BARATA SURABAYA MACHINE SHOP

Table 4-5 Investment Cost Estimation
(Detailed Design Work)

A —— ENGINEERING WORK & SUPERVISION IN INDONESIA
B ▭ ENGINEERING & DESIGN IN CONSULTANT'S HOME WORK
C ---- LOCAL EXPENSES

DESCRIPTION		COST ESTIMATION (MIL. YEN)				SCHEDULE					
		A	B	C	TOTAL	1985	1986	1987	1988	1989	1990
Expansion/reconstruction of buildings	Investigation of existing situation, designing, preparation of specifications both for construction works and procurement of steel materials, and supervision of construction works.	9.4		3.6	13.0						
			6.0		6.0						
				4.0	4.0						
Electrical and utility facilities	Investigation of existing situations, planning of infra-structure, designing, preparation of specifications both for construction works and procurement of materials and equipment, and supervision.	8.5		3.0	11.5						
			6.0		6.0						
				0.5	0.5						
Machinery equipment	Investigation of existing situations, preparation of specifications both for procurement of machinery, equipment, parts and tools, and machinery reforming work and supervision.	1.9		0.6	2.5						
			12.0		12.0						
Machinery foundation	Designing, preparation of specifications for foundation work, and supervision.	6.1		2.4	8.5						
				3.8	3.8						
Handling facilities	Preparation of specifications for procurement.		1.2		1.2						
Site fabrication	Preparation of specifications and supervision for site fabrication of steel materials for buildings.	4.7		1.8	6.5						
			0.6		0.6						
General	Review of F/S, preparation of implementation program, supervision of implementation time schedule and general consultation to the implementation of the project.	28.1		11.4	39.5						
				5.2	5.2						
TOTAL		58.7	25.8	36.3	120.8						

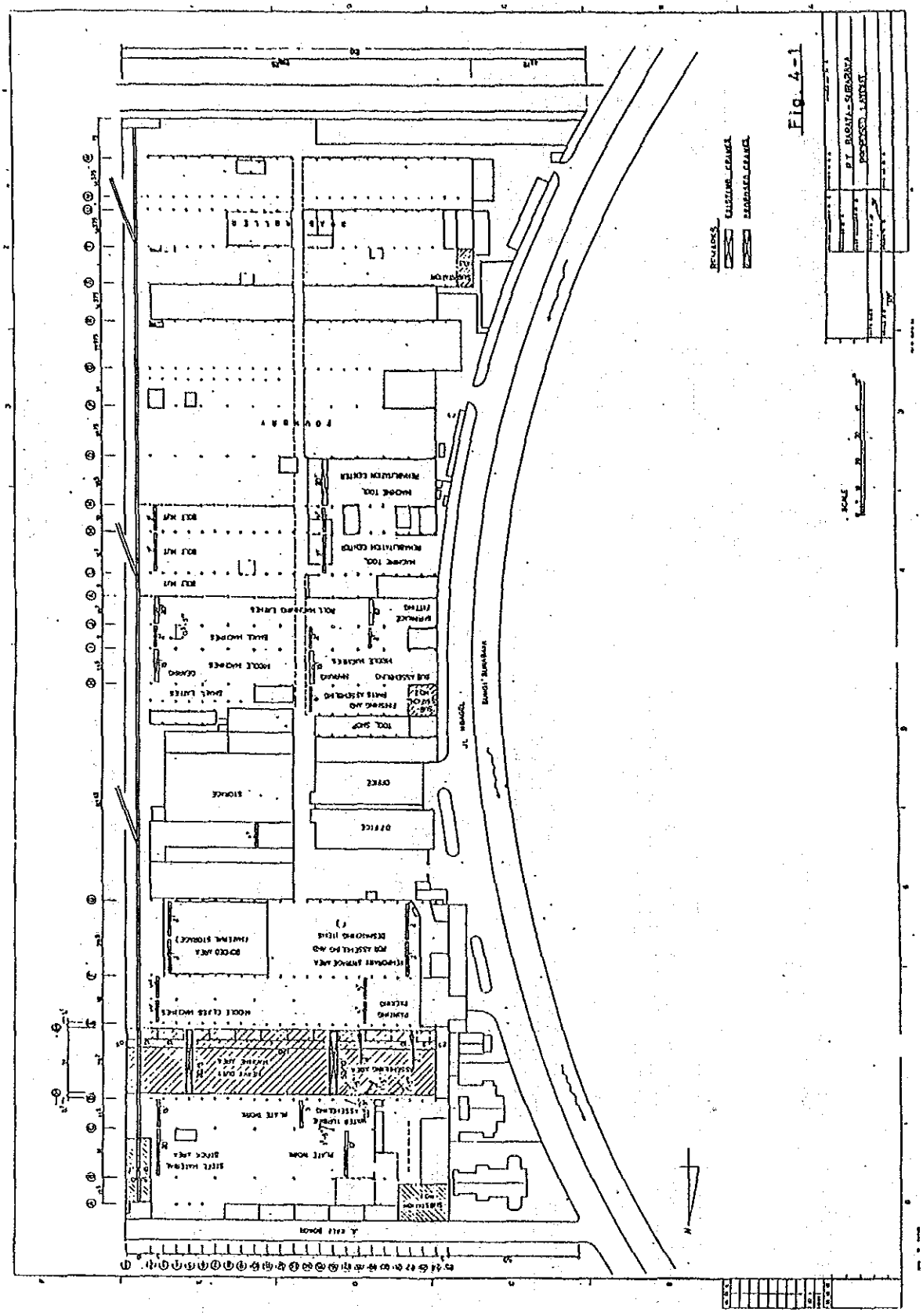


Fig. 4-1

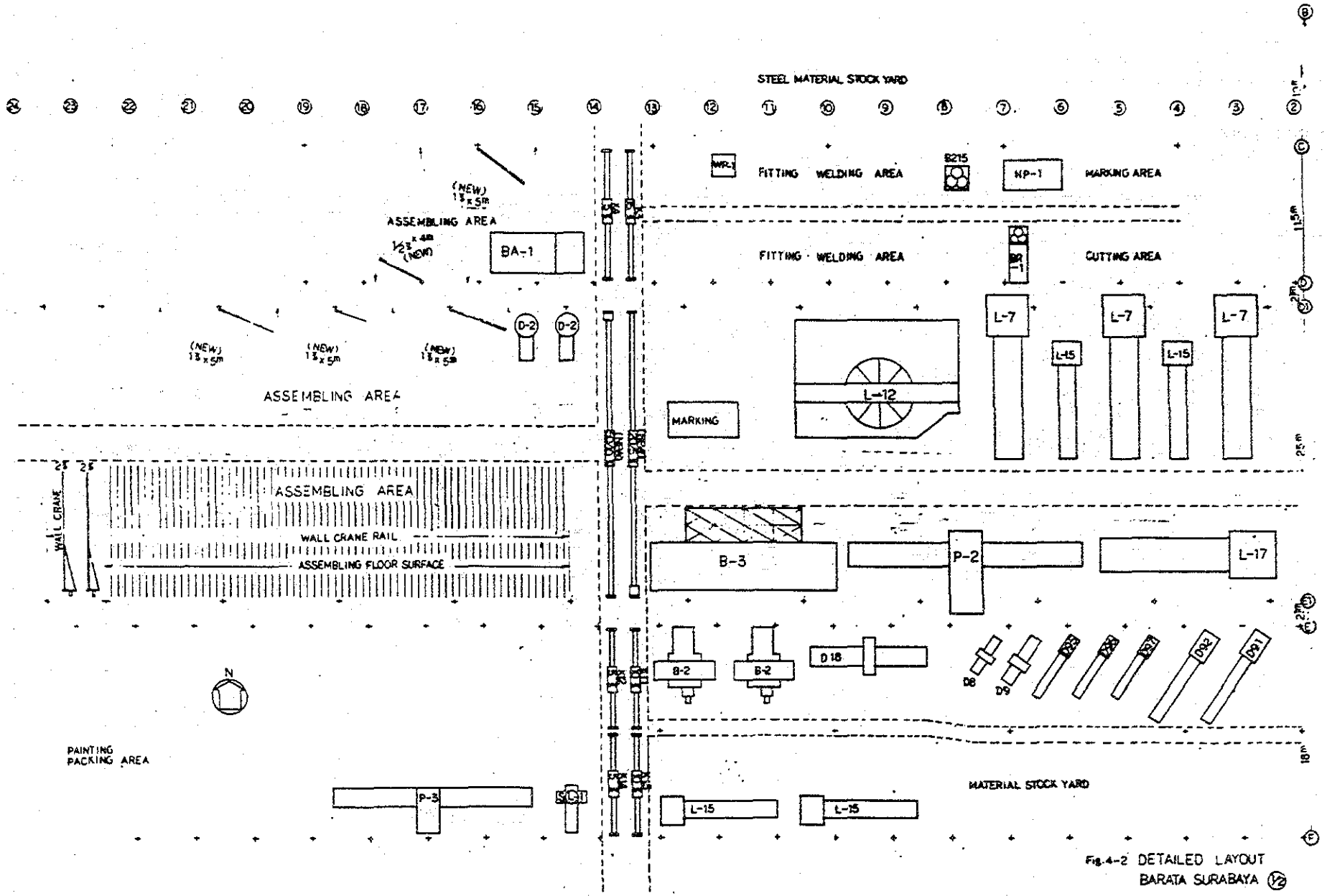


Fig.4-2 DETAILED LAYOUT
BARATA SURABAYA (V2)

Remarks: 1. Machine code number with hyphen (○-○) means New machine Tool.

2. Machine code number without hyphen means Existing machine Tool.

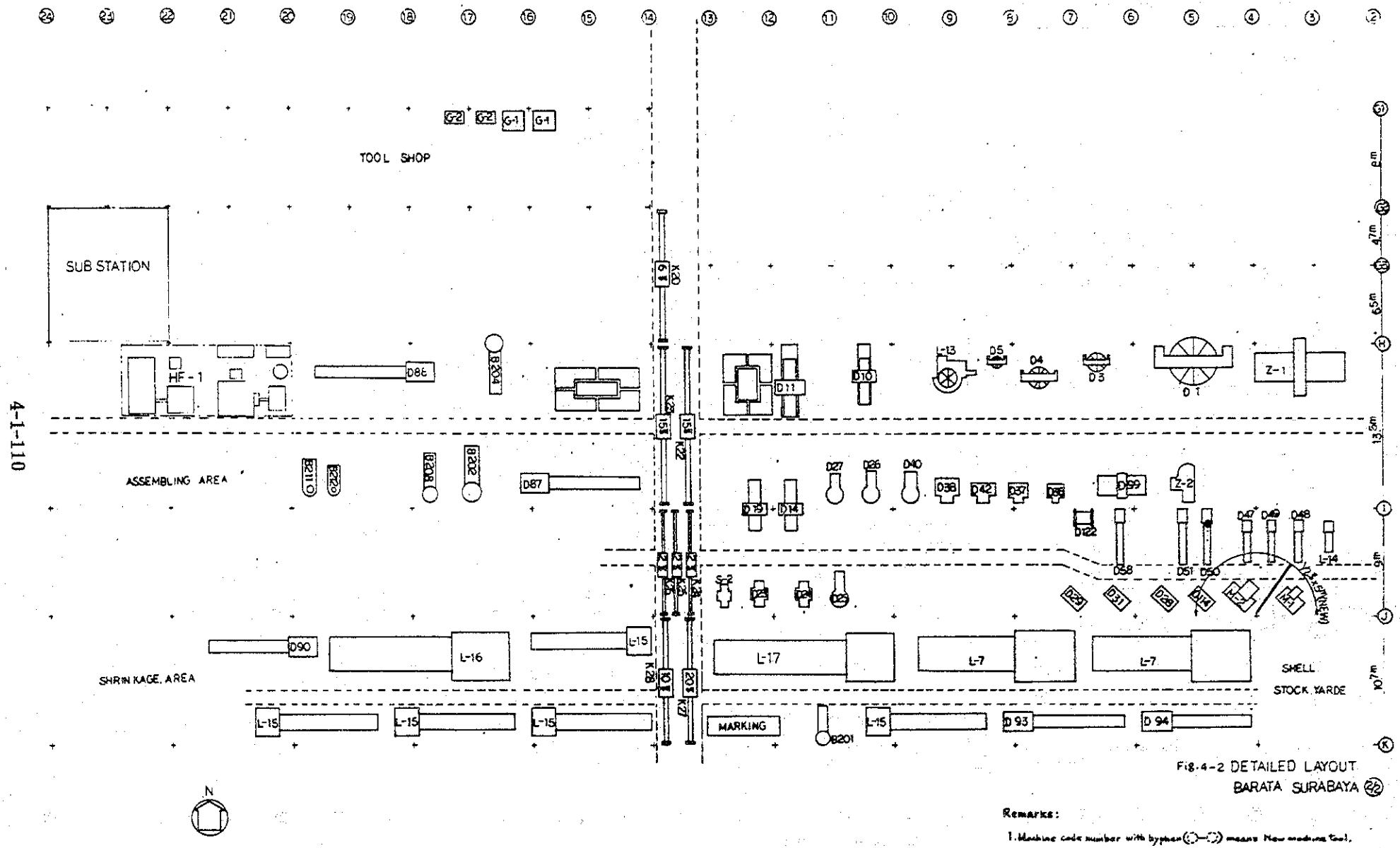


Fig.4-2 DETAILED LAYOUT
BARATA SURABAYA (2/2)

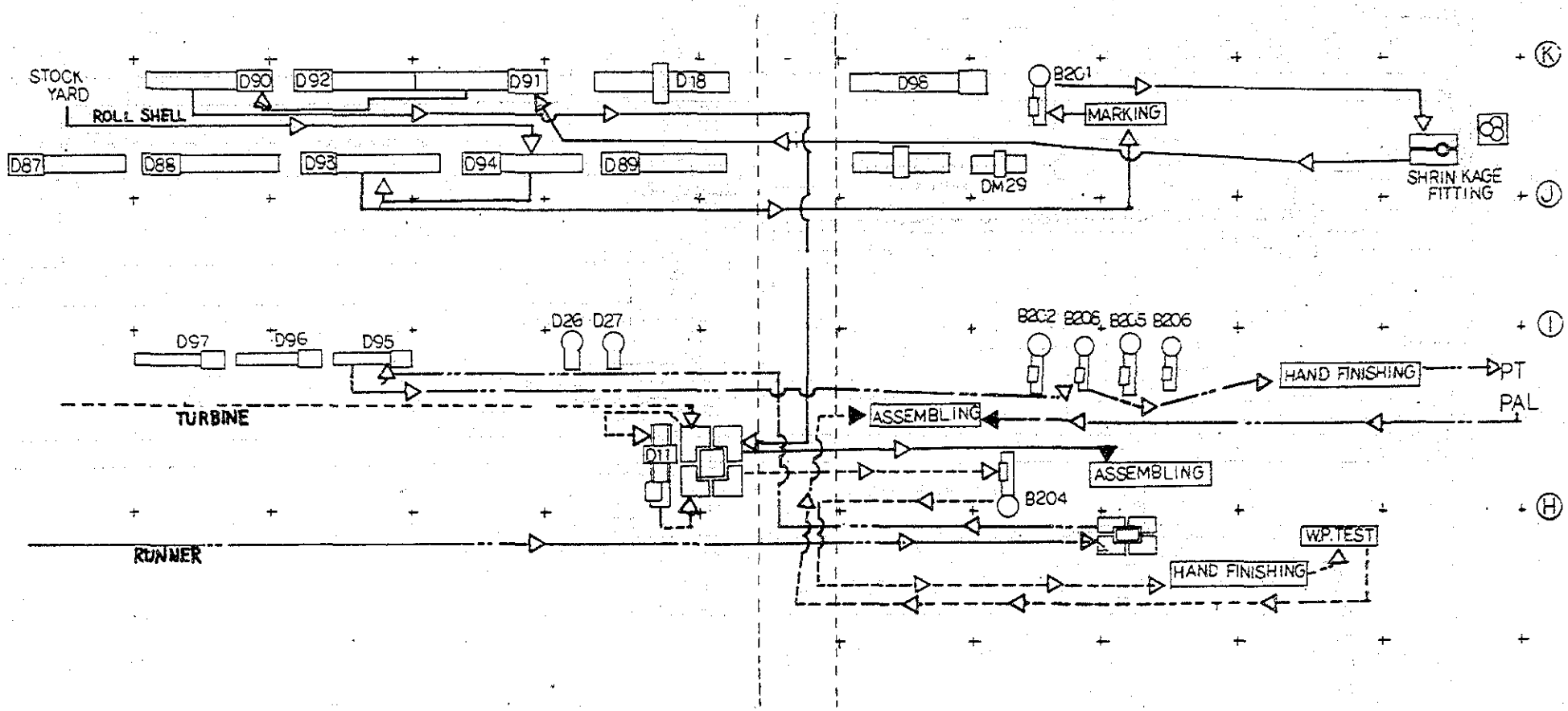
Remarks:

1. Machine code number with bypass (○—○) means New machine tool.
2. Machine code number without bypass means Existing machine tool.

Fig. 4-3

EXISTING PRODUCTION FLOW

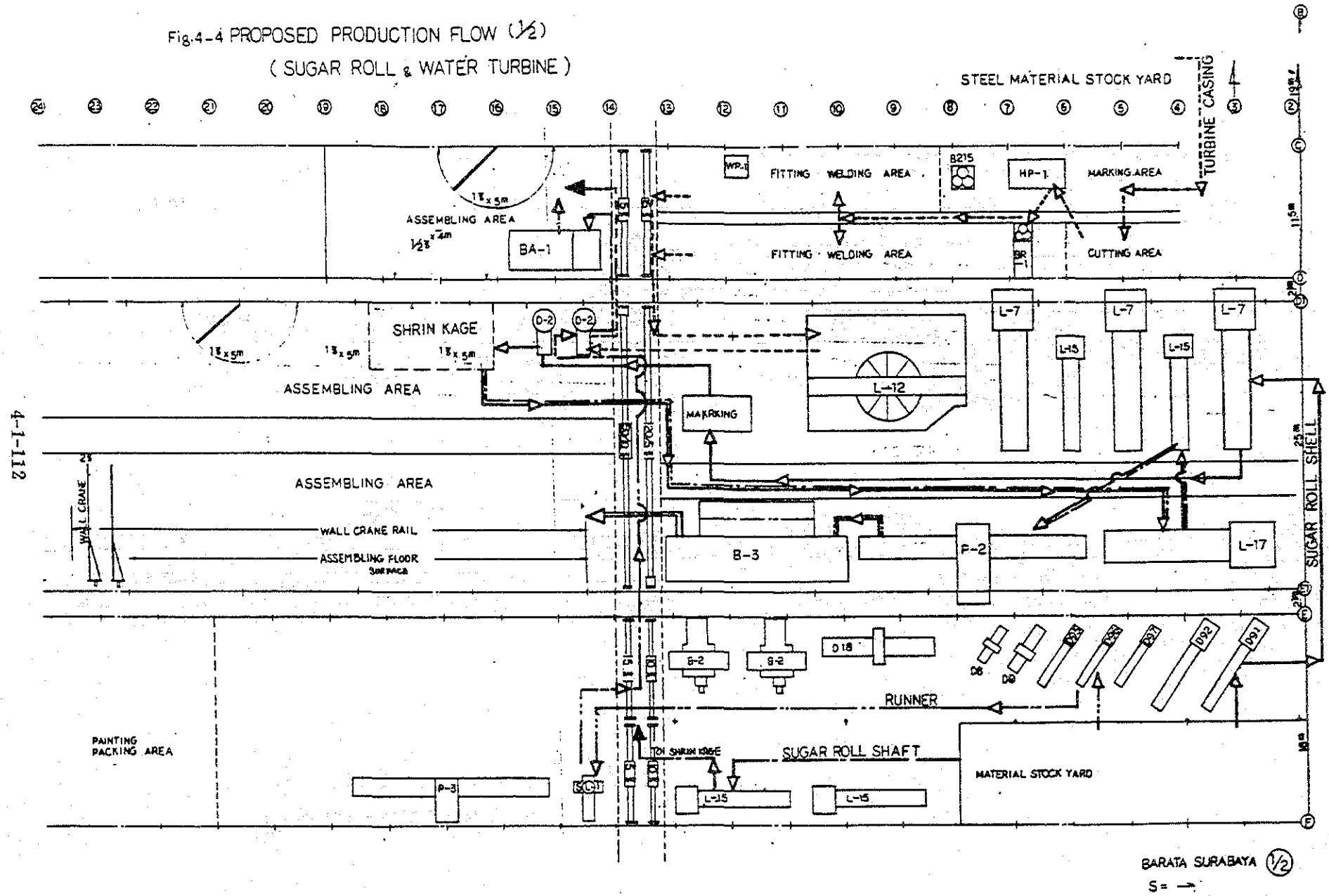
(SUGAR ROLL & WATER TURBINE)



BARATA SURABAYA

Fig.4-4 PROPOSED PRODUCTION FLOW (1/2)

(SUGAR ROLL & WATER TURBINE)



