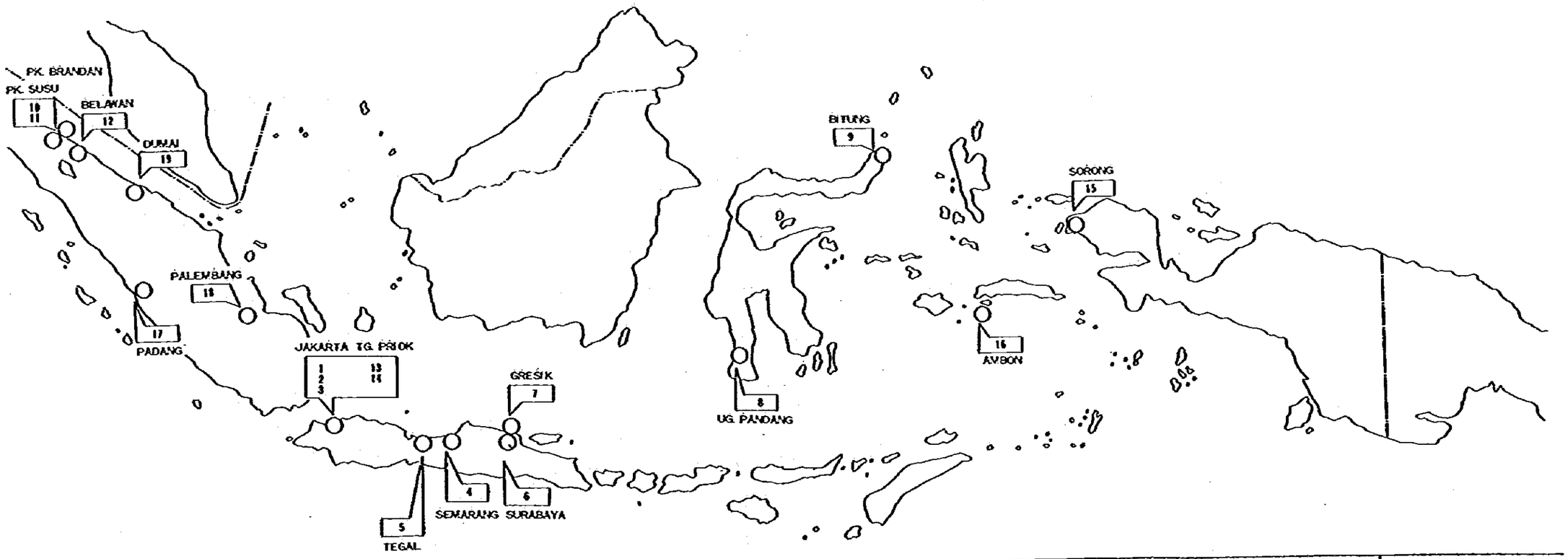
THE COMPREHENSIVE STUDY FOR SHIPBUILDING INDUSTRY DEVELOPMENT IN INDONESIA

THE 1st ISSUE

JAPAN INTERNATIONAL COOPERATION AGENCY

MARCH, 1979

Location-Map of he 18 Studied Shipyards in the Republic of Indonesia



	JAKARTA 1 P. T. ADIGUNA SY ② P. T. PAKIN 3 P. T. INGGOM	SEMARANG 4 P. T. I. P. P. A. GAYA BARU TEGAL ⑤ P. T. MENARA SURABAYA 6 P. T. DOK SURABAYA	GRESIK 7 P. T. IKI GRESIK UJUNG PANDANG ⑧ P. T. IKI MAKASSAR BITUNG 9 P. T. IKI BITUNG	PANGKALAN SUSU 10 DOK PK. SUSU PANGKALAN BRANDAN 11 DOK PK. BRANDAN BELAWAN 12 P. T. POSEIDON		JAKARTA 13 P. T. DOK TG. TG. PRIOK 14 P. T. PELITA BAHARI SORONG 15 DOK KARN SORONG AMBON 16 P. T. WAIAVE	PADANG 17 P. T. IKI PADANG PALEMBANG ⑱ P. T. INTAN SENGKUNYIT DUMAI 19 DOK DUMAI

Remarks: ○ Indicates the yards precisely studied twice, at the stage of the 1st survey and the 2nd one too

PREFACE

In response to the request of the Government of Indonesia, the Government of Japan decided to conduct a survey/study on the shipbuilding industry development plan of that country and the Japan International Cooperation Agency (JICA) conducted the definite works of the survey/study.

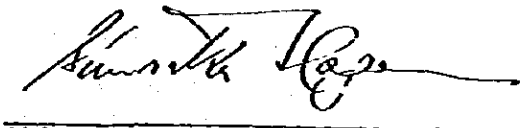
JICA despatched to Indonesia a survey/study team in the fiscal year of 1977 and 1978 also and prepared the first report as well as the interim scheme on the subject for the Third Five Year Development Plan of Indonesia and submitted them to the Government of Indonesia.

In cooperating with the result of further studies and analysis made subsequently as well as of discussion with the officials of the Government of Indonesia, the present final report of the Comprehensive Study for Shipbuilding Industry Development in the Republic of Indonesia has been formulated.

I hope that the report will be found to be useful for the development of shipbuilding industry and for the economic and social development of Indonesia and that it will contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the Government and officials concerned of Indonesia for their positive cooperation extended to our survey/study team.

March, 1979



Shinsaku Hogen
President
JAPAN INTERNATIONAL COOPERATION AGENCY

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Principal abbreviations and acronyms

BAPINDO	:	Bank Pembangunan Indonesia (State Devlopement Bank)
BAPPENAS	:	National Planning Council
BKI	:	Indonesian Classification Bureau
CSB	:	Central Statistics Bureau
DAPEL	:	DAERAH PENGANGKUTAN LAUT
DWT	:	Deadweight Tonnage
GT	:	Gross Tonnage
IGGI	:	Inter-Governmental Group of Indonesia
INL	:	Indonesian National Line
INSA	:	Indonesian National Shipowners Association
KL	:	Kilo Liters
LT	:	Long tons
LTFD	:	Long-term Fleet Development Study
P.T.PANN	:	P.T. Pembangunan Armade Niaga Nasional (National Fleet Development Corporation)
PELNI	:	P.N. Pelagaran Nasional Indonesia (National Shipping Company)
PERTAMINA	:	PERTAM BANGAN MINYAK DAN GAS NASIONAL (National Company of Petroleum & Natural Gas)
RLS	:	Regular Liner Services of Inter-island Shipping
Rp	:	Rupiah
SOLAS	:	The International Convention for the Safety of Life at Sea
SEA COMM	:	Directorate General of Sea Communications, Ministry of Communications
UNIDO	:	United Nations Industrial Development Organization

Four Model Shipyards (or 4 Sample Shipyards)	:	P. T. MENARA P. T. IKI MAKASSAR (Former GALANGAN KAPAL MAKASSAR) P. T. INTAN SENGKUNYIT P. T. PABRIK KAPAL INDONESIA (P. T. PAKIN)
Eleven Shipyards (or 11 Sample Shipyards)	:	P. T. IKI PADANG (Former GALANGAN KAPAL PADANG) P. T. POSEIDON P. T. INGGOM SHIPYARD P. T. ADIGUNA SHIPYARD P. T. PELITA BAHARI P. T. DOK DAN PERKAPARAN TANJUNG P. T. IPPA GAYA BARU SEMARANG P. T. DOK DAN PERKAPARAN SURABAYA P. T. IKI GRESIK (Former GALANGAN KAPAL GRESIK) P. T. IKI BITUNG (Former GALANGAN KAPAL BITUNG) P. T. WAIAHE
PERTAMINA's Shipyards (or Shipyards owned by PERTAMINA)	:	PERTAMINA DOK DUMAI PERTAMINA DOK PANGKALAN SUSU PERTAMINA DOK KARIM SORONG
18 Studied Shipyards	:	All of the Shipyards above-indicated.

Conversion-Rate of Currency in this report.

(1) Rp415 per U.S. Dollar

(2) Yen200 per U.S. Dollar

Government of Indonesia decided to devalue the rupiah to RP 627/US$1 in November, 1978, however, the study takes account on the value at the former conversion-ratio for the convenience of appraisal/estimate.

