mm Max. drilling height : 140 mm Distance spindle to column : 265 mm | 1 HP 960 RPM | 20 | III | II | II | | x |
| 28 BOR. 66 | COLUMN DRILLING MACHINE | 1 | - Bulgaria - Kazanlik B.Y.32 - No. Serie 1778 - 1965 | Table length : 400 mm Table width : 400 mm Max. drilling height : 250 mm Distance spindle to column : 325 mm | 1 HP 920 RPM | 20 | III | II | II | | x |
| 29 BOR. 67 | COLUMN DRILLING MACHINE | 1 | - Bulgaria - Kazanlik B.Y.20 - No. Serie 2427 - 1965 | Table length : 350 mm Table width : 300 mm Max. drilling height : 140 mm Distance spindle to column : 265 mm | 1 HP 920 RPM | 20 | III | II | III | | x |

LIST I-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JASARTA Machine Item: 10 Machinery - 7

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion | |
|---------------|-----------------------------|------|--|--|-----------------|-------------------|-----------|-------------|-------------|------------|---------------|
| | | | | | | Loading % | Tolerance | Workability | Maintenance | | Modernization |
| 30 BOR. 70 | COLUMN DRILLING MACHINE | 1 | - Buffalo | Table length : 300 mm Table width : 270 mm Max. drilling height : 130 mm Distance spindle to column : 215 mm Table vertical travel : 700 mm | 3 HP | 75 | III | II | III | | O |
| 31 BOR. 71 | BENCH TYPE DRILLING MACHINE | 1 | - Rumania - Infrafrica - No. serie 10418 - 1963 | Max. drilling height : 80 mm Distance spindle to column : 200 mm Head vertical travel : 190 mm | 1 HP 920 RPM | 75 | III | II | II | | x |
| 32 BOR. 72 | COLUMN DRILLING MACHINE | 1 | - Buffalo | Table length : 300 mm Table width : 300 mm Max. drilling height : 150 mm Distance spindle to column : 230 mm Table vertical travel : 530 mm | 1 HP 920 RPM | 90 | III | II | III | | x |
| 33 BOR. 73 | COLUMN DRILLING MACHINE | 1 | - Cosiger - Ohio U.S.A. | Table length : 560 mm Table width : 470 mm Max. drilling height : 155 mm Distance spindle to column : 300 mm Table vertical travel : 290 mm Head vertical travel : 250 mm | 1 HP 920 RPM | 0 | III | II | III | x | x |
| 34 BOR. 74 | RAIL DRILLING MACHINE | 1 | | Max. drilling height : 200 mm | - | 30 | III | II | III | | x |
| 35 BOR. 75 | RAIL DRILLING MACHINE | 1 | | Max. drilling height : 200 mm | - | 30 | III | II | III | | x |
| 36 BOR. 76 | RAIL DRILLING MACHINE | 1 | | Max. drilling height : 200 mm | - | 30 | III | II | III | | x |

LIST 1-1
LIST OF EXISTING MACHINE TOOL

MILL NAME: BANATA JAMARTA Machine Item: 10 Machinery - 8

| No. | Machine Item | Qty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | Conclusion |
|-----|------------------------------|-----|---|---|-------------------|-------------------|-----------|-------------|-------------|------------|
| | | | | | | Loading | Tolerance | Workability | Maintenance | |
| 37 | BOR. RAIL DRILLING MACHINE | 1 | - | Max. drilling height : 200 mm | - | 30 | III | II | III | x |
| 38 | BOR. COLUMN DRILLING MACHINE | 1 | - Hamburg wansbek - Germany - Otto Hafner Ixion | Table length : 420 mm Table width : 390 mm Max. drilling height : 100 mm Distance spindle to column : 280 mm | 1 HP 1420 RPM | 0 | III | III | III | x |
| 39 | BOR. RADIAL DRILLING MACHINE | 1 | - | Max. drilling height : 340 mm Distance spindle to column : 1250 mm Arm vertical travel : 930 mm | 20 HP 1440 RPM | 0 | III | III | III | x |
| 40 | FMS. MILLING MACHINE | 1 | - U.S.A. - Milwaukee | Max. Milling height : 600 mm Max. table longitudinal travel : 400 mm Table length : 1200 mm | 10 HP 710 RPM | 0 | III | III | III | x |
| 41 | DM. DUPLEX MILLING MACHINE | 1 | - Japan - Hitachi Seiki - 1975 | Max. table longitudinal travel : 800 mm Distance centre spindle to table : 50 - 450 mm Working area : 300 x 1,35 mm | 55 KW | - | - | - | - | x |
| 42 | STK. SLOTTING MACHINE | 1 | - Alfred & Schute | Table diameter : 6700 mm Max. ram travel : 300 mm | 5 HP 950 RPM | 40 | III | II | II | 0 |
| 43 | BOR. COLUMN DRILLING MACHINE | 1 | - Imperator - G.A. 50226 | Max. drilling diameter : 617 mm | 1 HP 920 RPM | 60 | III | II | II | x |
| 44 | BOR. COLUMN DRILLING | 1 | - Infratirea - Type 24U 1016 - No. 10618 - 1963 | Max. drilling diameter : 612 mm | 1 HP 920 RPM | - | - | - | - | x |

LIST I-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JAKARTA Machine Item: 12 Surface Preparation

| No. | Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | |
|-----|---------|---------------------------|------|-------------------------|--------------------|---------------------|-------------------|-----------|-------------|-------------|---------------|
| | | | | | | | Loading % | Tolerance | Workability | Maintenance | Modernization |
| 1 | CRD. 60 | PEDESTAL GRINDING MACHINE | 1 | - Rumania - Infracia | Grindstone size : | 2 HP 2500 RPM | - | - | - | - | 0 |
| 2 | CRD. 61 | PEDESTAL GRINDING MACHINE | 1 | - Union | Grindstone size : | 1.5 HP 2500 RPM | FULL | II | II | II | 0 |
| 3 | CRD. 62 | PEDESTAL GRINDING MACHINE | 1 | | Grindstone size : | 0.75 HP 2500 RPM | FULL | II | II | II | 0 |
| 4 | SL. 46 | TOOL GRINDER MACHINE | 1 | - Gotha - Rumania | Grindstone size : | 1 HP 2250 RPM | - | - | - | - | 0 |
| 5 | SL. 47 | TOOL GRINDER MACHINE | 1 | | Grindstone size : | 1 HP 920 RPM | - | - | - | - | 0 |

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA JASARTA Machine Item: 14 Utility Equipment

| No. Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | | |
|-----------------|----------------|------|-------------------------|---------------------------------------|-------------|-------------------|-----------|-------------------------|---------------|------------|
| | | | | | | Loading % | Tolerance | Workability/Maintenance | Modernization | Conclusion |
| 1 KOM. 91 | AIR COMPRESSOR | 1 | - Fuji | Working pressure : 2.5 atm 500 RPM | 6 HP | | | | | ○ |
| 2 KOM. 92 | AIR COMPRESSOR | 1 | - Fuji | Working pressure : 2.5 atm 500 RPM | 6 HP | | | | | ○ |
| 3 KOM. 93 | AIR COMPRESSOR | 1 | - Fuji | Working pressure : 2.5 atm 500 RPM | 6 HP | | | | | ○ |
| 4 KOM. 90 | AIR COMPRESSOR | 1 | - Ingersol Rand | Working pressure : 8 atm 1500 RPM | - | | | | | ○ |
| 5 KOM. 99 | AIR COMPRESSOR | 1 | - Sput Techniet | Working pressure : 5 atm 1425 RPM | 1 HP | | | | | ○ |

LIST I-1
LIST OF EXISTING MACHINE/TOOL

MTLL NAME: BARATA JAKARTA Machine Item: 15 Transportation Equipment

| No. | Code | Machine Item | Q'ty | Supplier Purchased Data | Main Specification | Motor Power | Machine Condition | | | Conclusion | | |
|-----|------------|--------------------------------|------|-------------------------|--|-------------|-------------------|-----------|-------------|------------|-------------|---------------|
| | | | | | | | Loading % | Tolerance | Workability | | Maintenance | Modernization |
| 1 | OC. 150 | OVERHEAD TRAVEL- LING CRANE | 1 | - Demag S.W.L. | Max. lifting height : 7.5 mtrs. Between crane transverse: 15 mtrs. Safe working load : 10 tons | 10.2 HP | | | | | x | |
| 2 | OC. 151 | OVERHEAD TRAVEL- LING CRANE | 1 | - Demag - 1971 | Max. lifting height : 7.5 mtrs. Between crane transverse: 15 mtrs. Safe working load : 5 tons | 8.84 HP | | | | | | x |
| 3 | OC. 152 | OVERHEAD TRAVEL- LING CRANE | 1 | - Verlende | Max. lifting height : 8 mtrs. Between crane transverse: 12 mtrs. Safe working load : 5 tons | 10.2 HP | | | | | | x |
| 4 | OC. 153 | OVERHEAD TRAVEL- LING CRANE | 1 | - Verlende | Max. lifting height : 8 mtrs. Between crane transverse: 12 mtrs. Safe working load : 5 tons | 8.84 HP | | | | | | x |
| 5 | OC. 154 | OVERHEAD TRAVEL- LING CRANE | 1 | - Ex. Baraca | Max. lifting height : 8 mtrs. Between crane transverse: 12 mtrs. Safe working load : 5 tons | 8.84 HP | | | | | | x |

P.T. BARATA: JAKARTA FACTORYLIST 4-1 NEW AND USABLE EXISTING MACHINE/TOOL LIST

| | PAGE |
|---|---------|
| 1. MACHINE TOOLS & WELDING MACHINES | 2 - 14 |
| 2. ASSEMBLY EQUIPMENT & MATERIAL HANDLING | 15 - 22 |
| 3. QUALITY ASSURANCE & TESTING UNIT | 23 - 24 |
| 4. AUXILIARY UNIT | 25 - 26 |

() ; shown usable existing machine Code No.