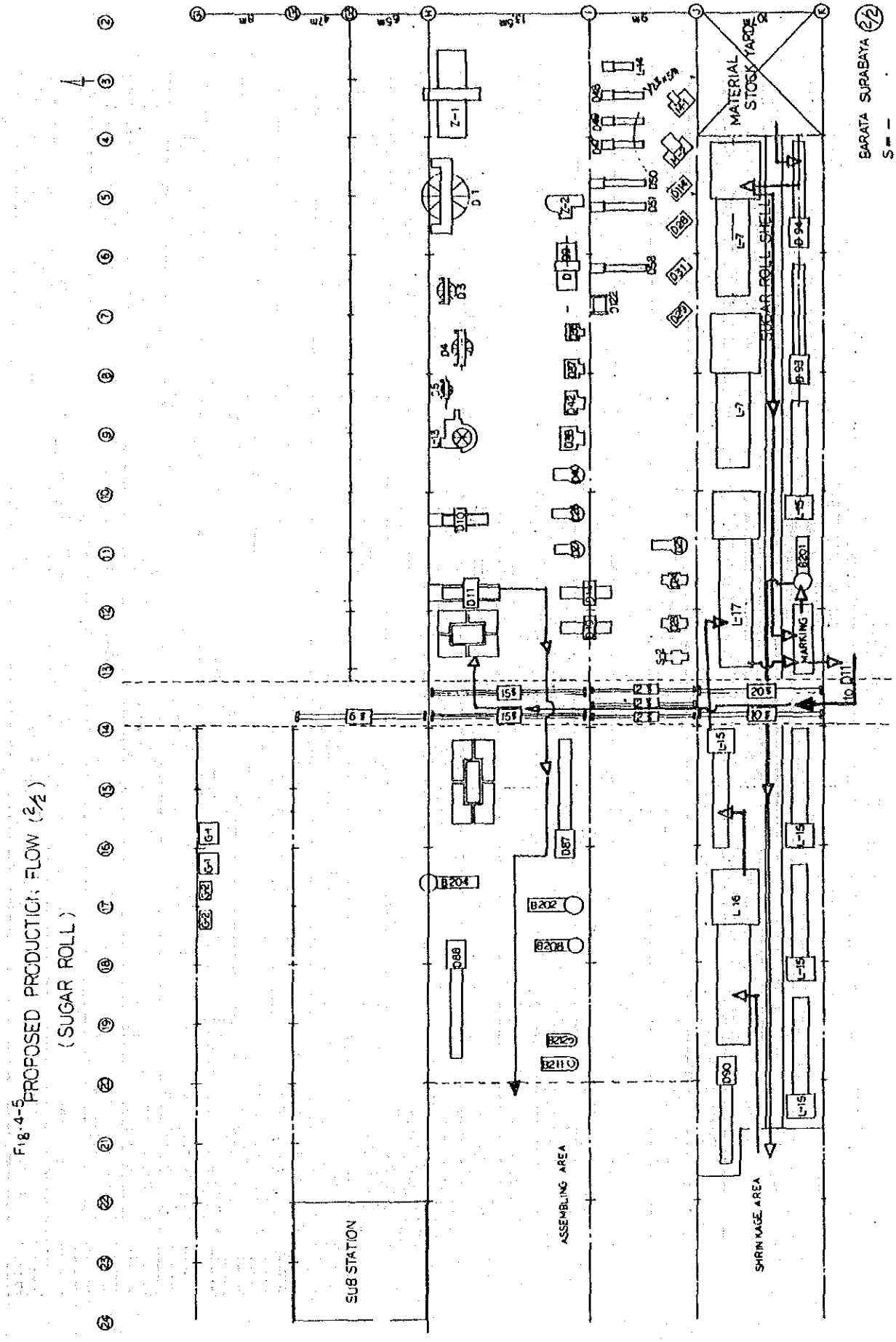
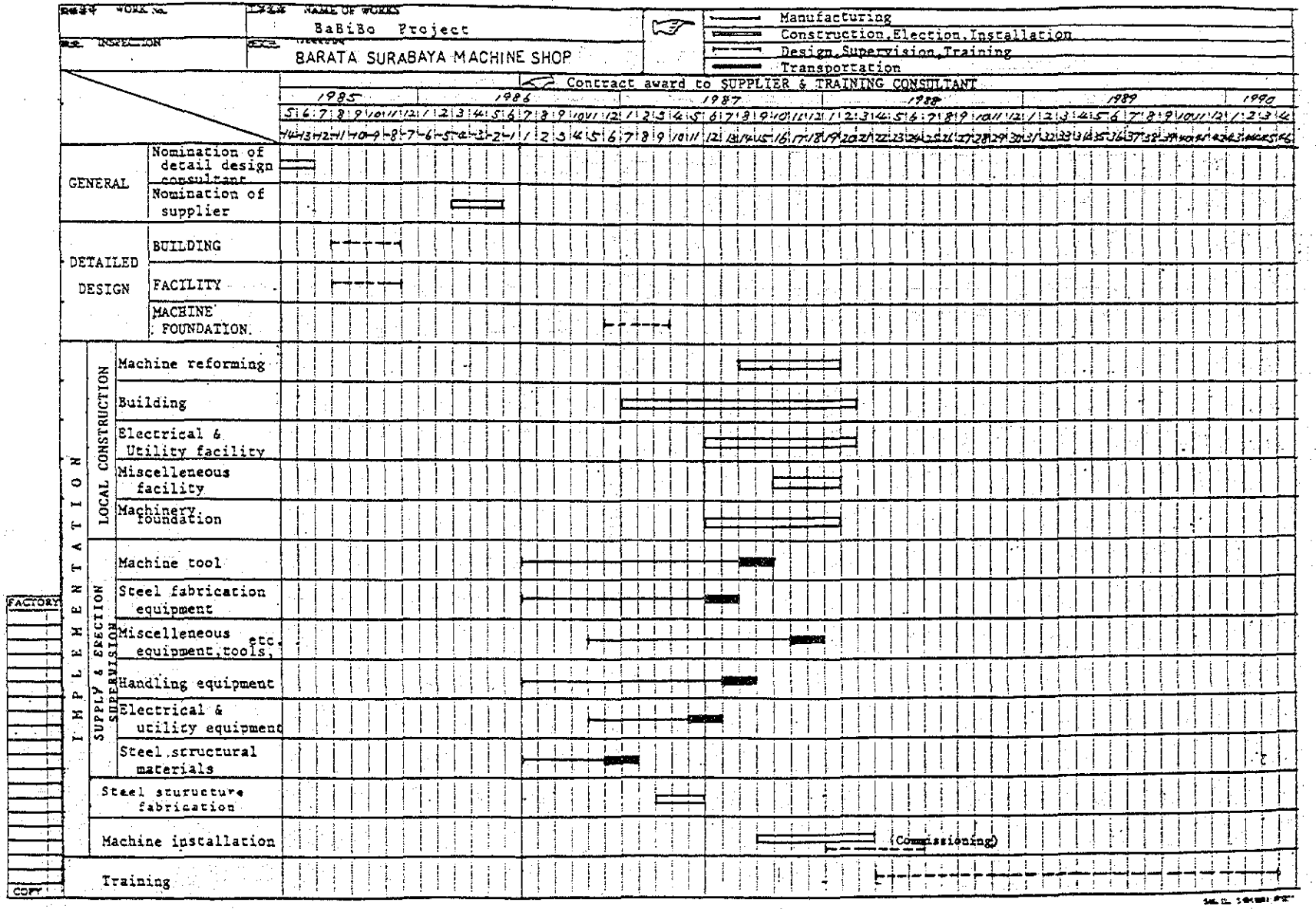


Fig. 4-5 PROPOSED PRODUCTION FLOW (2/2)
(SUGAR ROLL)

Fig. 4-5 IMPLEMENTATION SCHEDULE



4.1.5 Production Management and Job Training

(1) Managerial Organization

The managerial organization in Surabaya Machine Shop is analized and reviewed from the viewpoint detailed below. Machine Tool Rehabilitation Center is recommended to hold the existing managerial organization on condition that P.T. Barata Indonesia does not become a machine tools manufacturer.

1) Production management organization

The production program stipulates that Surabaya Machine Shop converts the existing production organization mainly related to parts machining to an organization covering assembly as well as machining in the future. In accordance with the production program, the function of judging whether orders are booked from the viewpoint of the load plan and machining techniques becomes a very important factor. Therefore, this function, that is, the production planning function must be under the direct control of Branch Manager.

On the other hand, the production control function includes material procurement and the follow-up of the delivery date to exercise the program.

It will be required that the production control function be integrated with the production planning function to form the function as the coordination center for Surabaya Machine Shop as a whole.

2) Quality control organization

Quality control will be required to satisfy the following functions.

(1) Quality control on materials

The quality control on casted materials, bought out materials, and steel materials must be performed in such a way as to fully

make certain of the production process, physical and chemical properties, dimensional accuracy, functional reliability, etc.

(2) Quality control on machining

Measurement on the way of machining is subject to operator's voluntary inspection, as a rule. However, inspection and check between machining procedures and quality control on finished parts or on parts in the assembly procedure are required. In particular, machining of cast materials must be subjected to non-destructive examination for surface and inner defects during the rough machining procedure.

(3) Performance check

Finished products must be checked for the performance as a commodity product before delivery. In addition, it is necessary to make sure that they are so packed as to maintain the desired performance and quality until they have been handed over to the customer.

In some cases, drive units must be checked for operation performance. It is necessary to perform the calibration and recording.

Surabaya Machine Shop must prepare its own quality control manual to satisfy the above-mentioned quality control function, and must ensure that all persons belonging to this workshop are familiar with the manual, which is one of the important duty directly imposed on the Branch Manager.

3) Production engineering

The production engineering necessary for Surabaya Machine Shop is subdivided into following two categories.

① Machining technique control

Machining equipment and machining technique are progressing day by day, with which no one must be satisfied even though one investment is made on new equipment. New machining technique must always be developed and introduced with every effort, and be accompanied by sophisticated design and manufacture of the necessary jigs and tools. Then, a machining & assembling manual must be renewed on the basis of this machining technique, which must be thoroughly familiarized directly for workers.

② Preventive maintenance

Equipment and machines must be regularly and constantly inspected for accuracy and remedied, whether they are newly installed, or deteriorated. The preventive maintenance procedure must be set as a rule by Surabaya Machine Shop, and inspection results must be precisely recorded for the follow-up in the future.

In addition, it should be noted that cutter tools are to be properly remedied and replenished, from the view point of production control and quality control. These cutter tools must be kept and trusted in strict accordance with a predetermined rule.

Major maintenance work including reform of machine and replacement of parts should be consigned to Machine Tool Rehabilitation Center.

These functions are a link of production activities. In Surabaya Machine Shop, these functions should be under the direct control of the Factory Manager. Production techniques, preventive maintenance, and the skill and morality of operators are important factors upon which productivity depends. Therefore, the training of operators and improvement in their morality are necessarily attributable to Factory Manager's responsibility.

(2) Organization chart and personnel

In consideration of managerial organization and the necessary functions stated hereabove, the organization chart in Surabaya Machine Shop is planned as detailed below.

1) In general, the above functions should be controlled by the Branch Manager and Factory Manager. The two kinds of functions must be clearly differenciated. In particular, the Factory Manager should be allowed to devote himself to improvement in productivity.

2) Therefore, the Branch Manager must perform the following items at his responsibility: ensuring orders necessary for the Factory Manager to improve productivity, coordinating production scheduling, direct support consisting of the timely supply of drawings and materials, and quality control, and indirect support consisting of labor and safety control.

Here proposed is the basic organization chart on the basis of the above as shown in Fig. 5-1., Organization of Surabaya Machine workshop. The personnel plan specifies the personnel to achieve the functions shown in (1) and is planned as shown in Table 5-1, Personnel plan. It is impossible for the Contract Section and the Administration to propose the personnel plan solely for Surabaya Machine Shop, because the Contract Section is closely related to the Business Group in service allotment and the Administration Section has the functions common to those of other organizations in Surabaya Shop, that is, Road Roller Shop, Cast Iron Foundry, and Machine Rehabilitation Center. The personnel program should therefore be reviewed only by P.T. Barata Indonesia.

In the present organization of P.T. Barata Indonesia, Surabaya Foundry is integrated with Machine Shop into Surabaya Machine and Foundry Branch. However, the present feasibility study report proposes the plan on the consideration that Surabaya Machine Shop is an independent Branch separated from Surabaya Foundry.

(3) Training plan

It is our understanding that the training which is required by P.T. Barata Indonesia for the future and which has already been exercised is subdivided into categories shown in Table 5-2, Present education/training situation.

(1) Management training is to be planned and exercised directly be the top management of enterprise, and related to the personnel policy of enterprise.

(2) Design engineering training falls in the category most necessary for P.T. Barata Indonesia at present. However, this type of engineering development should originally be implemented by license agreement and technical collaboration agreement, etc., and the computer aid system, etc. should positively be introduced in accordance with the engineering development plan and design system as a part of the whole policy of P.T. Barata Indonesia.

For this reason, this chapter presents the training plan as subdivided into production engineering in 1) and skill training in 2).

1) Production engineering training

The training in this category must essentially meet the present situation of Surabaya Machine Shop, although the training may be performed in different ways. The training should be supported by improvement in the system and should not be the general lecture for specified persons.

The most recommendable training method is as shown below.

(i) An engineer who is acquainted with production techniques at the factory of overseas enterprise having the product mix and equipment similar to those of Surabaya Machine Shop is dispatched to Surabaya Machine Shop for a certain period.

(ii) The engineer takes a leading role to organize a task force team together with the middle management and engineers of Surabaya Machine Shop.

(iii) The task force team is assigned to review and improve the system and approach on production control, quality control, and production techniques.

This recommended method enables the middle management and engineers participated in the task force team to develop themselves and to be familiar with new approaches through this job training, review of the system improvement plan, and practice of the improved control approach. In addition, the recommended method contributes effectually toward realizing improved control system in Surabaya Machine Shop.

It should be noted that the managements of P.T. Barata Indonesia has to totally reply upon instructors sent from overseas enterprise on the understanding that the instructors perform their own task in lieu of the managements, and that the success of training lies solely on the middle management and engineers, participated in the task force team who positively show their strong desire to the training.

2) Skill training

In fact, skill training is to level up skill peculiar to each worker. P.T. Barata Indonesia has put into practice unique job training as shown in Table 5-3, Training Plan. It is our judgment that the skill of each worker is never on a low level.

This chapter proposes a skill training plan reviewed in the following two points.

(1) When new and unfamiliar machines and equipment are introduced, an installation supervisor is sent and commissioning is followed by operation training within the scope of the equipment supply contract.

This method enables operators to master the operation of the machine alloted to them while they use the machine. This method may be put in practice in such a way that helpers and other operators in charge of relevant machines and equipment join the training. Thus, this method enables operators to understand the procedure and key point of preventive maintenance as well as operation of the machine.

Another advantage of this training is that operators join training while machining products of their company and that operator's absence loss is prevented as compared with overseas training.

Table 3-5, Facility Plan (New machine tools) includes new types of machines and equipment that may require skill training. They are BF-130 with NC, Hobbing machine, High frequency hardening equipment, Large-size vertical lathe with NC, Bevel gear shaper, Dynamic balancing machine, Oil hydraulic press, etc.

(2) In addition to instructions and training given by an installation supervisor as shown above, it is necessary for a specialist with sufficient skill and experience to give a wide range of skill instructions on machining, inspection, and assembling.

In particular, Surabaya Machine Shop is going to introduce equipment and technique of inspection including non-destructive examination and functional check. This raises an important problem, leveling-up of inspection skill, to be solved by Surabaya Machine Shop.

3) Training plan

The training plan is made to fulfill the content and method of the training in 1) and 2) as shown in Table 5-3.

The training period is minimized in consideration of production engineering and a level of operator's skill in Surabaya Machine Shop. It will be necessary that this first training is followed by the second and third, which will be planned and put into practice as required.

The content of the second and third training should be planned with careful consideration taken in change of situations such as P.T. Barata Indonesia launching into a new product field, expansion of material availability in Indonesia.

Barata Surabaya machine shop

Table 5-1 Personnel Program

ORGANIZATION	MAIN FUNCTION	PERSONNEL PLAN							
		1984		1989		1994		1999	
		MANAGER ENGINEER & STAFF	WORKER	MANAGER ENGINEER & STAFF	WORKER	MANAGER ENGINEER & STAFF	WORKER	MANAGER ENGINEER & STAFF	WORKER
Branch manager		1		1		1		1	
Production control	1) production scheduling & control 2) coordination with other groups 3) packing and dispatching 4) material & subcontract control	34		5	35	7	40	8	40
Quality control	1) material & work inspection 2) product inspection 3) calibration of inspection tool	10		10	22	10	25	10	25
Factory manager		1		1		1		1	
Technical	1) production engineering & technique 2) preparation of jig & tool 3) workers training	(included in work groups)		10	10	12	10	12	10
Maintenance	1) preventive maintenance 2) repair and control of tool	46		2	34	2	22	2	16
Machining	1) machining work 2) hardening	127			118		129		132
Assembling	1) assembling and fitting 2) plate work & painting	69			58		58		71
Handling	1) material & tool handling	(included in work groups)			27		30		33
TOTAL				29	304	33	314	34	327
		288		333		347		361	

NOTE: Members for Contract Sect. and Administrative Sect. are not included in the above figures.
This Table is only of Surabaya machine shop, then excludes of Machine-tool rehabilitation center.

Table 5-2 Present Education/Training Situation

P.T. Barata Indonesia

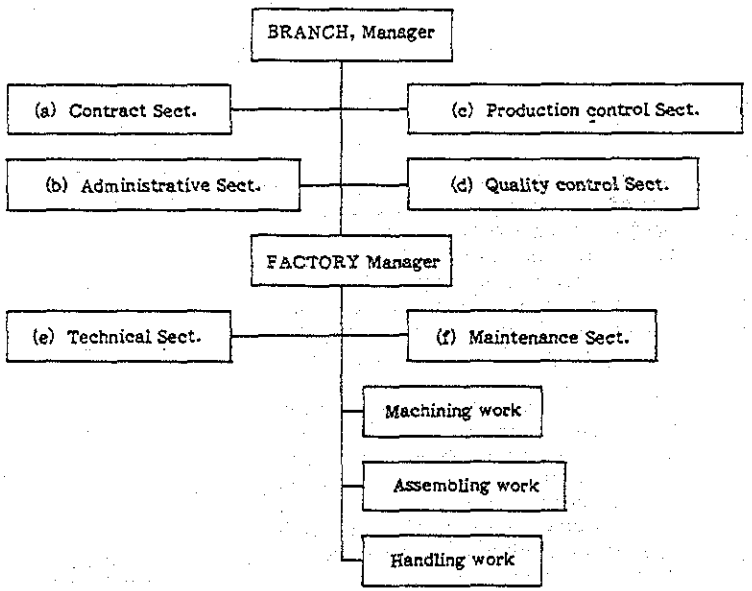
Category	Contents	Present education situation in P.T. Barata Indonesia
(A) Management training	1) Technique such as economical analysis, market forecast and so on 2) Management technique 3) Organization control, personnel training, etc.	1) Participation to lecture meeting held or arranged by Indonesia Government. 2) Meeting for training by outside instructors invited by P.T. Barata Indonesia. 3) Attendance and participation to training held in Indonesia or overseas. 4) Education and training given by the manager of P.T. Barata Indonesia.
(B) Design Engineering Training	1) Design and engineering techniques of plant machinery and equipment 2) Design and drawing techniques of machinery, equipment, and structures. 3) Technique control and technique such as computer aided system.	1) Education and training given by the licenser according to license agreement 2) Entrance into special schools or training centers in Indonesia. 3) Participation into overseas training or entrance into overseas training centers.
(C) Production Engineering Training	1) Production management technique 2) Quality control technique 3) Production techniques (including reform of machining equipment and design of jigs/tools)	1) Participation into overseas lecture meeting or training. 2) Study by overseas technical magazines and manufacturer's literatures. 3) Advice and instructions given by the consultant. 4) Instructions and introduction of new techniques given by the supervisor from the manufacturer of equipment.
(D) Skill training	1) Training to improve worker's skill.	1) Training inside P.T. Barata Indonesia. 2) Entrance into training centers in Indonesia. 3) Instructions given by the supervisor from the facility manufacturer.

Surabaya machine shop

Table 5-3 Training Plan

Category	Contents and Methods of Training	Trainee	Training Schedule 1988 1989 1990	Training cost
Production Engineering Training	A task force team is organized and team members are trained and developed through planning and putting into practice a theme, which is improvement in the present situation of systems and methods on production control, quality control, and production techniques.	Middle management and engineers in the Production planning & control section, Quality control section, Production technical section, maintenance section, and Machine tool rehabilitation center.	⟵——⟶	One qualified engineer Two specialists 199 million yen (857.7 million Rp.)
Skill training	1) The purpose of the skill training is to give a wide range of knowledge on machining, assembling, inspection, etc. and to level up worker's skill. The skill training consists of lecture and on-job-training performed at site in Surabaya Machine Shop.	Foremen, senior workers, and inspectors Surabaya Machine Shop and Machine Tool Rehabilitation Center, relevant to the supersonic examiner, dynamic balancing machine, etc. in particular.		
	2) Relating to machinery and equipment which are newly installed and introduced in Surabaya Machine Shop according to this F/S report, the skill training is exercised jobs ranging from installation to operation including instructions on efficent usage of skill and accessories in operation.	Operators and some maintenance workers of the following equipment (1) BF-130 with NC (2) Hobbing machine (3) High frequency hardening equipment (4) Large-size vertical lathe with NC (5) Bavel gear shaper (6) Dynamic balancing machine (7) Bending roller (8) Oil hydraulic press (9) Lathe system machines (20 units in total) (10) Other equipment	⟵⟶ ⟵⟶ ⟵——⟶ ⟵⟶ ⟵⟶ ⟵⟶ ⟵⟶ ⟵⟶ ⟵⟶ ⟵⟶	Included in equipment cost within the scope of supply of equipment and machinery.

Fig. 5-1 Organization of Surabaya Machine Workshop



Namely each section (a) to (f) shall be the staff of the Factory manager or Production manager and the foundamental function/obligation of these section shall be as follows;

(a) Contract Sect. ..... (1) coordination to each business group.
(2) estimation and cost follow

(b) Administrative Sect.... (1) general & labor affair
(2) accounting & book keeping
(3) security & safety control

(c) Production control..... Sect. (1) time scheduling & follow
(2) material procurement and inventry control
(3) drawings preparation
(4) packing, despatching & transportation arrangement

(d) Quality control Sect. .. (1) preperation of QC manual
(2) inspection & recording
(3) calibration of inspection measure & equipment

(e) Technical Sect. ..... (1) investigation & development of production technique
(2) preparation of machining & assembling instruction
(3) Solution of irregularity
(4) design of special jig and tool
(5) study of special treatment

(f) Maintenance Sect..... (1) checking & recording of machine accuracy
(2) repairement and improvement of machining, handling facilities
(3) procurement and control of tools and consumables.