I POINTS OF THE PLAN

This report, as the conclusive works of the survey/study for the shipbuilding industry development in the Republic of Indonesia (hereinafter referred to as Indonesia), is made up of the two separate issues. The first issue mostly comprises the conclusive summary of the reinforcement and development planning for the said industry. The second issue contains the depth-study with analytical appraisal on the industry by related field/aspect and subject/factor. The report, composed of these two issues, is mainly arranged by the Japanese survey/study teams sent to Indonesia in 1977 and 1978 too. However, at the same time, it is also the result of remarkable joint works in cooperating with Indonesian counter-partners. The report is, therefore, a definite signpost built by the two peoples of Indonesia and Japan who strenuously concentrate their efforts upon the fruitful future of shipbuilding industry in Indonesia. It is a great appreciation for the members concerned with the report if the Government authorities concerned in Indonesia would pay attention to it as the helpful reference.

In this chapter I, for the first place, the basic approach is mentioned for future development of shipbuilding industry in Indonesia, followed by a blueprint for development by 1990/1991 in terms of expected production, necessary facilities and personnel, and the amount of fund needed for it. Along with, measures to promote and materialize these plans, the appropriate posture required for shipbuilding industry itself, priority measures for the time being are mentioned, and at last, economic effects emerging from these efforts, are referred.

1. BASIC UNDERSTANDING ON THE SHIPBUILDING INDUSTRY DEVELOPMENT IN INDONESIA

Taking into consideration the present state of shipbuilding industry, the peculiarity of marine transportation in Indonesia, and the present international state of demand and supply of ships, measures for development of shipbuilding industry in this country for the coming several years at least should be examined on the following basic understanding.

1) At this stage of things the level of shipbuilding facilities, business management, technics, growth of related industries system of inspection of ships or any other area is not high enough, and even sufficient encouraging measures had been taken it would require a considerable time to reach the world level.

2) Accordingly, it is necessary to encourage domestic production of ships, setting an objective to start from building and repairing small ships and thus consolidating the foundation of the industry, gradually to handle more larger ones.

3) For this purpose, improvement and adjustment of the existing shipbuilding facilities must be completed in the first place, and then consider to build new facilities in need.

4) For the present, full consideration and attention must be paid to cope with building and repairing interislands liners. As for building new vessels, establishment of equipment, facilities, business management, and technics required for maximum capacity to 3,000 DWT should be taken into consideration.

5) Building of larger ocean liners would be better to handle after experiences and practices with regard to interislands liners have been accumulated enough.

6) To turn the present internal latent demand for shipbuilding to the domestic shipyards, it is urgent to improve and set in better order the environment of the shipbuilding industry.

7) It is necessary for shipyards themselves to get reliance from shipowners by making every effort to reduce the time required for contruction and to improve the quality of their products. In other words, enlargement & modernization of the facilities is not the sole measure to get orders.

2. OUTLINE OF THE PLAN FOR FUTURE DEVELOPMENT

2-1 Forecast for the Demand of New Shipbuilding and Repairing

Based on the estimate by SEA COMM on the demand for shipping transport, shipping tonnage needed to meet this demand and a

replacement plan up to 1983, the team, extending the period to 1990, tried to estimate the demand for shipbuilding and repairing in 1983 and 1990.

2-1-1 Demand for new ship construction

Total amount of demand for new shipbuilding less 3000 DWT (1,800 GT) in 1983 is expected to reach 56,000 GT, and in 1990 about 94,000 GT, consisting of RLS fleet, mainstay of domestic transportation and other local shipping, coastwise tankers and fishing boats. In particular, in this archipelagic country the RLS fleet plays an important role in taking upon the interislands shipping. So that if RLS fleet is constructed in domestic shipyards, it would contribute considerably to the development of shipping and shipbuilding in this country. Besides, the amount of demand above-mentioned does not include industrial carrier and pioneer shipping, then some increase of demand can be expected.

2-1-2 Demand for repairing

Existing tonnage of ships in Indonesia is estimated to amount to 2,243,400 GT in 1983, and 3,199,000 GT in 1990. As to the demand for repairing two cases can be possible if the study takes into consideration the past experiences and practices of repairing in other countries and the results of regular inspection of small local vessels. Namely, as a maximum demand in 1983 is estimated 1,985,200 GT and 2,820,700 GT in 1990, and as a minimum demand in 1983 is expected 1,109,600 GT and 1,869,800 GT in 1990 when excludes regular ocean liners and tankers above 1,000 GT from aforementioned demand. In regard to ship-repairing, both ship owners and crew naturally wish to have their ships repaired in their own country. But at present, records show that 25% of repairing Indonesian ships is done in Singapore, Japan, Taiwan and Hong Kong in 1977/78, specifically 16% in Singapore.

If the number of domestic-built ships will increase with improvement of shipbuilding facilities, shiprepairing facilities will be improved, and prices and conditions of payment will be more favorable to shipowners, the above-mentioned minimum demand could be secured as the domestic demand.

2-2 Reinforcement Plan for Shipbuilding Facilities

To establish and arrange sufficient reception, facilities of shipyards coping with the incressing demand for shipbuilding and repairing will take 3-4 years at least, because the study must take into consideration the time for drafting detailed plans and construction, the time for training personnel, and the time for preparations before carrying out the decided measures. Moreover, if the study adds the time from start up to full operation, it seems almost impossible to establish a system to meet 100% of the demand for shipbuildings and repairing in 1983. So that, for the present the plan should set the following target, and consider to reinforce facilities, to train personnel, and to raise fund for facilities in accordance with this target.

2-2-1 Target of the Plan

In the field of new ship building, the plan set the target of construction to meet 90% of annual demand, about 50,000 GT, up to 1983, and 100% of it, about 94,000 GT in 1990.

In regard to repairing, the plan aims to satisfy 70% of annual maximum demand, totally about 1,400,000 GT in 1983, and 100% of it, totally about 2,800,000 GT in 1990.

Relation between demand for shipbuilding and repairing and production amount at target is shown in Chart 1-01.

2-2-2 Newly reinforced facilities for new shipbuilding

If the study compares above-mentioned target of production amount with the existing capacity for the ships by size, facilities of shipyards handling ships of 0 - 100 GT and 500 - 1,000 are in excess of demand and do not need any enlargement. On the other hand, in the case of ships of 100 - 500 GT three building berths are needed up to 1983, and 33 building docks or berths are newly necessary to be added up to 1990. Also, for shipyards building ships of 1,000 - 1,800 GT, three docks or berths are needed up to 1983, and 8 must be additionally installed up to 1990. Table 1-01 shows the relation of figures.

Chart I –01. Relation between Demand for Shipbuilding / Repairing and Production Amount