| 1. MACHINE TOOLS & WELDING MACHINES | | |
|-------------------------------------|--|-------------------|
| NO. | TYPE OF MACHINE | QUANTITY |
| 1.1 | HEAVY DUTY UNIVERSAL LATHE MACHINE | |
| 1.1.1 | Max. turning diameter Distance between center | 290 mm 1000 mm |
| | | 1 For site |
| 1.1.2 | Max. turning diameter Distance between center | 350 mm 1500 mm |
| | | 1 |
| 1.1.3 | Max. turning diameter Distance between center | 450 mm 4000 mm |
| | | 2 |
| 1.1.4 | Max. turning diameter Distance between center | 550 mm 4000 mm |
| | | 1 |
| 1.1.6 | Max. center distance | 1500 mm |
| (B.10) | Center height above machine bed | 200 mm |
| (B.11) | Center height above carriage | 110 mm |
| (B.12) | Spindle bore | 50 mm |
| (B.13) | | |
| (B.14) | | |
| (B.16) | | |
| 1.1.7 | Distance chuck to the turret end | 490 mm |
| (B.19) | Center height above machine bed | 225 mm |
| | Center height above carriage | 120 mm |
| | | 1 |
| 1.1.8 | Max. center distance | 3000 mm |
| (B.22) | Center height above machine bed | 30 mm |
| | Center height above gap | -- |
| | Center height above carriage | 250 mm |
| | Spindle bore | 100 mm |
| | | 1 |
| 1.1.9 | Max. center distance | 2860 mm |
| (B.23) | Center height above machine bed | 340 mm |
| | Center height above carriage | 250 mm |
| | Spindle bore | ø70 mm |
| | | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------------------|--|----------|
| 1.2 | HEAVY DUTY FACING LATHE MACHINE | |
| 1.2.2 (B.B.43) | Max. center distance 2400 mm Center height above machine bed 950 mm | 1 |
| 1.3 | VERTICAL BORING & TURNING MILL MACHINE | |
| 1.3.3 | Max. turning diameter 2350 mm Max. turning height 2550 mm | 1 |
| 1.3.5 (KRS. 41) | Table diameter 1200 mm ϕ Max. turning diameter 1270 mm ϕ Max. turning height 900 mm | 1 |
| 1.3.6 (KRS.42) | Table diameter 1250 mm ϕ Max. turning diameter 1600 mm ϕ Max. turning height 1030 mm Max. loading weight 4000 kgs | 1 |
| 1.4 | HEAVY DUTY RADIAL DRILLING MACHINE | |
| 1.4.2 | Max. drilling capacity 50 mm ϕ | 1 |
| 1.4.3 | Max. drilling capacity 65 mm ϕ | 4 |
| 1.4.4 | Max. drilling capacity 80 mm ϕ | 1 |
| 1.4.7 (BOR.64) | Table diameter 750 mm ϕ Max. drilling height 260 mm Distance spindle to column 400 mm Table vertical travel 540 mm | 1 |
| 1.4.8 (BOR.70) | Table length 300 mm Table width 270 mm Max. drilling height 130 mm Distance spindle to column 215 mm Table vertical travel 700 mm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|----------------|--|----------|
| 1.5 | VERTICAL DRILLING MACHINE PILLAR TYPE | |
| 1.5.1 | Max. drilling capacity 35 mm ϕ | 1 |
| 1.8 | PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH SWIVEL RAM AND HEAD Max. drilling capacity 45 mm ϕ | 1 |
| 1.9 | HORIZONTAL BORING & MILLING MACHINE | |
| 1.9.1 | Heavy duty horizontal boring & milling machine - (Table Type) Spindle diameter 130 mm Table size 1520 x 1700 mm | 1 |
| 1.9.3 | Heavy duty horizontal boring & milling machine - (Floor Type) Spindle diameter 130 mm Floor size 4000 x 4000 mm | 1 |
| 1.9.5 (K36) | Max. head travel na. Max. table long. travel Max. workpiece width 1850 mm Max. spindle travel | 1 |
| 1.10 | UNIVERSAL MILLING MACHINE Table size 1800 x 560 mm | 1 |
| 1.11 | PLANING MACHINE | |
| 1.11.2 | Heavy duty double column planing machine table size 8000 x 1400 mm | 1 |
| 1.11.3 | Heavy duty open side planing machine table size 6000 x 2000 mm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|---|--|----------|
| 1.12 | HEAVY DUTY HYDRAULIC HACKSAW MACHINE | |
| 1.12.1 | Max. cutting 280 mm ϕ | 1 |
| 1.12.2 (MGR81) (MGR82) | Blade size 370 mm Max. cutting capacity 5 inch | 2 |
| 1.14 | UNIVERSAL TOOL & CUTTING GRINDING | |
| 1.14.1 | Swing 265 mm Distance between workhead and tailstock 910 mm Table size 180 x 1320 mm | 1 |
| 1.14.2 (SL46) (SL47) | Grindstone size | 2 |
| 1.15 | SEMI-AUTOMATIC GRINDER FOR SHARPENING TWIST DRILL & CORE DRILL | |
| 1.15.1 | Range drills diameter 10 - 100 mm Point angle 80 1/4 - 170 1/4 | 1 |
| 1.17 | PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS) | |
| 1.17.1 | Pedestal grinding machine wheel size 150x25x51mm | 2 |
| 1.17.2 | Pedestal grinding machine wheel size 300x40x76mm | 3 |
| 1.17.3 | Pedestal grinding machine wheel size 500x60x127mm | 1 |
| 1.17.4 (GRD60) (GRD61) (GRD62) | Grindstone size | 3 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------|---|---------------|
| 1.19 | HEAVY DUTY HYDRAULIC PRESS MACHINE | |
| 1.19.1 | Power 900 Tons Table area 4800 x 2000 mm Stroke 600 mm Daylight 1500 mm (Example of cold forming capacity 1. 1000 mmR x 3000 mmL at plate thickness 35 mm 2. 1000 mmR x 4500 mmL at plate thickness 25 mm) | 1 |
| 1.20 | HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT Max. force 40 Tons Piston stroke 300 mm Max. length of shaft 2000 mm Throat depth 250 mm Table size 1000 x 300 mm | 1 For site |
| 1.21 | HYDRAULIC PRESS BRAKE MACHINE Power press 750 Tons Max. plate width 4000 mm Throat depth 400 mm Day light 650 mm Stroke 350 mm | 1 |
| 1.22 | HORIZONTAL PROFILE STRAIGHTENING MACHINE Force 200 Tons Throat depth 235 mm Stroke 750 mm Day light 600 mm Table block size 450 x 1700 mm | 1 |
| 1.23 | HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE Force 800 Tons Day light 650 mm Stroke 200 mm Max. plate width 4000 mm | 1 |
| 1.24 | HEAVY DUTY HEAD FLANGING MACHINE Max. head diameter:s 3000 mm (Range of plate thickness: 8-18 mm) Min. head diameter 800 mm (Range of plate thickness: 4.5-12 mm) | 1 |
| 1.25 | HEAVY DUTY HYDRAULIC PRESS MACHINE | |
| 1.25.2 | Force 2000 Tons Table area 6000 x 3000 mm stroke 1000 mm Day light 2000 mm (Example of cold forming capacity 1. 1000 mmR x 3000 mmL at plate thickness 80 mm 2. 1000 mmR x 6000 mmL at plate thickness 45 mm) | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-------------------|--|----------|
| 1.26 | MECHANICAL PLATE BEND ROLLING MACHINE | |
| 1.26.3 | Max. plate thickness bending capacity 22 mm Max. plate width 4000 mm Min. bending diameter 650 mm | 1 |
| 1.26.5 | Max. plate thickness bending capacity 38 mm Max. plate width 4000 mm Min. bending diameter 850 mm | 1 |
| 1.26.7 (MRL51) | Max. plate thickness 0.5 inch Max. length of plate 2000 mm | 1 |
| 1.27 | HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE Max. bending capacity of pipe 4 inch ϕ | 1 |
| 1.28 | HYDRAULIC BENDING MACHINE Max. bending for : Pipe ST.37 (diameter x thickness) 216 x 5.8 mm Square solid bar 110 mm Round bar 120 mm | 1 |
| 1.29 | MECHANICAL PLATE SHEARING MACHINE | |
| 1.29.1 | Max. plate thickness 16 mm Plate width 4000 mm | 1 |
| 1.29.3 (MRL84) | Max. plate thickness 3 mm Max. length of plate 2500 mm | 1 |
| 1.30 | MECHANICAL UNIVERSAL STEEL WORKER MACHINE Flat shear max. 250 x 22 mm Bar stock shear 65 mm ϕ Square stock shear 55 mm Punch max. ϕ 38 in thickness 27 mm Notching 16 mm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------|---|----------|
| 1.31 | HAND NIBBLING MACHINE Max. nibbling capacity 8 mm Smallest radius 300 mm | 1 |
| 1.32 | PUNCHING MACHINE Mechanical heavy duty punching machine | 1 |
| 1.32.2 | Max. punching capacity 30 mm ϕ Thickness 25 mm | |
| 1.33 | HANDY HEAVY PNEUMATIC RIVETING HAMMER Max. rivet diameter : Steel construction up to 37 mm Boiler construction up to 33 mm | 3 |
| 1.34 | MECHANICAL PLATE FORMING MACHINE Max. plate thickness 8 mm (light metal St.37) Depth of gap horizontal 675 mm | 1 |
| 1.35 | TUBE EXPANDER Max. pipe diameter 10 - 45 mm | 4 |
| 1.36 | UNIVERSAL FILING AND BAND SAW MACHINE Stroke of blade of file 0 - 120 mm Table 400 x 400 mm | 1 |
| 1.37 | KEY SEATING MACHINE Width of key 3 - 70 mm Max. key way length 500 mm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-------------------|--|----------|
| 1.38 | PIPE BEVELLING/EDGING MACHINE | |
| 1.38.1 | Edge cutting machine Cutting length 8000 mm | 1 |
| 1.38.2 | Portable handy electric bevelling machine Max. material thickness 32 mm | 1 |
| 1.39 | AIR COMPRESSOR | |
| 1.39.1 | Mobile air compressor with diesel power Max. pressure 10 bar Capacity 20 m ³ /min. | 1 |
| 1.39.2 | Static air compressor Max. pressure 8.8 bar Capacity 15 m ³ /min. | 2 |
| 1.39.3 | High pressure air compressor Max. pressure : 200 atm Capacity : 22 m ³ /Hr Motor : 11 kW | 1 |
| 1.39.4 (KOM91) | Working pressure 2.5 atm 500 rpm | 1 |
| 1.39.5 (KOM92) | Working pressure 2.5 atm 500 rpm | 1 |
| 1.39.6 (KOM93) | Working pressure 2.5 atm 500 rpm | 1 |
| 1.39.7 (KOM90) | Working pressure 8 atm 1500 rpm | 1 |
| 1.39.8 (KOM99) | Working pressure 5 atm 1425 rpm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-----------------|--|----------|
| 1.40 | MECHANICAL TUBE FINNING MACHINE Max. tube outside diameter 25 mm Max. height of fins 50 mm | 1 |
| 1.41 | INDUCTION HEATING EQUIPMENT Welding current 600 Amp Duty cycle 100% at 600 Amp Output voltage 60 - 80 volts | 2 |
| 1.42 | CUTTING TOOLS | 1 |
| 1.43 | SURFACE PLATE FOR MARKING Dimension 4000 x 6000 mm x 400 mm. Max. load 10 tons | 2 |
| 1.44 | COPIER GAS CUTTING MACHINE 4 cutting torches Max. plate thickness 150 mm Effective cutting 6000 x 3000 mm | 1 |
| 1.45 | PLASMA CUTTING MACHINE | |
| 1.45.1 | Max. cutting thickness alloy steel 70 mm | 1 |
| 1.45.2 (-) | | 2 |
| 1.46 | AUTOMATIC GAS CUTTING MACHINE (CIRCULAR) Max. cutting thickness 150 mm Circle cutting range diameter 60 - 2000 mm Cutting speed range 80 - 1000 mm/min | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-----------------|---|----------|
| 1.47 | PORTABLE FLAME CUTTING MACHINE Cutting capacity 150 mm | 3 |
| 1.48 | PIPEEND BEVELLING FLAME CUTTING MACHINE Effective pipe diameter 150 - 1000 mm Pipe thickness 5 - 50 mm | 2 |
| 1.49 | MANUAL FLAME CUTTING Max. cutting thickness 150 mm | 10 |
| 1.50 | SEMIAUTOMATIC GAS METAL ARC WELDING MACHINE | |
| 1.50.1 | Max. welding current 600 Amp Max. wire diameter 1.6 mm | 10 |
| 1.51 | SUBMERGED-ARC AUTOMATIC TANK WELDING MACHINE 1400 Amp. Max. wire diameter 6 mm Max. vertical height 4200 mm | 3 |
| 1.52 | AUTOMATIC SUBMERGED ARC WELDING MACHINE | |
| 1.52.1 | 1500 Amp. Max. wire diameter 6 mm | 10 |
| 1.52.2 (-) | - | 2 |
| 1.53 | AC ARC WELDING MACHINE | |
| 1.53.1 | Max. welding current 500 Amp Duty cycle 60% at 500 Amp. AC | 20 |
| 1.53.2 (-) | Max. welding current 300 - 500 Amp | 15 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-----------------|--|----------|
| 1.54 | DC ARC WELDING MACHINE | |
| 1.54.1 | Max. welding current Duty cycle | 10 |
| 1.54.2 (-) | Max. welding current | 10 |
| 1.55 | DC MOTOR GENERATOR WELDING MACHINE | |
| 1.55.1 | Max. welding current Duty cycle | 8 |
| 1.56 | DC DIESEL GENERATOR WELDING MACHINE | |
| 1.56.1 | Max. welding current Duty cycle | 3 |
| 1.56.2 (-) | Max. welding current | 1 |
| 1.57 | T.I.G. WELDING MACHINE | |
| 1.57.1 | Output current Duty cycle | 3 |
| 1.57.2 (-) | Max. welding current | 2 |
| 1.59 | DIESEL GENERATOR | |
| 1.59.1 | Continuous output 3 phase alternating current (AC) | 1 |
| 1.60 | CARBON ARC AIR GOUGING MACHINE | |
| 1.60.1 | Rated current Duty cycle Usable carbon diameter | 4 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------|---|----------|
| 1.61 | WELDING POSITIONER | |
| 1.61.1 | Rotated and tilting table Table size 1500 x 1500 mm Max. load on table in horizontal position. 4 Tons | 1 |
| 1.61.2 | Rotated and tilting table Table size diameter 500 mm Max. load on table in horizontal position 500 kg | 2 |
| 1.61.3 | Welding positioner Rotated and tilting table Table size diameter 1000 mm Max. load on table in horizontal position 1000 kg | 1 |
| 1.62 | TURNING TABLE FOR GAS CUTTING | |
| 1.62.1 | Turning table for gas cutting Effective cutting diameter 5000 mm Max. load 15 tons | 1 |
| 1.62.2 | Turning table for gas cutting Effective cutting diameter 4000 mm Max. load 10 Tons | 1 |
| 1.63 | BOOM TYPE WELDING MACHINE | |
| 1.63.1 | Boom type automatic submerged arc welding machine Automatic welding carrier Vertical, 4000 mm Horizontal 5000 mm Sub-merged arc welding machine 1200 Amp 4.8 mm | 2 |
| 1.63.2 | Boom type automatic gas metal arc welding machine Automatic welding carrier Vertical 1000 mm Horizontal 5000 mm Gas metal arc welding machine 500 Amp. 1.6 mm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|---------|--------------------------------|---------------|
| 1.64 | SHAPING MACHINE | |
| 1.64.1 | Table length | 3 |
| (SKR32) | Table width | 310 mm |
| (SKR31) | Max. tool-head travel | 420 mm |
| (SKR30) | Max. table vertical travel | 280 mm |
| | Max. table longitudinal travel | 480 mm |
| 1.65 | PROFILE CUTTING MACHINE | |
| 1.65.1 | Max. cutting capacity | 1 |
| (MPF85) | (Rotary saw) | 100 mm ϕ |
| | | |
| 1.66 | SLOTING MACHINE | |
| (STK33) | Table diameter | 1 |
| | Max. ram travel | 700 mm ϕ |
| | | 300 mm |

| 2. ASSEMBLY EQUIPMENTS & MATERIAL HANDLING | | |
|--|--|----------|
| NO. | TYPE OF MACHINE | QUANTITY |
| 2.1 | BAY TRANSFER CAR | |
| 2.1.1 | Capacity 10 Tons | 3 |
| 2.1.2 | Capacity 20 Tons | 3 |
| 2.2 | FORKLIFT TRUCK 3 TONS | 1 |
| 2.3 | FORKLIFT TRUCK 5 TONS | 1 |
| 2.5 | 30 TONS HYDRAULIC TELESCOPIC TRUCK CRANE Wheel type | 1 |
| 2.6 | HOIST | |
| 2.6.1 | Hoist 1 Ton x 6 m | 6 |
| 2.6.2 | Hoist 2 Tons x 6 m | 6 |
| 2.7 | JIB CRANE 1 TON Lifting height 5 meters | 2 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------|---|----------|
| 2.8 | OVERHEAD TRAVELLING CRANE 5 TONS | |
| 2.8.1 | Lifting height 6 meters Rail span 12 meters | 2 |
| 2.8.2 | Lifting height 7 meters Rail span 12 meters | 4 |
| 2.8.3 | Lifting height 7 meters Rail span 15 meters | 3 |
| 2.11 | OVERHEAD TRAVELLING CRANE 10/3 TONS | |
| 2.11.1 | Lifting height 7 meters Rail span 12 meters | 1 |
| 2.11.2 | Lifting height 10 meters Rail span 24 meters | 1 |
| 2.11.4 | Lifting height 12 meters Rail span 24 meters | 2 |
| 2.16 | OVERHEAD TRAVELLING CRANE 25/5 TONS | |
| 2.16.1 | Lifting height 10 meters Rail span 24 meters | 1 |
| 2.16.2 | Lifting height 12 meters Rail span 24 meters | 2 |
| 2.21 | GANTRY CRANE 25/5 TONS | |
| | Lifting height 12 meters Rail span 10 meters | 1 |
| 2.23 | PULLERS WITH LOAD LIMITER Pulling capacity Approx. 3000 kgs Cable diameter 5/8" | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|------|--|----------|
| 2.24 | UNIVERSAL THEODOLITE COMPLETE SET | 1 |
| 2.25 | MANUAL SCREW JACK Lifting capacity 10 Tons Stroke 150 mm Collapsed height 280 mm | 2 |
| 2.26 | HAND PUMP HYDRAULIC JACK 10 TONS Stroke 150 mm Closed height 330 mm | 2 |
| 2.27 | HAND PUMP HYDRAULIC JACK 35 TONS Stroke 300 mm Closed height 545 mm | 2 |
| 2.28 | HAND PUMP HYDRAULIC JACK 100 TONS Stroke 300 mm Closed height 598 mm | 2 |
| 2.29 | HAND PUMP HYDRAULIC JACK COMPLETE SET 500 TONS Stroke 150 mm Closed height 473 mm | 1 |
| 2.30 | HAND PUMP HYDRAULIC SPREAD CYLINDER SPRING RETURN Lifting capacity 1 Ton Max. stroke ±150 mm | 2 |

| NO. | TYPE OF MACHINE | QUANTITY |
|------|---|----------|
| 2.31 | HAND PUMP HYDRAULIC SPREAD CYLINDER SPRING RETURN Lifting capacity 3 Tons Max. stroke ±250 mm | 2 |
| 2.32 | HAND PUMP HYDRAULIC PIPE BENDER COMPLETE SET Max. pipe to be bend 1/2"φ up to 4"φ | 2 |
| 2.33 | ELECTRIC WINCH COMPLETE WITH PANEL CONTROL Max. lifting capacity 15 Tons | 2 |
| 2.34 | ELECTRIC WINCH COMPLETE WITH PANEL CONTROL Max. lifting capacity 25 Tons | 1 |
| 2.35 | ROPE PULLEY Max. 250 kg | 3 |
| 2.36 | CHAIN BLOCK PULLEY Max. load and lifting capacity 5 Tons and 3000 mm | 2 |
| 2.37 | CHAIN BLOCK PULLEY Max. load and lifting capacity 10 Ton and 3400 mm | 2 |
| 2.38 | CHAIN BLOCK PULLEY Max. load and lifting capacity 25 Tons and 3500 mm | 2 |

| NO. | TYPE OF MACHINE | QUANTITY |
|--------|--|----------|
| 2.39 | PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR Adjustable rotating speed Drum diameter 1000 - 5000 mm | |
| 2.39.1 | 5 Tons | 2 |
| 2.39.2 | 10 Tons | 3 |
| 2.39.3 | 20 Tons | 3 |
| 2.39.4 | 50 Tons | 2 |
| 2.40 | PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR Max. load 5 Tons Drum diameter 1000 - 3000 mm | 2 |
| 2.41 | YOKE OR CHAIN PIPE VISE WITH TRIPOD STAND Max. pipe diameter 100 mm | 3 |
| 2.42 | HEAVY DUTY PORTABLE ANGLE GRINDER Wheel diameter 175 mm Drive motor Approx. 1.5 kW | 15 |
| 2.43 | HEAVY DUTY VERTICAL SANDER Wheel sander 175 mm Drive motor 1.5 kW | 2 |
| 2.44 | POWER CABLE PULLERS Max. pulling power 2 Tons With drive motor | 2 |