4.2 Barata Gresik Factory

4.2.1 Results of Technical diagnosis of the Factory

With respect to the P.T. Barata surabaya Factory and Gresik area, technical diagnosis were made from July to August 1984. This chapter describes the results of these diagnosis on the technical items and various measures to be taken for improvement.

(1) Outline and history of the factory

1) P.T. Barata Indonesia was established in 1901 to perform maintenance and rehabilitation services, sometimes even manufacturing for the development of sugar industry and other plantations.

2) Currently the Surabaya factory is offering various services and products such as the construction of cement and sugar plants, steel constructions including water gates, steel bridges and storage tanks, plate works and piping systems including ducting works, penstocks, plateforms and piping design, self-propelled equipment and casting products.

(2) Present production conditions

1) Annual-production of fabrication division

The annual-production of steel structures and plate works by Surabaya Factory is approximately 5,000 tons.

2) Maximum production weight and sales amount in %

Heat exchangers	45	ton/month	2.5 %
Vessels	15	"	6.0 "
Tanks	120	"	12.5 "
Pipings	250	"	7.5 "
Steel structures	500	"	29.0 "
Plate works	350	"	37.5 "

Parts/machining	75	"	2.5 "
Others	25	"	2.5 "

3) Since the relations between the objective plants (Cement, Sugar, Fertilizer, Pulp/paper Palm oil) and annual production were found not to be clear in the process of survey, clarification in these respects was proposed resulting in the forecast of product mix.

(3) Production facilities and production technology

1) Existing production facilities

(1) For the facilities related to the steel structure and plate works, refer to the list 1-1 List of Existing Machine/Tool.
The following equipment have been taken to be the objects of survey: cutting equipment, forming machine, welding equipment, drying oven of rods, heat treating furnace, surface perparation and testing and examination equipment, and utilities.

(2) The total floor space for steel structure and plate works is 15,220 M^2 with 6 BAYs and the work area for he steel structure and piping prefabrication is 8,500 M^2.

2) Production technology

(1) Experienced codes and standards

JIS, ASME, BS, API, and Indonesian standard.

(2) Experienced material

Carbon steel, C-Mo steel, Cr-Mo steel, ferritic stainless steel, Austenitic stainless steel, Aluminum, and Stainless clad steel.

(3) Normally required production period after receiving an order on exwork base is as follows:

Heat exchanger	ϕ 1.5M x L4.5M	6 weeks
Vessel	ϕ 4.5M x 29M	8 weeks
Tanks	ϕ 3.5M x L11M	8 weeks

3) Recommendation according to the results of factory survey.

① Measures should be taken to put the production facilities, floor space layout and floor in good condition. Also, it appears that the present floor space may become too small when changes in the production capacity and product mix are attempted in the future.

② When the production of higher-level quality products is attempted, the present production technology level may become necessary to be improved.

(4) Control system and personnel organization

Although Gresik Factory will be separated from Surabaya Factory and will become an independent Factory in the future, presently, it still exists only in the condition of a plant site. Consequently, the review had to be made based on the fabrication division of Surabaya Factory.

1) Management system and personnel

The Present management system and personnel organization are shown in Table 1-1 & 1-2.

① Recommendation to the management system

The present system is considered to have been well organized in functional aspect. There is no clear cut distinction between the assigned functions because of the mixing of divisions and sections with one another. Taking this opportunity of construction of a new factory, making the distinction between business and managerial function is recommended.

② Personnel

It appears that there is an urgent necessity to recognize and improve the technical levels of personnel to cope with the improvement in the product quality and production increase in the future. In pursuing this approach, the intent is to improve the skill and professional knowledge of the personnel through training programs and restrain the increase in the number of personnel.

2) Production control system

① The basic function of the production control is to create a system capable of improving quality, advancing technology and reducing cost. And in addition, the system must be able to manage each production process so that the products can be produced according to the predetermined plan.

② The results of the survey have revealed the lack of close coordination between the production control and planning section, and technological section in executing their functions.

③ A complete review on the delay on the appointed delivery time is also necessary.

④ Designs

Judging from the results of the survey, the designing and drawing ability of the plant mechanical equipment producing in the factory must be improved. Because the basic concept of quality and production controls, and production increase is to obtain the good drawings and achieve the production of equipment in accordance with these drawings. And in addition, it is considered that all these factors can be improved through the good communication and quick response between and by the designing & production sections.

3) Quality Control system and Inspection

(1) It appears that in executing the management and QC work, the basic concept of QC is smoothly penetrating the mind of the personnel because of such symptom as the compilation of a QC manual by Surabaya Factory at its known initiative.

(2) A more effective control system, however, may be necessary to spread, improvement and check the QC manual. The first step to be taken in this respect is to perform the work such as non-destructive examination of the welded section and material test for vital component material on the basis of inside order. The Factory has so far been depending on the subcontractors for the performance of such works.

(3) In addition, the data on the defective workmanship and claim should be collected. With the improvement in quality and increase in production, the countermeasures to prevent the recurrence of these types of problems may become deciding factors in QC.

4) Maintenance system

Although Surabaya factory is provided with a maintenance section, the establishment of a maintenance section at Gresik Factory is also recommended.

Reference materials must be collected to determine the key control points because a large number of new equipment will be purchased.

5) Layout, floor space structure and transportation facilities

Omitted. For more information regarding the new Factory, refer to the chapter 4.2.3.

6) **Utility**

Omitted. For more information regarding the new Factory, refer to the chapter 4.2.3.

4.2.2 Technical Prerequisite

This paragraph describes the prerequisite for the accomplishment of the renovation project.

(1) Location of plant site

1) The renovation project of P.T. Barata Surabaya factory is intended to transfer its fabrication division to the new factory for achieving new products mix and production increase.

2) The most important and foundamental requirement of the site selection process at Gresik is the need to find a location that has proper amount of land and acceptable nature of soil for the plant site. The reasonable land preparation cost of plant site that would not make the burden for the operating cost of the plant is also an important consideration.

3) Although the nature of soil was judged to be not so inferior quality on examination, still the ground level needs to be raised by 1 m for the replacement of soil and prevention of the land from being flooded in the rainy season. A great number of concrete piles may be also required.

4) Consequently, it is considered that the use of the present projected plant site is advisable rather than looking for other plant sites.

5) The land preparation of a plant site is subject to the permission to use land from the Indonesian government.

(2) Selection criteria of production facilities

Gresik factory may mainly manufacture processing equipment for cement plant, sugar plants and various other equipment which have so far been manufactured but the so-called precision equipment will be excluded. In selecting the selection criteria of production facilities, care should be paid to the following points:

1) The facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities.

2) The equipment with a high level of NC should be avoided because no mass production equipment will be used in the factory (for example, CAD/CAM machine.)

3) Although the stress relief furnace, acid cleaning equipment and coating facilities are planned to be installed as supplementary facilities, the plating facilities will be excluded so that the plating can be performed by experts on the basis of outside order.

4) Making the concept of quality control generally known to the employees through the implementation of inspection facilities centering around the non-destructive examination.

(3) Limitations of transportation

1) Transportation of products

(1) The port nearest to the new factory will be Cemen Gresik or Petrokimen. Neither exclusive port nor loading facilities, however, are available at these ports though there will be no problem in the transportation of products from the factory to these ports. Therefore, Surabaya Tanjung Perak port which is next to the nearest port to the new factory will be the only choice.

(2) There is a distance of about 36 km from Gresik factory to Surabaya tanjung Perak port.

(3) The weight limitation in transportation from Gresik to Surabaya is subject to the 8-ton requirement by Police of Surabaya. Thus the marginal product transportation is restricted to a low level.

(4) In view of the above facts, the amendment of statute and keeping roads and bridges in repair may become necessary so that the transportation of products with weight up to at least 30 tons is possible.

4.2.3 Basic Concept and Outline of Renovation Program

The following procedures have been taken in drafting the renovation program based on the result of investigations and diagnosis on the present state as described in the previous clause 4.2.1:

(1) Drafting a new production plan optimized with respect to the Gresik factory based on the REPELITA-IV of the Indonesian Government, market research conducted by the study team and study on the existing plant sites.

(2) Drafting a plan with respect to the capabilities of the new facilities pursuant to the new production plant.

(3) Comparison of the capabilities between the new facilities and existing ones, drafting a layout for the new factory, and review on the various problems involved in the transportation of products.

(4) Reviews on the costs and processes regarding the plant construction, and equipment and facility installations.

(5) Reviews on the organizations and production technology after completion of the new factory.

Outline of the basic plan is that the Gresik factory may have an

independent can-fabrication division separated from Surabaya factory which principally perform the production and sales of steel structures and plate works, and related field works.

The intent has been to achieve a product mix capable of producing conventional products such as machinery and processing equipment as its basic load centering around cement and sugar plants. The productive capacity of hardware, the so-called facility productivity has been designed to produce 15,230 t/y which exceeds the present production record of approximately 5,000 t/y. The new factory may start production in October, 1988.

Conversely, in order to provide a complete software system which is the responsibility of Gresik factory, various reviews have been made in regard to the training programs necessary for the cultivation and increase of managers, engineers and skilled workers, and improvement in the technical levels of these personnel for preventing problems from occurring in the course of plant construction and operation initiation. Reviews have also been made on the factory and personnel organizations.

(1) Production plan classified into products manufactured by factory

1) Product mix at Gresik factory

① The product mix which is the basis of facility capacity design consists of the following two items: (1) Manufacturing of sugar plant equipment and cement plant equipment pursuant to the "SCOPE OF WORK FOR THE FEASIBILITY STUDY ON THE DEVELOPMENT OF PLANT PROCESSING EQUIPMENT INDUSTRIES" agreed upon by and between the Japan International Cooperation Agency and Directorate General of Basic Metal and Machinery Industries of Ministry of Industry. (2) Manufacturing of products which have so far been and will be manufactured by Barata Surabaya factory in a close relation with the local region (hereinafter called the "BASIC LOAD").

(2) In the meantime, it is important that the technical levels of Gresik factory is consistent with that of the fabrication division of Sruabaya factory, and in addition, permit to improve the technical levels as well as quality and productivity by adopting the new production technology. Judging from the classification of the products according to their types, Gresik factory is considered to be suitable to perform the works centering around steel structures and plate works.

(3) Consequently, as shown in Table 3-1, the product mix of Gresik factory has been classified into 10 items that can be manufactured inside the factory, and 5 items of fields works (for convenience, hereinafter called "Site Work"). Thus the types, number and arrangements of the necessary equipment have been determined through the classification of product forms.

2) Planning production scale of Gresik factory

(1) On making the market research on the cement and sugar plants and basic load to be manufactured by the Gresik factory, the factory's annual production scale has been determined based on the estimated productions from 1989 to 1993. Then review has been made as to the feasibility of the production of these plant equipment in Indonesia for seeking a local percentage.

(2) Next, the exclusive rates for the processing of these two types of local intended plant equipment by Gresik factory were determined. Steel structure and plate works were accorded a due exclusive factor, and productions were allotted to each product mix.

(3) In the meantime, investigations were performed on the factory production records in regard to the basic load as well. The basic loads for which production will be continued were also classified into steel structure and plate work in the same manner as described in the preceding paragraph (2). The productions were allotted to each product mix accordingly.

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 plan and required facilities

The production capacity of Gresik factory is set to 15,230 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 71.5%
BABIBO's share - 60%

(ii) Sugar plant equipment: local content ratio - average 60%
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 22,930 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 fabricaition division of Surabaya factory

for determining the facilities that can be diverted to the 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 was made according to the following standard:

Class I — Those can produce to the required condition without further improvement to the existing conditions.

Class II — Those that could possibly produce the required condition with some required/modernization.

Class III — Those that cannot produce the required condition with any other required/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 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 with respect to the following items:

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

ii) The types and number of the required equipment.

③ Setting off the applicable old 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 new factory

As a result of survey on the Surabaya 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 Surabaya factory agreed that a new factory be constructed adjoining Gresik Foundry Shop subject to the approval of the Indonesian Government. This clause describes the factory layout with the production of plate works and steel structure and partial transfer of equipment from Surabaya factory.

1) Basic plan of factory layout

Factory site area = 83,150 m^2
Total material storage area = 600 m^2

Building space area = 17,300 m^2
Layout = Refer to the attached drawing Fig. 3-1.
Annual production = 15,230 t/y

In the preceding paragraph 4.2.3-(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 4.2.3-(2), 2) and manufacturing process flows reviewed in paragraph (3). 1)-②:

i) Facilities and attached equipment for use in preparation.

ii) Facilities for use in the processing of machine

iii) 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 old equipment of Surabaya 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 outside order 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 test 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 product. The following four items have been reviewed with respect to Gresik 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 foundry shall be diverted for use in the new factory.

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 Wiring to the following items shall be provided for use with the machine tool and attached facilities:

(i) Propane gas (vi) Air

(ii) Oxygen (vii) Industrial water

(iii) Acetylene

(vi) Argon

(v) CO_2

(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

A factory will be constructed under the previously described project adjoining the Gresik foundry shop. In executing this plan, special care has been paid to the following:

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 total plant site area would be 83,150 cm^2, the land preparation process shall be divided into Phase I (43,150 m^2) and Phase II (4,000 m^2, extension).

② In Phase I, the land will be dug down by about 1 m, then the soil from the site of Phase I will be piled on the site of Phase II.

③ Water will be drained off from the land of Phase I, and sand will be replaced. Then the land will be raised by 1 m.

④ The sand to be used for replacement shall consist of quality rever sand of 40% and mountain sand of 60%.

⑤ The estimate for Phase II was excluded from the estimate of this occasion.

2) The ground and pile

Because of comparatively soft ground, the use of piles with a length of 15 m was determined. the construction costs were computed on the assumption that the piles can be procured in Indonesia.

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 furnaces, 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. Formal acceptance of delivery shall be executed upon completion of test run of the equipment after installation.

③ As shown in the attached diagram 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 work, including land preparation.

iii) Equipment installation work.

iv) Electrical wiring works.

v) Piping works inside the building

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

4.2.4 *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

1) Outline of renovation program at Gresik 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 15,230 tons centering around plate works and steel structure.

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 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 until 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 large-sized product -- The endurance of the bay shall be 10 t/m^2. The endurance of other sizes of the bays shall be 5 t/m^2.

3) Comparison before and after the renovation

In order to study the improvement degree resulting from the renovation, comparison has been made between the existing factory (Surabaya factory, fabrication division) and new factory in regard to the production per unit area and direct worker. The results of the comparison are shown in the following table.

	Before renovation (a)	After renovation (b)	Ratio (b/a)
Production per unit area (ton/Y/m^2)	0.59	0.88	1.49
Production per direct worker (ton/Y/man)	17.8	29.4	1.65

4) Factory layout

The new factory has been characterized by the emphasis placed on the factory layout, and broadly grouping the bays according to the types of products, namely, the material, preparation steel structure, general plate, unit cylinder, heat exchanger assembly and pressure vessel assembly yards. Note that a carrying but gateway for the D-bay is installed at the west side for carrying out something long providing a sufficiently wide carrying out area and an easy access to the main road.

① Shop layout

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

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

(ii) The storage of forming dies and jig shall be made in the open.

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) General purpose machine tools are concentrated upon C-bay as a machine shop.

iii) Forming equipment is concentrated on A and B-bay according to the manufacturing process flow. Heavy duty head flanging machine is arranged in C-bay because it should be installed in the vicinity of press machine.

iv) Material preparation areas are arranged in plate works (B-bay) and structure works (A-bay).

v) Welding equipment is arranged according to the manufacturing process flow.

vi) X-ray room for the heavy vessel and Furnace for stress relief, blasting and painting areas are arranged in D-bay.

vii) 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.

viii) Heating furnace and midway X-ray rooms are arranged in the east side of A and B bays respectively.

ix) Material testing equipment which is indispensable for the plate works is arranged in the east side corner of A-bay.

x) The packing of the heavy and light works are arranged in the

assembly yard and storage area respectively.

xi) Bay transfer is arranged in the center of the south side of the factory.

5) Equipment list and manufacturing process flow

① Equipment list

The list 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 trainee 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 an 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 2. Civil works 3. Building works
4. Erection of machines and equipment
5. Erection of electricity and instruments 6. Piping work
7. Operation instructions on main 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 shown in Table 4-6.

1. Boring & Turning mill
2. CNC Drilling
3. Boring & Milling
4. Planer
5. Press
6. Flanging Machine
7. Bending Roller
8. Furnaces

(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).

4.2.5 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 4.2.1 (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 at 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 countermeasure (such as overtime service) is taken in time.

2) A loading plan is a measure 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 loading 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 Following-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 techniques. Change in the product mix causes the use of thick gauge plates. This makes important the techniques to select forming, heat-treatment, and

welding methods, and welding materials and to prevent cracks during welding.

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

(2) Quality control system

As stated in 4.2.1 (4), 3) Surabaya factory has already been prepared a quality control manual. The contests of this manual must be fully understood and observed by every worker in the factory. In order to attain this object, the managerial circle shown in Fig. 5-1 should be adopted to all inter-company divisions.

In the second, technical review proves the use of thick gauge plates involves the following important countermeasures.

1) Coutermeasures 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 outside order, that is, qualified inspectors should be increased and trained.

For prevention of weld defects, quality controllers are required who must be aquainted 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 assuarance.

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 Gresik factory is increased to 50 tons in excess of 20 tons in surabaya factory. The special piping in Shop is required owing to the increase flammable gas consumption, thereby requiring safety control with more importance. Therefore, the quality 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.

   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 Surabaya 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; techniques, after-sales service results in.

3) Feedback to design and engineering departments.
4) Feedback to quality control and production 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

Engineering is shifted from Surabaya factory to Gresik factory provided with new equipment. At this point, the following items are proposed to smoothly expand production items.

1) New techniques 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 techniques, including production techniques, 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 expansive 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 4.2.5 (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

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

1) Organization

The organization is based on 4.2.1 (4), Technical diagnosis, and previous Table 1-1, with the following point emphasized.

① Gresik factory should enjoy independence of Surabaya factory in terms of the scale of production and personnel. It should be established as Gresik factory, not as a sub-unit of Surabaya factory. However, Gresik factory may act as a branch of Surabaya factory for business and accounting.

② The organization in Gresik factory is simplified to a maximum, considering too many departments and sections in Surabaya factory.

③ In Gredik factory, the line division is separated from the stuff division and is integrated with the production control and planning, and maintenance sections, and designing and production sections to form a production control department.

2) **Personnel**

The personnel plan is laid out as shown below.

① The number of direct workers is determined as shown in 4.2.3 (2), 2).

② The number of indirect workers is determined from our experience. The number of persons in the general affair department is based on 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 4.2.4 (5), 2).
Training should be tackled with complete preparation because they have great influence on the operaiton of new Gresik factory.

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

AUG. 1984

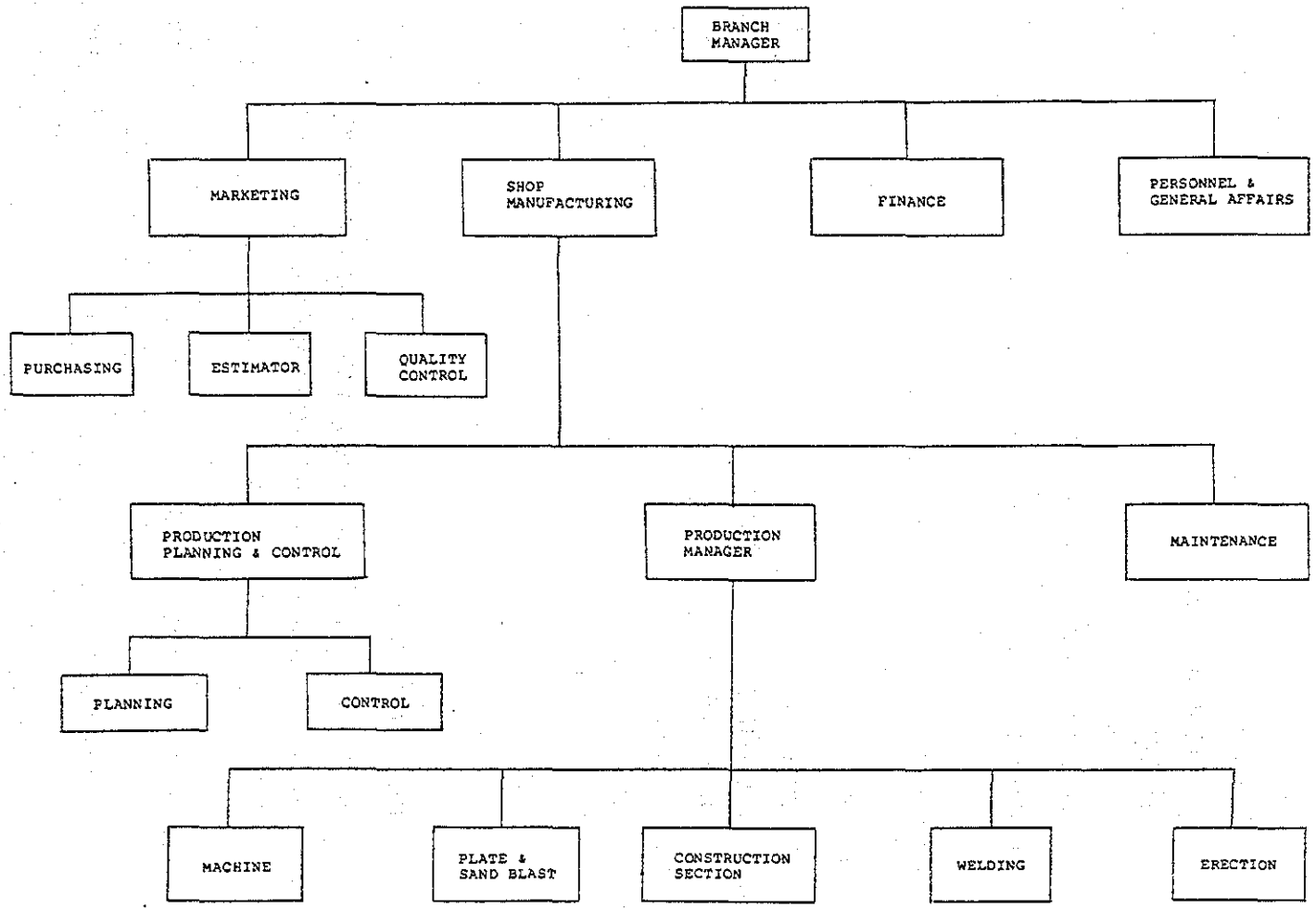


Table 1-2 Existing Number of Employees for P.T. Barata Surabaya Factory

Aug. 1984

	NO. OF PERSONNEL
1. ENGINEERS	
DESIGN	3
MECHANICAL	15
METALLURGICAL	-
WELDING	1
OTHERS (SCHEDULE CONT., QC, ETC.)	4
SUB-TOTAL	23
2. DRAFTMAN	9
3. DIRECT WORKERS	
WELDERS	64
(QUALIFIED)	(31)
IRON WORKERS	92
FITTERS	85
MECHANICIANS	22
INSPECTORS	8
OTHERS	10
SUB-TOTAL	281
4. INDIRECT WORKERS	69
SUCH AS CRANE OPERATORS, WAREHOUSE KEEPERS, MECHANICIANS FOR SHOP FACILITIES MAINTENANCE, ETC.	
5. OTHER STAFFS AND CLERKS	86
TOTAL EMPLOYEES	468