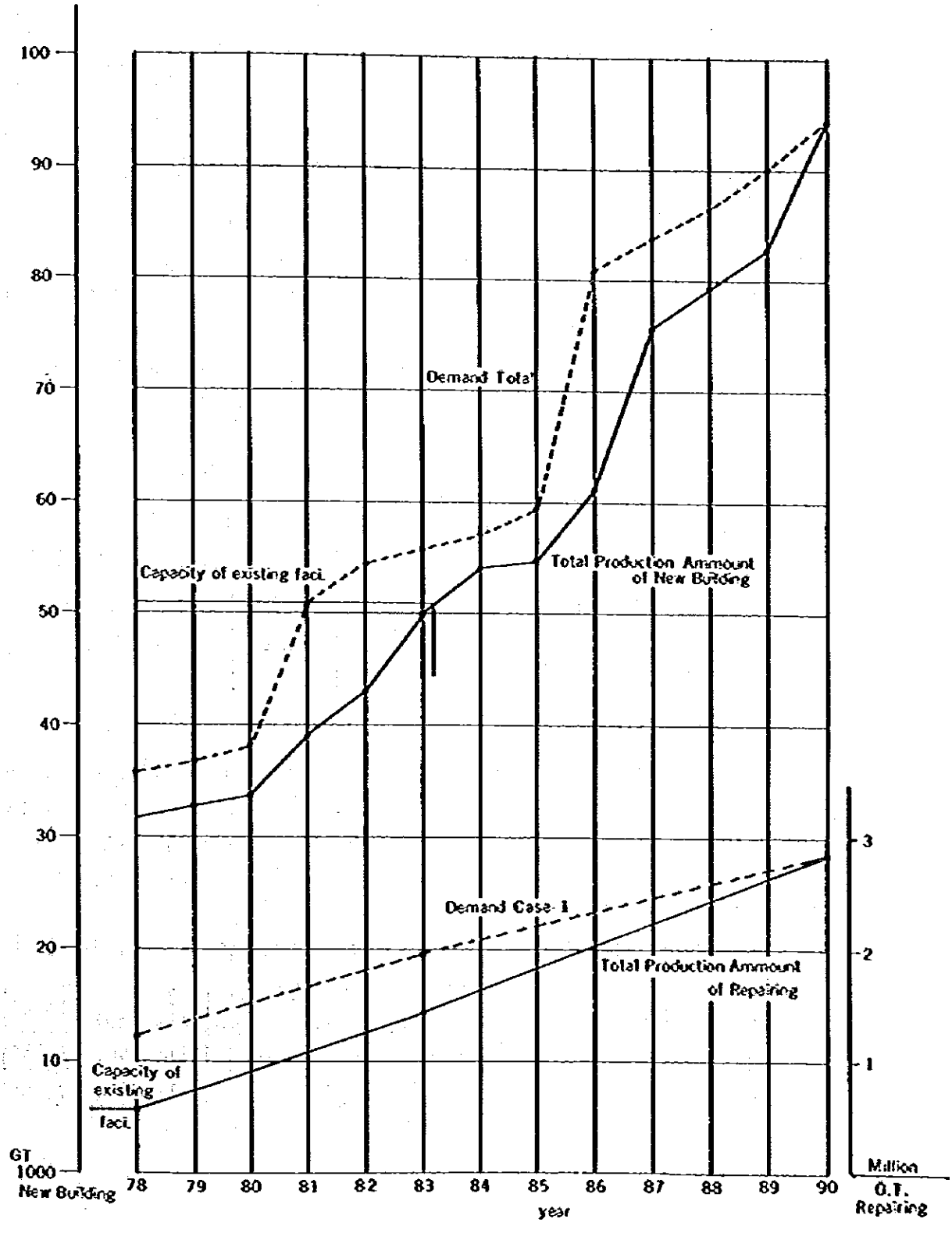


Table 1-01 Plan for Increasing Facilities of New Shipbuilding

Size (GT) / Year	0 - 100	100 - 500	500 - 1,000	1,000-1,800
1979/80 - 1983/84 3rd 5 Years Plan	-	3	-	3
1984/85 - 1990/91	-	33	-	8
Total	-	36	-	11

By the way, the number of facilities mentioned in the table does not include new facilities of P.T. PELITA BAHARI expected to be built by aids of the Japanese Government.

2-2-3 Newly reinforced facilities for repairing

Like new ship building facilities, Table 1-02 shows the plan for reinforcing facilities obtained by comparing the target of production with the existing capacity by size of ships. Facilities for all sizes of ships except 0 - 100 GT are needed to be newly built.

Table 1-02 Plan for Increasing Facilities of Repairing Docks/ Slipways

Size (GT) / Year	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000
1979/80 - 1983/84	-	19	3	6	3
1984/85 - 1990/91	-	29	1	10	3
Total	-	48	4	16	6

2-2-4 Plan for personnel

The number of workers needed to achieve the target of production amount of new ship building and repairing is shown in Table 1-03. In this case the present productivity per worker is assumed to stay constant as it is until 1983 and then to increase by 30% by 1990.

Table 1-03 Plan for Personnel needed Number of Workers for Each Year

Year	Workers for New Shipb'g	Workers for Repairing	Personnel for Design	Indirect Personnel	Total
1983/84	6,252	7,504	476	1,254	15,486
1990/91	9,230	12,061	711	1,791	23,498

At the present, about 9,800 employees is said to be employed in shipbuilding industry in all. So that, about 6,000 are needed to be newly employed up to 1983/84, and about 14,000 up to 1990.

2-2-5 Investment amount for facilities

The amount of investment in need for facilities mentioned above is estimated as shown in Table I-04. Main part of it is turned to fund for newly installed shipbuilding and repairing facilities, namely docks, berths and slipways, and supporting workshops and attendant facilities for them. Investment for improving efficiency of the existing facilities is also included in it partially. But new investment about 4,000 million Rp for establishing a center for materials and a center for shipbuilding training or their supporting facilities is not included.

Table I-04 Investment Plan for Facilities Million Rp

Division / Year	New Shipbuilding Facilities	New Repairing Facilities	Total
1979/80 - 1983/84	20,700	22,650	43,350
1984/85 - 1990/91	140,500	29,750	170,250
Total	161,200	52,400	In all 213,600

3. MEASURES TO BE TAKEN FOR THE PLAN

To carry out the above-mentioned plan for development of shipbuilding industry, arrangement of the surroundings of shipyards is required, and examination and execution of the following measures are indispensable for the national interest.

3-1 Securement of Fund for Building and Repairing Ships

For realizing the amount of work indicated in the development plan, it is necessary to provide shipping industry with fund in need and preferential treatment in financial aspect in the case that ships are built at domestic shipyards. 100,000 million Rp in 1983, and 200,000 million Rp in 1990 are needed for new-ship construction and repairing. Securement of these funds and arrangement of financial measures to afford long term and low interest loans are desirable. Also, in regard to shipyards, flexible

financial treatment to afford operating fund necessary for the deferred payment should be considered.

3-2 Securement of Fund for Improvement of Shipbuilding Facilities

To encourage the improvement of shipbuilding facilities, it is required to arrange financial system for development so as to supply needed fund smoothly and offer preferential treatment on loans. Fund for facilities needed up to 1990 is estimated over 200,000 million Rp. The study concludes the fund should be secured and invested intensively in facilities of the shipyards which are to be preferentially improved. The achievements in these shipyards will be distributed among other shipyards. Such a process of employment of fund is necessary for the shipbuilding industry as a whole. Also from the point of view of profit-efficiency in the yards, interest rate of lower than 10% for these facility-fund seems to be appropriate.

3-3 Education and Training of Personnel

For increase of production, education and training of personnel both in quantity and quality are required. The best way for it is to establish a training center in one of the yeards that are to be improved preferentially, and to educate and train managers, shipbuilding engineers and skilled workers in a center. These staff members are expected, in turn, to educate and train employees in yards which they belong to. For education and training in these leading shipyards or training centers established there, technical aids and guidances form advanced shipbuilding nations will become necessary.

3-4 Standardization of Ship

Development of several standard types of ship by cooperation of shipping and shipbuilding industries in accordance with the present state of domestic shipping in Indonesia will contribute considerably to cost-down and smooth supply of parts for ships entering service and benefit very much both ship-owners and shipyards. Also, by developing these standards of ship common base for shipbuilding engineering will be established and will contribute considerably to comprehensive development of shipbuilding technics hereafter.

3-5 Edition of Guidance-books for Standards and Orders

To maintain and extend the achievement of education and training of staff members in a shipbuilding training center or other various training institutes, edition of guidance-books for various standards and orders by public institutes is desirable. Also, it is necessary to distribute these books among all engineers and skilled workers engaged in shipbuilding so that they can use them at any time for on-the-job-training or self-study. In particular, guidance-books for standard facilities of shipyards, designing and working standards of steel ship, construction orders for steel ship, management standards of shipyard, working standards in shipyards, and warrant standards of quality in shipyards are indispensable.

3-6 Facilitation of Procuring Materials

Production of all materials for shipbuilding by related industries in Indonesia is very difficult and most of materials are imported at present. This state of things will not be improved for the time being. Therefore, the goverment should continue to afford preferential treatment such as reduction of or exemption from customs duty for imported materials. At present the complicated import procedure is main factor to delay the time for delivery. Simplification of the procedure is needed. Also, home-stock of main materials should correspond to ordering for materials of the part of shipyards. These measures are indispensable to observe strictly the progress of work and shorten the time for repairing. To answer to these improvements, it is necessary to establish a materials center, main function of which is to take care of customs entry and planned stock of materials.

3-7 Improvement of Ship Inspection System

The study became aware of the fact that there is much to be desired about the system of ship inspection. For example, the same criteria of inspection are applied to both interisland liners and ocean going liners -- a rule not corresponding with the actual state of shipping in the world. Also, there are ships in service which have failed to get regular inspection stipulated by the

Shipping Association to assure safety shipping. Establishment of appropriate standards of inspection will contribute to assure safety shipping and to reduce expenses for maintenance. Improvement of inspection system will reduce the number of ships failing to get inspection, and raise life-time of ships, contributing in the long run not only to improvement of the management of ship-owners but to that of shipyards in the shape of increasing demand for repairing.