| NO. | TYPE OF MACHINE | QUANTITY |
|------|--|----------|
| 2.45 | HAND WINCH (TOTALLY ENCLOSED TYPE) Capacity 1000 kg Length 50 m | 2 |
| 2.46 | CABLE FISH - TAPE BLOWER VACUUM Tube in diameter to be vacuum 19 - 31 m | 2 |
| 2.47 | CABLE SHEAVE & ROLLER SEVERAL TYPE Max. power of pulley 1 Ton Range diameter of cable to be pulled 2 - 15 m | 2 |
| 2.48 | COMPLETE SET CABLE GRIPS (WIRE & CABLE CRIMPING TOOL) Max. safety load 1000 kg Range of strip copper wire cable 5 - 150 mm | 2 |
| 2.49 | COMPACT HYDRAULIC CABLE BENDER Bend capacity 250 up to 1000 MCM | 2 |
| 2.50 | MANUAL TACHET CABLE BENDER Universal bending shoe fits all cable size 500 MCM | 2 |
| 2.51 | MANUAL HYDRAULIC CABLE CUTTER Max. cable diameter to be cut 2" | 2 |

| NO. | TYPE OF MACHINE | QUANTITY |
|------|--|----------|
| 2.52 | CABLE STRIPPER Range capacity of cable stripper 6 up to 20 AWG | 2 |
| 2.53 | CABLE STRIPPER Range capacity of cable stripper 4 AWG up to 1000 MCM | 2 |
| 2.54 | PORTABLE HYDRAULIC CABLE CUTTER Max. cable diameter to be cut 100 mm | 2 |
| 2.55 | CABLE LUG PRESSURE (CRIMPER MANUAL) Range capacity 1.25 - 8 mm | 2 |
| 2.56 | CABLE LUG PRESSURE (CRIMPER MANUAL) Range capacity 5.5 - 14 mm | 2 |
| 2.57 | CABLE LUG PRESSURE (CRIMPER HYDRAULIC) Range capacity 14 - 150 mm Power 10 Tons | 2 |
| 2.58 | PRECISION CURRENT TRANSFORMER Primary rating 10/15/30/50/ 100/250/300/ 500/750/1000A | 1 |
| 2.59 | PRECISION AMPERE METER (AMMETER) Range 100/200/500/ 1000MA | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|------|--|----------|
| 2.60 | PRECISION AMMETER (LINE CURRENT TESTER) Full scale valve 15/30/75/150/ 300A | 1 |
| 2.61 | PRECISION VOLT METER Range 30/75/150/300V | 1 |
| 2.62 | INSULATION TESTER | 1 |
| 2.63 | AIR LESS PAINTING SPRAYING UNIT COMPLETE MOBILE TYPE Suitable for high pressure design for heavy viscosity of paint. | 1 |

| 3. QUALITY ASSURANCE & TESTING UNIT | | |
|-------------------------------------|--|----------|
| NO. | TYPE OF MACHINE | QUANTITY |
| 3.1 | PORTABLE COBALT UNIT AND PORTABLE IRIIDIUM UNIT | 1 |
| 3.2 | AUTOMATIC FILM PROCESSING UNIT | 1 |
| 3.3 | COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT | 2 |
| 3.4 | PORTABLE ULTRASONIC TESTING UNIT Suitable for weld inspection, corrosion and also crack detection. Complete set with standard accessories. | 1 |
| 3.5 | RADIOGRAPHIC X-RAY TESTING UNIT Complete set with standard accessories | 1 |
| 3.6 | HIGH PRESSURE WATER PUMP | |
| 3.6.1 | With electric motor. For testing the leakage of the pipe or pressure vessel after welding. Max. pressure 40 Atm | 1 |
| 3.6.2 | With electric motor. For testing the leakage of the pipe or pressure vessel after welding. Max. pressure 400 Atm | 1 |

| NO. | TYPE OF MACHINE | QUANTITY |
|-----|--|----------|
| 3.7 | ELECTRO MAGNETIC PAINT THICKNESS TESTER Complete with recommended standard accessories | 1 |
| 3.8 | UNIVERSAL TESTING MACHINE For tensile test, compression test, transverse test and bending test | 1 |

| 4. AUXILIARY UNIT | | |
|-------------------|--|--|
| NO. | TYPE OF MACHINE | QUANTITY |
| 4.1 | BOGIE HEARTH FURNACE | |
| 4.1.1 | Effective chamber Working temperature | 6000 x 6000 x 18000 mm 100 Ton Max. 750°C |
| 4.1.2 | Max. charge weight Working temperature Effective chamber | 25 Tons Max. 950°C 6000 x 6000 x 3000 mm |
| 4.2 | SHOT GRIT COMPARTMENT UNIT | |
| | Size Compelte with dust collector | 6000 x 4500 x 15000 mm |
| 4.3 | SAND BLASTING MACHINE | |
| | Movable type Tank content Working pressure | 140 Liters 8 bar |
| 4.5 | WELDING ELECTRODE OVEN | |
| 4.5.1 | Dimension Adjustable temperature, range | 2000 x 2000 x 1000 mm 500 kg Max. 100°C |
| 4.5.2 | Capacity | 100 kg |
| | | 2 For site |
| 4.6 | SUBMERGED-ARC FLUX DRYING OVEN | |
| | | 4 2: For site |

| NO. | TYPE OF MACHINE | QUANTITY |
|-------|-----------------------------------|----------|
| 4.7 | ACID CLEANING EQUIPMENT | |
| 4.7.1 | Acid cleaning equipment | 1 |
| 4.7.2 | Acid cleaning equipment for AFC | 1 |
| 4.8 | DRYING CHAMBER | 1 |
| 4.9 | PAINTING CHAMBER | 1 |
| 4.10 | SPECIAL EQUIPMENT/JIGS & FIXTURES | 1 |
| 4.11 | MEASURING DEVICES | 1 |

4.4 Barata Tegal Plant

4.4.1 Technological Diagnosis of Barata Tegal Work Shop

(1) History and production status of the work shop

Tegal General Work Shop of P.T. Barata Indonesia is founded in 1920 as a maintenance and rehabilitation center of sugar plants in the central Java. Some of the sugar plants in this area started operation as early as in 1835.

The work shop has had no appreciable renovation or modernization since 1920, so the crane facilities and machine tools are of extremely old-fashioned and inefficient type. The work shop depends upon the Machine Tool Rehabilitation Center of Surabaya for maintenance of its machine tools. But the maintenance has not been executed satisfactorily. Although people involved in shop management are really eager to exert every possible efforts for maintenance, the facilities are undoubtedly in the state of considerable deterioration and any reasonable degree of accuracy can never be expected.

Production items of the shop are:

- 1) Maintenance services for and supply of spare parts to the sugar plants in the central Java area. Basically, the Tegal Work Shop currently covers 23 - 28 plants among those situated in Central Java.
- 2) Manufacturing and supply of irrigation facilities such as water gate and water tray throughout the area.
- 3) Manufacturing of some of steel structures for which P.T. Barata Indonesia contracted installation in the Central Java area. These are mainly fabricated at the installation site.

As described above, while Tegal Work Shop is engaged mainly in the manufacturing of spare rolls for sugar cane mills on one hand, they are in the nature of a general work shop on behalf of P.T. Barata Indonesia in the Central Java area.

Production record of Tegal Work Shop for the past 5 years including 1984 is shown in Table 1-1 "Production Record". Problem to be pointed out as of critical importance is that the work load of the shop, particularly the machine work department, is not averaged throughout the year, since the maintenance works for the sugar plants must necessarily be limited to the cane off season, that is through December to April.

(2) Current capability and technology for production

As stated in the forgoing clause, Tegal Work Shop has two main departments; one is machine work department which is mainly engaged in the working and manufacturing of rolls for sugar cane mills, the other is plate work department that is mainly engaged in the fabrication of steel structure/equipment for irrigation facilities. Present plant processing equipment of the shop is of awfully old-fashioned and deteriorated nature.

As is shown in Table 1-1 "Production Record" past record for the machine work department is about 200 tons per year. It is to be noted that the production for this department is greatly affected by seasonal variation in the work quantity for sugar plants maintenance. If given constant work load throughout the year, the department could maintain a machining capacity of at least 400 - 500 tons per year. However, to maintain this level of capacity, it would be necessary to give adequate suspension time to machinery for repair works and accuracy compensation.

On the other hand, the plate work department has practically nothing of the facilities to work with. People are mainly engaged in conventional manual handiwork, and they mainly work on middle through light gauge plates.

Another obstacle to improving production efficiency of the shop is the fact that the handling facilities are only poorly provided.

It may safely be said that these handicaps in facilities are made up for by both the worker's and managerial skill. For example, bevel gears to be used for irrigation gate winch are made through the handicraft process of marking, shaper machining and manual finishing by means of files. This is because they don't have any proper hobbing machines. However, the workmanship is quite satisfactory.

Table 1-2 "Production Analysis" is the summary of bottleneck points in terms of the facilities and production techniques of the Work Shop. It is quite clear that there are many bottlenecks for manufacturing procedures for each product.

(3) Management and labor

1) Organization and labor

As is shown in Fig. 1-1 "Barata Organization" Tegal Work Shop belongs to the Machining & Foundry business group. The work shop, besides sharing machining and manufacturing works for sugar plant equipment with Surabaya machine shop, is in charge of general work shop for the group. It also supports other business groups in the plate works and site constructions in the Central Java area.

Fig. 1-2 "Organization Chart" shows the managerial organization of the shop, while Table 1-3 "Personnel" describes its personnel line-up. It is noted that 78 out of 104 direct workers, or 75%, are skilled workers. Along with this high percentage of skilled workers, their relatively high age is suggestive of the higher level of skill.

2) Production control system

Given below is the present status of the production control system of Tegal Work Shop.

① Production order flow and production scheduling

Fig. 1-3. (a) "Production Order Flow" shows how an work order goes to operators through the instruction sequence. When a finish card ⑥ is fed back from the Quality Control Section to the Production Planning Control Section (hereinafter called PPC), the particular work is considered finished.

PPC is the key section that governs production scheduling of the shop. It's functional organization is as shown in the Fig. 1-3 (b)

"Functional Organization". Production time schedule is created by means of network technique.

On the sheet are specified the following items:

- i) Day when the work started, day when it ended, and the number of days required for each work procedure.
- ii) Critical paths encountered during the procedures.
- iii) Details of work to be done and facility code number for each procedure.
- iv) Man-hours/machine-hours required for each procedure.

PPC, based upon this time schedule, follows up and expedites progress of works, controls against past figures of man-hours/machine-hours and keeps records of them.

② Quality control

Quality control in Tegal Work Shop is done by three members only including a section manager, consequently, scope of inspection is limited to check the dimensions of the plate-worked products and parts against the tolerances of instructions furnished by clients or the shop's own drawings.

In other words, it can safely be said that the quality control of the work shop wholly depends on:

- i) skill level of the direct workers, and
- ii) quality of the materials purchased or furnished.

Moreover, though each operator is apparently responsible for precision in his works, he has to depend on extremely poor

inspection tools. This means that reliability of products has to be based solely on the operator's skill and experience.

On the other hand, quality control over fabrication at the erection site is wholly conducted by supervisors at the site. So, the Quality Control Section has virtually nothing to do with such kind of field works.

③ Facility maintenance

Facility maintenance at the Tegal Work Shop is generally performed as follows:

- i) 8 members of the Maintenance Section prepare themselves to any troubles raised daily by operators who use facilities.
- ii) In addition to the above, the Maintenance Section performs periodic general inspection on the facilities for preventive maintenance.
- iii) An expert maintenance chief from Surabaya Machine Tool Rehabilitation Center visits Tegal Work Shop once in every 6 months to conduct special diagnosis on the facilities. The results of the diagnosis are reported to the top management.
- iv) Replacement of parts and repair works that require improvements on accuracy are all performed at the Surabaya Machine Tool Rehabilitation Center.
- v) Maintenance works having done to each machinery and facility are recorded on each card and kept in custody.

Maintenance budget of Tegal Work Shop for 1984 fiscal year amounts only to 13 million Rps. This amount along with the number of maintenance people are considered insufficient in view of deterioration of the facilities averaging 50 years of use.

④ Procurement of materials

Procurement of materials for the shop is classified by route as follows:

- i) Procurement from its own foundry, mainly from Surabaya Foundry.
- ii) Purchase from other sources.

One of the other sources is the government-owned steel mill and the other is local distributor. In either case, purchase specifications/terms/pricings are reviewed by a "Material Receiving Team" designated by the Branch Manager of Tegal Work Shop, and quality check of the materials is done at acceptance.

On the other hand, as to procurement from its own foundry, it was understood as follows, taking as an example cast iron of spare roll shell for sugar cane mill:

- a) Marketing members visit sugar cane mills they are responsible for and obtain preliminary orders for replacement rolls in August and September every year.
- b) PPC sets up a plan for production and gives out preliminary orders for the shells to Surabaya Foundry.
- c) During the cane off season through December to April old rolls for replacement are taken out from the sugar plants to be sent to the Shop.
- d) At Tegal Work Shop, old shells are removed, new shells (that have been provided as described in ii) are shrinkage-fitted and machine-worked. Re-installation is done by April when the cane season starts.

Materials delivered from Surabaya Foundry to Tegal Work Shop are altogether "as cast," and almost no quality inspection is done to these materials.

As described earlier, no satisfactory inspection is made on the critical materials of cast iron. It is understandably considered that if defects are detected beyond remedial work, serious problems would happen in view of both delivery schedule and trouble-shooting.

(4) Layout, transportation facilities, buildings and auxiliary facilities

1) Layout

Fig. 1-4 "Existing Layout" shows the present layout of the shop, given below are the characteristics and research results.

- ① Total dimension of the shop premise is about 13,000 square meters. Most of the land is occupied by shop buildings and auxiliary facilities leaving little room for expansion.
- ② Work spaces are not in order because places for marking and cutting are not well-defined. Work spaces are not utilized to the maximum efficiency. For instance, parking lot is within the premises of the shop.
- ③ Plate works are done in two locations. This makes work-flow of processes complicated and inefficient.

2) Transportation facilities

Fig. 1-4 "Existing Layout" shows the present transportation facilities of the shop. Given below are the characteristics and research results.

- ① Some of the overhead travelling cranes are so deteriorated that they don't work as normally expected.

② Rail carriages are the only means of transportation between bays.

3) Buildings and auxiliary facilities

Buildings of the shop are quite old, some are built in 1920, others are built after that. Roofs of the buildings were repaired several years ago so that no difficulties are felt in this regard.

(5) Infrastructure, power supply and utility facilities

Tables 1-4 "Infrastructure" and 1-5 "Electrical and Utility Facilities" show existing infrastructure and electrical and utility facilities for the shop.