TABLE 3-1 FORECAST OF PRODUCT MIX — P.T. BARATA: GRESIK 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. STEEL STRUCTURE	a.1 General structures	1,600	80	1,680	1,680		
	a.2 Bridges and similar structures	500	25	525	525		
	a.3 Industrial structures	3,000	0	3,000		1,648	1,347
	a.4 Big water gates and structures for water engineering	400	400	800	800		
	a.5 Conveyors	165	165	330		333	
b. PLATE WORKS	b.1 Cement plant equipment	0	535	535			536
	b.2 Sugar plant equipment	0	3,860	3,860		3,861	
	b.3 Fertilizer and petrochemical industry	300	1,700	2,000	2,000		
	b.4 Water treatment plants	600	300	900	900		
	b.5 Standardized heat-exchangers	100	1,500	1,600	1,090	447	67
	b.6						
	b.7						
SUB TOTAL		6,665	8,565	15,230	6,995	6,289	1,950
c. SITE WORK	c.1 General industries	3,100	0	3,100		1,372	1,725
	c.2 Vessels (pressure and atmospheric, vacuum)	0	310	310		311	
	c.3 Tanks of different design.	0	460	460		419	45
	c.4 Silos, bins, containers hoppers, ducts, chutes, etc.	200	300	500	500		
	c.5 Pipe works	0	940	940		709	231
SUB TOTAL		3,300	2,010	5,310	500	2,811	2,001
T O T A L		9,965	10,575	20,540	7,495	9,100	3,951

Table 3-2 Construction Schedule

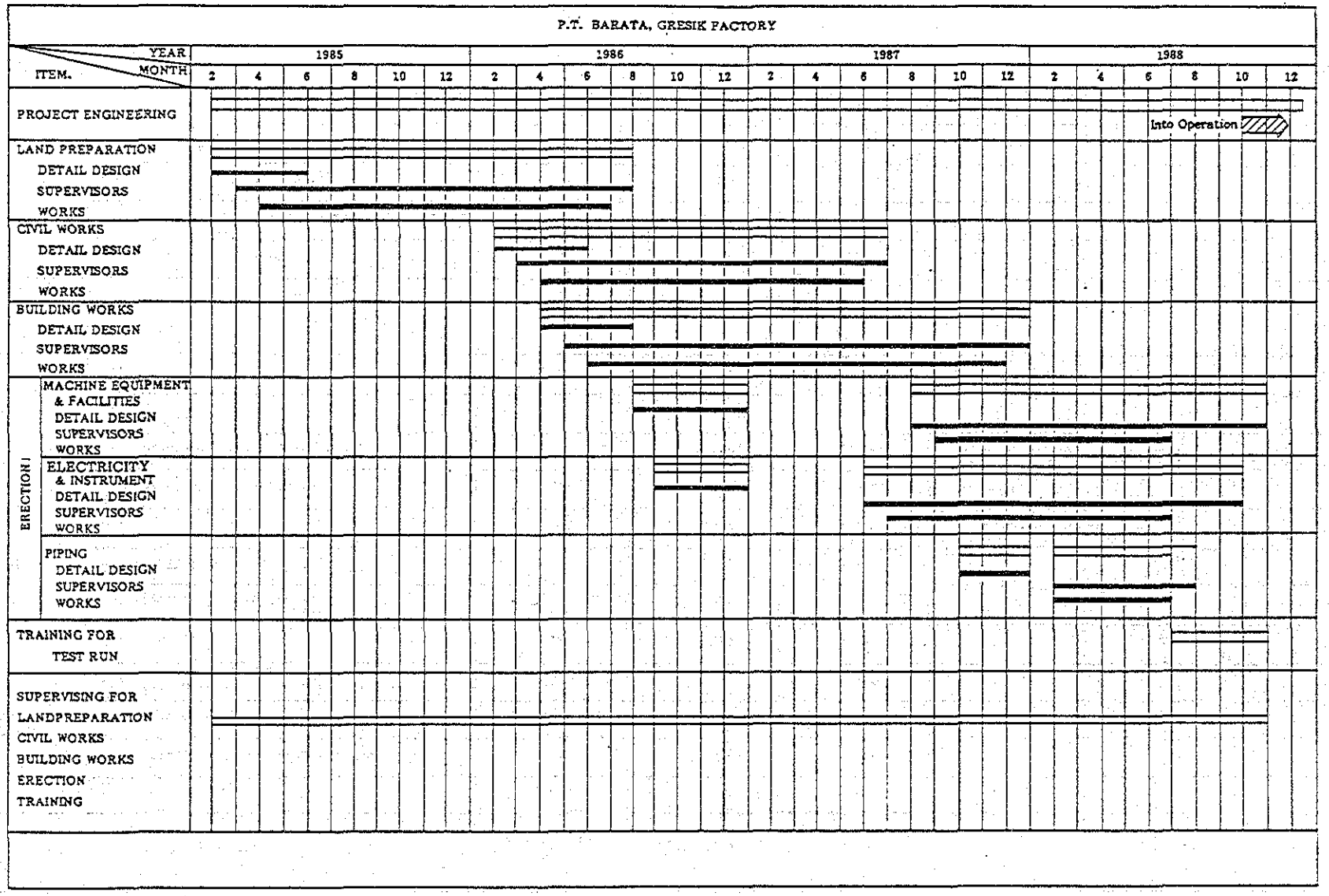


Table 4-1 Product Model for P.T. Barata Gresik

	TYPE OF PRODUCT	THICK-NESS (mm)	PRODUCT SIZE (ID x LENGTH (mm) WIDTH x LENGTH)	DESIGN PRESSURE (kg/cm^2)	MATERIAL	WEIGHT (Ton)
1	GENERAL STRUCTURE	6-50	W H L 500 x 2,000 x 10,000	-	C.S.	30
2	BRIDGES	6-50	W H L 500 x 2,000 x 10,000	-	C.S.	30
3	INDUSTRIAL STRUCTURE	6-50	W H L 500 x 2,000 x 10,000	-	C.S.	30
4	WATER GATES AND STRUCTURE FOR WATER ENGINEERING	6-30	W L 12,000 x 10,000	-	C.S.	40
5	CONVEYORS	6-12	W H L 2,000 x 1,500 x 10,000	-	C.S.	5
6	CEMENT PLANT EQUIPMENT	25-50	ϕ L 5,000 x 30,000	-	C.S.	50
7	SUGAR PLANT EQUIPMENT	4.5-30	ϕ L 3,000 x 5,000	10	C.S. SUS	40
8	FERTILIZER AND PETROCHEMICAL INDUSTRY	25-50	ϕ L 5,000 x 30,000	100	C.S. SUS SUS CLAD	100
9	WATER TREATMENT PLANTS	5-12	ϕ H 15,000 x 5,000	-	C.S. SUS 304	5
10	STANDARDIZED HEAT-EXCHANGERS	6-50	ϕ L 2,500 x 12,000	100	C.S. SUS SUS CLAD	40

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 Gresik

UNIT: m^2

NO	SHOP NAME	AREA
1	CUTTING PLAN ROOM	630
2	PREPARATION AREA	1,707
3	FORMING AREA	2,052
4	MACHINING AREA	1,782
5	ASSEMBLY AREA (INCLUDED WELDING)	7,242
6	RADIO GRAPHIC EXAMINATION AREA	335
7	SAND BLASTING AND PAINTING AREA	744
8	RAW MATERIAL STORAGE AREA	660
9	TOOL ROOM	168
10	PARTS STORAGE AREA	696
11	MAIN PASSAGE AND OTHERS	3,552
	Total	19,568

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

UNIT: 1,000,000 YEN

ITEM	FOREIGN	DOMESTIC	TOTAL
1. MACHINERY & EQUIPMENT	4,630.44		4,630.44
2. ELECTRICITY & INSTRUMENT	180.97	278.75	459.72
3. LAND PREPARATION	59.55	450.84	510.39
4. OCEAN FREIGHT, INSURANCE & LOCAL HANDLING	291.82	69.12	360.94
5 INLAND TRANSPORTATION		65.48	65.48
6. CIVIL	149.63	1,712.53	1,862.16
7. ERECTION	15.86	300.52	316.38
8. BUILDING (PLANT & OTHERS)	238.99	1,654.64	1,893.63
9. BUILDING (OFFICE)	9.96	68.95	78.91
10. OTHERS	428.63	7.71	436.34
11. ENGINEERING FEE	544.08	94.34	638.42
12. CONSTRUCTION EXPENSES		288.04	288.04
13. PHYSICAL CONTINGENCIES	196.49	349.36	545.85
TOTAL	6,746.42	5,340.28	12,086.70

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 Gresik Factory

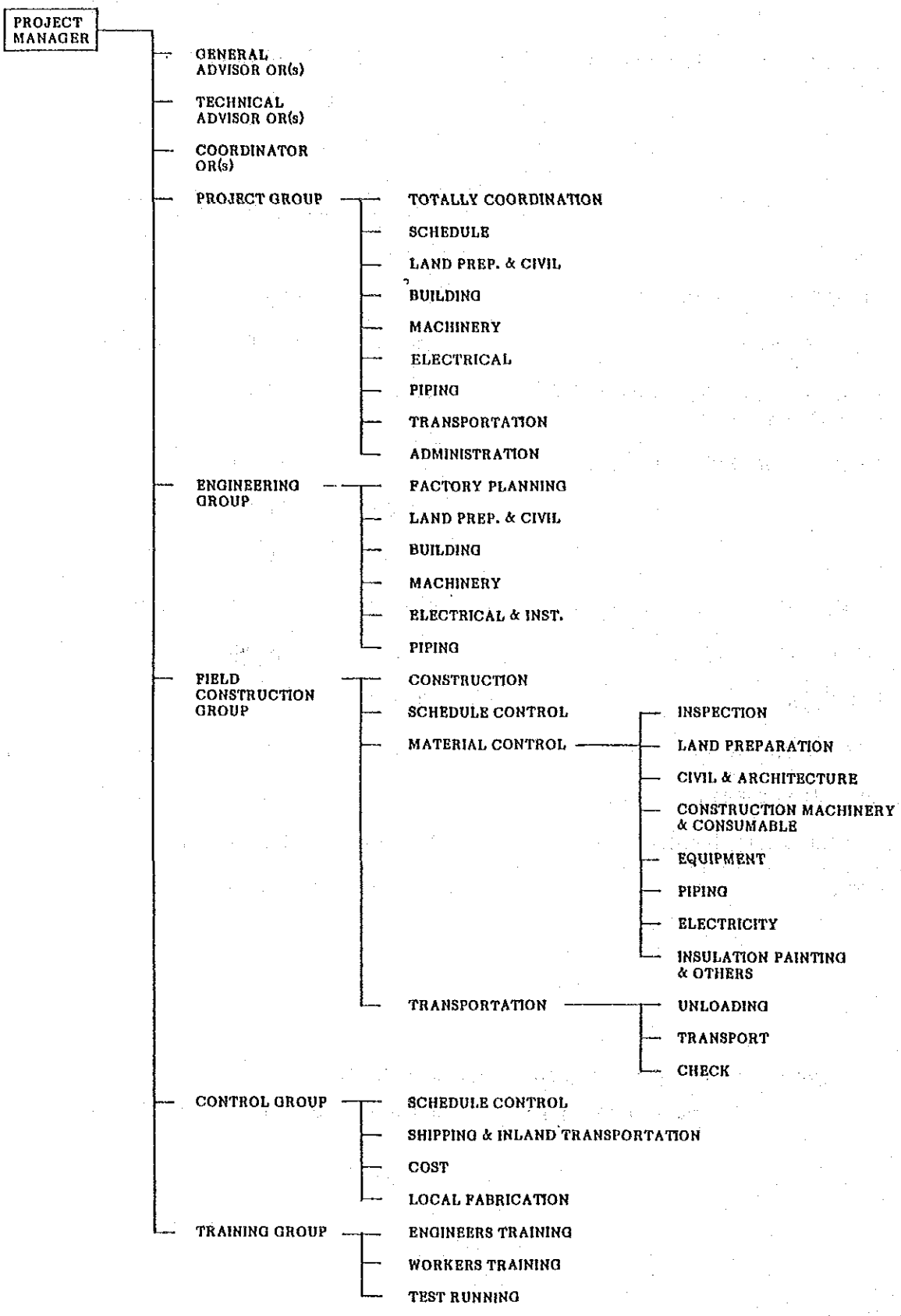


Table 4-5 Training Plan of Worker

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		FABRICATION COMPULSORY PARTS IN QUALIFICATION TEST.			

*: INCLUDED LECTURE (BASIC THEORY)

TABLE 4-6 Description of Investment Cost for Detail Design, Supervising and Training fee for BARATA-GRESIK. Unit: 1,000,000 YEN

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=148.04 D= 7.71 Item 10 of Table 4-3		
Land preparation	Lay-out planning and designing, preparation of specification both for working and supervision.	F= 3.45 D= 0.35 Item 3 of Table 4-3	F=136.69 D= -	
Civil works	Designing, Preparation of specification for foundation plan of building, machinery, facilities and supervision	F= 22.63 D= 2.51 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= 43.94 D= 4.88 Item8,9 of Table 4-3	F=136.68 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=273.31 D= - Item 10 of Table 4-3	F=110.48 D= 52.64 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=128.91 D= 41.70 Item 11 of Table 4-3	
Piping works	Designing, Preparation of specification for procurement and supervision.	F= 1.18 D= - Item 10 of Table 4-3	F= 8.74 D= - Item 11 of Table 4-3	
Training for testrun	Supervision for machine operators at machinery erecting intervals type of machinery for supervision listed in item.		F= 22.58 D= - Item 11 of Table 4-3	

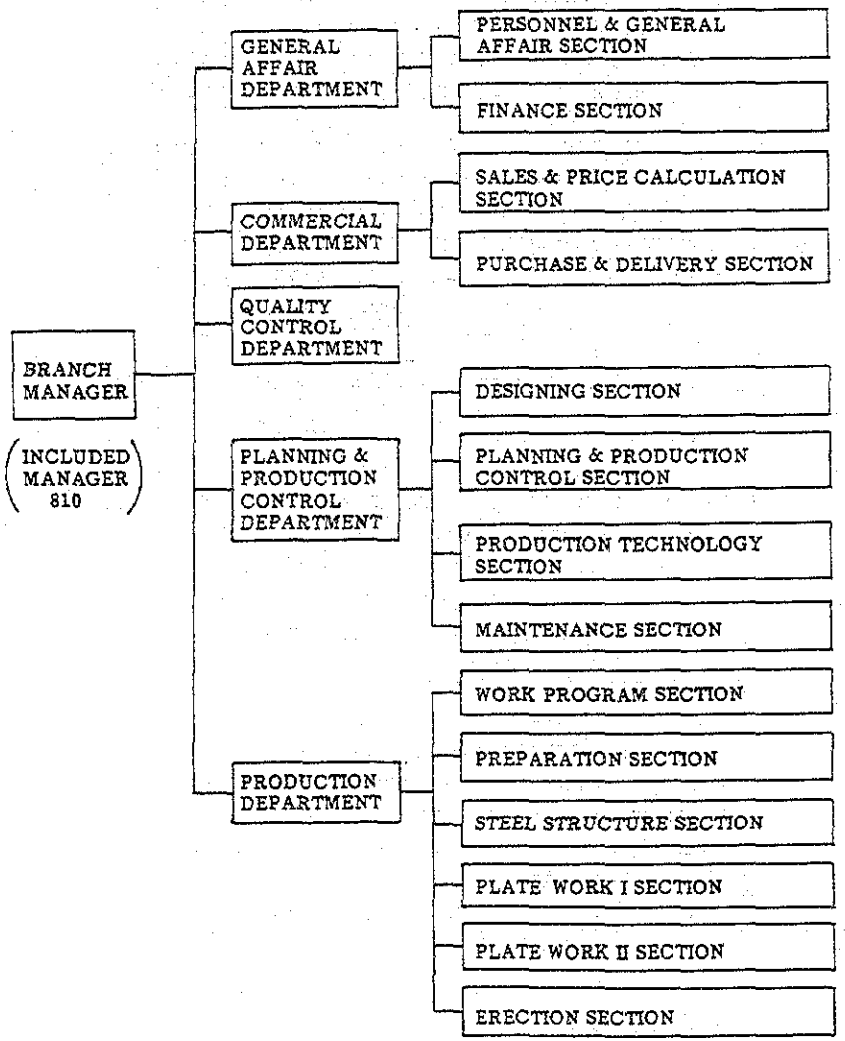
Table 4-7 Equipment Planning Bases (GRESIK)

NO.	MACHINE NAME	SELECTION BASE	PRODUCT	LOADING FACTOR (%)
1.1	HEAVY DUTY UNIVERSAL LATHE MACHINE	TO MACHINE SMALL PARTS, NOZZLES AND FLANGES	PETROCHEMICAL PLANT, WATER TREATMENT PLANT	88
1.2	HEAVY DUTY FACING LATHE MACHINE	TO FACE LARGE CYLINDRICAL SHELLS	CEMENT PLANT	83
1.3	VERTICAL BORING & TURNING MILL MACHINE	TO MACHINE NOZZLES, FLANGES AND END PLATES OF MEDIUM AND LARGE PRODUCTS	HEAT EXCHANGER, PETROCHEMICAL PLANT	90
1.4	HEAVY DUTY RADIAL DRILLING MACHINE	TO DRILL TUBE SHEETS, ETC.	HEAT EXCHANGER, INDUSTRIAL STRUCTURES	94
1.6	TRAVERSE TYPE RADIAL DRILLING MACHINE	TO DRILL LONG MATERIALS	DITTO	91
1.7	C.N.C. DRILLING CENTER MACHINE	TO SECURE DIMENSIONAL ACCURACIES OF PRODUCTS	HEAT EXCHANGER	92
1.9	HORIZONTAL BORING & MILLING MACHINE	TO BORE VARIOUS PARTS	PETROCHEMICAL PLANT, HEAT EXCHANGER	89
1.10	UNIVERSAL MILLING MACHINE	TO MILL VARIOUS PARTS	DITTO	68
1.11	PLANING MACHINE	TO PLANE VARIOUS PARTS	DITTO	76
1.23	HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE	TO STRAIGHTEN CYLINDRICAL SHELLS AFTER LONGITUDINAL WELDING	DITTO	62
1.24	HEAVY DUTY HEAD FLANGING MACHINE	TO FORM HEADS	DITTO & ALSO SUGAR PLANT	70
1.25	HEAVY DUTY HYDRAULIC PRESS MACHINE	TO DISH HEADS AND TO FORM THICK PLATES	DITTO	82
1.26	MECHANICAL PLATE BEND ROLLING MACHINE	TO FORM SHELL PLATES	DITTO	65
1.44	COPIER GAS CUTTING MACHINE	TO PRODUCE LARGE QUANTITIES OF SMALL PARTS	INDUSTRIAL STRUCTURES, GENERAL STRUCTURES	78
3.1	PORTABLE COBALT UNIT AND PORTABLE IRIDIUM 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 & ALSO HEAT EXCHANGER	-
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 POSTWELD HEAT TREATMENT	DITTO	-
4.2	SHOT GRIT COMPARTMENT UNIT	FOR SURFACE TREATMENT OF PRODUCTS	PETROCHEMICAL PLANT, HEAT EXCHANGER	-
4.7	ACID CLEANING EQUIPMENT	TO CLEAN RAW MATERIALS, PARTS AND COMPLETED PRODUCTS	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. Barata Gresik Factory



ORGANIZATION	TOTAL PERSONNEL	SECTION MANAGER	ENGINEER S/V & OFFICER	DIRECT WORKER	INDIRECT WORKER
GENERAL AFFAIR DEPARTMENT	64	2	46		16
PERSONNEL & GENERAL AFFAIR SECTION					
FINANCE SECTION					
COMMERCIAL DEPARTMENT	38	2	32		4
SALES & PRICE CALCULATION SECTION					
PURCHASE & DELIVERY SECTION					
QUALITY CONTROL DEPARTMENT	20		5	15	
PLANNING & PRODUCTION CONTROL DEPARTMENT	77				
DESIGNING SECTION		1	16		
PLANNING & PRODUCTION CONTROL SECTION		1	25		
PRODUCTION TECHNOLOGY SECTION		1	10		
MAINTENANCE SECTION		1	2		20
PRODUCTION DEPARTMENT	605				
WORK PROGRAM SECTION		1	7	76	22
PREPARATION SECTION		1	3	155	
STEEL STRUCTURE SECTION		1	2	75	
PLATE WORK I SECTION		1	3	121	
PLATE WORK II SECTION		1	3	121	
ERECTION SECTION		1	11		
TOTAL	804	14	165	563	62

MACHINE NO. AND MACHINE NAME LIST OF Fig. 3-1 LAYOUT PLAN (GRESIK)