3-8 Improvement of Administration System

It is necessary to establish efficient administration system able to grasp the actual state of shipbuilding by gathering regularly necessary information on shipbuilding industry, and to afford appropriate direction and control. Unification of organs for direction and control over all shipbuilding and repairing industries including the shipyards of PERTAMINA, is urgent to be realized, and establishment of a comprehensive development plan, framing and execution of necessary measures for it, should be promoted. Also, education and training for administration personnel engaged in the shipbuilding administration concerned are indispensable.

4. INTERNAL REINFORCEMENT OF THE SHIPYARDS

Shipyards themselves are required to improve their internal conditions for reinforcing their facilities successfully, along with improvement of external conditions by concrete measures mentioned in the foregoing part. It is the mission of shipyards to make an effort to shorten the time necessary for building and repairing ships and supply ships with sufficient quality at adequate price satisfying the requirements of customers, and this is the decisive means to invite latent demand.
People concerned with shipbuilding should keep in mind firmly this major premise for their business and devise concrete measures to improve their internal conditions.

4-1 Improvement of Management-control

1) Improvement of ability for financial administration
At present this ability is generally poor. Introduction of cost accounting system and comprehensive budget system

is urgently needed to collect data of management in the enterprise that will be useful for grasping correctly real state of business of the enterprise and for improvement of management.

2) Strict control of labor

It is necessary to define the responsibility and competence of managers and middle-managers, and to establish more strict incentive plans together with setting up the standard for evaluation.

3) Improvement of middle-management

In the labor intensive industry as shipbuilding, ability of middle managers heavily influences the management of the shipyards. Rearing of object-minded managers of this class, and increase of both their number and quality are needed.

4-2 Improvement of Production-management System

1) Strict control of materials

Promotion of planned follow-up from ordering to receiving materials is needed. For this purpose, it will be desirable to set a standard time from ordering to getting materials from historical data and find an adequate time of ordering in accordance with the schedule of construction.

2) Definite job order

It is needed to define the order of direction from middle-managers to workers on the spot, and also regular transfer of the order is desirable. The progress of work should be controlled on more detailed schedule, and at the same time routine-order of reporting to middle managers from workers is necessary to be defined. By these means, data for controlling the number of needed hours and other date for management will be collected.

3) Improvement of quality control system

In order to promote self-control of quality by workers themselves, quality control standards should be established. Inspection technics using X-ray or the like expected to be prevalent hereafter should be acquired by the workers.

4-3 Improvement of Technical Level

1) Improvement of designing staff

Development for a standard type of ships can reduce the amount of its work in designing. On the other hand, however, individual shipyard must improve its design staff and elevate technical adaptability to be able to answer detailed request of customers.

2) Improvement of elemental technical level

For improvement of the level of basic elemental technics such as cutting and welding, shipyards must send their employees to outer training institutions, but at the same time they should establish organs in shipyards to educate and train not only workers specialized in cutting and welding but all workers engaged in shipbuilding and equipping.

3) Improvement of marine engine electrical engineering skill

In order to maintain the performance of ships constructed, acquisition of marine engine electrical skill will become particularly necessary in the future. Today, shipbuilders depend upon outer industries in improving quality and maintaining performance of their ships. Such an easy-going way of shipyards should be altered, and they must positively develop and level up their own ability.

4-4 Improvement of Engineering Work

1) Adopting the block construction system

Positive introduction of the block construction system is recommendable to cope with increasing production amount and large-sized ships. The system might invite quicker rotation of berth and adjustment of uneven working hours for employees, because berth work can be turned to workshop and filed works. Also the system might become a way for introduction of more advanced engineering work such as preoutfitting in the future.

2) Introduction of automatic and semi-automatic cutting and welding machinery

These machinery should be introduced in order to improve precision for the present, and not simply to save hands.

3) Improvement of coating

At present, in most of shipyards removal of rust and coating are done by manual work, and the result cannot be said satisfactory. By doing preparatory work and coating with shop-primer for steel materials when they are carried in, rusting during the period of construction of ships should be prevented. And also the quality of coating should be improved by the introduction of airless spray method.

4) Intensive introduction of tools

In addition to the improvement of elemental technical level various kinds of tools are required to get more finer combination works. Tools for cutting, frame-working, and transportation machinery such as chain-block are a few examples to be urgently introduced.

5. PRIORITY PROJECT

In realizing the shipbuilding development plans, four shipyards of which facilities seem to be relatively easily improved and expanded in view of little physical difficulty for expansion, better surrounding conditions, and already prepared removal plans at the present condition, were picked out to be developed at first.
In starting this project, needless to say, profitability, feasibility and others should be studied in full detail, and the candidate-site and proper scale of the shipyard must be defined.
The study, by the way, was to draft a shipyard model for each of the four shipyards that locate in dispersed districts and of which expectable sizes of ships to be built are different from each other.
In the result, it was judged that these shipyards would be able to provide enough possibility.
Also, supporting facilities such as a materials center and a training center, essential for shipyard in development plan, should be studied in detail. In the following statement the study shall refer briefly to this point.

5-1 Reinforcement Project for Four Model Shipyards

1) P.T. IKI MAKASSAR (UJUNG PANDANG)

This shipyard is located in UJUNG PANDANG, center of SALAWESI Island, near to MAKASSAR port possible for large-

size ships to enter. At present, the yard is only for repairing small-size ships, and in regard to shipbuilding its experience is limited only to build vessels of very small-size. But in front of the workshops, the shipyard has a vast reclaimed ground about 140,000 square meters. It is possible to construct new shipbuilding facilities for ships of 3,000 DWT, and repairing facilities for large-sized ships. The following shows the plan of construction.

Plan of New Construction

New Shipbuilding Berth	.....	for 3,000 DWT x 1
Repairing Dock	.....	for 25,000 DWT x 1
" "	.....	for 7,000 DWT x 1

Projected Production Amount

New Ships up to 1990	.....	7,300 GT (Annually)
Repair Ships after 1984	.....	176,000 GT (Annually in Total)

Estimated Investment for Facilities

Min. 14,438 Million Rp

Personnel needed

About 1,000 in 1984 - 1989

About 1,200 in 1990

After building above-mentioned facilities there remains a room of the ground, on which new shipbuilding and repairing facilities for larger-sized ships will be possible to construct in the future together with enlargement of facilities. However, besides the berth and dock, the study indicates that the yard must construct office buildings, various workshops and other supporting facilities. And the sea around the reclaimed ground is not deep and requires to be dredged. Fund for these facilities and expansions cannot be ignored.

2) P.T. MENARA (TEGAL)

Located in the city of Tegal. The city is the center of casting industry. Favoured by this background conditions, this shipyard was the first to build ships of 1,000 DWT in this country. However, the ground being too limited for

expansion of it's facilities, it is difficult to construct new shipbuilding facilities for larger-sized ships. So that, for the present, it is desirable to raise efficiency of the workshops as a whole by intensive continuous building of 1,000 DWT (500 GT) ships at the existing berth. In regard to repairing, the size of ships is limited to less 1,000 DWT because of the depth of water in the canal. Accordingly, measures such as to construct a dock for 1,000 DWT ships which is wider than ordinary ones should be considered in order to be ready for docking of 3,000 DWT ships in the future.

Plan for New Construction and Rehabilitation

New Ship Building: Rearrangement and new construction of workshops are necessary so that continuous buildings of 1,000 DWT ships on the existing berths would be possible.

New Construction of Repairing Dock: Construction of one dock for 1,000 DWT ships. By the way, remove two docks for 200 DWT in accordance with the rearrangement of workshops.

Plan for Production Amount

New Ship Construction	.....	2,880 GT in 1990
Ship Repairing	.....	3,500 GT (in Total) in 1984 - 1989

Estimated Investment for Facilities

Min. 3,510 Million Rp

Personnel needed

300 or less employees in 1984 - 1889 and about 600 employees in 1990.

The workshops face on the north the Java Sea beyond the road, and there is a plan for expanding Tegal port in the future. If this plan is realized, the yard can expect to construct new shipbuilding facilities for large-sized ships.

3) P.T. INTAN SENGKUNYIT (PALEMBANG)

This shipyard is relatively prominent one among the shipyards in this country. Construction of facilities for 3,000 DWT ship is almost completed there. Considering the balance between the capacity of workshops and building berth, the

following construction and improvement are needed in the case for building and repairing of 3,000 DWT ships.