Table 1-1 Production Record

| TEGAL WORKSHOP | | UNIT: DESPATCHED WEIGHT (TON) | | | | |
|--|-------------|-------------------------------|-------------|-------------|--|----------------|
| <u>CATEGORY</u> | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> (partially forecasted) | <u>AVERAGE</u> |
| (a) Sugar plant maintenance | 125 | 135 | 130 | 288 | 320 | 198 |
| (b) Plate work | 600 | 625 | 620 | 248 | 310 | 486 |
| (c) Steel structure for site erection | 48 | 40 | 50 | 135 | 160 | 87 |
| TOTAL | 773 | 800 | 800 | 671 | 790 | 771 |

Table 1-2
Production Analysis

Name of Factory: Tegal. P.T. Barata Indonesia

| Category of Plant | Name and Specification of Typical Component | Average Production per annum (pcs) | Drawings Source | | | Bottleneck Facility | Critical Path in Procedure | Bottleneck Technique | Remarks |
|-------------------|---|------------------------------------|-----------------|--------------|---------------|----------------------------|----------------------------|--|---------|
| | | | Own Design | Sub-contract | Under License | | | | |
| Sugar | Roll shell | 30 | 0 | 0 | - | Lathe (internal bore) | Shrinkage * fitting | * Horizontal position with Impact hammer | |
| | Roll pinion | 15 | 0 | 0 | - | Slotting machine (key way) | | | |
| | Square coupling | 5 | 0 | 0 | - | | | | |
| Irrigation | Gate | 100 | 0 | 0 | - | | | | |
| | Bevel gear | 600 | 0 | 0 | - | Gear cutting mach'n | | * Marking Shaping & Hand finishing (present process) | |
| Pump | Casing (machining) | | | | | | | | |
| Boggy | Shaft (machining) | | | | | | | Foreign material | |

Table 1-3 Personnel

| TEGAL WORKSHOP | | (in 1984) |
|--------------------------|----------------|--------------------------------------|
| <u>Classification</u> | <u>Numbers</u> | <u>Remarks</u> |
| 1) Manager | 1 | Branch manager |
| 2) Engineers | | |
| a) University graduated | 4 | Including sectional managers. |
| b) High school graduated | 81 | |
| 3) Employees | 53 | Financial, accountants, typist, etc. |
| 4) Direct workers | | |
| a) Skilled | 78 | |
| b) Unskilled | 26 | Helpers. |
| 5) Indirect workers | 28 | Security, drivers, time-keeper, etc. |
| <hr/> | | |
| 6) Total | 271 | |

Table 1-4 Infrastructure

| ITEM | SURVEY RESULT | REMARKS |
|------|--|--|
| 1.1 | Transportation (1) Name of port (2) Capacity of pier (3) Capacity of loading/unloading equipment (4) Distance to loading/unloading port (5) Minimum width of road (6) Hight clearance of overbridge structure (7) Limitation of cargo size (8) Limitation of load over access road | Cirebon 150 Ton (Pontoon) - 75 km - 3.5m 2.5 MW x 12 ML 30 Ton |
| 1.2 | Electrical/Communication system (1) Availability of power supply system (2) Availability of public telephone system (3) Availability of public telex system (4) Availability of public facsimile system | P.L.N. TELCOM - - |
| 1.3 | Utility (1) Availability of public water supply system (2) Junction of site drainage with public waterway | P.D.A.M. Public side ditch along highway. Water from P.L.N and own well are also utilized. |

Table 1-5 Electrical and Utility Facilities (1/3)

| ITEM | SURVEY RESULT | REMARKS | | | | | | | | | |
|--|---|---|--------------------|--------------|---------------|--------------|--------------------|------------|-----------|------------------|--|
| 1.1 Power supply system | | | | | | | | | | | |
| (1) Power source (Power Corp./Own power plant) | P.L.N. | | | | | | | | | | |
| (2) Capacity of power source Capacity of main transformer (KVA) | 200 KVA x 1 set for 220V 100 KVA x 1 set for 380V | 380V power is utilized only for latest machine (D-64) | | | | | | | | | |
| (3) Voltage | 6 KV, 3 Phase, 50 Hz | | | | | | | | | | |
| 1) Receiving voltage (HV/UHV) | 220/380 V, 3 Phase - for Motor | | | | | | | | | | |
| 2) Service voltage (LV) | 220/110 V, 1 Phase - for LTG. & Outlet | | | | | | | | | | |
| (4) Consumption | 19,000 KWH/Mo. | | | | | | | | | | |
| (5) Emergency Generator | None | | | | | | | | | | |
| (6) Allowance of public substation | | | | | | | | | | | |
| 1.2 Lighting system (Illumination level) | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th data-bbox="1212 672 1244 896">Location</th> <th data-bbox="1212 907 1244 1120">Illumination Level</th> <th data-bbox="1212 1131 1244 1568">Kind of Lamp</th> </tr> </thead> <tbody> <tr> <td data-bbox="1260 672 1292 896">(1) Work shop</td> <td data-bbox="1260 907 1292 1120">0 - 50 Lux -</td> <td data-bbox="1260 1131 1292 1568">Mercury vapor lamp</td> </tr> <tr> <td data-bbox="1300 672 1332 896">(2) Office</td> <td data-bbox="1300 907 1332 1120">300 Lux -</td> <td data-bbox="1300 1131 1332 1568">Fluorescent lamp</td> </tr> </tbody> </table> | Location | Illumination Level | Kind of Lamp | (1) Work shop | 0 - 50 Lux - | Mercury vapor lamp | (2) Office | 300 Lux - | Fluorescent lamp | |
| Location | Illumination Level | Kind of Lamp | | | | | | | | | |
| (1) Work shop | 0 - 50 Lux - | Mercury vapor lamp | | | | | | | | | |
| (2) Office | 300 Lux - | Fluorescent lamp | | | | | | | | | |

Table 1-5 Electrical and Utility Facilities (2/3)

| ITEM | SURVEY RESULT | REMARKS |
|---|---|---|
| 1.3 Communication system | (1) Direct Line (Telephone) (2) Inter phone system | 2 Lines 12 Local sets |
| 1.4 Air conditioning/ventilation system | (1) Office building (2) Work shop | Unit type air-conditioner (Total 10 sets) Natural ventilation |
| 1.5 Fire-fighting system | (1) Fire extinguisher | 12 sets of ABC type |
| 1.6 Compressed air supply system | Compressor Q'ty: Capacity: Pressure: | 2 sets 150 CFM each. 7.4 kg/cm ² |

Table 1-5 Electrical and Utility Facilities (3/3)

| ITEM | SURVEY RESULT | REMARKS |
|---|---|--------------------------|
| 1.7 Water supply system | | |
| (1) Water source | P.D.A.M. | Well |
| (2) Capacity of water source | | |
| 1) Supply pump capacity | - Ton/H | 1 HP Pump |
| 2) Storage tank capacity | 1 Ton | 0.75 Ton |
| (3) Consumption of water | 25 Ton/Mo. | |
| (4) Service pressure | - Kg/cm ² | 2 kg/cm ² |
| | Purchased daily Tank by Tank | Used for only one toilet |
| | Supplied by PLN's head tank without any payment | |
| (5) Water treatment for special purpose | Boiling | |

Fig. 1-1 Barata Organisation

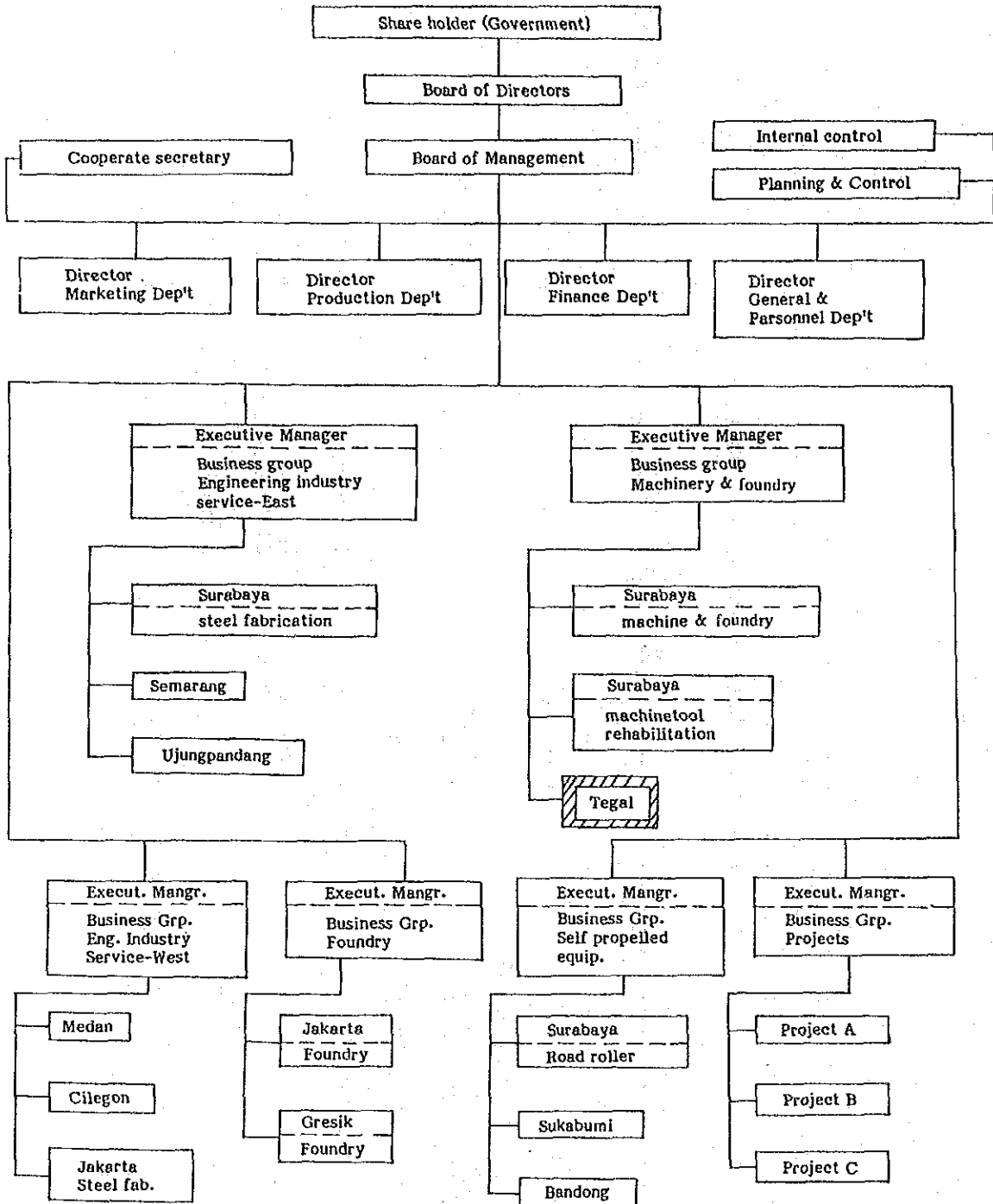
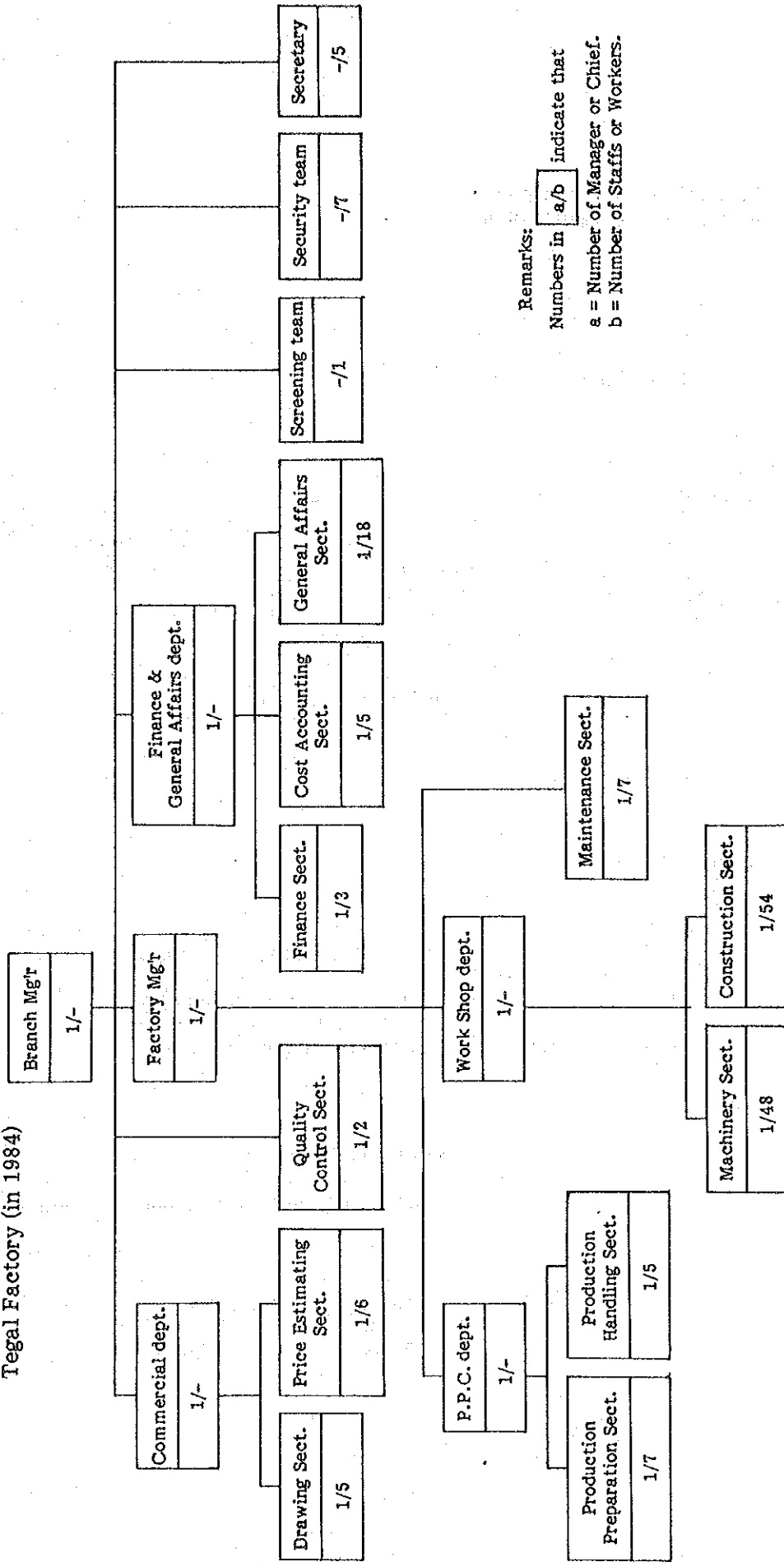


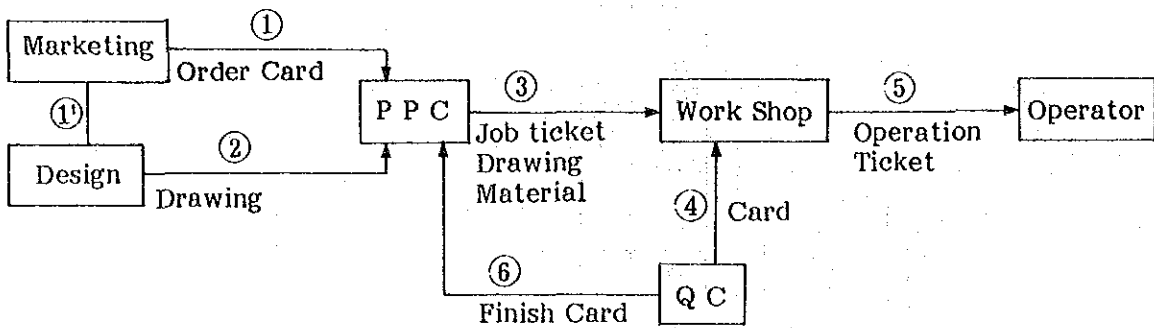
Fig. 1-2 Organization Chart
Tegal Factory (in 1984)



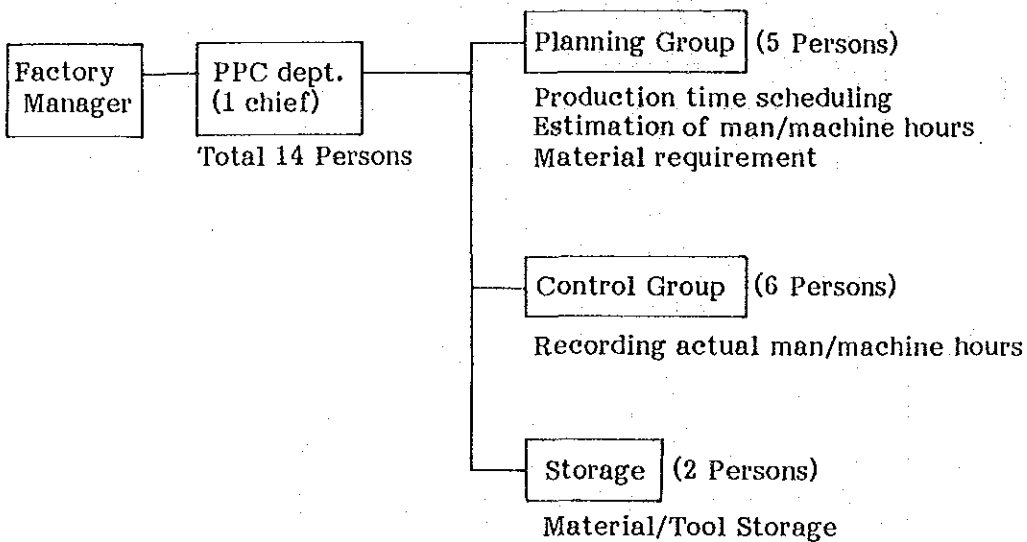
Remarks:
Numbers in a/b indicate that
a = Number of Manager or Chief.
b = Number of Staffs or Workers.