NO.	MACHINE NAME
1.1	HEAVY DUTY UNIVERSAL LATHE MACHINE
1.2	HEAVY DUTY FACING LATHE MACHINE
1.3	VERTICAL BORING & TURNING MILL MACHINE
1.4	HEAVY DUTY RADIAL DRILLING MACHINE
1.5	VERTICAL DRILLING MACHINE PILLAR TYPE
1.6	TRAVERSE TYPE RADIAL DRILLING MACHINE
1.7	C.N.C. DRILLING CENTER MACHINE
1.8	PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH - SWIVEL AND HEAD
1.9	HORIZONTAL BORING & MILLING MACHINE
1.10	UNIVERSAL MILLING MACHINE
1.11	PLANNING MACHINE
1.12	HEAVY DUTY HYDRAULIC HACKSAW MACHINE
1.13	HEAVY DUTY HYDRAULIC CIRCULAR SAW MACHINE
1.14	UNIVERSAL TOOL & CUTTER GRINDING
1.15	SEMIAUTOMATIC GRINDER FOR SHARPENING TWIST DRLL & CORE DRILL
1.16	AUTOMATIC SHARPENING FOR METAL CUTTING CIRCULAR SAWS
1.17	PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS)
1.19	HEAVY DUTY HYDRAULIC PRESS MACHINE
1.20	HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT
1.21	HYDRAULIC PRESS BRAKE MACHINE
1.22	HORIZONTAL PROFILE STRAIGHTENING MACHINE
1.23	HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE
1.24	HEAVY DUTY HEAD FLANGING MACHINE
1.25	HEAVY DUTY HYDRAULIC PRESS MACHINE
1.26	MECHANICAL PLATE BEND ROLLING MACHINE
1.27	HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE
1.28	HYDRAULIC BENDING MACHINE
1.29	MECHANICAL PLATE SHEARING MACHINE
1.30	MECHANICAL UNIVERSAL STEEL WORKER MACHINE

NO.	MACHINE NAME
1.32	PUNCHING MACHINE
1.34	MECHANICAL PLATE FORMING MACHINE
1.36	UNIVERSAL FILLING AND BAND SAW MACHINE
1.38	PIPE BEVELLING/EDGING MACHINE
1.39	AIR COMPRESSOR
1.43	SURFACE PLATE FOR MACHINE
1.44	COPIER GAS CUTTING MACHINE
1.61	WELDING POSITIONER
1.62	TURNING TABLE FOR GAS CUTTING
1.63	BOOM TYPE WELDING MACHINE
2.1	BAY TRANSFER CAR
2.5	30 TONS HYDRAULIC TELESCOPIC TRUCK CRANE
2.8	OVERHEAD TRAVELLING CRANE 5 TONS
2.11	OVERHEAD TRAVELLING CRANE 10/3 TONS
2.15	OVERHEAD TRAVELLING CRANE 25/5 TONS
2.18	OVERHEAD TRAVELLING CRANE 50/10 TONS
2.39	PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR
2.40	PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR
3.1	PORTABLE COBALT UNIT AND PORTABLE IRIDUM UNIT
3.3	COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT
3.4	PORTABLE ULTRASONIC TESTING UNIT
3.5	RADIOGRAPHIC X-RAY TESTING UNIT
3.6	HIGH PRESSURE WATER PUMP
3.8	*UNIVERSAL TESTING MACHINE*
4.1	BOGIE HEARTH FURNACE
4.2	SHOT GRIT COMPARTMENT UNIT
4.3	SAND BLASTING MACHINE
4.7	ACID CLEANING EQUIPMENT

200 000

11 x @ 6 000 = 66 000 | 10 000 | 16 x @ 6 000 = 96 000 | 10 000 | 3 x @ 6 000 = 18 000

RAW MATERIAL STORAGE YARD

25'/51'

ACID CLEANING EQUIPMENT

STRUCTURE PRE-FAB-COMPLETE WORKS STORAGE YARD

ACCORDION HOUSE BLASTING & PAINTING YARD

MARKING & GAS CUTTING AREA

STRUCTURE ASSEMBLY AREA

NOZZLES ASSEMBLY AREA

CYLINDER UNIT ASSEMBLY AREA

MARKING & GAS CUTTING AREA

ASSEMBLY AREA FOR HEAD PLATE

PARTS STORAGE AREA

ASSEMBLY AREA FOR TUBE BUNDLE

ASSEMBLY AREA FOR SHELL

CHANNEL WELDING AREA

CIRCUM WELDING AREA

FINAL ASSEMBLY AREA

ASSEMBLY AREA FOR HEAVY STRUCTURE & WATER GATE ETC.

PRE-ASSEMBLY AREA

BLASTING & PAINTING ROOM

X-RAY ROOM

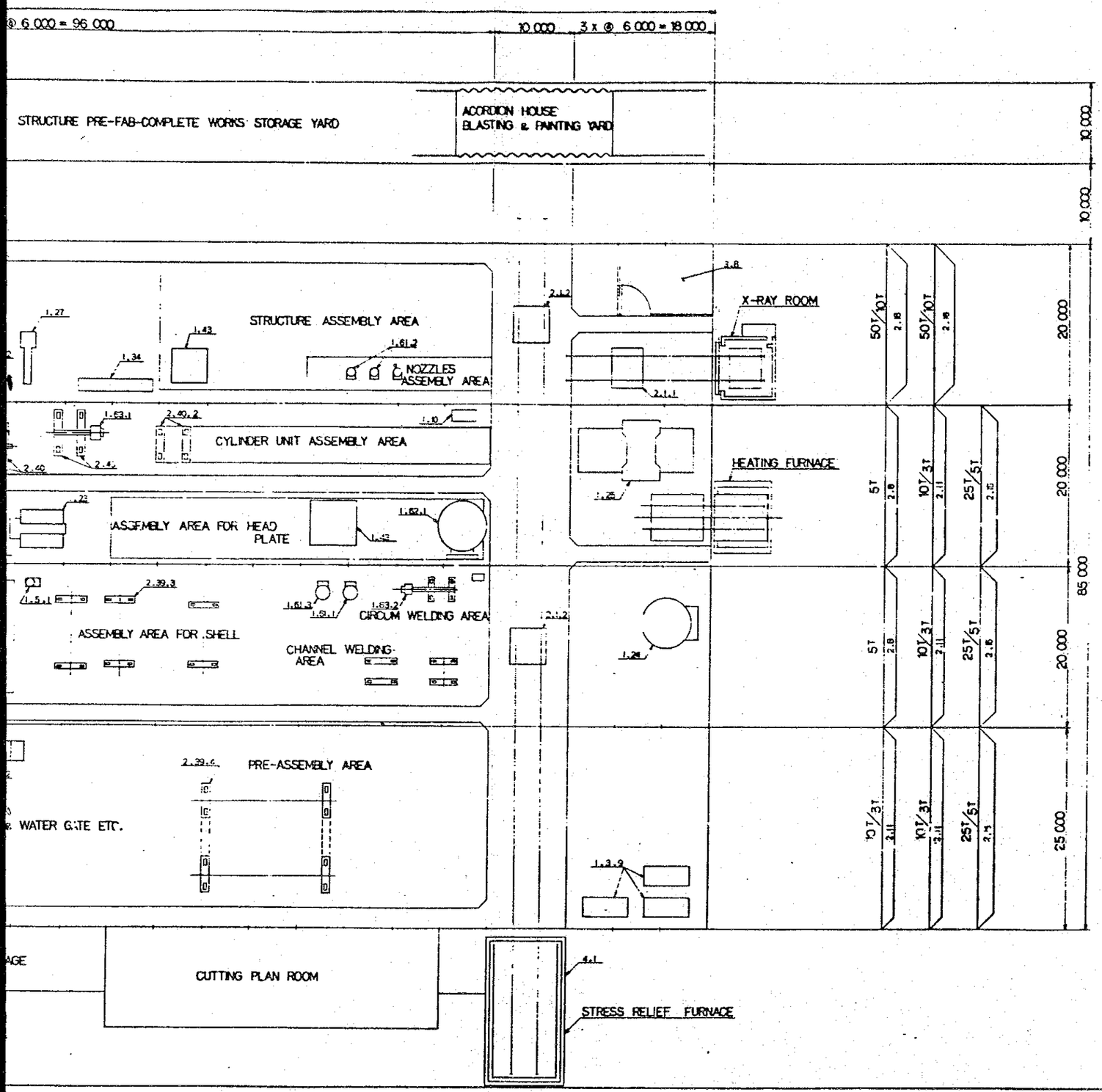
S/S

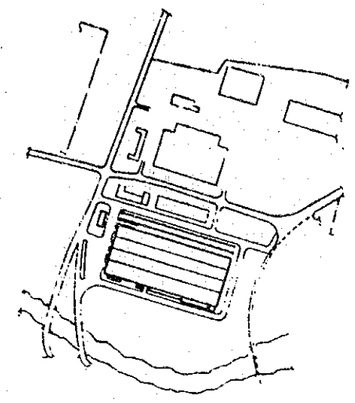
TOOLS STORAGE ROOM

PARTS STORAGE

CUTTING PLAN ROOM

STRESS RELIEF FURNACE





KEY PLAN

NO.	MACHINE NAME	NO.	MACHINE NAME
1.1	HEAVY DUTY UNIVERSAL LATHE MACHINE	1.36	UNIVERSAL FILLING AND BAND SAW MACHINE
1.2	HEAVY DUTY FACING LATHE MACHINE	1.38	PIPE BEVELLING/EDGING MACHINE
1.3	VERTICAL BORING & TURNING MILL MACHINE	1.39	AIR COMPRESSOR
1.4	HEAVY DUTY RADIAL DRILLING MACHINE	1.43	SURFACE PLATE FOR MACHINE
1.5	VERTICAL DRILLING MACHINE PILLAR TYPE	1.44	COPIER GAS CUTTING MACHINE
1.6	TRAVERSE TYPE RADIAL DRILLING MACHINE	1.61	WELDING POSITIONER
1.7	C.N.C. DRILLING CENTER MACHINE	1.62	TURNING TABLE FOR GAS CUTTING
1.8	PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH - SWIVEL AND HEAD	1.63	BOOM TYPE WELDING MACHINE
1.9	HORIZONTAL BORING & MILLING MACHINE	2.1	BAY TRANSFER CAR
1.10	UNIVERSAL MILLING MACHINE	2.5	30 TONS HYDRAULIC TELESCOPIC TRUCK CRANE
1.11	PLANNING MACHINE	2.8	OVERHEAD TRAVELLING CRANE 5 TONS
1.12	HEAVY DUTY HYDRAULIC HACKSAW MACHINE	2.11	OVERHEAD TRAVELLING CRANE 10/3 TONS
1.13	HEAVY DUTY HYDRAULIC CIRCULAR SAW MACHINE	2.15	OVERHEAD TRAVELLING CRANE 25/5 TONS
1.14	UNIVERSAL TOOL & CUTTER GRINDING	2.18	OVERHEAD TRAVELLING CRANE 50/10 TONS
1.15	SEMIAUTOMATIC GRINDER FOR SHARPENING TWIST DRILL & CORE DRILL	2.39	PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR
1.16	AUTOMATIC SHARPENING FOR METAL CUTTING CIRCULAR SAWS	2.40	PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR
1.17	PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS)	3.1	PORTABLE COBALT 60 UNIT AND PORTABLE IRIDIUM UNIT
1.19	HEAVY DUTY HYDRAULIC PRESS MACHINE	3.3	COMPLETE SET PORTABLE MAGNETIC PARTICLE INSPECTION EQUIPMENT
1.20	HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT	3.4	PORTABLE ULTRASONIC TESTING UNIT
1.21	HYDRAULIC PRESS BRAKE MACHINE	3.5	RADIOGRAPHIC X-RAY TESTING UNIT
1.22	HORIZONTAL PROFILE STRAIGHTENING MACHINE	3.6	HIGH PRESSURE WATER PUMP
1.23	HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE	3.8	UNIVERSAL TESTING MACHINE
1.24	HEAVY DUTY HEAD FLANGING MACHINE	4.1	BOGIE HEARTH FURNACE
1.25	HEAVY DUTY HYDRAULIC PRESS MACHINE	4.2	SHOT GRIT COMPARTMENT UNIT
1.26	MECHANICAL PLATE BEND ROLLING MACHINE	4.3	SAND BLASTING MACHINE
1.27	HEAVY DUTY HYDRAULIC PIPE BENDING MACHINE	4.7	ACID CLEANING EQUIPMENT
1.28	HYDRAULIC BENDING MACHINE		
1.29	MECHANICAL PLATE SHEARING MACHINE		
1.30	MECHANICAL UNIVERSAL STEEL WORKER MACHINE		
1.32	PUNCHING MACHINE		
1.34	MECHANICAL PLATE FORMING MACHINE		

Fig. 3-1 LAYOUT PLAN (GRESIK)

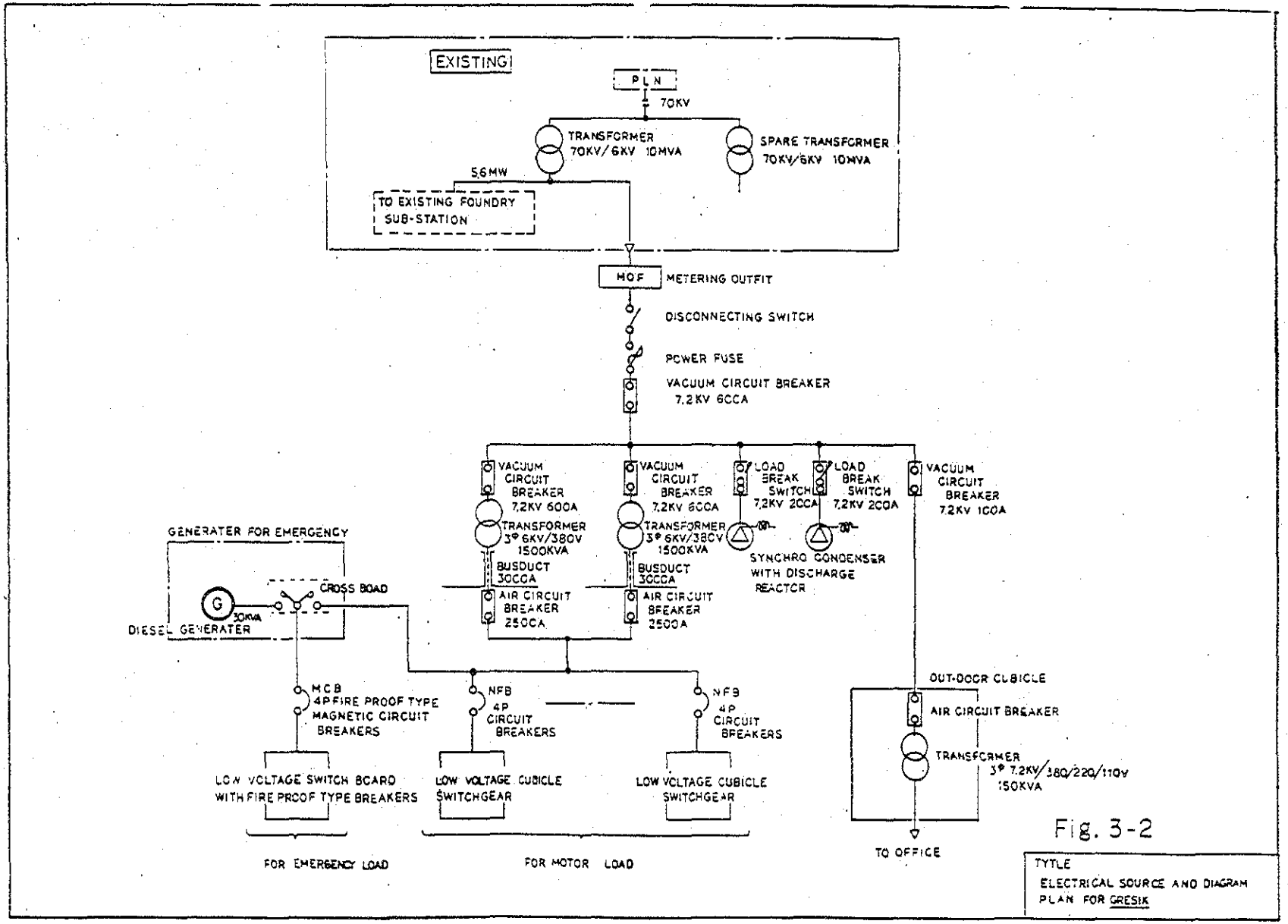


Fig. 3-2

TYTLE
ELECTRICAL SOURCE AND DIAGRAM PLAN FOR GRESIK

200 000

11 x @ 6 000 = 66 000 | 10 000 | 16 x @ 6 000 = 96 000 | 10 000 | 3 x @ 6 000 = 18 000