Plan for New Construction and Rehabilitation,

New Shipbuilding Berth	.....	For 3,000 DWT x 2
Slipway for Repairing	.....	For 3,000 DWT x 1
" "	.....	For 1,000 DWT x 1

Remarks: The above plan is calculated based on the exising slipways for 250 DWT and 1,000 DWT are to be improved.

Plan for Production Amount

New Ship Construction	.....	11,500 GT (Annually) in 1990
Repairing	.....	20,400 GT (Annually in total) after 1984

Investment for Facilities

Min. 7,086 Million Rp

Personnel needed

700 or less in 1983, about 1,400 in 1990. But the ground facing MUSI river is occupied by building berth and slipyways and has little room for outfitting and unloading quays.
It is necessary to consider to dredge the river running along the boundary line of the ground, and to construct the quays above-mentioned.

4) P.T. PAKIH (JAKARTA)

The shipyard is located along the upper stream of the canal and it takes a considerable time for ships to pass to and fro. So that, in view of negative effect on getting orders, the shipyard is planning to remove the workshops on the new ground near to the mouth of the canal. But there is a breakwater in front of the new ground at a distance of 40 meters.
In the present state of things, if a new shipyard is constructed on this ground, and use the canal, other ships will be unable to go up and down the canal.
It is desirable to cut off the ground of workshops and expand the water front, then to construct facilities for slipways of side truck type.

The size of ships built or repaired will be limited by various conditions of the ground to less 1,500 DWT for building and to 1,000 DWT for repairing.

Plan for New Construction

Side Truck Type Slipway	.....	1
New Building Berth as It's attending Berths:		
New Shipbuilding	.....	1,500 DWT x 1
" "	.....	1,000 DWT x 2
Repairing	.....	1,000 DWT x 1
"	.....	750 DWT x 2

Plan for Production Amount

New Ship	.....	6,600 GT in 1990
Repaired Ship	.....	7,000 GT Annually after 1984

Investment for Facilities

Min. 9,400 Million Rp

Personnel needed

500 employees or more in 1983, about 800 employees in 1990.

Nearby the ground to which the present shipyard is to be removed there is a ground of 200m x 200m facing the sea. If this ground can be bought, shipbuilding facilities for large ships of 3,000 DWT or more can be constructed, and efficient workshops will appear.

5-2 Establishment of a Materials Center

Most of the materials for shipbuilding in this country depends upon the import from abroard as already explained and these imported materials take a considerable time to pass the custom-house, impeding a great deal the development of shipbuilding industry. Among the functions of materials centers the most important and difficult one is to simplify custom formalities. The government offers to the shipbuilding industry tax exemption as a preferential treatment in importing materials for ship construction. But shipyards have to apply for getting this treatment and the procedure for it takes a considerable time. In addition, this procedure starts only when the shipyard actually needs to procure the materials. So that it takes a long time for the

shipyard to be able to use the materials, forming a bottle neck to smoothing the construction in accordance with the working plan. It is urgent to improve this troublesome procedure and shorten the time for it. If a materials distribution center, as an organization to deal imported materials for shipbuilding and to treat necessary procedure for custom-application in a whole, the bottle neck would be removed to a considerable extent.
At first, as one of the ideas, one materials center should be established in JAKARTA, and with the development of shipbuilding industry in various parts of the country the same center will be necessary to be established in SURABAYA, UJUNG PANDANG, and PALEMBANG. Most of the materials handled by the center will be steel materials, shape steels, pipes, valves and others. Various machinery and tools, or parts for repairing will be handled if necessary.
In the first period up to 1983, 30% of the amount of materials required for the production plans above-mentioned could be handled, and 100% of it in the second period, carefully watching its effectiveness, up to 1990.
Investment at the first stage is roughly estimated as about 800 million Rp.
Besides the function to handle imported materials, the center might be able to operate as a kind of processing factory in ordering/manufacturing in a lump primary processed steel materials or outfitting components if necessary.

5-3 Establishment of Training Center for Shipbuilding Workers

Improvements of production control system and technical level up are indispensable for promotion of the production amounts indicated in the development plan.
On the other hand, with increase of production the number of employees needed in this development plan will reach 15,800 or more in 1983/84, and 23,500 or more in 1990/91. This number means, indeed, 1.5 - 2.5 times more of the existing employees about 9,800 employed in the shipbuilding industry at present.
Accordingly, besides level up of the present engineers and skilled workers, education and training of a large number of new workers

are required. It is not enough to improve the present training courses for engineers in universities, higher technical schools, Metal Industry Development Center and others, and is desirable to establish training centers proper for shipbuilding industry. In these centers, it is desirable, apart from practical education and training for engineers and skilled workers, to edit and provide guidance books for designing standard types of ship in Indonesia, various designing standards, standards of work and quality and others fitted for shipbuilding industry in this country. The following is the outline of such a kind of centers.

Content of Training

Course for Designers, Engineers on the Spot: 6 Months for 40 Men

Course for skilled Workers : 3 Months for 100 Men

Annual Graduates

Designers, Engineers on the Spot: 80 Persons

Skilled Workers on the Spot : 400 Persons

Necessary Ground

Min. 7,000m^2

Investment in Need

Min. 3,100 Million Rp

Graduates from the center are expected to become the leading staff in their shipyards, and to contribute to level up the shipbuilding industry as a whole by this far-reaching effect. In addition, the center is desirable to be established in leading shipyards since higher effectiveness of practice or exercise can be expected.

6. PROFIT-EFFICIENCY OF THE PLAN

The study tried an estimation for profit-efficiency of this plan in a whole, using the figures of necessary investment for newly constructed and rehabilitated facilities of shipyards and of anticipated profit. In addition, the study picked up one of the shipyards of which internal conditions are supposed to be fairly good as a sample for an estimation of profit efficiency of an individual shipyard.

Generally, shipbuilding industry seems to need a great amount of fund for facilities and require a substantial period to recover investment.

According to the estimation, although it is a quite rough one, a trial calculation indicated the certain possibility of recovery at the interest of 10% or lower for the facility-investment on the assumption of continuous contribution for productive activities of facilities both of new construction and rehabilitation for 15 years.

7. ECONOMIC EFFECTS

When concrete measures of the development plan and improvements of surroundings are carried out, their economic effects on Indonesian economy will not be ignored. Among them the following four points at least can be cited as the main effects.

1) Increase of Production

Total amount of production of new ship construction and ship repairing, and in related industries is expected to reach annually about 120,000 million Rp in 1983, and about 240,000 million Rp in 1990.

In them, about 100,000 million Rp in 1983, and about 200,000 million Rp in 1990 come from only new ship construction and ship-repairing. If the study takes about 13,000 million Rp in 1976 as the base-line, annual average growth rate amounts to 21%. Thus, the achievement of this plan is expected to contribute very much to hitting the target of average growth rate 11% (industrial sector) in the third five-year plan.

2) Saving of Foreign Currency

The country has to import ships from abroad and depends heavily upon other countries in repairing her ships at present. In realizing this plan the nation can expect to save about 55,000 million Rp in 1983, and 110,000 million Rp in 1990.

3) Expansion of Employment

The number of employees in shipbuilding industry was about 9,800 in 1976. It will reach about 15,800 in 1983, and about 23,500 in 1990. Namely, opportunity for employment will be newly given to about 6,000 persons up to 1983, and additionally to about 8,000 in 1990.

4) Far-reaching Effects on Local Communities

New construction and improvement of shipbuilding facilities would invite increase of production and employment in the related regions.

For example, when the plan for P.T. IKI MAKASSAR mentioned in the paragraph 5-1 is carried out, following economic effects will be produced in the city of UJUNG PANDANG and the area around it.

(1) In 1990 about 15,000 persons will be employed in the shipyard. This number occupies 2.5% of the present population of the city, 600,000.

(2) The amount of production of the shipyard is expected to reach some 7% in 1983 and 11% in 1990 of the whole industrial production of the city.

Increase of highly educated employees in the shipyard and growth of industrial production will influence considerably on the aspects of education and life of the people in the area. Also, development of related industries can be expected and will contribute a great deal to the increase of industrial production of the city. The study expects that the same effects, though different in scale, can be brought in other regions, too.

8. EXECUTION SCHEDULE

Table I-05 shows the enlargement plan for facilities of new ship building and repairing.