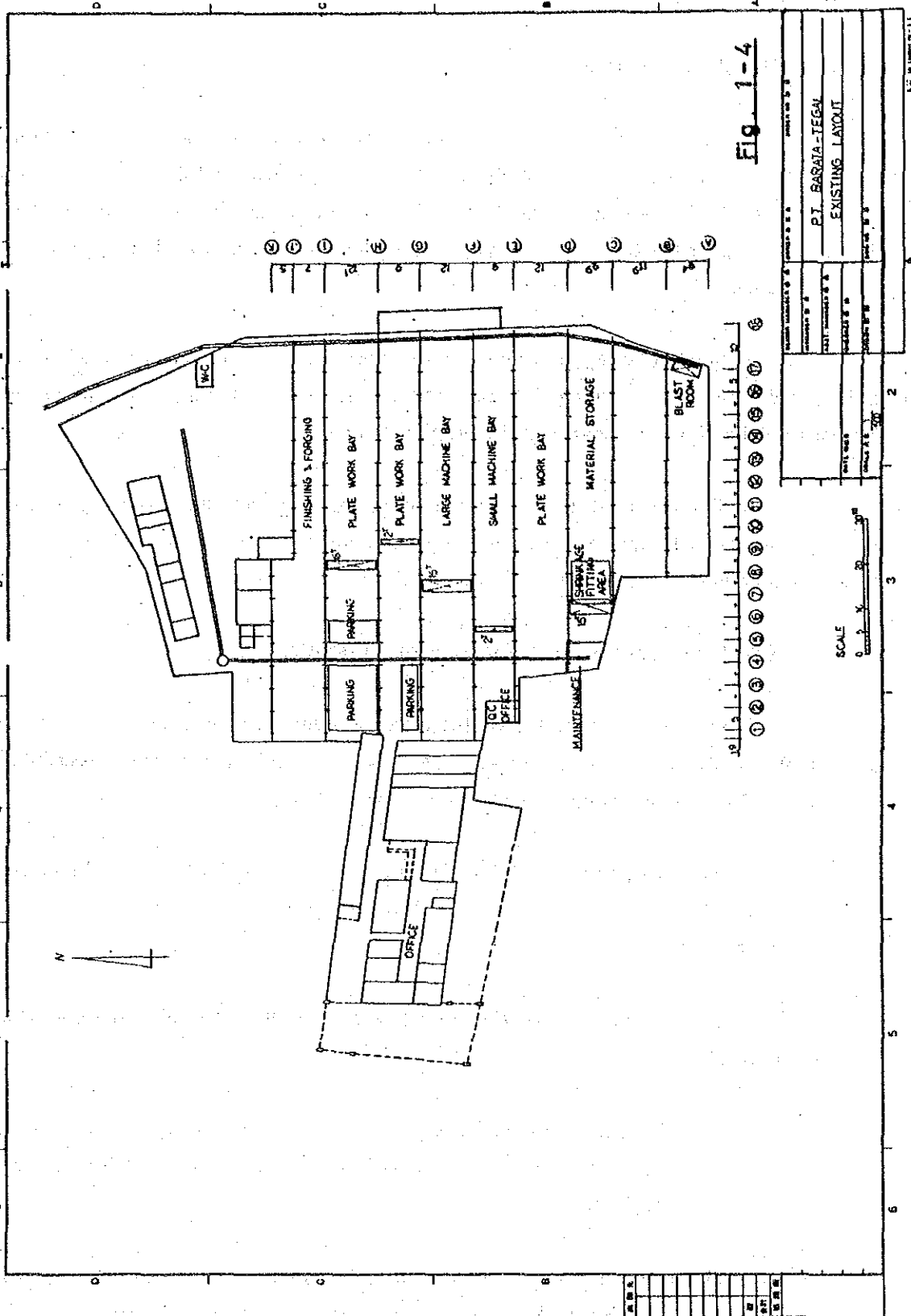
Fig. 1-3 Production Control System in Barata Tegal Work Shop

(a) Production Order Flow



(b) Functional Organization





4.4.2 Technological Assumption

(1) Plant location

Tegal Work Shop is located in the center of the urban district. The premises of the shop are surrounded by roads and adjacent buildings with no room of expansion for plant premises. Moreover, the premises are occupied by buildings and offices. Only a small patch of land is used for volley ball court, but there are no room for plant expansion.

Further study, however, shows that some of the areas in one of the plant buildings are used for parking lot for employees and that some of spaces are not efficiently utilized without overhead travelling cranes.

Therefore, it is imperative to increase production capacity and improve overall productivity by making drastic changes to some of the existing plant facilities and layout to make more effective use of the buildings.

(2) Selection standards for production facilities

On the assumption that the main products for the shop are spare parts for sugar plant maintenance and equipment for irrigation facilities, it is necessary to make improvement to both the machining and plate work facilities.

However, in view of the structure of the shop buildings and nature of this shop within the hierarchy of P.T. Barata Indonesia, it is not necessary to make the facilities super-sized.

Basic principles for the facilities plan shall be considered along the line as described below:

- 1) Machinery for exclusive use shall be considered for items of repeated production such as cane roll mills and gate winches for irrigation facilities.
- 2) Introduction of plate forming facilities shall be considered. Also new installation of automatic welders shall be considered.

- 3) In view of the great seasonal variations of workload for the shop, it is necessary to set aside, within a feasible range, the existing facilities for peak workload. For this end, required repairs and remodellings shall be considered.
- 4) Power supply is a serious issue in terms of specifications even at the present stage. Therefore, construction of a substation shall be considered not only for the current renovation, but also for future renewal of the production facilities.
- 5) In view of limited use of shop premises and buildings, outside production and/or working at erection field site shall be considered for the steel structures of simpler nature required for repairs and remodellings of sugar plants and irrigation facilities.

(3) Transportation limit

Shipments of the products are effected by inland transportation either to the port of Cirebon (75 kms apart), Priok of Jakarta (320 kms apart), or Perak of Surabaya (470 kms apart). In view of the line-up and nature of the Tegal Work Shop products, shipments from the port of Cirebon is satisfactory even the capacity of available barge is 150 tons only.

Limit to inland transportation is 3.5 meters high, 2.5 meters wide and 12 meters long for a loaded condition and up to 30 tons of the loaded products subject to police approval.

Consequently there should be no limiting factors to the shop facilities renovation plan in connection with transportation limit.

4.4.3 Basic Renovation Plan

(1) Production program

1) Basic policy

P.T. Barata Indonesia is of intention to develop Tegal Work Shop as a general work shop in the central district of Java. The basic concept is as summarized below.

- ① The main duty of Tegal Work Shop is to provide the sugar plants in the central district of Java with maintenance service and spare parts. This basic concept is held unchanged.
- ② The materials of plate work for irrigation are limited to medium gauge plates and thin gauge sheets.
- ③ When P.T. Barata Indonesia books an order covering new construction work or repair and reform work from cement or sugar plants, it allots Tegal Work Shop a part of production and repair work for construction machinery, equipment, and parts, including site fabrication, subject to geographical transport conditions.
- ④ The work shown in (1) is concentrated to a season out of sugar cane, causing increase in the loads of machining. In order to release change in loads even slightly, Tegal Work Shop is allotted carriage axles cast in Gresik Foundry and pump casings cast in Jakarta Foundry for the purpose of machining.

2) Production program

The production program of Tegal Work Shop is made on the basis of markets research results and the basic policy stated in 1), as shown in Table 3-1, Production program.

① Supply of sugar cane mill spare roll

The roll is the basic line of Tegal Work Shop, who has a market share of 15% in the central district of Java at present. This share should be doubled at least.

In addition, orders are centered to a limited season; this concentration should be released as far as possible. It is necessary to positively negotiate with the sugar plant, customer, in such a way as to get an advance order of spare rolls at the earliest date.

② Other machining work

Carriage axles, pump casings, etc. are repeatedly ordered and produced. Their annual load should be leveled off and stabilized by an advanced order placed by the customer through positive negotiation, and by advance production carefully anticipated by P.T. Barata Indonesia.

③ Plate work

The plate work items are mainly delivered for the irrigation purpose. The items are also subject to seasonal change. For this reason, it is necessary to explore the new market of plate work items in cement and sugar plants.

④ Steel structures

Steel structures are used for new construction, repair, or reform work in sugar plants, and for irrigation. They should be used in accessory work to plate work items, particularly as a site fabrication item.

3) Local content

The market research suggests the localization of constructive machine parts for the cement plant with a capacity of 1 million tons per year and for the sugar plants with a capacity of 4,000 tons per day. The localization has been reviewed from the viewpoint of the basis of equipment capacity plan.

However, localization could not be realized only with equipment capacity. After important factors are design and production engineering, material availability, competitiveness, etc.

(2) Load plan and necessary equipment

1) Load plan

The production program in (1), above is developed to a load plan for each process, which is indicated in man/machine-hour as shown in Table 3-2, Production Load Plan.

Table 3-2 indicates plate work in man-hour and machining in machine-hour.

Both plate work and machining are weighted by a productivity improvement factor; improvement in productivity results from improved equipment efficiency after renovation and effect of familiarity to work.

In the production program, steel structures and very simple light gauge plate work depend on fabrication at erection field site or on outside fabrication, as a rule, for the purpose of utilizing the limited factory area as efficiently as possible and increasing values added.

2) Guideline of selecting new equipment

The guideline of selecting new equipment for Tegal General Work Shop is here proposed as detailed below.

① New equipment is installed only for the priority products in this shop in future.

② New equipment is of modernized type considering product mix and productivity.

For example, the floor type boring/milling machine, which mainly machines sugar plant roll shaft ends, is so specified as to have a numerically controlled device.

③ The new equipment is indispensable to the production process for products to be newly localized, and supplements what the existing equipment lacks.

Typical examples are the bevel gear cutter and hydraulic press.

④ This shop is inevitably subject to seasonal changes in loads. If any existing facilities are convertible, they are reformed and or repaired for re-use considering countermeasures for a peak load.

⑤ Some of the facilities in ④ are lower in load ratio, and re-used on condition that they are not regularly attended by workers but are operated by workers in charge of other machine as required.

(3) Plan of improving the present shop

Here shown in the reform plan required for ensuring the production equipment corresponding to (1), Production Program and (2), Load Plan.

1) Production facilities and inspection equipment

Field survey is followed by the diagnosis of the existing facilities. As a result, the existing facilities are divided into three groups:

① Workable facilities that can be re-used, facilities that are to be modernized and can be re-used after repair and reform, and

facilities that are to be scrapped and can not be used for the future production purpose. This classification is shown in Table 3-3 Summary of Existing Facilities.

- ② The reform and repair for facilities to be modernized are outlined in Table 3-4, Facility Plan (Machine rehabilitation and relocation).

The reform and repair work are within facilities manufacturer's responsibility and carried out as shown below.

- i) The supplier sends a supervisor who checks the existing facilities for points to be reformed or repaired.
- ii) The supplier manufactures and supplies parts required as a result of the check by a supervisor.
- iii) The reform and repair are carried out by the maintenance member of Surabaya Machine Shop under the direction of a supervisor sent by the supplier.

- ③ Table 3-5, Facility Plan (New machine tool) shows the summarized specifications and quantity of facilities to be newly purchased in order to satisfy the requirements of kinds and quantity of facilities proposed by the load plan.

2) Handling equipment

- ① Cranes in the Shop are required according to the product flow and product handling weight on the basis of the survey result of the existing facilities and the production program.

The cranes are as shown in the layout and should be newly purchased.

- o Overhead traveling crane 15 tons 4 units

- o Overhead traveling crane 6 tons 1 unit
- o Overhead traveling crane 2 tons 2 units
- o Wall jib hoist 1 ton 2 units

② The existing carriage rail must be reformed and the following vehicles purchased for the purpose of transport between Bays in Shop and cartage within a short distance.

- o Forklift 2 tons 1 unit
- o Railless carriage 15 tons 1 unit
- o Railless carriage 2 tons 1 unit

③ The handling equipment such as cranes newly purchased is outlined in Table 3-6, Facility Plan (Handling equipment).

3) Buildings and auxiliary facilities

The following reform work is required for installing production equipment, inspection equipment, and handling equipment as planned. The reform work is outlined in Table 3-7, Facility Plan (Building & auxiliary facilities).

① Reform work of Bay D - E

The existing buildings are reformed to the factory buildings that allow installing a 15-ton overhead traveling crane to serve as a large-size machine tools area by reinforcing main columns and foundations and by renewing the run-way girder and rails.

② Reform work of Bay B - C

The new installation of the 2-ton overhead traveling crane is followed by the new installation of the run-way girder and rails.

- ③ Substation work
- ④ Dining room partition change work
- ⑤ Parking area partition change work
- ⑥ Reinforcement of column for pole type jib hoist.

4) Electrical/utility facilities

The following reform and renewal work is required to enhance the capacity of the existing facilities and prevent obsolescence in the course of achieving the production program. The outline is as shown in Table 3-8, Facility Plan (Infrastructure/electrical/utility facilities).

① Payment to power supply company (P.L.N.)

Payment is required for increasing the power receiving capacity to about 500 kVA.

The receiving voltage is also increased from 6 kV to 22 kV.

② Substation work

The existing substation is totally renewed because of increase in the receiving capacity and obsolescence of the existing facilities.

③ Power wiring work

Power source wiring is involved by the installation of new machine tools and equipment and by the transfer or removal of the existing facilities. The existing underground wiring is utilized where possible.

④ Lighting equipment

Workability and safety require additional lighting equipment. The place of additional work and illuminance are as shown below.

- | | |
|--------------------------|---------|
| i) Marking area | 200 Lux |
| ii) Main passway in Shop | 50 Lux |

(4) Factory construction work and installation program

This renovation is performed on the basis of the basic plan shown in the F/S. This renovation requires the determination of detailed specifications of machinery and equipment and the determination of detailed specifications or design of augmentation or reform of necessary infrastructure, handling equipment, buildings, and electric/utility facilities. This must be accompanied by procurement of machinery and equipment, and consignment of field work to contractors.

The above is so-called D/D service, which content has great influence on total investment and production processes. Therefore, a consultant should be employed that has integral engineering capacity and sufficient experience of the project similar to this renovation.