A-BAY

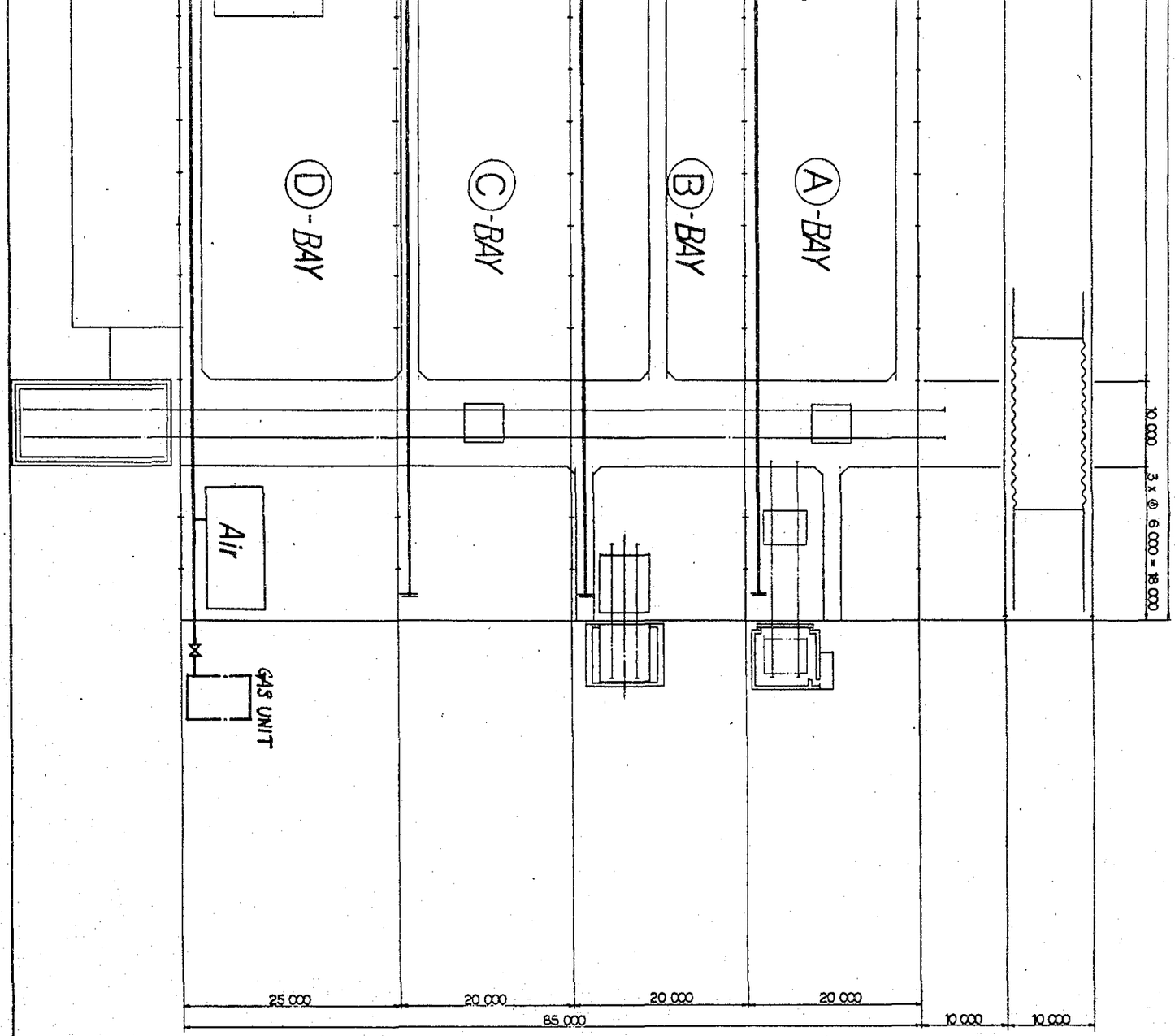
B-BAY

C-BAY

D-BAY

Air

GAS UNI



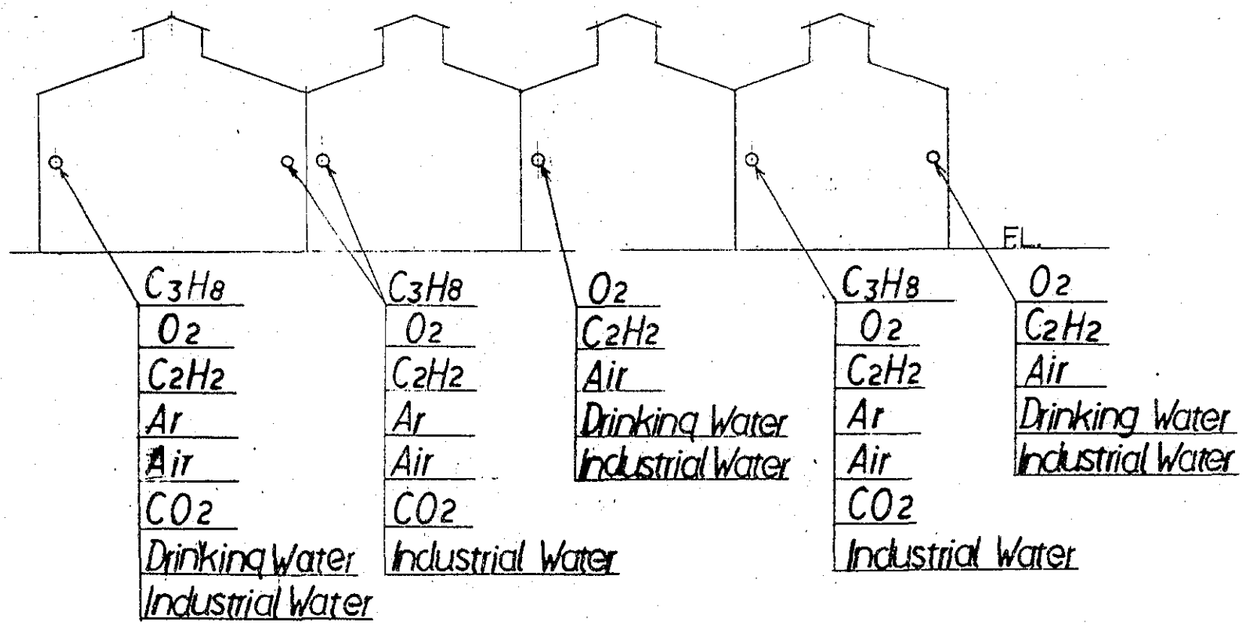
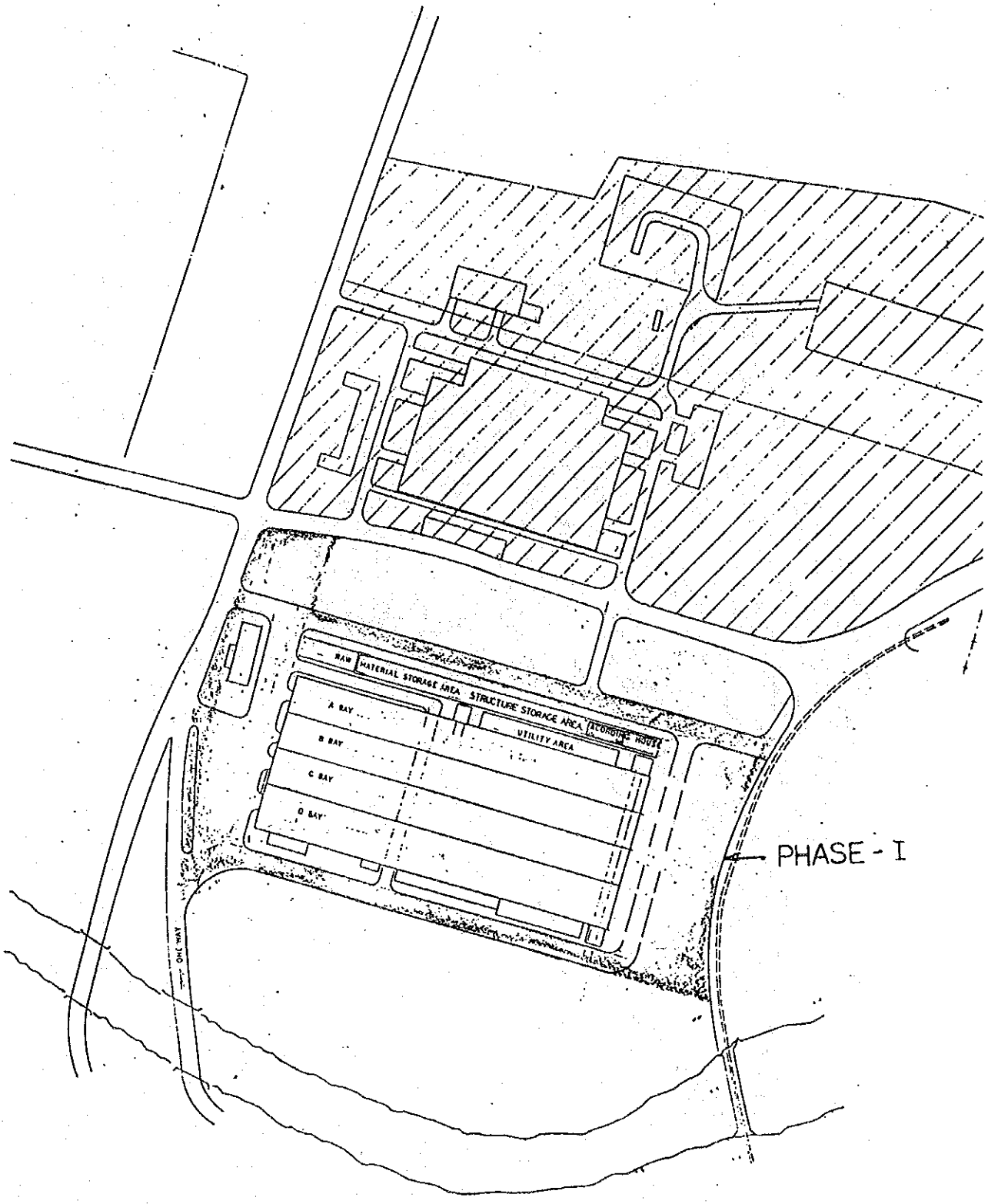


Fig.3-4 UTILITY PIPING PLAN
(GRESIK)

Fig.3-5 LAND PREPARATION PLAN
(GRESIK)



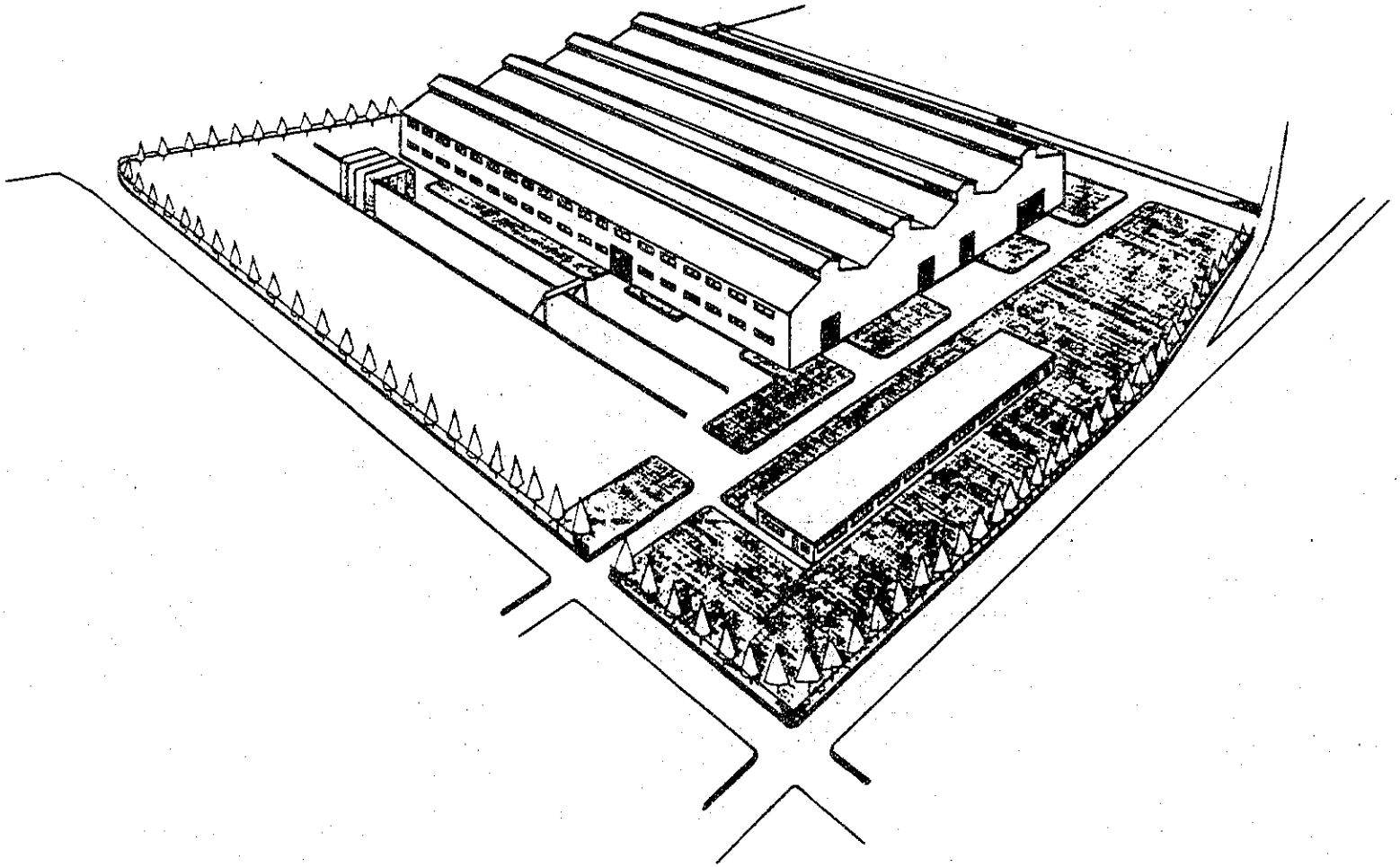


Fig. 3-6 BIRD'S VIEW OF SHOP BUILDING
(GRESIK)

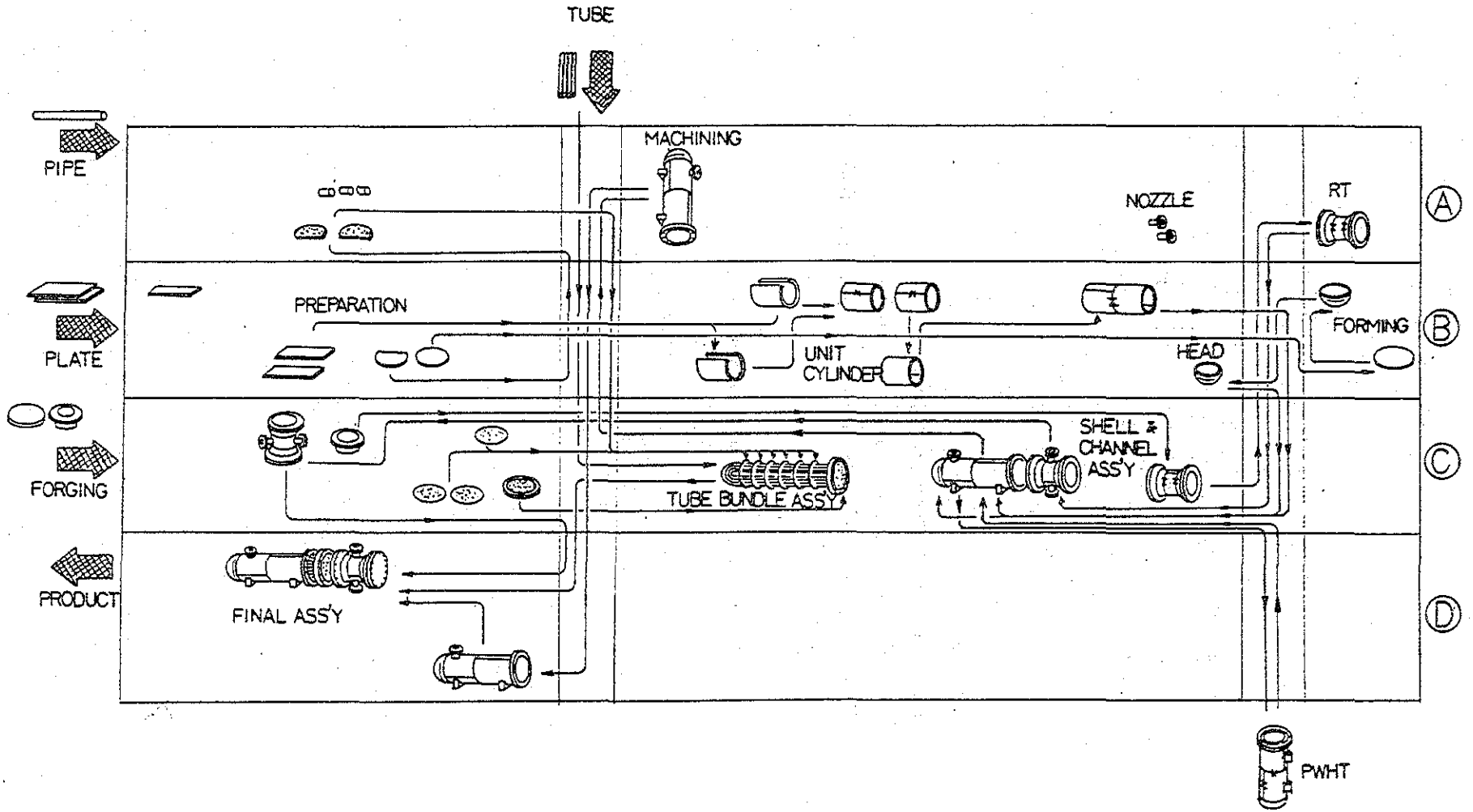
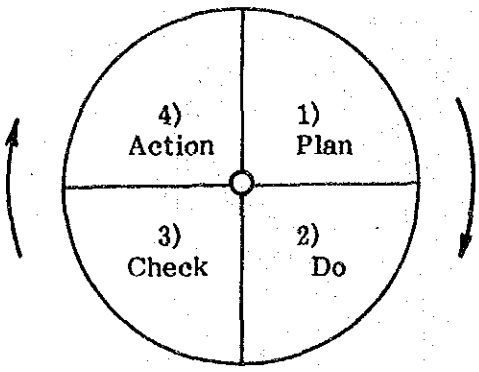


Fig 4-1 MANUFACTURING PROCESS FLOW (HEAT EXCHANGER)
(GRESIK)



(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.

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

UNIT: 1,000,000 YEN

TRAINING ITEM \ YEAR		1985	1986	1987	1988	1989	1990
FOR ENGINEER 1. PRODUCTION CONTROL 2. PRODUCTION TECHNIQUE 3. QUALITY CONTROL					F: 9.48 D: 7.19	INTO OPERATION SUPERVISOR BY TECHNICAL LICENSE 2 YEARS F: 56.85 D: 43.15	F: 47.38 D: 35.95
FOR WORKER 1. MACHINE WORKER 2. WELDING 3. FORMING 4. INSPECTION, ETC			BY COMPANY'S OWN SYSTEM		SUPERVISOR BY MACHINE SUPPLIER F: 22.58 D: -		
TRAINING COST	FOREIGN				32.06	56.85	47.38
	DOMESTIC				7.19	43.15	35.95

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.9	RADIAL DRILLING MACHINE	1	Dresses	Table length : Table width : Table height : Max. drilling height/depth : 630 mm Max. distance spindle to column : 790 mm Max. height work piece: Max. head travel : Max. drilling diameter: ϕ 1 1/4"	3 HP	10	III	III	III	×	×
	C.10	RADIAL DRILLING MACHINE	1	Fosdick Year: 1907	Table length : Table width : Table height : Max. drilling height/depth : 1,000 mm Max. distance spindle to column : 790 mm Max. height work piece : Max. head travel : Max. drilling diameter : ϕ 1 1/4"	3 HP 920 RPM	40	III	III	III	×	×
	C.11	RADIAL DRILLING MACHINE	1	- Hettner Ex DK - Year: 1929	Table length : Table width : Table height : Max. drilling height/depth : 1,250 mm Max. distance spindle to column : 1,340 mm Max. height work piece : Max. head travel : Max. drilling diameter : ϕ52 mm	7.4 HP 2950 RPM	20	III	III	III	×	×

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.12	RADIAL DRILLING MACHINE	1	- Hettner - Year: 1929	Table length : Table width : Table height : Table height : Max. drilling height/depth : 1,250 mm Max. height work piece : Max. head travel : Max. drilling diameter : ø52 mm	10.1 HP 2900 RPM	30	III	III	III	×	×
	C.15	RADIAL DRILLING MACHINE PORTABLE		Asquith (trans) Nieuw Year: 1939	Table length : Table width : Table height : Max. distance height/depth : 1,010 mm Max. distance spindle to column : 1,700 mm Max. height work piece : Max. head travel : Max. drilling diameter : ø 1 "	3 HP 940 RPM	40	III	III	III	×	O

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA

SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Moderni-zation	Conclusion
	C.17	PUNCHING MACHINE		Oeking Bekdiepte 350 mm Year: 1920	Max. height : 100 mm Max. distance center to body : 370 mm	3 HP 940 RPM	10	III	III	III	×	×
	C.19	PUNCHING MACHINE		Oeking (nieuw) Year: 1920	Max. height : 100 mm Max. distance center to body : 370 mm	3 HP 950 RPM	0	III	III	III	×	×
	C.20	PUNCHING MACHINE		Leipziger Mach Bekd 400 mm Year: 1912	Max. height : 350 mm Max. distance centre to body : 435 mm	3.51 HP 1414 RPM	5	III	III	III	×	×
	C.21	PUNCHING MACHINE		Oeking (2.E.H) Year: 1941	Max. height : 350 mm Max. distance center to body : 435 mm	4 HP 1420 RPM	10	III	III	II	×	×
	C.24	PEDESTAL GRINDING MACHINE 24"		Schoner 24" Year: 1922	Grindstone rotation : 900 rpm Grindstone size : ø51 x ø610 x 102 mm Type 21 A 30 - Q 9 V 7	5 HP 940 RPM	60	III	III	III	×	×
	C.26	PEDESTAL GRINDING MACHINE 12"		Willy's 12" Year: 1920	Grindstone rotation : 1450 rpm Grindstone size : 21 A 24 - Q6 BD 3 33 A 60 - LS 8K 1	3 HP 1500 RPM	30	III	III	III	×	×

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.27	PEDESTAL GRINDING MACHINE 24"		Braat Year: 1914	Grindstone rotation : 900 rpm Grindstone size : ϕ51 x ϕ610 x 102 mm 21 A 30 - Q 9 V 7	5 HP 940 RPM	60	II	II	III	x	x
	C.30	SHEET & PROFILE CUTTING MACHINE		Oeking (Nieuw) Year: 1927	Profile: L 120 x 120 x 15 mm Sheet thickness : ϕ5/8" Can be used to CUTTING U Profile Knife length : 270 mm	10 HP 1300 RPM	20	III	III	III	x	x
	C.31	SHEET METAL CUTTING MACHINE		Braat. sby.	Knife length : 200 mm Thick of sheet : ϕ2 mm	Manual						x
	C.33	SHEET METAL CUTTING MACHINE	1	- Fabr. Ver. Werkaugm Frankfurt - Model: S.5/2,500 - Year: 1953	Knife length : 2,550 mm Ability cutting of sheet ϕ 1-3mm	10.2 HP 1420 RPM	15	III	III	III	x	o
	C.37	SHEET METAL ROLLING MACHINE: 8"	1	- Unknown - Year: 1906	Max. workpiece: width of sheet : 2,400 mm Max. upper roll motion topwards : 20 mm Max. sheet thickness : 3 mm	15 HP 960 RPM	10	II	II	III	x	x
	C.38	WAVED ROLLING MACHINE (GROOVED ROLLING MACHINE)	1	- Unknown - Year:	Roll length : 1,500 mm	Manual						

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA — SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.39	SHEET METAL ROLLING MACHINE: 2"	1	- Becker - Year: 1905	Roll length : 620 mm Sheet thickness : 1 mm	Manual	5	III	III	III	×	×
	C.41	FACE ROLLING MACHINE (FLATTENING ROLL MACHINE)	1	Unknown	Max. work piece width of sheet : 2570 mm Thick of sheet : ≠ 3 mm	Manual	10	III	III	III	×	×
	C.42	STREK BANK (WESSEL) (DRAWING FRAME) (STRAIGHTENING MACHINE)	1	- Weinquartan (2EH) - Year: 1926	Strake length : 450 mm Stroke wall height : 450 mm	2 HP 940 RPM	40	II	II	II	O	×
	C.44	CIRCULAR - SAWING MACHINE	1	- BURKH & WEBER (Niew) - Year: 1939	Forward stroke : 300 mm Circular saw diameter : ϕ830 mm	10 HP 1435 RPM 1/8 HP 2725 RPM	10	III	III	II	×	×
	C.45	CIRCULAR SAWING MACHINE	1	- Burkh & Weber - Year: 1939	Forward stroke : 220 mm Circular saw diameter : ϕ610 mm	7.5 HP 1425 RPM 1/8 HP 2725 RPM	30	II	II	II	O	O
	C.48	RIVETING MACHINE	1	- Leipziger Machine - Year: 1920	Max. height : 450 mm Distance center to column : 1300 mm	4.8 HP 950 RPM	20	II	II	II	O	×
	C.50	RIVETING MACHINE	1	- Liepziger Machine - Year: 1922	Max. height : 450 mm Distance center to column : 2670 mm	4.8 HP 950 RPM	40	II	II	III	O	×