Reinforcement of facilities is executed by improving and repairing the existing facilities up to 1981, then the first period of work starts up to 1983 when PELITA III ends, and the second period of work starts from 1983 up to 1990. The plan must make an effort to train managers and employees and replenish personnel together with improvement and reinforcement of facilities. At the same time, a materials center must be established to facilitate supply of materials for shipyards.

Table I-06 shows the comprehensive picture of schedule of these development plans in execution.

Table I – 05

Schedule for the Enlargement Plan for Facilities of New Shipbuilding and Repairing.

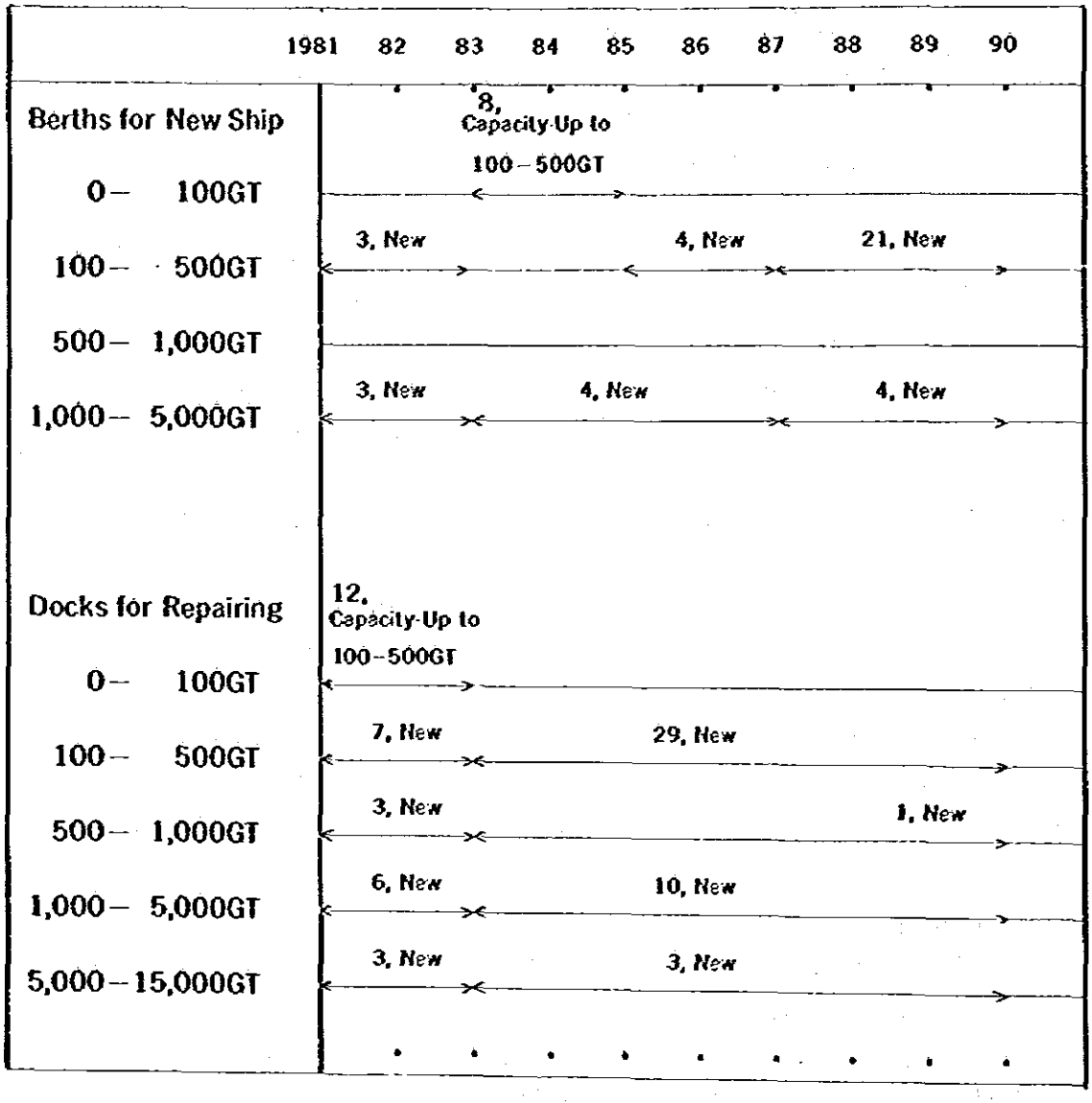
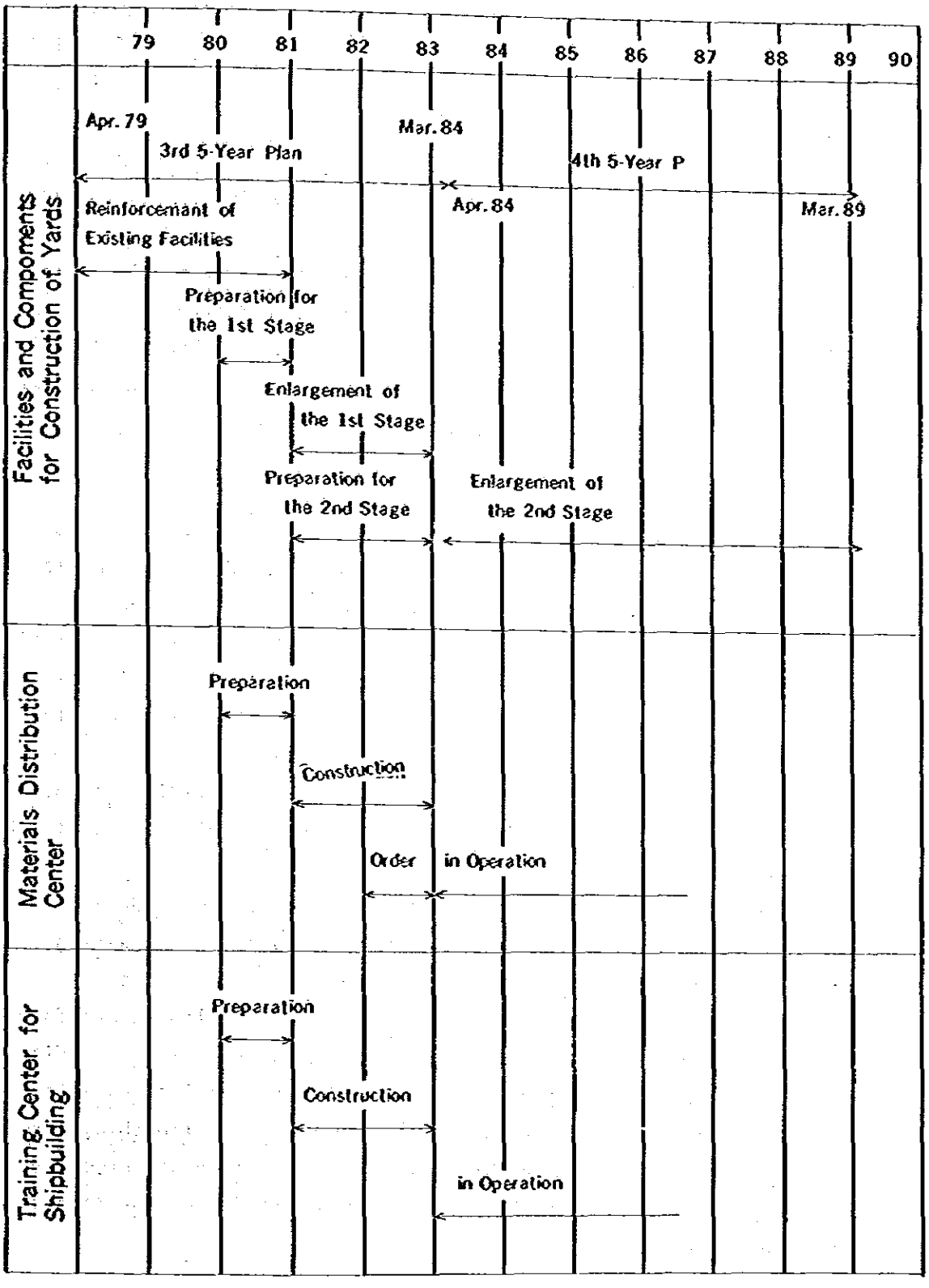


Table 1-06

Comprehensive Schedule of Development Plans in Execution.