This renovation includes many items to be newly designed, and involves partial work supervision carried by designers. Designers who have experience of this type of service in Indonesia should be used under the direction of the D/D consultant.

The detail of the D/D service imposed on the consultant is as shown below.

- 1) Detailed survey of the existing equipment.
- 2) Understanding of F/S, and correction if required.
- 3) Preparation of specifications for the purchase of newly installed machinery and tools and the installation work.

- 4) Preparation of reform specifications of existing machinery and tools.
- 5) Preparation of specifications for the purchase of handling equipment and the installation work.
- 6) Design of building reform work and preparation of installation specifications.
- 7) Design of electric/utility facilities work and preparation of purchase specifications.
- 8) Preparation of renovation breakthrough schedule.
- 9) Consultation on procurement, contract of work and contract procedures.
- 10) Approval of drawings and detailed specifications of machinery and equipment to be purchased.
- 11) Design of machine foundation work and preparation of purchase specifications.
- 12) Inspection of main machinery and equipment and supervision of main work.

Note: Supervision for the installation and test run of main machinery and equipment is within the scope of procurement contract of machinery and equipment, and therefore is excluded from the D/D service.

BARATA TEGAL GENERAL WORK SHOP

Table 3-1 Production Program

M: MACHINERY & MACHINING ITEMS

P: PLATE WORK

REMARKS S: STEEL STRUCTURE

UNIT: Ton

| PRODUCT | 1989 | | | 1994 | | | 1999 | | | |
|----------------------|------|-------|-------|-------|-------|-----|-------|-------|-------|-------|
| | QTY | M | P | S | TOTAL | QTY | M | P | S | TOTAL |
| CEMENT | | | | | | | | | | |
| 1 mil. T/Y PLANT | 1.5 | | 650 | | 650 | 1.5 | | 650 | | 650 |
| PARTS SUPPLY | | 25 | 100 | | 125 | | 50 | 200 | | 250 |
| SUGAR | | | | | | | | | | |
| 4000 T/D PLANT | 2 | | 560 | | 420 | 2 | | 560 | | 420 |
| SPARE CANE MILL ROLL | 50 | 690 | | | 690 | 80 | 1,100 | | | 1,100 |
| PARTS SUPPLY | | 10 | 200 | | 210 | | 10 | 200 | | 210 |
| PLANT REHABILITATION | 3 | | | 600 | 600 | 3 | | 600 | | 600 |
| OTHERS | | | | | | | | | | |
| IRIGATION GATE etc. | | 11 | | 400 | 411 | | 16 | 500 | | 516 |
| MISCELLANEOUS | | 368 | | | 368 | | 568 | | | 568 |
| TOTAL | | 1,104 | 1,510 | 1,420 | 4,034 | | 1,744 | 1,610 | 1,520 | 4,874 |
| | | | | | | | | 1,853 | 1,890 | 1,730 |
| | | | | | | | | | | 5,473 |

BRATA TEGAL GENERAL WORK SHOP

Table 3-2 Production Load Plan

| YEAR CATEGORY of PRODUCTS | TOTAL PRODUCTION | | BREAKDOWN of MAN/MACHINE HOURS within OWN WORKSHOP | | | | | | | | | | | | | | | |
|----------------------------------|---------------------|---------------------------------------|--|--------|---------|---------|---------|---------|---------|---------|--------|---------|-------|--------|--------|-------|--------|-------|
| | in WEIGHT TON | in M/M HOURS within own shop | in M/M HOURS by sub-con. & site fabri. | MARK'G | CUTTING | BENDING | FITTING | BEVEL'G | FORMING | WELDING | OTHERS | TOTAL | LATHE | FACING | BORING | DRILL | OTHERS | TOTAL |
| CEMENT PLANT COM- PONENTS | 775 | 27,520 | 3,0230 | 3,890 | 3,330 | 18,610 | 25,830 | 440 | 580 | 560 | 110 | 1,690 | | | | | | |
| 1989 SUGAR PLANT COMPO- NENTS | 2,480 | 149,280 | 120,180 | 17,920 | 10,080 | 84,000 | 112,000 | 27,310 | 3,770 | 1,820 | 4,380 | 37,280 | | | | | | |
| OTHERS | 779 | 71,970 | 28,800 | 4,320 | - | 24,480 | 28,800 | 29,370 | 4,510 | 3,190 | 6,100 | 43,170 | | | | | | |
| TOTAL | 4,034 | 248,770 | 179,210 | 26,130 | 13,410 | 127,090 | 166,630 | 57,120 | 8,860 | 5,570 | 10,590 | 82,140 | | | | | | |
| CEMENT PLANT COM- PONENTS | 900 | 34,260 | 36,500 | 4,840 | 4,150 | 23,150 | 32,150 | 550 | 730 | 690 | 140 | 2,110 | | | | | | |
| 1994 SUGAR PLANT COMPO- NENTS | 2,890 | 149,760 | 108,160 | 16,130 | 9,070 | 75,600 | 100,800 | 35,860 | 4,940 | 2,390 | 5,770 | 48,960 | | | | | | |
| OTHERS | 1,084 | 83,590 | 32,400 | 4,860 | - | 27,540 | 32,400 | 34,830 | 5,340 | 3,790 | 7,230 | 51,190 | | | | | | |
| TOTAL | 4,874 | 267,610 | 177,060 | 25,830 | 13,220 | 126,300 | 165,350 | 71,240 | 11,010 | 6,870 | 13,140 | 102,260 | | | | | | |
| CEMENT PLANT COM- PONENTS | 900 | 30,440 | 34,230 | 4,300 | 3,690 | 20,560 | 28,570 | 490 | 650 | 610 | 120 | 1,870 | | | | | | |
| 1989 SUGAR PLANT COMPO- NENTS | 3,380 | 175,200 | 107,900 | 21,500 | 12,100 | 100,800 | 134,400 | 29,890 | 4,120 | 1,990 | 4,800 | 40,800 | | | | | | |
| OTHERS | 1,193 | 77,940 | 28,800 | 4,320 | - | 24,480 | 28,800 | 33,430 | 5,130 | 3,640 | 6,940 | 49,140 | | | | | | |
| TOTAL | 5,473 | 283,580 | 170,930 | 30,120 | 15,790 | 145,860 | 191,770 | 63,810 | 9,900 | 6,240 | 11,860 | 91,810 | | | | | | |

TABLE 3-3 Summary of Existing Facilities (1/4)

COMPANY WORKS: BARATA/TEGAL

| MACHINE NAME | MAX | CAPACITY/ SIZE | YEAR A.D. When machine was manufactured | RESULT OF SURVEY | | | |
|-----------------------------|---|---------------------|--|------------------|-------------------|---------------------------------|---------|
| | | | | QTY | TO BE SCRAPPED | TO BE MODERNIZED WORKABLE | REMARKS |
| LATHE MACHINE | CENTER DISTANCE | : 8,000 mm | 1970 - | 1 | - | 1 | |
| | CENTER HEIGHT ABOVE BED | : 550 mm | 1950 - 1969 1930 - 1949 - 1929 | 9 11 3 | - 2 - | 7 6 3 | |
| BORING & MILLING MACHINE | CENTER OF SPINDLE HEIGHT ABOVE TABLE | : 500 - 1,600 mm | 1970 - | - | - | - | |
| | SPINDLE STROKE | : 950 mm | 1950 - 1969 1930 - 1949 - 1929 | 1 6 3 | - 1 1 | 1 5 2 | |
| DRILLING MACHINE | TABLE LENGTH | : 2,020 mm | 1970 - | - | - | - | |
| | TABLE WIDTH | : 1,210 mm | 1950 - 1969 | 2 | 2 | - | |
| | DRILLING DEPTH | : 360 mm | 1930 - 1949 | 4 | - | 2 | |
| | DISTANCE SPINDLE TO COLUMN | : 1,500 mm | - 1929 | - | - | - | |
| PLANOMILLER & PLANNER | TABLE LENGTH | : 4,000 mm | 1970 - | - | - | - | |
| | TABLE WIDTH | : 1,400 mm | 1950 - 1969 | 1 | 1 | - | |
| | PLANING LENGTH | : 3,700 mm | 1930 - 1949 | 2 | 1 | 1 | |
| | PLANING HEIGHT | : 1,200 mm | - 1929 | - | - | - | |

TABLE 3-3 Summary of Existing Facilities (2/4)

COMPANY WORKS: BARATA/TEGAL

| MACHINE NAME | MAX | CAPACITY/ SIZE | YEAR A.D. When machine was manufactured | RESULT OF SURVEY | | |
|------------------------|---------------------|-------------------|--|------------------|---------------------|---------|
| | | | | QTY SCRAPPED | TO BE MODERNIZED | REMARKS |
| SHAPER & SLOTTER | TABLE DIAMETER | : ϕ 600 mm | 1970 - | - | - | - |
| | LONGITUDINAL TRAVEL | : 350 mm | 1950 - 1969 | 3 | 1 | 2 |
| | TRANSVERSE TRAVEL | : 450 mm | 1930 - 1949 | 1 | - | 1 |
| | | | - 1929 | 1 | - | 1 |
| OTHER MACHINES | | | 1970 - | - | - | - |
| | | | 1950 - 1969 | - | - | - |
| | | | 1930 - 1949 | 2 | 2 | - |
| | | | - 1929 | - | - | - |
| SURFACE PREPARATION | | | 1970 - | 2 | - | 2 |
| | | | 1950 - 1969 | 1 | 1 | - |
| | | | 1930 - 1949 | - | - | - |
| | | | - 1929 | 1 | - | 1 |
| CUTTING EQUIPMENT | CUTTING THICKNESS | : 16 mm | 1970 - | - | - | - |
| | | | 1950 - 1969 | 3 | - | 3 |
| | | | 1930 - 1949 | 1 | 1 | - |
| | | | - 1929 | - | - | - |

TABLE 3-3 Summary of Existing Facilities (3/4)

COMPANY WORKS: BARATA/TEGAL

| MACHINE NAME | MAX | CAPACITY/ SIZE | YEAR A.D. When machine was manufactured | RESULT OF SURVEY | | | REMARKS |
|-------------------------------|-----------------|-------------------|--|------------------|-------------------|---------------------|--------------------------------|
| | | | | QTY | TO BE SCRAPPED | TO BE MODERNIZED | |
| FORMING MACHINE | PLATE LENGTH | : 2,400 mm | 1970 - | - | - | - | |
| | PLATE THICKNESS | : 3/8" | 1950 - 1969 | - | - | - | |
| | | | 1930 - 1949 | 3 | 1 | 1 | |
| | | | - 1929 | - | - | - | |
| WELDING EQUIPMENT | | | 1970 - | 9 | 6 | - | |
| | | | 1950 - 1969 | 3 | - | 1 | |
| | | | 1930 - 1949 | 3 | 1 | - | |
| | | | - 1929 | - | - | - | |
| OTHER FACILITY & EQUIPMENT | | | 1970 - | 2 | 1 | - | 1 BLOWER MACHINE, AIR COMPRES- |
| | | | 1950 - 1969 | 4 | 2 | - | SOR, ETC. 2 |
| | | | 1930 - 1949 | - | - | - | |
| | | | - 1929 | - | - | - | |
| TRANSPORTATION EQUIPMENT | O.H.T. CRANE | : 15 tons | 1970 - | - | - | - | |
| | | | 1950 - 1969 | - | - | - | |
| | | | 1930 - 1949 | 6 | - | 1 | 5 |
| | | | - 1929 | - | - | - | |

TABLE 3-3 Summary of Existing Facilities (4/4)

COMPANY WORKS: BARATA/TEGAL

| MACHINE NAME | MAX | CAPACITY/ SIZE | YEAR A.D. When machine was manufactured | RESULT OF SURVEY | | REMARKS |
|--------------|-----|-------------------|--|-------------------|---------------------|---------|
| | | | | TO BE SCRAPPED | TO BE MODERNIZED | |
| | | | 1970 - | | | |
| | | | 1950 - 1969 | | | |
| | | | 1930 - 1949 | | | |
| | | | - 1929 | | | |
| | | | 1970 - | | | |
| | | | 1950 - 1969 | | | |
| | | | 1930 - 1949 | | | |
| | | | - 1929 | | | |

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BARATA TEGAL GENERAL WORK SHOP

Table 3-4 Facility Plan (Machine Rehabilitation & Relocation) (1/5)

| NO. FACILITY | DESCRIPTION | BASIS OF PLAN | REMARKS |
|--------------|--|---|---------|
| D4 (1 set) | <p>Lathe Machine (Reform and overhaul specifications)</p> <ol style="list-style-type: none"> 1. Change of belt drive system to motor and reduction gears drive system to increase spindle speed and cutting ability. 2. Replacement and adjustment of bearing metals and bearings in each part. 3. Fitting and accuracy adjustment of worn sliding surfaces and connections. Replacement and adjustment of worn parts. 4. Check of electric, hydraulic, air, lubricating oil systems (including cutting oil pump unit). Restoration and conditioning of lost functions and parts. 5. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 6. Total restoration, reassembling, test run, and cutting test. 7. Correction, restoration, finish painting of other exterior items. | <p>The drive system is totally changed from the belt system to the motor system, and functions with lowered accuracy are restored, thus serving to augmenting capacity to meet the requirements at a peak load.</p> | |
| D5 (1 set) | <p>Lathe Machine (Reform and overhaul specifications)</p> <ol style="list-style-type: none"> 1. Change of belt drive system to motor and reduction gears drive system to increase spindle speed and cutting ability. 2. Replacement and adjustment of bearing metals and bearings in each parts. 3. Fitting and accuracy adjustment of worn sliding surfaces and connections. Replacement and adjustment of worn parts. 4. Check of electric, hydraulic, air, lubricating oil systems (including cutting oil pump unit). Restoration and conditioning of lost functions and parts. 5. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 6. Total restoration, reassembling, test run, and cutting test. 7. Correction, restoration, and finish painting of other exterior items. | <p>as above</p> | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-4 Facility Plan (Machine Rehabilitation & Relocation) (2/5)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|-------------|---|---|--|----------------|
| D7 (1 set) | Lathe Machine (Reform and overhaul specifications) | <ol style="list-style-type: none"> 1. Change of belt drive system to motor and reduction gears drive system to increase spindle speed and cutting ability. 2. Replacement and adjustment of bearing metals and bearings in each part. 3. Fitting and accuracy adjustment of worn sliding surfaces and connections. Replacement and adjustment of worn parts. 4. Check of electric, hydraulic, air, and lubricating oil systems (including cutting oil pump unit). Restoration and conditioning of lost functions and parts. 5. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 6. Total restoration, reassembling, test run, and cutting test. 7. Correction, restoration, finish painting of other exterior items. | The drive system is totally changed from the belt drive system to the motor system, and functions with lowered accuracy are restored, thus serving to augmenting capacity to meet the requirements at a peak load. | |
| D56 (1 set) | Horizontal Milling Machine (Reform and overhaul specifications) | <ol style="list-style-type: none"> 1. Change of belt drive system to motor and reduction gears drive system to increase spindle speed and cutting ability. 2. Replacement and adjustment of bearing metals and bearings in each part. 3. Fitting and accuracy adjustment of worn sliding surfaces and connections. Replacement and adjustment of worn parts. 4. Check of electric, hydraulic, air, and lubricating oil systems (including cutting oil pump unit). Restoration and conditioning of lost functions and parts. 5. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 6. Total restoration, reassembling, test run, and cutting test. 7. Correction, restoration, finish painting of other exterior items. | as above | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-4 Facility Plan (Machine Rehabilitation & Relocation) (3/5)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|-------------|--|--|---|----------------|
| D52 (1 set) | Planing Machine (Reform and overhaul specifications) | <ol style="list-style-type: none"> 1. Change of belt drive system to motor and reduction gears drive system to increase spindle speed and cutting ability. 2. Replacement and adjustment of bearing metals and bearings in each part. 3. Fitting and accuracy adjustment of worn sliding surfaces and connections. Replacement and adjustment of worn parts. 4. Check of electric,hydraulic, air, and lubricating oil systems (including cutting oil pump unit). Restoration and conditioning of lost functions and parts. 5. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 6. Total restoration, reassembling, test run, and cutting test. 7. Correction, restoration, finish painting of other exterior items. | <p>The drive system is totally changed from the belt drive system to the motor drive system, and functions with lowered accuracy are restored, thus serving to augmenting capacity to meet the requirements at a peak load.</p> | |
| D23 (1 set) | Lathe Machine (Overhaul specifications) | <ol style="list-style-type: none"> 1. Total overhaul and check. Replacement and adjustment of bearing metals and bearings in each part. 2. Fitting and accuracy adjustment of worn sliding surfaces and connections in each part. Replacement and adjustment of worn parts. 3. Check of electric, hydraulic, air, and lubricating oil systems (including cutting oil pump unit). Restoration and adjustment of lost functions and parts. 4. Replacement or correction of lead screws. Replacement and adjustment of internal screws (including feed screws). 5. Total restoration, reassembling, test run, and cutting test. 6. Correction, restoration and finish painting of other exterior items. | <p>Inferior accuracy, due to deterioration require overhaul, which serves to augmenting capacity at a peak load. (particularly, noise is large at present.)</p> | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-4 Facility Plan (Machine Rehabilitation & Relocation) (4/5)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------|--|----------------------|---|
| D1 | (1 set) | Lathe Machine (Overhaul specifications) | | |
| | | 1. Total overhaul and check. Replacement and adjustment of bearing metals and bearings in each part. | | Obsolescence and badly lowered accuracy require overhaul, which serves to augmenting capacity at a peak load. |
| | | 2. Fitting and accuracy adjustment of worn sliding surfaces and connections in each part. Replacement and adjustment of worn parts. | | |
| | | 3. Check of electric, hydraulic, air, and lubricating oil systems (including cutting oil pump unit). Restoration and adjustment of lost functions and parts. | | |
| | | 4. Replacement or correction of lead screws. Replacement and adjustment of internal screws. | | |
| | | 5. Total restoration, reassembling, test run, and cutting test. | | |
| | | 6. Correction, restoration, and finish paintings of other exterior items. | | |
| Others | (4 units) | Cutting machine and plate work equipment (Overhaul and partial correction) | | |
| | | Required correction specifications are determined after detailed check on Detailed Design. | | |