LIST 1-1
LIST OF EXISTING MACHINE TOOL

MTLL NAME: BARATA SURABAYA

SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Moderni-zation	Conclusion
	C.56	COLUMN DRILLING MACHINE	1	- Pacera LB.3 - Year: 1950	Max. drilling height : 460 mm Distance center to column : 195 mm Drilling diameter : ø10 mm	0.5 HP 1720 RPM						×
	C.61	SHEET METAL ROLL-ING	1	- Unknown - Year: 1919	Upper roll diameter : ø315 mm Lower roll diameter : ø260 mm Roll length : 3050 mm Min. Rolling ability : 350 mm	13.6 HP 940 RPM	40	III	II	III	×	×
	C.62	PROFILE ROLLING MACHINE	1	- Moma Wetzlar - Year: 1910	- Distance of constant roll : 525 mm Max step motion of roll: 70 mm	5.6 HP 920 RPM	40	III	III	II	×	×
	C.63	DRAWING FRAME MACH (STRAIGHTENING MACH)	1	- Braat Sby - Year: 1940	Stroke length : 450 mm Stroke wall height : 450 mm	3.5 HP 940 RPM	40	III	II	II	×	×
	C.64	SHEET METAL SHAP-ING MACHINE	1	- FX Honer - Year: 1914	Sheet length : 7,370 mm	20.4 HP 1440 RPM	0	III	III	III	×	×
	C.65	SHEET METAL CUTT-ING MACHINE	1	- Oeking - Year: 1920	Knife length : 500 mm Max. sheet thickness : ø5/8"	9 HP 1430 RPM	5	III	III	III	×	×
	C.66	RADIAL DRILLING MACHINE	1	- Hettner - Year: 1928	Max. distance height/depth : 1000 mm Max. distance spindle to column : 2,200 mm Max. drilling diameter : ø30 mm	10.1 HP 2900 RPM 1 HP	5	III	III	III	×	○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.67	RADIAL DRILLING MACHINE	1	- Hettner - Year: 1929	Max. distance height/depth : 1,000 mm Max. distance spindle to column : 2,200 mm Max. drilling diameter : ϕ30 mm	10.1 HP 2900 RPM	0	III	III	III	×	×
	C.72	SHEET METAL CUTTING MACHINE	1	- Pels - Year: 1939	Knife length : 2,285 mm Max. sheet thickness : ϕ9-16 mm	30 HP 965 RPM	50	II	II	II	○	○
	C.74	CIRCULAR SAWING MACHINE	1	- Wagner - Year: 1948	Max. step motion of saw: 220 mm Circular saw diameter : ϕ610 mm	6 HP 1400 RPM	40	II	II	II	○	○
	C.75	CIRCULAR SAWING MACHINE	1	- Wagner - Year: 1948	Max. step motion of saw: 220 mm Circular saw diameter : ϕ610 mm	6 HP 1440 RPM	10	III	III	III	×	×
	C.78	COPYING AUTOGENOUS CUTTING MACHINE	1	- B.O.C. - Year: 1949	Sheet metal cutting ability : 50 mm Max. radius cutting : 1100 mm	0.1 HP						×
	C.80	SHEET ROUNDED CUTTING MACHINE	1	- Unknown	Min. diameter cutting : ϕ200 mm Max. diameter cutting : ϕ1000 mm Max. sheet thickness : ϕ1.5 mm	Manual						×
	C.129	RING ROLLING MACHINE	1	- Van-Krauenburg - Year: 1953	Distance rolling shaft : 340 mm	5 HP 1430 RPM	20	II	II	III	○	○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA — SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.130	RING ROLLING MACHINE	1	- Van Kranenburg - Year: 1954	Distance rolling shaft : 340 mm	5 HP 1430 RPM	20	II	II	III	○	×
	C.142	FORGING FURNACE	1	- Unknown	Furnace length : 1,500 mm Furnace width : 1,400 mm Furnace height : 800 mm	4 HP 1410 RPM						×
	C.144	RADIAL DRILLING MACHINE	1	- Ing Giovanni Breda S.P.A. - Padoval Italia - Year: 1957	Drilling height/depth : 455 mm Distance spindle to column : 660 mm Drilling diameter : ϕ1 1/4"	2.4 HP 1400 RPM	60	II	II	II	×	○
	C.145	RADIAL DRILLING MACHINE	1	- Ing Giovanni Breda S.P.A - Padoval Italia - Year: 1957	Drilling height/depth : 455 mm Distance spindle to column : 660 mm Drilling diameter : ϕ 1 1/4"	2.4 HP 1400 RPM	60	II	II	II	×	○
	C.149	COLUMN DRILLING MACHINE	1	- Flott - Year: 1962	Drilling height/depth : 570 mm Distance spindle to column : 280 mm Drilling diameter : ϕ5/8"	1.5 HP 1400 RPM	30	III	II	III	×	○
	C.143	FAN	1	- Braat Surabaya	-	3 HP 2900 RPM						×
	C.151	COPYING AUTOGENOUS CUTTING	k	- Unknown	Cutting capacity : -	-	60	II	II	III	×	○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA

SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	C.14	RADIAL DRILLING MACHINE PORTABLE	1	- Asquith (Transp Nieuw) - Year: 1939	Max. distance height/depth : 1,010 mm Max. distance spindle to column : 1,700 mm Max. drilling diameter: ϕ1"	3 HP 940 RPM	30	III	III	III	×	○
	C.16	RADIAL DRILLING MACHINE PORTABLE	1	- Asquith (Transp Nieuw) - Year: 1939	Max. distance height/depth : 1,010 mm Max. distance spindle to column : 1,700 mm Max. drilling diameter: ϕ1"	3 HP 940 RPM	30	III	III	III	×	○
	C.51	RIVETTING MACHINE	1	- Liepziger machine - Year: 1915	Max. height : 450 mm Distance center to column : 1,300 m	4.8 HP 950 RPM	5	III	III	III	×	×
	C.101	MANUPULATOR	1	- Braat - Surabaya	Max. width : 1,650 mm Shaft length : 5,000 mm	1 HP	-	-	-	-	-	×
	C.102	MANUPULATOR	1	- Braat - Surabaya	Max. width : - Shaft length : 6,670 mm	3 HP 940 RPM	40	III	III	III	×	×
	C.134	AIR COMPRESSOR	1	- Ingersol rand USA - Year: 1970	Max. pressure : 150 Atm Voltage : 220/380 V	30 Hp 1400 RPM	60	II	II	II	○	○
	C.153	AIR COMPRESSOR	1	- Ingersol rand USA - Year: 1970	Max. pressure : 150 Atm Voltage : 220/380V	30 HP 1400 RPM	60	II	II	II	○	○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: 'B

SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Moderni-zation	Conclusion
	C.122	AIR COMPRESSOR	1	- Welin & Hupner - Ingersoll Rand - Year: 1951	Working pressure : DRIVING MOTOR / DIESEL ENGINE Induction motor	10 HP 17.35RPM 220/380 V 50 Hz	5	III	III	III	x	o
	C.123	AIR COMPRESSOR	1	- Ingersol Rand - Type: 30 - Model: 71 T 2 - No: 30T. 279036 - Made in: Swizerland - Year: -	Working pressure : 24.6 LBS Driving Motor / Diesel Engine Induction motor Merk: Brown Boveri Swizerland	15 HP 1425 RPM 220/380V 40.5 A 50 Hz	10	III	III	III	x	o
	C.126	AIR COMPRESSOR	L	- Ingersoll Rand - Type: 30 - Year: 1953	Working Pressure : Driving motor / Diesel Engine Induction Motor Mark: A E G Type: D A - 40/4	6.5 HP 1430 RPM ΔY220/380V 1.85/9.5A 50 Hz						o
	-	ELECTRICAL WINCH	4	- G o t o. - Serie No: 22046 6.6.04 - Year: 1962 - Yaskawa - Yapan	Capacity : Ton Voltage : Current :	15 HP 960 RPM 380/220V 23 A						o

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION:

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Moderni-zation	Conclusion
	C.131	DIESEL AIR COM-PRESSOR	1	- Atmos - Type: DK 260 - Made in: Czechoslovakia - Year: 1965	Final operating pressure : 7 kg/cm² Deliveret air volume : 260/Cum/Hour Oil tank capacity : 4.5 L Oil pressure : 4 kg/cm² ENGINE / DRIVING MOTOR: Mark : Tatra Numb of cylinder : 4 Type : T.924-A-6 Oil tank capacity : 16 L Oil pressure : 4 kg/cm²	1200 RPM 45 HP 1200 RPM						o
	-	DIESEL AIR COM-PRESSOR	1	- Ingersoll Rand - Gyro - Flo - Made in U.S.A. - Year: 1972	Working pressure : 14/kg/cm² (200 LBS) Driving Motor / Diesel Engine Ford Model : 271LE' Numb of Cylinder : 4 in line 251 CL	2500 RPM						o
	C.128	DIESEL AIR COM-PRESSOR	1	- Ingersoll Rand - Gyro. Flo - HBS-608226 - Type DR - 210 - Made in U.S.A. - Year: 1952	Working pressure : 125 Max. temperature : 300 Driving motor / Diesel Engine General motor Type two Strokes Cycle Model. 43300 Series 51.	49 HP 1800 RPM						o

LIST OF EXISTING MACHINE/TOOL

MILL NAME; BARATA SURABAYA

SECTION; STEEL CONSTRUCTION

No.	CODE	Machine Item	Qty	Supplier Purchased Data	Main Specification	MOTOR DRIVE POWER	MOTOR DRIVE R.P.M.	Machine Condition: Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	K.1	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8,5 M	7,5 HP	945						○
					Between crane transverse : 17,810 mm	7,5 HP	945						
					Safe working load : 2 Ton/5 Tons	10,2 HP	950						
						20,4 HP	960						
	K.2	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8,5 M	8,8 HP	1430						○
					Between crane transverse : 17,810 mm	13,5 HP	945						
					Safe working load : 10 Tons	13,5 HP	950						
	K.3	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 6 M	10,2 HP	1430						○
					Between crane transverse : 10,275 mm	4,1 HP	1000						
					Safe working load : 15 Tons	10 HP	950						
	K.4	OVERHEAD TRAVELLING CRANE	1	- Barata. surabaya	Max. lifting height : 6 M	5,5 HP	980						○
					Between crane transverse : 10,275 mm	5,5 HP	980						
					Safe working load : 5 Tons	3,4 HP	920						
	K.5	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 4,5 M	5,6 HP	980						○
					Between crane transverse : 10,275 mm	5,6 HP	980						
					Safe working load : 3 Tons	3,4 HP	920						

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	K.6	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 4.5 m Between crane transverse : 13,280 mm Safe working load : 2 Tons	1 HP 1300 RPM 3.5 HP 1300 RPM 2 HP 940 RPM						○
	K.7	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 4.5 m Between crane transverse : 13,280 mm Safe working load : 2 Tons	2 HP 940 RPM 3.5 HP 1300 RPM 0.5 HP -						○
	K.8	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 4.5 m Between crane transverse : 13,265 mm Safe working load : 2 Tons	2 HP 940 RPM 1 HP 1300 RPM 3.5 HP -						○
	K.9	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. Lifting height : 6.5 m Between crane transverse : 13,265 mm Safe Working load : 2 Tons	0.5 HP 940 RPM 3.5 HP 1300 RPM 2 HP 940 RPM						○
	K.10	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 6.5 m Between crane transverse : 13,265 mm Safe working load : 3 Tons	2 HP 940 RPM 1 HP 1300 RPM 3.5 HP - 0.25 HP -						○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	K.11	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8 m Between crane transverse : 8,100 mm Safe working load : 10 Ton	6 HP 1450 RPM 11.6 HP 1430 RPM 2.6 HP 1410 RPM						○
	K.12	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8 m Between crane transverse: - Safe working load : 5 Tons							○
	K.13	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8 m Between crane transverse : 8,100 mm Safe working load : 10 Tons	11.6 HP 1430 RPM 7.5 HP 945 RPM 2.6 HP 1410 RPM						○
	K.14	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 8 m Between crane transverse : 8,100 mm Safe working load : 5 Tons	13.6 HP 1000 RPM 10 HP 1440 RPM 1.5 HP 930 RPM						○
	K.15	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 5 m Between crane transverse : 13,270 mm Safe working load : 2 Tons	3.5 HP 2 HP 0.5 HP						○
	K.16	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 5 m Between crane transverse : 13,270 mm Safe working load : 3 Tons	3.5 HP 1300 RPM 2 HP 940 RPM 1 HP 1300 RPM						○
	K.17	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 5 m Between crane transverse : 13,240 mm Safe working load : 3 Tons	3.5 HP 2 HP 940 RPM 1 HP 1300 RPM						○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Modernization	Conclusion
	K.18	OVERHEAD TRAVELLING CRANE	1	- Barata. Surabaya	Max. lifting height : 5 m Between crane transverse : 13,240 mm Safe working load : 2 Tons	2 HP 940 RPM 1 HP 1300 RPM 3.5 HP 1300 RPM						○

LIST 1-1
LIST OF EXISTING MACHINE/TOOL

MILL NAME: BARATA SURABAYA

SECTION: STEEL CONSTRUCTION

No.	Code	Machine Item	Q'ty	Supplier Purchased Data	Main Specification	Motor Power	Machine Condition					
							Loading %	Tolerance	Workability	Maintenance	Moderni-zation	Conclusion
	-	MOBIL CRANE	1	- P & H - Model-1010 - *No:* 24237	Capacity of lifting : 100 Ton							o
	-	MOBIL CRANE	1	- Nobas Nordhause - Type: UB 80 - Np: 48580006 - Year: 1964	Capacity of lifting : 10 Ton							o
	-	MOBIL CRANE	1	- Veb Zemag Zeitz - Type: UB 162 - No: 573 - Year: 1954								o
	L129	DIESEL GENSET	1	- Kromhout Motor Fabriek NV. Amsterdam Holand - A. Van Kaiek Generatoren Und motoren Werks Germany - Year: 1965	Engine type : 6 TS 177 Engine : No: 17711 Number of cylinder : 6 Generator A v K Type: A142/75-H-AS No: 4000908 Synchronous generator	105 BHP 1500 RPM 75 kVA 1500 RPM						o

P.T. BARATA: GRESIK FACTORY

LIST 4-1 NEW AND USABLE EXISTING MACHINE/TOOL LIST

( ); 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	2
1.1.3	Max. turning diameter Diatance between center	450 mm 4000 mm	2
1.1.4	Max. turning diameter Distance between center	550 mm 4000 mm	1
1.2	HEAVY DUTY FACING LATHE MACHINE		
1.2.1	Max. turning diameter Max. work size	6000 mm 6000 mmϕ x 15000 mmL	1
1.3	VERTICAL BORING & TURNING MILL MACHINE		
1.3.1	Max. turning diameter Max. turning height	1000 mm 1000 mm	1
1.3.2	Max. turning diameter Max. turning height	1600 mm 1500 mm	1
1.3.3	Max. turning diameter Max. turning height	2350 mm 2550 mm	1
1.3.4	Max. turning diameter Max. turning height	5000 mm 2000 mm	1

NO.	TYPE OF MACHINE		QUANTITY
1.4	HEAVY DUTY RADIAL DRILLING MACHINE		
1.4.1	Max. drilling capacity	35 mmϕ	4
1.4.2	Max. drilling capacity	50 mmϕ	4
1.4.3	Max. drilling capacity	65 mmϕ	3
1.4.4	Max. drilling capacity	80 mmϕ	2
1.4.5 (C15)	Max. drilling capacity	25.4 mmϕ	1
1.4.6 (C66)	Max. drilling capacity	30 mmϕ	1
1.4.7 (C14) (C16)	Max. distance height/depth Max. distance spindle to column Max. drilling diameter	1010mm 1700 mm 1 inch ϕ	2
1.5	VERTICAL DRILLING MACHINE PILLAR TYPE		
1.5.1	Max. drilling capacity	35 mmϕ	2
1.5.2	Max. drilling capacity	45 mmϕ	1
1.6	TRAVERSE TYPE RADIAL DRILLING MACHINE		
	Max. drilling capacity Max. column saddle travel	80 mmϕ 5000 mm	1
1.7	C.N.C. DRILLING CENTER MACHINE		
	Max. drilling capacity Max. column travel Spindle head travel Arm vertical travel	65 mmϕ 6000 mm 3100 mm 1000 mm	1

NO.	TYPE OF MACHINE	QUANTITY
1.8	PORTABLE UNIVERSAL RADIAL DRILLING MACHINE WITH - SWIVEL RAM AND HEAD	
	Max. drilling capacity 45 mmø	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
1.9.2	Heavy duty horizontal boring & milling machine - (Table Type) Spindle diameter 160 mm Table size 2000 x 2500 mm	1
1.9.3	Heavy duty horizontal boring & milling machine - (Floor Type) Spindle diameter 130 mm Floor size 4000 x 4000 mm	1
1.10	UNIVERSAL MILLING MACHINE	
	Table size 1800 x 560 mm	1
1.11	PLANNING MACHINE	
1.11.1	Heavy duty double column planning machine Table size 4000 x 2000 mm	1
1.11.2	Heavy duty double column planning machine Table size 8000 x 1400 mm	1
1.11.3	Heavy duty open side planning machine Table size 6000 x 2000 mm	1
1.12	HEAVY DUTY HYDRAULIC HACKSAM MACHINE	
1.12.1	Max. cutting 280 mmø	1

NO.	TYPE OF MACHINE		QUANTITY
1.13	HEAVY DUTY HYDRAULIC CIRCULAR SAW MACHINE		
	Max. cutting	350 mmø	1
1.14	UNIVERSAL TOOL & CUTTER GRINDING		
1.14.1	Swing	265 mm	1
	Distance between workhead and tailstock	910 mm	
	Table size	180 x 1320 mm	
1.15	SEMIAUTOMATIC GRINDER FOR SHARPENING TWIST DRILL & CORE DRILL		
1.15.1	Range drills diameter	10 - 100 mm	1
	Point angle	80 1/4 - 170 1/4	
1.16	AUTOMATIC SHARPENING FOR METAL CUTTING CIRCULAR SAWS		
1.16.1	Max. out side diameter	1600/2000 mm	1
1.17	PEDESTAL GRINDING MACHINE (DOUBLE GRINDING WHEELS)		
1.17.1	Pedestal grinding machine		2
	Wheel size	150x25x51 mm	
1.17.2	Pedestal grinding machine		6
	Wheel size	300x40x76 mm	
1.17.3	Pedestal grinding machine		1
	Wheel size	500x60x127 mm	
1.19	HEAVY DUTY HYDRAULIC PRESS MACHINE		
1.19.1	Power	900 Tons	1
	Table area	4800 x 2000 mm	
	Stroke	600 mm	
	Day light	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		

NO.	TYPE OF MACHINE		QUANTITY
1.20	HYDRAULIC STRAIGHTENING PRESS MACHINE FOR SHAFT		
	Max. force	40 Tons	1
	Piston stroke	300 mm	
	Max. length of shaft	2000 mm	
	Throat depth	250 mm	
	Table size	1000 x 300 mm	
1.21	HYDRAULIC PRESS BRAKE MACHINE		
	Power press	750 Tons	1
	Max. plate width	4000 mm	
	Throat depth	400 mm	
	Day light	650 mm	
	Stroke	350 mm	
1.22	HORIZONTAL PROFILE STRAIGHTENING MACHINE		
	Force	200 Tons	1
	Throat depth	235 mm	
	Stroke	750 mm	
	Day light	600 mm	
	Table block size	450 x 1700 mm	
1.23	HORIZONTAL CYLINDRICAL SHELL STRAIGHTENING MACHINE		1
	Force	800 Tons	
	Day light	650 mm	
	Stroke	200 mm	
	Max. plate width	4000 mm	
1.24	HEAVY DUTY HEAD FLANGING MACHINE		
1.24.1	Max. head diameter (Range of plate thickness: 9-30 mm)	5000 mm	1
	Min. head diameter (Range of plate thickness: 4.5-12 mm)	800 mm	
1.25	HEAVY DUTY HYDRAULIC PRESS MACHINE		
1.25.1	Force	2000 Tons	1
	Table area	6000 x 4000 mm	
	Storke	1000 mm	
	Day light	2000 mm	
	Example of cold forming capacity 1. 1500 mmR x 3000 mmL at plate thickness 90 mm 2. 1500 mmR x 6000 mmL at plate thickness 50 mm		

NO.	TYPE OF MACHINE		QUANTITY
1.26	MECHANICAL PLATE BEND ROLLING MACHINE		
1.26.1	Max. plate thickness bending capacity	12 mm	2
	Max. plate width	2000 mm	For site
	Min. bending diameter	450 mm	
1.26.4	Max. plate thickness bending capacity	25 mm	1
	Max. plate width	4000 mm	
	Min. bending diameter	700 mm	
1.26.5	Max. plate thickness bending capacity	38 mm	1
	Max. plate width	4000 mm	
	Min. bending diameter	850 mm	
1.26.6	Max. plate thickness bending capacity	60 mm	1
	Max. plate width	4000 mm	
	Min. bending diameter	1000 mm	
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 :		1
	Pipe ST.37 (diameter x thickness)	216 x 5.8 mm	
	Square solid bar	110 mm	
	Round bar	120 mm	
1.29	MECHANICAL PLATE SHEARING MACHINE		
1.29.1	Max. plate thickness	16 mm	1
	Plate width	4000 mm	
1.29.2 (C72)	Knife length	2285 mm	1
	Max. sheet thickness	9 - 16 mm	

NO.	TYPE OF MACHINE		QUANTITY
1.30	MECHANICAL UNIVERSAL STEEL WORKER MACHINE		
	Flat shear max.	250 x 22 mm	1
	Bar stock shear	65 mmϕ	
	Square stock shear	55 mm	
	Punch max. ϕ38 in thickness	27 mm	
	Notching	16 mm	
1.31	HAND NIBBLING MACHINE		
	Max. nibbling capacity	8 mm	1
	Smallest radius	300 mm	
1.32	PUNCHING MACHINE		
1.32.1	Handy portable hydraulic heavy duty punching machine		1
	Max. punching capacity hole	30 mmϕ in 16 mm	
	Depth throat	100 mm	
1.32.2	Mechanical heavy duty punching machine		1
	Max. punching capacity	30 mmϕ	
	Thickness	25 mm	
1.33	HANDY HEAVY PNEUMATIC RIVETING HAMMER		
	Max. rivet diameter :		3
	Steel construction	up to 37 mm	
	Boiler construction	up to 33 mm	
1.34	MECHANICAL PLATE FORMING MACHINE		
	Max. plate thickness	8 mm (light metal St.37)	1
	Depth of gap horizontal	675 mm	
1.35	TUBE EXPANDER		
	Max. pipe diameter	10 - 45 mm	3

NO.	TYPE OF MACHINE		QUANTITY
1.36	UNIVERSAL FILING AND BAND SAW MACHINE		
	Stroke of blade of file	0 - 120 mm	1
	Table	400 x 400 mm	
1.38	PIPE BEVELLING/EDGING MACHINE		
1.38.1	Edge cutting machine		1
	Cutting length	8000 mm	
1.38.2	Portable handy electric bevelling machine		1
	Max. material thickness	32 mm	
1.39	AIR COMPRESSOR		
1.39.1	Mobile air compressor with diesel power		3
	Max. pressure	10 bar	
	Capacity	20 m^3/min	
1.39.2	Static air compressor		3
	Max. pressure	8.8 bar	
	Capacity	15 m^3/min	
1.39.3	High pressure air compressor		1
	Max. pressure	200 ATM	
	Capacity	22 m^3/Hr	
	Motor	11 kW	
1.41	INDUCTION HEATING EQUIPMENT		
	Welding current	600 Amp	2
	Duty cycle	100% at 600 Amp	
	Output voltage	60 - 80 Volts	
1.42	CUTTING TOOLS		1
1.43	SURFACE PLATE FOR MACHINE		
	Dimension	4000 x 6000 x 400 mm	2
	Max. load	10 Tons	