II PRINCIPAL DIRECTION FOR THE PLANNING

Principal direction for the planning, based on Points of the Plan as aforementioned in Chapter I, guides the priority projects composed of various necessary measures as soft-ware and needed funds for facilities and personnel as hard-ware to realize the development of shipbuilding industry.

This direction takes 1983/84, the last year of the third five-year plan, as a short-term object, and the several years extending up to 1990/91 as a long-range object.

In the following pages, necessary measures are taken up at first and then with regard to improvement plan for shipbuilding industry, amounts of production and investment for facilities, personnel and related industries are explained. At last the study examined economic effects and profitability expected when priority projects are carried out.

1. MEASURES TO BE TAKEN TO THE PLANNING

1-1 Securement of Demand for New Shipbuilding and Ship-repairing

For the development of shipbuilding industry the most important thing is how to provide the shipyards with works. Even the facilities of shipyards are improved enough and their technical levels are raised sufficiently, if the amount of work is not provided enough for them, development of shipbuilding industry cannot be expected.

In order to secure the amount of work for shipbuilding we must keep firmly the actual demand, and at the same time stimulate the latent demand to turn to actual one.

With development of Indonesian economy and growth of demand for tonnage, demand for new-ship construction and ship-repairing reaches a considerable amount. But the present capacity of shipbuilding and repairing facilities of Indonesian shipyards and their technical abilities are not enough to meet it. In addition, in view of the fact that domestic financial fund for new-ship construction and ship-repairing is short and foreign shipyards are conducting new ship building and repairing on deferred payment for Indonesia, it is not easy to secure demand for Indonesian shipbuilding industry.

In order to secure a reliable amount of demand for new ship construction and repairing in Indonesia, it is important to intensify financial measures such as providing long-term and low interest fund for new ship construction and repairing. Not only to finance new ship building and repairing for ship owners, but also to provide shipyards with operating fund on deferred payment are necessary to consider.

By the way, the amount of fund for new ship construction and ship-repairing per year is shown in the following.

Year	New Ship Building	Repairing	Total
1983	76,000	28,000	104,000
1990	144,000	56,000	200,000

Unit: Million Rp/Year

I-2 Securement of Fund for Improvement of Shipbuilding Facilities

In almost all shipyards in Indonesia arrangement of berths, docks, quays, transportation facilities, welding facilities and others is not satisfactory. Not only rehabilitation and improvement of existing facilities to meet the demand for new ship construction and repairing hereafter, but also new installment of these facilities to cope with the increase of demand are necessary.

The amount of investment for this improvement of shipbuilding facilities in the third and fourth five-year plans is estimated as shown in the following.

Terms	Amount of Investment
1979 ∿ 1983/4	±43,350
1983/4 ∿1990	±170,250

Unit: Million Rp

In this case, it would be better to distinguish the shipyards and facilities to be preferentially improved from others and to supply fund case by case according to each need.

Investment should be concentrated on the shipyards, facilities which are to be preferentially arranged, and results shall be distributed among other shipyards. This is more effective than distributing fund for improvement indifferently to all shipyards. But it requires a huge amount of fund and advanced way of production management so that guidances and aids from abroad will become necessary to get.

For the other shipyards too, arrangement and improvement of their facilities are indispensable. To promote the improvement of shipbuilding facilities, intensive improvement of financial system for development, smooth supply of needed fund and preferential terms for loan are expected.

1-3 Cultivation of Personnel, Education and Training

Production control, namely control of the progress of work, quality control, control of materials, labor control and others are not seen in almost all Indonesian shipyards, and technical level in designing of ship, processing of steel materials, welding, outfitting and others, is not satisfactory, along with poor arrangement of facilities.

To promote the improvement of facilities and increase of production hereafter, we must positively arrange efficient production control system and make on effort to raise the technical level.

To improve their poor production control and technical level, appropriate cultivation of personnel, education and training for business managers, shipbuilding engineers and skilled workers on the spot are necessary to carry out.

At present, in Indonesia there is a study institute called MIDC (Metal Industry Development Center) functioning in part as training center. Also, there are local institutes called Vocational Training Center. However, in either case, accommodation capacity is insufficient for realization of the development plan. Therefore, it is desirable to promote broad and practical cultivation of personnel, education and training through the following measures.

To begin with, it is desirable to pick out one shipyard from the selected priority yards to be preferentially improved and establish a shipbuilding training center there. This shipyard, as the leading shipyard, plays central role in shipbuilding engineering, and as such engaged in new ship building and repairing, through which the shipyard cultivates, educates and trains workers for other home shipyards.

Of course, for its facilities and engineering guidance this shipyard will need engineering guidance from advanced shipbuilding nations.

The following is the point of practical education and training.

1) Business managers, shipbuilding engineers, and candidate lecturers of the training center in the shipyard get training in the advanced shipbuilding nations.

2) The shipyard invites technical mission from the advanced shipbuilding nations. The mission engages in guidance on improvement of facilities, business management, shipbuilding and repairing engineering, and works on the spot, and at the same time engages in guidance of training at the shipbuilding training center.

3) Business managers and shipbuilding engineers of this shipyard join the technical mission from the advanced shipbuilding nations in executing the plans on improvement of facilities and others.

4) Business managers and engineers of all shipyards in Indonesia get education, training and guidance on the spot matched with the actual state of Indonesia, in this shipyard and its training center.

5) This shipyard and its training center could be engaged in editing guidance books for standardization of ships, standard of shipbuilding, and points.

I-4 Standardization of Ships

Taking into consideration the present state of interisland transportation and shipping and their future development, standardization of ships matched with the actual circumstances of interisland transportation is effective to make interisland transportation more efficient. Standardization of ships will benefit shipyards in terms of simplification of construction, unification of materials, facilitation of procuring materials and so on. For ship-owners too, it will bring smooth supply of parts for ships in service, and afford very big merit on maintenance of ships.

In standardizing of ships we must take into consideration future changes of Indonesian interisland shipping, and for several most practical types of ships should be provided standard designs with practical and simple specifications by joint work of shipping and shipbuilding industries. Standard designs are composed of basic

designs, detailed designs, construction orders, plans for progress of work, and tables of materials. It is not enough to standardize ships, but consideration must be paid to practical construction to be carried based on standard designs. As for standard types, 300 DWT, 750 DWT, 1,000 DWT, 1,650 DWT and 2,300 DWT are considered for cargo boats, and 1,000 DWT, 2,000 DWT and 3,000 DWT for tankers.

1-5 Edition of Guidance Books for Standard, Order and So On

For improving and maintaining technical level in the shipyard, daily training of engineers and skilled workers is indispensable, and for that following guidance books for standard, order and others are necessary to be edited and provided.

1) Facilities Standard for Shipyards
Layout of workshops, scale of docks and berths, machinery and tools, utility and so on.

2) Designing Standard for Steel Ships
For drawing basic design and detailed design, calculation formula of designing, standard numerical value and check-point are needed.

3) Standard for Engineering of Steel Ship
This standard defines precision value of quality or order for points of repair, target value of precision and permitted value.

4) Points for Steel Ship Construction
In the case of constructing steel ships conditions of shipyards and ships should be taken into consideration. On the spot of construction the order of works must be decided.

5) Standard of Control in the Shipyard
Control of construction progress (Control the progress of production to be finished within the time-limit of delivery)
Quality control (Construct the ship to satisfy the plan in performance, dimensions and capacity, and intensity)
Materials control (Prepare necessary materials to be able to supply when they needed with minimum stock.)
Labor control (Human relations, education and discipline)

6) Working Standard in the Shipyard

On each job and work, tools in use, arrangement of working and other basic, practical ways necessary for workers are explained in detail.

7) Quality Assurance Standard for the Shipyard

This is the examination standard to construct ships of good quality able to satisfy enough the requested performance and quality.

It is necessary for public institutions to distribute these guide books not only for the people concerned but also for all engineers and skilled workers engaged in shipbuilding so that they can use them whenever they need for on-the-job-training or self-study.

I-6 Facilitation of Procuring Materials for shipbuilding like iron-steel, engines and other manufacturing connected with shipbuilding industry are not produced yet in Indonesia. Shipyards are depend-end on imports for these materials except a few goods like welding rod, paint and so forth.

Concerning importing these necessary materials for shipbuilding industry, the Government of Indonesia affords the preferential treatment such as reduction of or exemption from custom duties nowadays but it seems that shipyards have some difficulty in importing those materials smoothly, since the various formalities for importation are too much complicated. Shipbuilders or shipyards are unable to stock enough materials beforehand so that they are obliged to obtain them time to time, mainly because of shortage of operating capitals, resulting in that it takes long before they procure the materilals in need.