BARATA TEGAL GENERAL WORK SHOP Table 3-4 Facility Plan (Machine Rehabilitation & Relocation) (5/5)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---------------------------|--------------------|------------------------------|-------------------|
| C120 | Air Hammer Machine | | Required by change in layout | Bay A-B → Bay I-J |
| C121 | Blower | | | |
| C109 | Profile Cutting Machine | | | |
| C125 | Air Hammer Machine | | | |
| C106 | Riveting Machine | | as above | Bay D-E → Bay F-G |
| B78 | Sawing Machine | | | |
| D76 | Column Drilling Machine | | | |
| D23 | Lathe Machine | | as above | Bay D-E → Bay F-G |
| D2 | Lathe Machine | | | |
| D52 | Planing Machine | | | |
| D55 | Horizontal Boring Machine | | | |
| D5 | Lathe Machine | | | |
| D6 | Lathe Machine | | | |
| D40 | Slotting Machine | | | |
| D8 | Lathe Machine | | | |
| D22 | Lathe Machine | | | |
| D1 | Lathe Machine | | | |
| D60 | Milling Machine | | | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (1/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>UNIT</u> | <u>QUANTITY</u> | <u>REMARKS</u> |
|------------|--|---|-------------|-----------------|--|
| L-7 | BL (2 sets) | Heavy Duty Large Lathe with Boring System | | | |
| | 1. Technical Specifications | | | | |
| | (1) Swing over bed | | mm | 2,200 | This machine substitutes the badly deteriorated existing machine. This is a new, special purpose machine manufactured with special specifications to bore the sugar roll, one of the major products. |
| | (2) Swing over carriage | | mm | 1,650 | |
| | (3) Max. distance between center line of main spindle and inside face of tool post | | mm | 1,200 | |
| | (4) Max. distance between center (O, D Cutting) | | mm | 5,000 | |
| | 2. Main power | | | | |
| | (1) Main drive motor | | kw | DC55 | |
| | 3. Standard accessories | | | | |
| | | | | 1 set | |
| | 4. Optionals accessories | | | | |
| | (1) Boring guide support 520-1150 mm dia. | | | 1 set | |
| | (2) Boring bar head 450-860 mm dia. | | | (1 set) | |
| | | | | (1 set) | |

Table 3-5 Facility Plan (New Machine Tool) (2/36)

BARATA TEGAL GENERAL WORK SHOP

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------|------------------------------|---------------------------------|--|
| L-8 | L (1 set) | Heavy Duty Lathe | | |
| | | 1. Specifications | | |
| | | (1) Swing over bed | mm (in) 1,600 (63) | This machine is newly installed to serve as a special-purpose machine for finish-machining the sugar roll (shaft & shell) after shrinkage fit. |
| | | (2) Swing over carriage | mm (in) 1,200 (48) | |
| | | (3) Distance between centers | mm (in) 8,000 (314 3/4) | |
| | | (4) Motors | | |
| | | . Main drive | kW (HP) AC4P, 45 (60) | |
| | | 2. Standard accessories | | 1 set |
| | | 3. Special accessories | | 1 set |
| L-10 | L (3 sets) | Heavy Duty High Speed Lathe | | |
| | | 1. Specifications | | |
| | | (1) Swing over bed | mm (in) 630 (24 3/4) | This machine serves to machine axles of the rail boggy. |
| | | (2) Swing over carriage | mm (in) 400 (15 3/4) | |
| | | (3) Swing in gap | mm (in) 900 (35 1/2) | |
| | | (4) Distance between centers | mm (in) 2,000 (78 3/4) | |
| | | (5) Main drive motor | kW (HP) 4P 7.5 or 11 (10 or 15) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (3/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------|-----------------------------------|----------------------|---|
| | | 2. Standard accessories | | 3 sets |
| | | 3. Special accessories | | 3 sets |
| L-17 | L (1 set) | Heavy Duty Lathe | | This machine is a new, powerful, and special-purpose machine mainly used for chevron-grooving the sugar cane roll |
| | | 1. Specifications | | |
| | | (1) Swing over bed | mm (in) | 2,000 (78 3/4) |
| | | (2) Swing over carriage | mm (in) | 1,600 (63) |
| | | (3) Max. distance between centers | mm (in) | 10,000 (393 3/4) |
| | | (4) Motors | | |
| | | • Main drive | : | AC 4P 45 kW (60 HP) |
| | | • Helical driving geared motor | : | AC 3.7 kW |
| | | • Milling cutter driving motor | : | AC 2.2 kW |
| | | 2. Standard accessories | | 1 set |
| | | 3. Special accessories | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (4/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>UNIT</u> | <u>QUANTITY</u> | <u>REMARKS</u> |
|------------|-----------------|---|-------------|----------------------------|--|
| L-9 | LV (1 set) | Vertical Boring & Turning Mill | | | This machine is newly installed to substitute the existing obsolete machine, and mainly used for machining the sugar pinion. |
| | | 1. Specifications | | | |
| | | (1) Table diameter | mm (in) | 2,000 (78.7) | |
| | | (2) Max. Swing | mm (in) | 4,000 (157) | |
| | | (3) Max. work height | mm (in) | 2,000 (79) | |
| | | (4) Vertical travel of rail head | mm (in) | 1,000 (39.4) | |
| | | (5) Horizontal travel of side head ram | mm (in) | 500 (19.6) | |
| | | (6) Swivel angle of rail head (both in and out) | | 30° | |
| | | (7) Vertical travel of cross rail | mm (in) | 1,450 (57) | |
| | | (8) Max. table load | kgf (lbs) | 16,000 (35,300) | |
| | | (9) Main motor | AC 4P 37 kW | (50 HP) | |
| | | 2. Standard accessories | | 1 set | |
| | | 3. Special accessories | | 1 set | |
| L-11 | LV (1 set) | Vertical Boring & Turning Mill | | | This machine is mainly used for machining, before gear cutting, the axle for the rail boggy and the bevel gear for irrigation. |
| | | 1. Specifications | | | |
| | | (1) Table diameter | mm (in) | 1,600 (63) | |
| | | (2) Max. workpiece diameter | mm (in) | 2,000 (78.7) | |
| | | (3) Max. work height | mm (in) | 1,500 (59) | |
| | | (4) Rail-head cross travel | mm (in) | -100 to 1,000 (-3.9 to 39) | |
| | | (5) Rail-head ram vertical travel | mm (in) | 1,000 (39.4) | |
| | | (6) Rail-head swivel angle (right & left) | | 30° | |
| | | (7) Cross-rail vertical travel | mm (in) | 1,000 (39.4) | |
| | | (8) Max. table load | kgf (lbs) | 9,000 (17.64) | |
| | | (9) Main motor | AC 4P 30 kW | (40 HP) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (5/36)

| <u>NO. FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|---------------------|---------------------------------------|----------------------|----------------|
| 2. | Standard accessories | 1 set | |
| 3. | Special accessories | 1 set | |
| | (1) Digital read out system (axis XY) | (1 set) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (6/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|---|--|--|--|---|
| B-1 | BF (1 set) | Floor-Type Horizontal Milling & Boring Machine | | |
| 1. Machine specifications | | | | |
| (1) | Spindle diameter | mm (in) | 130 (5.12) | This is a new, powerful machine mainly used for machining the key way on the sugar roll shaft and the sugar roll shaft end to a rectangular shape. This machine is equipped with an NC device, and attachments such as a special-purpose floor plate, rotary table, angle plate. This machine is capable of a wide range of machining, with high accuracy and efficiency. |
| (2) | Sliding sleeve diameter | mm (in) | 340 (13.4) | |
| (3) | Milling spindle nose diameter | mm (in) | 225 (8.86) | |
| (4) | Spindle taper | ISO 7/24 taper No. 50 | | |
| (5) | Sliding sleeve travel | mm (in) | 450 (17.7) | |
| (6) | Spindle travel | mm (in) | 1,000 (39.4) | |
| (7) | Total travel of sliding sleeve and spindle | mm (in) | 1,000 (39.4) | |
| 2. Electrical equipment | | | | |
| (1) | Spindle drive motor | | DC 18.5/25 kW (25/33 HP) cont. 30 min. rating | |
| (2) | Axis drive DC servo motor | | | |
| | For column horizontal travel | (X axis) | } 2.8 kW (4 HP) | |
| | For spindle head vertical travel | (Y axis) | | |
| | For spindle and sliding sleeve travel | (Z axis) | | |
| (3) | MDI-NC system | | | |
| 3. Machine dimensions in relation to horizontal travel and spindle head vertical travel | | | | |
| (1) | Column horizontal travel | mm (in) | 4,500 (177) | |
| (2) | Spindle head vertical travel | mm (in) | 3,500 (138) | |
| 4. Standard accessories | | | | |
| | | | | 1 set |
| 5. Optional accessories | | | | |
| | | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (7/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>QUANTITY</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|--|--|-----------------|----------------------|----------------|
| (1) | Angle head | | (1 set) | | |
| (2) | Universal head | | (1 set) | | |
| (3) | Rotary table | (various type) | (1 set) | | |
| (4) | Floor plate and jack screws for level adjustment | 1600 x 2400 x 300 mm (63 x 94 x 39.5") | (4 sets) | | |
| (5) | Angle plate | 1500 x 2500 x 4000 mm (59 x 89.4 x 157.5") | (2 pcs/1 set) | | |
| (6) | MDI-system | | (1 set) | | |

Table 3-5 Facility Plan (New Machine Tool) (8/36)

BARATA TEGAL GENERAL WORK SHOP

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------|---|--------------------------|---|
| D-1 | DR (2 sets) | Radial Drills | | The purpose of this machine is mainly to drill screw holes at the end of the sugar cane roll shell. |
| | | 1. Specifications | | |
| | | (1) Machining capacity | | |
| | | • Drilling solid steel | mm (in) 75 (3) | |
| | | • Drilling cast iron | mm (in) 90 (3 5/8) | |
| | | • Boring in steel | mm (in) 200 (7 7/8) | |
| | | • Boring in cast iron | mm (in) 280 (11) | |
| | | (2) Spindle | | |
| | | • Dia. of spindle and quill | mm (in) 75/95 (3, 3 3/4) | |
| | | • Vertical travel | mm (in) 400 (15 3/4) | |
| | | • Morse-taper | No. 5 | |
| | | (3) Dimensions | | |
| | | • Max. distance, column surface to spindle center | mm (in) 1,620 (63 3/4) | |
| | | (4) Motors | | |
| | | • Spindle drive | kW (HP) 7.5 (10) | |
| | | • Arm elevation | kW (HP) 2.2 (3) | |
| | | 2. Standard accessories | | |
| | | | 1 set | |
| | | 3. Special accessories | | |
| | | | 1 set | |
| | | (1) Leveling block | (1 set) | |
| | | (2) Tilting table | (1 set) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (9/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>UNIT</u> | <u>QUANTITY</u> | <u>REMARKS</u> |
|-------------------|-----------------|---|-------------|------------------|---------------------------|
| D-2 | DR (2 sets) | Radial Drills | | | Augmentation of capacity. |
| 1. Specifications | | | | | |
| | (1) | Machining capacity | mm (in) | 75 (3) | |
| | | • Drilling solid steel | mm (in) | 90 (3 5/8) | |
| | | • Drilling cast iron | mm (in) | 200 (7 7/8) | |
| | | • Boring in steel | mm (in) | 280 (11) | |
| | | • Boring in cast iron | | | |
| | (2) | Spindle | mm (in) | 75/95 (3, 3 3/4) | |
| | | • Dia. of spindle and quill | mm (in) | 400 (15 3/4) | |
| | | • Vertical travel | | | |
| | | • Morse-taper | | No. 5 | |
| | (3) | Dimensions | | | |
| | | • Max. distance, column surface to spindle center | mm (in) | 2,020 (79 1/2) | |
| | (4) | Motors | | | |
| | | • Spindle drive | kW (HP) | 7.5 (10) | |
| | | • Arm elevation | kW (HP) | 3.7 (5) | |
| | 2. | Standard accessories | | 1 set | |
| | 3. | Special accessories | | 1 set | |
| | (1) | Leveling block | | (4 pcs) | |
| | (2) | Tilting table | | (1 set) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (10/36)

| NO. | FACILITY | DESCRIPTION | BASIS OF PLAN | REMARKS |
|-----|---|-------------------|---------------|---|
| Z-2 | BGS (1 set) | Bevel Gear Shaper | | |
| 1. | Capacity | | | |
| (1) | Max. pitch diameter of work piece to be cut | | | The existing machine is almost scrap. The function is difficult to restore because parts are unavailable. The new machine is newly installed to meet the mass-production requirements of the bevel gear for irrigation as shown in the future production program. |
| | Ratio 2 : 1 to 8 : 1 | mm | 610 | |
| | Ratio 1 : 1 | mm | 610 | |
| (2) | Max. cone distance of bevel gear | mm | 525 | |
| (3) | Max. width of tooth | mm | 160 | |
| (4) | Max. module | | 20 | |
| (5) | Min. number of teeth | | | |
| (6) | Pitch cone angle of bevel gear | | | |
| | Ratio 8 : 1 | | 10 | |
| | Ratio 1 : 1 | | 14 | |
| | Max. Min. | | 83° 7° | |
| (7) | Max. ratio of gear | | 8 : 1 | |
| 2. | Dimensions | | | |
| (1) | Distance from face plate to apex | | | |
| | Max. | mm | 521 | |
| | Min. | mm | 51 | |
| (2) | Diameter of face plate | mm | 480 | |
| (3) | Center height of work head | mm | 343 | |
| 3. | Motors | | | |
| (1) | Main motor | kW | 5.5 | |
| 4. | Standard accessories | | | 1 set |
| 5. | Optional accessories | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (11/36)

REMARKS

BASIS OF PLAN

DESCRIPTION

NO. FACILITY

S-1 SH (1 set) Shaper

Augmentation of capacity.