NO.	TYPE OF MACHINE		QUANTITY
1.44	COPIER GAS CUTTING MACHINE		
	4 Cutting torches		1
	Max. plate thickness	150 mm	
	Effective cutting	6000 x 3000 mm	
1.45	PLASMA CUTTING MACHINE		
1.45.1	Max. cutting thickness alloy steel	70 mm	1
1.45.2 (-)	-		1
1.46	AUTOMATIC GAS CUTTING MACHINE (CIRCULAR)		
	Max. cutting thickness	150 mm	1
	Circle cutting range diameter	60 - 2000 mm	
	Cutting speed range	80 - 1000 mm/min	
1.47	PORTABLE FLAME CUTTING MACHINE		
	Cutting capacity	150 mm	4
1.48	PIPEEND BEVELLING FLAME CUTTING MACHINE		
	Effective pipe diameter	150 - 1000 mm	2
	pipe thickness	5 - 50 mm	
1.49	MANUAL FLAME CUTTING		
	Max. cutting thickness	150 mm	20 7: For site

NO.	TYPE OF MACHINE		QUANTITY
1.50	SEMIAUTOMATIC GAS METAL ARC WELDING MACHINE		
1.50.1	Max. welding current Max. wire diameter	600 Amp. 1.6 mm	10
1.51	SUBMERGED-ARC AUTOMATIC TANK WELDING MACHINE		
	1400 Amp. Max. wire diameter Max. vertical height	6 mm 4200 mm	3
1.52	AUTOMATIC SUBMERGED ARC WELDING MACHINE		
1.52.1	1500 Amp. Max. wire diameter	6 mm	13
1.52.2 (-)	-		2
1.53	AC ARC WELDING MACHINE		
1.53.1	Max. welding current Duty cycle	500 Amp. 60% at 500 Amp. AC	20
1.53.2 (-)	Max.welding current	300 - 500 Amp.	40
1.54	DC ARC WELDING MACHINE		
1.54.1	Max. welding current Duty cycle	500 Amp. 60% at 450 Amp. AC	10
1.54.2 (-)	Max. welding current	300 - 500 Amp.	12

NO.	TYPE OF MACHINE		QUANTITY
1.55	DC MOTOR GENERATOR WELDING MACHINE		
	Max. welding current Duty cycle	600 Amp 60% at 600 Amp.	12
1.56	DC DIESEL GENERATOR WELDING MACHINE		
1.56.1	Max. welding current Duty cycle	600 Amp 60% at 600 Amp.	3
1.56.2 (-)	Max. welding current	500 Amp.	5
1.57	T.I.G. WELDING MACHINE		
1.57.1	Output current Duty cycle	DC Max. 500 Amp. 60% at 500 Amp.	2
1.57.2 (-)	Max. welding current	500 Amp.	8
1.58	AUTOMATIC SEAL WELDING MACHINE FOR TUBE END WELDING		
	Tube diameter range Steel tube boiler material and exchanger	20 - 100 mm	2
1.59	DIESEL GENERATOR		
	Continuous output 3 Phase alternating current (AC)	250 kVA 380/220 Volt, 50 Hz	2
1.60	CARBON ARC AIR GOUGING MACHINE		
	Rated current Duty cycle Usable carbon diameter	DC 600 Amp. 100% 5 - 11 mm	5

NO.	TYPE OF MACHINE		QUANTITY
1.61	WELDING POSITIONER		
1.61.1	Rotated and tilting table		1
	Table size	1500 x 1500 mm	
	Max. load on table in horizontal position	4 Tons	
1.61.2	Rotated and tilting table		3
	Table size diameter	500 mm	
	Max. load on table in horizontal position	500 kg	
1.61.3	Welding positioner		1
	Rotated and tilting table		
	Table size diameter	1000 mm	
	Max. load on table in horizontal position	1000 kg	
1.62	TURNING TABLE FOR GAS CUTTING		
1.62.1	Turning table for gas cutting		1
	Effective cutting diameter	5000 mm	
	Max. load	15 Tons	
1.62.3	Turning table for gas cutting		1
	Effective cutting diameter	3000 mm	
	Max. load	10 Tons	
1.63	BOOM TYPE WELDING MACHINE		
1.63.1	Boom type automatic submerged arc welding machine		2
	Automatic welding carrier		
	Vertical	4000 mm	
	Horizontal	5000 mm	
	Sub-merged arc welding machine	1200 Amp. 4.8 mm	
1.63.2	Boom type automatic gas metal arc welding machine		1
	Automatic welding carrier		
	Vertical	1000 mm	
	Horizontal	5000 mm	
	Gas metal arc welding machine	500 Amp. 1.6 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	2
2.2	FORKLIFT TRUCK 3 TONS		1
2.3	FORKLIFT TRUCK 5 TONS		1
2.4	FORKLIFT TRUCK 10 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	10
2.6.2	Hoist	2 tons x 6 m	10
2.7	JIB CRANE 1 TON		
	Lifting height	5 meters	3

NO.	TYPE OF MACHINE		QUANTITY
2.8	OVERHEAD TRAVELLING CRANE 5 TONS		
2.8.4	Lifting height Rail span	12 meters 20 meters	2
2.11	OVERHEAD TRAVELLING CRANE 10/3 TONS		
2.11.3	Lifting height Rail span	12 meters 20 meters	4
2.15	OVERHEAD TRAVELLING CRANE 25 TONS		
	Lifting height Rail span	12 meters 20 meters	3
2.18	OVERHEAD TRAVELLING CRANE 50/10 TONS		
	Lifting height Rail span	15 meters 25 meters	2
2.23	PULLERS WITH LOAD LIMITER		
	Pulling capacity Cable diameter	Approx. 3000 kgs 5/8"	1
2.24	UNIVERSAL THEODOLITE COMPLETE SET		1
2.25	MANUAL SCREW JACK		
	Lifting capacity Stroke Collapsed height	10 Tons 150 mm 280 mm	3

NO.	TYPE OF MACHINE		QUANTITY
2.26	HAND PUMP HYDRAULIC JACK 10 TONS		
	Stroke	150 mm	3
	Closed height	330 mm	
2.27	HAND PUMP HYDRAULIC JACK 35 TONS		
	Stroke	300 mm	3
	Closed height	545 mm	
2.28	HAND PUMP HYDRAULIC JACK 100 TONS		
	Stroke	300 mm	3
	Closed height	598 mm	
2.29	HAND PUMP HYDRAULIC JACK COMPLETE SET 200 TONS		
	Stroke	150 mm	1
	Closed height	473 mm	
2.30	HAND PUMP HYDRAULIC SPREAD CYLINDER SPRING RETURN		
	Lifting capacity	1 Ton	3
	Max. stroke	±150 mm	
2.31	HAND PUMP HYDRAULIC SPREAD CYLINDER SPRING RETURN		
	Lifting capacity	3 Tons	3
	Max. stroke	±250 mm	
2.32	HAND PUMP HYDRAULIC PIPE BENDER COMPLETE SET		
	Max. pipe to be bend	1/2"ϕ up to 4"ϕ	2

NO.	TYPE OF MACHINE		QUANTITY
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	6
2.36	CHAIN BLOCK PULLEY		
	Max. load and lifting capacity	5 tons and 3000 mm	3
2.37	CHAIN BLOCK PULLEY		
	Max. load and lifting capacity	10 Tons and 3400 mm	3
2.38	CHAIN BLOCK PULLEY		
	Max. load and lifting capacity	25 Tons and 3500 mm	3
2.39	PAIR OF DRUM ROTATOR WITH DRIVE MOTOR AND IDLER ROTATOR		
	Adjustable rotating speed Drum diameter	1000 - 5000 mm	
2.39.1	5 Ton		3
2.39.2	10 Ton		4

NO.	TYPE OF MACHINE		QUANTITY
2.39.3	20 Tons		5
2.39.4	50 Tons		2
2.39.5	100 Tons		1
2.40	*PAIR OF IDLER DRUM ROTATOR WITHOUT DRIVE MOTOR*		
	Max. load Drum diameter	5 Tons 1000 - 3000 mm	3
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 Drive motor	175 mm Approx. 1.5 kW	15
2.43	HEAVY DUTY VERTICAL SANDER		
	Wheel sander Drive motor	175 mmϕ 1.5 kW	3
2.44	POWER CABLE PULLERS		
	Max. pulling power With drive motor	2 Tons	3
2.45	HAND WINCH (TOTALLY ENCLOSED TYPE)		
	Capacity Length	1000 kg 50 m	3

NO.	TYPE OF MACHINE		QUANTITY
2.46	CABLE FISH - TAPE BLOWER VACUUM		
	Tube in diameter to be vacuum	19 - 31 m	3
2.47	CABLE SHEAVE & ROLLER SEVERAL TYPE		
	Max. power of pulley Range diameter of cable to be pulled	1 Ton 2 - 15 m	3
2.48	COMPLETE SET CABLE GRIPS (WIRE & CABLE CRIMPING TOOL)		
	Max. safety load Range of strip copper wire cable	1000 kg 5 - 150 mm	3
2.49	COMPACT HYDRAULIC CABLE BENDER		
	Bend capacity	250 up to 1000 MCM	3
2.50	MANUAL TACHET CABLE BENDER		
	Universal bending shoe fits all cable size	500 MCM	3
2.51	MANUAL HYDRAULIC CABLE CUTTER		
	Max. cable diameter to be cut	2"	3
2.52	CABLE STRIPPER		
	Range capacity of cable stripper	6 up to 20 AWG	3
2.53	CABLE STRIPPER		
	Range capacity of cable stripper	4 AWG up to 1000 MCM	3

NO.	TYPE OF MACHINE		QUANTITY
2.54	PORTABLE HYDRAULIC CABLE CUTTER		
	Max. cable diameter to be cut	100 mm	3
2.55	CABLE LUG PRESSURE (CRIMPER MANUAL)		
	Range capacity	1.25 - 8 mm	3
2.56	CABLE LUG PRESSURE (CRIMPER MANUAL)		
	Range capacity	5.5 - 14 mm	3
2.57	CABLE LUG PRESSURE (CRIMPER HYDRAULIC)		
	Range capacity Power	14 - 150 mm 10 Tons	3
2.58	PRECISION CURRENT TRANSFORMER		
	Primary rating	10/15/30/50/ 100/250/300/ 500/750/1000A	2
2.59	PRECISION AMPERE METER (AMMETER)		
	Range	100/200/500/ 100MA	2
2.60	PRECISION AMMETER (LINE CURRENT TESTER)		
	Full scale valve	15/30/75/150/ 300A	2
2.61	PRECISION VOLT METER		
	Range	30/75/150/300V	2

NO.	TYPE OF MACHINE	QUANTITY
2.62	INSULATION TESTER	2
2.63	AIR LESS PAINTING SPRAYING UNIT COMPLETE MOBILE TYPE Suitable for high pressure design for heavy viscosity of paint	2

3. QUALITY ASSURANCE & TESTING UNIT

NO.	TYPE OF MACHINE	QUANTITY
3.1	PORTABLE COBALT UNIT AND PORTABLE IRIDIUM 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	2
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	6000 x 6000 x 18000 mm 100 Ton	1
	Working temperature	Max. 750°C	
4.1.2	Max. charge weight Working temperature Effective chamber	25 Tons Max. 950°C 6000 x 6000 x 3000 mm	1
4.2	SHOT GRIT COMPARTMENT UNIT		
	Size	6000 x 4500 x 15000 mm	1
	Complete with dust collector.		
4.3	SAND BLASTING MACHINE		
	Movable type Tank content Working pressure	 140 liters 8 bar	1
4.5	WELDING ELECTRODE OVEN		
4.5.1	Dimension	2000 x 2000 x 1000 mm	4 2: For site
	Adjustable temperature, range	Max. 100°C	
4.6	SUBMERGED-ARC FLUX DRYING OVEN		4 2: For site

4.3 Barata Jakarta Factory

4.3.1 Results of Technical Diagnoses of the Factory

With respect to P.T. Barata Jakarta Factory, technical diagnoses were studied from July to August 1984. This chapter describes the results of these diagnoses on the technical items and various measures to be taken for improvement.

(1) Outline and history of the factory

1) P.T. Barata Indonesia was established in 1901 to perform maintenance and rehabilitation services, sometimes even manufacturing for the development of sugar industry and other plantations.

2) Currently Jakarta Factory is offering various services and products such as the construction of cement and sugar plants, steel constructions including water gates, steel bridges and storage tanks, plate works and piping systems including ducting works, penstocks, platforms and piping design and casting products.

(2) Present product conditions

1) Annual production of fabrication division

The annual production of steel structures and plate works by Jakarta Factory is approximately 2,000 tons.

2) Maximum production weight and sales amount in %

Vessels	45	ton/month	5 %
Tanks	70	ton/month	10 %
Pipings	25	ton/month	5 %
Steel structures	100	ton/month	50 %
Plate works	60	ton/month	10 %
Parts/machining	20	ton/month	5 %
Others		-	15 %

3) Because the relations between the objective plants (Cement, Sugar, Fertilizer, Pulp/paper, Palm oil) and annual production were found not to be clear in the process of survey, clarification in these respects was proposed resulting in the forecast of product mix.

(3) Production facilities and production technology

1) Existing production facilities

① For the facilities related to the steel structure and plate works, refer to the list 1-1, List of Existing Machine/Tool.
The following equipment have been taken to be the objects of survey: cutting equipment, forming machine, welding equipment, drying oven of rods, heat treating furnace, surface preparation and testing and examination equipment, and utilities.

② The total floor space for steel structure and plate works is 5,238 m^2 with 4 Bays, the steel structure and prefabrication and assembly of piping are performed in the open area.

2) Production technology

① Experienced codes and standards

JIS, ASME, B.S., API and Indonesian standard.

② Experienced materials

Carbon steel, C-Mo steel, Cr-Mo steel, ferritic stainless steel, austenitic stainless steel, and others.

③ Normally required production period after receiving an order on exwork base is as follows:

Vessels	ϕ1.8M× L45M	8 weeks
Tanks	ϕ3.0M× L4M	8 weeks

3) **Recommendation according to the results of factory survey**

① Equipment, layout and floor need to be rearranged. The present building area will be insufficient when output is increased or when equipment is changed.

② When the production of higher-level quality products is attempted, the present production technology level may become necessary to be improved.

(4) Control system and personnel organization

Jakarta factory will take good maintenance for its existing equipment and develop mainly in plate works. The following recommendations are for increase in both the number of production items and the output based on present standings:

1) **Management system and personnel**

The present management system and personnel organization are shown in Table 1-1 & 1-2.

① Recommendation to the management system

The present system is considered to have been well organized in functional aspect. There is no clear cut distinction between the assigned functions because of the mixing of divisions and section with one another. Taking this opportunity of construction of a new factory, making the distinction between business and managerial function is recommended.

② Personnel

It appears, that there is an urgent necessity to recognize and improve the technical levels of personnel to cope with the improvement in the product quality and production increase in future.

To prepare for this approach, the intent is to improve the skill and technology of the personnel through training programs and refrain the increase in the number of personnel.

2) Production control system

(1) The basic function of the production control is to create an system capable of improving quality, advancing technology and reducing cost. And in addition, the system must be able to manage each production process so that the products can be produced according to the predetermined plan.

(2) The results of the survey have revealed the lack of close coordination between the production control and planning section, and technological section in executing their functions.

(3) A complete review on the delay on the appointed delivery time is necessary also.

(4) Designs

Judging from the results of the survey the designing and drawing ability of the plant equipment producing in the factory must be improved. Because the basic concept of quality and production controls, and production increase is to obtain the good drawings and achieve the production of equipment in accordance with these drawings. And in addition, it is considered that all these factors can be improved through the good communication and quick response between and by the designing & production sections.

3) Quality control system and inspection

(1) It appears that in executing the management and QC work, the basic concept of QC is smoothly penetrating the mind of the personnel because of such symptom as the compilation of a QC manual by Jakarta factory at its own initiative.

② A more effective control system, however, may be necessary to spread, improve and check the QC manual. The first step to be taken in this respect is to perform the work such as non-destructive test of the welded section and material test for vital component material on the basis of inside order. The factory has so far been depended on the subcontractors for the performance of such works.

③ In addition, the data on the defective workmanship and claim should be collected. With the improvement in quality and increase in production, the counter-measures to prevent the recurrence of these types of problems may deciding factors in QC.

4) Maintenance system

In Jakarta factory, there is maintenance section. It will need to decide management points, such as collection of materials for new machines, when renovation is under way.

(5) Layout, floor space structure and transportation facility

1) Present floor space structure will be able to be used in the future.

2) Overhead traveling crane is deteriorated especially in its driving system: it might not be used long.

3) The site is large and has still much space: extension is possible.

(6) Utilities

1) Power supply equipment, especially transformers, is used in common with foundry equipment. Further capacity increase is possible.

2) Water is from factory own well.

4.3.2 Technological preconditions

Preconditions which will enable renovation are discussed in this clause.

(1) Location of factory

1) Renovation of P.T. BARATA — Jakarta factory consists of extension of bays on both sides of existing shop, introduction of new product mix and increase of output.

2) Site of Jakarta factory should have enough space for extension and be of stable soil so that cost of construction of extension may not be so high as to press running of existing factory.

3) We found in our diagnosis that site where extension will be built has no problem regarding soil quality.

(2) Selection criteria of production facilities

Jakarta factory may mainly manufacture processing equipment for cement plant, sugar plants and various other equipment which have so far been manufactured but the so-called precision equipment will be excluded. In selecting the selection criteria of production facilities, care should be paid to the following points:

1) The facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities.

2) The equipment with a high level of NC should be avoided because no massproduction equipment will be used in the factory (for example, CAD/CAM machine).

3) Although the stress relief furnace, acid cleaning equipment and painting facilities are planned to be installed as supplementary facilities, the plating facilities will be excluded so that the plating can be performed by experts on the basis of outside order.

4) Making the concept of quality assurance generally known to the employees through the implementation of inspection facilities centering around the non-destructive examination.

(3) Limitations of transportation

1) Transportation of products

(1) The port nearest to the Jakarta factory is Tanjung Priok about 15 km away.

(2) The weight limitation in transportation on load to Tanjung Priok are allowed up to 30 ton.
Police of Surabaya places no requirement concerning weight in Jakarta. Transportation is no special problem.

4.3.3 Basic Concept and Outline of Renovation Program

The following procedures have been taken in drafting the renovation on program based on the results of investigations and diagnosis on the present state as described in the previous clause 4.3.1:

(1) Drafting a new production plan optimized with respect to the Jakarta factory based on the REPELITA-IV of the Indonesian Government, market research conducted by the study team and study on the existing plant sites.

(2) Drafting a plan with respect to the capabilities of the new facilities pursuant to the new production plan.

(3) Comparison of the capacities between the new facilities and existing ones, drafting a layout for the new factory, and review on the various problems involved in the transportation of products.

(4) Reviews on the costs and processed regarding the plant construction, and equipment and facility installations.

⑤ Reviews on the organizations and production technology after completion of the new factory.

Outline of basic plan is: to develop plate works further (the other main product of Jakarta factory is steel structure), and newly to establish related field works.

The intent has been to achieve a product mix capable of producing conventional products such as machinery and processing equipment as its basic load centering around cement and sugar plants. The productive capacity of hardware, the so-called facility productivity has been designed to produce 10,737 t/y which far exceeds the present production record of approximately 2,000 t/y. The new factory may start production in October 1988.

Conversely, in order to provide a complete software system which is the responsibility of Jakarta factory, various reviews have been made in regard to the training programs necessary for the cultivation and increase of managers, engineers and skilled workers, and improvement in the technical levels of these personnel for preventing problems from occurring in the course of plant construction and operation initiation. Reviews have also been made on the factory and personnel organizations.

(1) Production plan classified into products manufactured by factory

1) Product mix at Jakarta factory

① The product mix which is the basis of facility capacity design consists of the following two items: (1) Manufacturing of sugar plant equipment and cement plant equipment pursuant to the "SCOPE OF WORK FOR THE FEASIBILITY STUDY ON THE DEVELOPMENT OF PLANT PROCESSING EQUIPMENT INDUSTRIES agreed upon by and between the Japan International Cooperation Agency and Directorate General of Basic Metal and Machinery Industries of Ministry of Industry. (2) Manufacturing of products which have so far been and will be manufactured by Barata Surabaya factory in a close relation with the local region (hereinafter called the "BASIC LOAD").

② In the meantime, it is important that the technical levels of Jakarta factory is consistent with that of the fabrication division

of existing factory, and in addition, permit to improve the technical levels as well as quality and productivity by adopting the new production technology. Judging from the classification of the products according to their types, Jakarta factory is considered to be suitable to perform the works centering around steel structures and plate works.

③ Consequently, as shown in Table 3-1, the product mix of Jakarta factory has been classified into 9 items that can be manufactured inside the factory, and 5 items of fields works (for convenience, hereinafter called "Site Work"). Thus the types, number and arrangements of the necessary equipment have been determined through the classification of products.

2) Planning production scale of Jakarta factory

① On making the market research on the cement and sugar plants and basic load to be manufactured by the Jakarta factory the factory annual production scale has been determined based on the estimated productions from 1989 to 1993. Then review has been made as to the feasibility of the production of these plant equipment in Indonesia for seeking a local percentage.

② Next, the exclusive rates for the processing of these two types of local intended plant equipment by Jakarta factory were determined. Steel structure and plate works were accorded a due exclusive factor, and productions were allotted to each product mix.

③ In the meantime, investigations were performed on the factory production records in regard to the basic load as well. The basic loads for which production well be continued were also classified into steel structure and plate work in the same manner as described in the preceding paragraph ②. The productions were allotted to each product mix accordingly.