1. Specifications

- (1) Max. stroke mm 550
- (2) Max. shaping width mm 600
- (3) Vertical travel of table mm 240
- (4) Max. distance between table surface and ram mm 350
- (5) Table dimensions (L x H x W) mm 420 x 370 x 355
- (6) Vertical travel of tool holder mm 170
- (7) Motor kW x p 1.8 x 4

2. Standard accessories

1 set

3. Optional accessories

1 set

(1) Automatic feed stop device

(1 set)

SL-1 SL (1 set)

Heavy Duty Precision Slotting Machine

Augmentation of capacity. This machine is mainly used for machining the keyway of the sugar pinion.

1. Specifications

- (1) Ram
 - Max. stroke mm 615
 - Forward tilt of ram 0 - 10°
 - Drive motor kW x p 7.5 x 4
- (2) Table
 - Dia. of working surface mm 1,000 dia.
 - Longitudinal traverse mm 650
 - Cross traverse mm 600
 - Table center to column mm 835 - 1,485
 - Max. workpiece weight on the table kg 3,500

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (12/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---|--------------------|----------------------|----------------|
| 2. | Standard accessories | | 1 set | |
| 3. | Special accessories | | 1 set | |
| | (1) Auto sizing device with ram top stopping & zero cutting device | | (1 set) | |
| | (2) Working finish signal lamp | | (1 set) | |
| | (3) Digital indicator for table travel | | (1 set) | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (13/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-------------------|---|--------------------------------|----------------|
| G-1 | U.T.G. (1 set) | Universal Cutter & Tool Grinder | | |
| | | 1. General specifications | | |
| | | (1) Capacity | | |
| | | • Swing over table | mm (in) 250 (10) | |
| | | • Distance between centers | mm (in) 700 (27 1/2) | |
| | | • Distance between tailstock & workhead | mm (in) 580 (22 3/4) | |
| | | (2) Table | | |
| | | • Working surface | mm (in) 135 x 940 (5 5/6 x 37) | |
| | | (3) Motors | | |
| | | • Grinding wheel spindle motor | kW (HP) 0.75 (1) | |
| | | (option) | kW (HP) 1.5 (2) | |
| | | 2. Standard accessories | | 1 set |
| | | 3. Optional accessories | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (14/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>UNIT</u> | <u>QUANTITY</u> | <u>REMARKS</u> |
|------------|--------------------|---|-------------|-----------------|----------------------|
| G-2 | D.H.C. (2 sets) | High Speed Double Head Grinding Machine | | | |
| | | 1. Specifications | | | |
| | | (1) Wheel size (O.D x W x L.D) | mm | 1 | φ 355 x 50 x φ 31.75 |
| | | (2) Motor for wheel head | KW | 1 | 2.2/0.75 |
| | | 2. Standard accessories | | 1 | 1 set |
| | | 3. Optional accessories | | 1 | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (15/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|--|---|----------------------|--|
| WZ-1 | Bader Machine (2 sets) | Bader Machine | | The purpose of this machine is to finish weld beads, with enhanced efficiency. |
| | 1. Specifications | | | |
| | (1) Belt size (width x length) | 75 x 3,350 mm | | |
| | (2) Belt speed | 2,000 m/min. | | |
| | (3) Motor | 200/220V 2P SHP | | |
| | 2. Accessories (Standard) | | 1 set | |
| WZ-4 | High Speed Cutting Machine (2 sets) | High Speed Cutting Machine (Cut Grinder) | | The purpose of this machine is to cut shaped steels, with enhanced efficiency. |
| | 1. Specifications | | | |
| | (1) Wheel dimensions | 510 ^ø x 4 x 30 ^ø mm | | |
| | (2) Vise O.D. | 250 mm | | |
| | (3) Cutting capacity (Max.) | 125 ^ø mm | | |
| | (4) Motor power | 5.5 kW | | |
| | 2. Accessories (Standard) | | 1 set | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (16/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---|---|-------------------------|---|
| WZ-5 | Portable Flame Cutting Machine (2 sets) | Semi Automatically Cuts Straight Lines and Bevels | | The purpose of this machine is to improve cutting accuracy and achieve high efficiency. |
| 1. | Specifications | | 440 x 205 x 215 | |
| (1) | Overall dimensions (L x W x H) | mm (in) | (17 x 8 x 8 1/2) | |
| (2) | Motor - Condenser induction Motor | | 9W/10W A.C 100V or 200V | |
| (3) | Cutting capacity (thickness) | mm (in) | 5 - 100 (1/5 - 4) | |
| 2. | Standard accessories | | | 1 set |
| 3. | Options | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (1/7/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---|--|---|----------------|
| WZ-6 | Portable Flame Cutting Machine (2 sets) | Semi Automatically Cuts Straight Lines, Circles and Bevels | same as WZ-5 | |
| | 1. Specifications | | | |
| | (1) Overall dimensions (L x W x H) | mm (in) | 450 x 120 x 240 (18 x 4 3/5 x 9 1/2) | |
| | (2) Motor (Universal motor AC.DC) | V | 100 or 200 | |
| | (3) Cutting capacity (thickness) | mm (in) | 5 - 100 (1/5 - 4) | |
| | (4) Circle cutting range (diameter) | mm (in) | 60 - 1,200 (2 - 47) | |
| | 2. Construction & accessories | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (18/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------------------|---|--|----------------|
| SM-1 | Shearing Machine (1 set) | New Gapless Shears | Augmentation of capacity. | |
| | 1. Specifications | (1) Cutting capacity (2) Shear angle (3) Motor powers | 10 mm x 2,500 mm 2°30' 11 KW (15 HP) | |
| | 2. Accessories | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (19/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---------------------------------------|----------------------------------|----------------------|---|
| BR-2 | Bending Roller (1 set) | Pyramid Type Plate Bending Rolls | | This machine is used for manufacturing sugar tanks and containers, with augmented capacity. |
| | 1. Specifications | | | |
| | (1) Bending capacity | | | |
| | • Materials of steel plate to be bent | | | |
| | Material: Steel plate | | | |
| | • Max. bending capacity | | | |
| | Width | 3,000 mm | | |
| | Thickness | 30 mm | | |
| | Inside diameter | 700 mm | | |
| | (2) Motors | | | |
| | • Main drive motor | | 37 kW 6P 1 set | |
| | • Top roll adjusting motor | | 22 kW 6P 1 set | |
| | • Top roll counter balance motor | | 3.7 kW 6P 1 set | |
| | • Bearing swing down motor | | 2.2 kW 6P 1 set | |
| | 2. Spare parts & others | | 1 set | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (20/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|----------------------------|---|---|---|
| HP-4 | Hydraulic Press (1.set) | 360 Ton Hydraulic Press 1. Specifications (1) Max. pressing capacity (2) Stroke (3) Daylight (4) Effective working area of table (5) Bolster dimensions (6) Main motor | 300 Ton 600 mm 1,100 mm 3,100 x 1,200 mm 1,020 x 630 mm 11 kW x 4P | This press is required in relation with ER-2 to augment capacity. |
| | | 2. Accessories (Standard) | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (21/36)

| NO. | FACILITY | DESCRIPTION | BASIS OF PLAN | REMARKS |
|-----|------------------------------------|---|------------------------------------|--|
| W-1 | Welding Machine (2 sets) | Submerged Arc Welder | | This welder is used for welding cylindrical parts such as tanks and containers for the sugar plant. The purpose of this machine is to automate welding and improve weld quality. TR-2 turning roll and MP-1 manipulator is equipped as relevant equipment. |
| | 1. Specifications | | | |
| | (1) Max. welding current | A | 1,500 | |
| | (2) Welding wire diameter | mm | 3.2 - 6.4 | |
| | (3) Control system | | Solid state variable speed control | |
| | (4) Travel speed | cm/min | 10 - 100 | |
| | (5) Wire reel | Magazine type | | |
| | (6) Capacity of flux hopper | ltr. | 6 | |
| | (7) Adjustable range of nozzle | mm | Vertical 50 Horizontal 50 | |
| | 2. Accessories | | 1 set | |
| W-2 | Welding Machine (2 sets) | A-C Arc Welders | | |
| W-3 | Welding Machine (2 sets) | A-C Arc Welders | | |
| | 1. Specifications | | | |
| | (1) Secondary current | A | 500 300 | W-2 W-3 |
| | (2) Primary input | KVA-KW | 43-23 24-13 | |
| | (3) Secondary current range | A | 80-510 50-300 | |
| | (4) Max. secondary no-load voltage | V | 85 80 | |
| | (5) Duty cycle | % | 60 40 | |
| | (6) Electrode size | mm | 3.2-8 2.0-6 | |
| | 2. Accessories | | 1 set | |
| W-4 | Welding Machine (1 set) | Thyristor Controlled DC Power Supplies for Arc Air Gouging & Blasting | | |
| | 1. Specifications | | | |
| | (1) Rated output current | A | 600 | |
| | (2) Current range (single range) | A | 100 - 600 | |
| | (3) Arc voltage | V | 46 | |
| | (4) Duty cycle | % | 60 | |
| | (5) Open circuit voltage | V | 15 | |
| | (6) Input voltage phase | V | 380 - 3 | |
| | (7) Frequency | Hz | 50/60 | |
| | (8) Input at rated load | KVA-KW | 42 - 33.5 | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (22/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------------------------|---------------------|----------------------|----------------|
| W-5 | Diesel Welder (2 sets) | Engine Welder | | |
| | 1. Specifications | | | |
| | (1) Welding motor generator | | | |
| | • Nominal rating | kW | 6.82 | |
| | • Rated output current | A | 220 | |
| | • Rated voltage | V | 31 | |
| | • Current range | A | 50 - 240 | |
| | • Duty cycle | % | 50 | |
| | • Rotation frequency | rpm | 3,000 | |
| | • Electrode size | mm | 2.6 - 4.0 | |
| | (2) Alternating current generator | | | |
| | • Nominal rating (3 phase) | kVA | 5 | |
| | • Rated voltage | V | 200 | |
| | • Power factor | | 1.0 | |
| | • Frequency | Hz | 50 | |
| | • Rating | | Continuity | |
| | (3) Engine | | | |
| | • Nominal rating | PS/rpm | 16/3000 | |
| | • Displacement | c.c | 751 | |
| | • Fuel | Gas oil (JIS No. 2) | | |
| | • Fuel tank capacity | ltr. | 19 | |
| | • Starting system | Cell motor | | |
| | • Battery | 12V-NS-60 | | |
| | • Dimensions (L x W x H) | mm | 1,340 x 675 x 890 | |
| | • Weight | kg | 375 | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (23/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------------|------------------------------|--|----------------|
| TR-2 | Turning Rolls (1 set) | Low Shaft Type Turning Rolls | Refer to W-1. | |
| | | 1. Specifications | | |
| | | (1) Loading weight | 60,000 kg | |
| | | (2) Work piece dia. | 600 - 7,000 mm | |
| | | (3) Roll peripheral speed | 83-830 ^{rpm} /100-1000 ^{rpm} | |
| | | (4) Roll outer dia. x width | ∅ 400 x 260 mm | |
| | | (5) Drive | Double wheels | |
| | | (6) Motor | 3-∅ 200V - 3.7 KW | |
| | | 2. Accessories (Standard) | 1 set | |
| SR-1 | Steel Rolls (4 sets) | Steel Rolls | | |
| | | 1. Specifications | | |
| | | (1) Loading weight | 20,000 kg | |
| | | (2) Work piece dia. | 600 - 7,000 mm | |
| | | (3) Roll outer dia. x width | ∅ 315 x 170 mm | |
| | | (4) Drive | Nothing | |
| | | 2. Accessories (Standard) | 1 set | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (24/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|-----------------|--------------------------------------|----------------------|----------------|
| MP-1 | Manipulators | Center Boom Manipulators | Refer to W-1. | |
| | (1 set) | 1. Specifications | | |
| | | (1) Horizontal boom travel distance | 3,000 mm | |
| | | (2) Horizontal boom travel speed | 150 - 1,500 mm/min. | |
| | | (3) Vertical boom travel distance | 3,000 mm | |
| | | (4) Vertical boom travel speed | 800 mm/min. | |
| | | (5) Max. load capacity at boom's end | 100 kg | |
| | | 2. Accessories (Standard) | | |
| | | | | 1 set |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (25/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|---------------------------------|--|---------------------------|----------------------------|
| WD-1 | Welding Rod Dryer (1 set) | Drying Oven for Electrodes | | Augmentation of equipment. |
| | | 1. Specifications | | |
| | | (1) Total welding rod weight treatable | 200 kg | |
| | | (2) Max. operating temperature | 400°C | |
| | | (3) Number of shelves | 5 tiers 2 rows | |
| | | (4) Max. power consumption | 6.0 kW | |
| | | (5) Power supply | 3 phase 200V | |
| | | (6) Temperature regulator | electronically controlled | |
| | | (7) Max. welding rod length treatable | 550 mm | |
| | | (8) Agitating fan | X | |
| | | (9) Thermometer | O | |
| | | (10) Wheeled or not | Not wheeled | |
| | | (11) Overall dimension (H x W x D) | 975 x 750 x 680 mm | |
| | | (12) Capacity (H x W x D) | 450 x 650 x 570 mm | |
| | | (13) Weight | 200 kg | |

BARATA TEGAL GENERAL WORK SHOP

Table 3-5 Facility Plan (New Machine Tool) (26/36)

| <u>NO.</u> | <u>FACILITY</u> | <u>DESCRIPTION</u> | <u>BASIS OF PLAN</u> | <u>REMARKS</u> |
|------------|----------------------------|---|----------------------------|----------------|
| WD-2 | Welding Flux Dryer (1 set) | Drying Oven for Electrodes Flux | Augmentation of equipment. | |
| | | 1. Specifications | | |
| | | (1) Weight of flux-cored wire treatable | 50 kg | |
| | | (2) Max. operating temperature | 300°C | |
| | | (3) Number of chambers | 1 | |
| | | (4) Max. power consumption | 6 kW | |
| | | (5) Power supply | 200 V 3 phase | |
| | | (6) Temperature regulator | Electronically controlled | |
| | | (7) Mode of drying | Rotary drum | |
| | | (8) Temperature | Provided | |
| | | (9) Overall dimension (H x W x D) | 1,200 x 1,550 x 950 mm | |
| WD-3 | Welding Rod Oven (1 set) | Welding Rod Oven | Augmentation of equipment. | |
| | | 1. Specifications | | |
| | | (1) Total welding rod weight treatable | 200 kg | |
| | | (2) Max. operating temperature | 120°C | |
| | | (3) Number of chambers | 5 tiers 2 rows | |
| | | (4) Max. power consumption | 3.6 kW | |
| | | (5) Power supply | 220 V | |
| | | (6) Temperature regulator | Electronically controlled | |
| | | (7) Max. welding rod length treatable | 550 mm | |
| | | (8) Wheeled or not | Not wheeled | |
| | | (9) Overall dimension (H x W x D) | 1,255 x 650 x 800 mm | |
| | | (10) Weight | 200 kg | |