Simplification for administrative procedure in the importation is the must. It should be considered to establish a sort of bonded warehouse inside shipyards.

In 1974, SEA COMM asked P.T. DHARMA NIAGA to propose an improvement plan for material procurement which assures smooth supply of materials to shipyards. The plan was transferred to realize afterwards by consigning import business of certain materials to this company, but was unable to expect significant effectiveness because of

general trend of recession in shipbuilding industry itself.
It should be needed that the principal parts and materials are constantly in storage after custom-clearance and prepare all the time to provide them shortly upon the request of shipyards at low price. In connection with it, together with the proposed project for the standardization of ships, it should be necessary to arrange an integrated material-list which shows exact number and standard of parts and materials needed according to each size of ships such as iron steel, cable wire, engine and other machineries, deck instruments, navigational equipments and so forth. In the case of repairing, the same can be said too. One of the reasons why repairing used to take much time is the waste of time in getting necessary parts and materials, particularly in the case of non-arrangement for advanced ordering. This, needless to say, simultaneously invites delay of delivery of repairing ships.
A specific organization like a materials center is naturally to be considered. The center would store parts and materials as the stock in accordance with the integrated material-list as the aforementioned and would provide them to each shipyards upon requirement. As the one of functional activities in the center, it is also considered to deal a sort of primary processing abilities. To fix iron steel as the primary-processed in the center, for example, can be projected in providing it to shipyards under an en-bloc ordering/producing way on outfitting parts.

1-7 Improvement of Ship Inspection System

Ship inspection system in Indonesia at present has been established in accordance with the year of 1929's SOLAS Agreement entitled as the Act of Ship Safety. The system, however, seems not to be sufficiently operated in the usual case except ocean-going vessels engaged in international cruising because of financial limit of ship owners and limit of financial/physical capabilities of shipyards. The system is also not appropriate practically, because it is applied commonly either for interislands vessels or for ocean-going ones.
It is obviously advisable to re-arrange the system that would be applied for interislands vessels according to the peculiar situation

of interislands cruising. Re-arrangement of the ship inspection system does surely invite the safety of interislands cruising and, at the same time, does greatly contribute the improvement of financial problem of ship owners whose cost in new ship building, payment in repairing and expense in upkeeping can be expected to reduce in substance. Further more, such re-arrangement of the system must invite remarkable improvement of financial/physical condition of shipyards which are able to expect increase the demand for repairing, because a non-inspected vessles shall be never permitted to cruise.

1-8 Improvement of Administration System

It goes without saying that the administration system at official bureaus must be well organized and arranged otherwise shipbuilding industry is obliged to solely run about. It is urgently necessary to integrate the administration system into a single unification, to clarify who is responsible for controlling and directing the shipbuilding industry (new shipbuilding and repairing) induding PERTAMINA's shipyards, then to keep close coordination among the official bureaus concerned.

It is also necessary to re-arrange data-collection system otherwise the exact status-quo shall never be grasped. It is considered to be regulated that every shipyard in the country has the duty to submit the certain statistical information to the authority in an established paper-format. The statistical information consists of such items at least as follows:

1) for the report on facilities condition of shipyards.
   - (a) Area-measure of the site.
   - (b) Berths and docks.
     - i Possible construction capacity of vessels, as for max. length, max. width and gross tonnage.
     - ii Size-measures of berths and docks, as for length, width, depth, inclination, etc.
   - (c) Fixed-basement for hull-block-combination or the similar one, as for placement, area of square meters, unit-number of cranes and hoisting power.

(d) Hooring facilities and tug-boat

i Hooring quay, pier and buoy, as for their length and depth of water and gross tonnage of possible mooring.

ii Tug-boat, as for its gross tonnage, kind and/or type of engine, and horse-power.

(e) Carrying equipments for heavy goods.

(f) Processing machineries for iron and/or steel materials, such as marking appliance, cutting, bending and welding.

Remarks: The report should be once submitted as the complete set of all information, then only adjustment annually, if any.

2) For the report on production of shipyards.

(a) Amount of production, as for new ship building, conversion or repairing and others.

(b) Construction-schedule for new ship building, as the format of graph-lined table for each ship regarding keel-laying, launch and delivery.

(c) Time-table of labor hours.

i New ship building, as for its division, total number of labor hours, budget and result.

ii Converting or repairing ship.

iii Direct labor hours.

iv Indirect labor hours.

v Actual capacity of labor hours.

(d) Loading weight of steel materials.

i In the case of new ship building, as for its division, total loading weight, budget and result.

ii In the case of converting or repairing ship, the same as the above.

Remarks: The above items should be reported twice a year.

3) For the report on labor

(a) Personnel and work-man, as for work-man must be identified by specific work such as welding, wood-working, engineering, etc.

(b) Permanent, part-time and sub-contractors

Remarks: This item should be reported once or twice a year.

4) For the report on management

(a) Income statement

(b) Balance-sheet

Remarks: This item should be reported once a year at the end of each fiscal year.

2. REINFORCEHENT PLAN FOR SHIPBUILDING INDUSTRY

2-1 Projected Production of Shipbuilding

2-1-1 Production program for new ship building

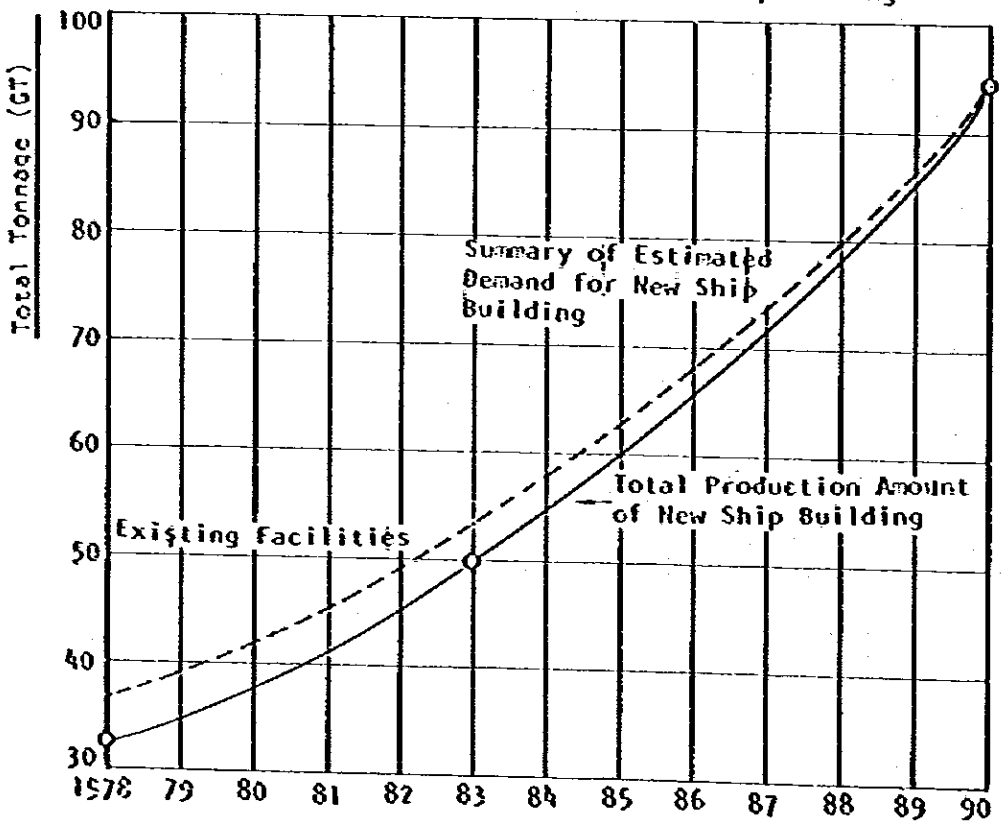
Table II-01 is the production program by size of ships. The demand for new ships being required for interislands transportation is estimated as 56,000 GT in 1983 and 94,000 GT in 1990. Referring to the present state of productivity in Indonesia's shipbuilding industry it is undoubtedly hard to satisfy all demands domestically at once so that 90% in 1983, 100% in 1990 of the demand respectively are set as a goal for production.

Table II-01 Production Program of New Shipbuilding Unit: GT

Size / Year	0-100	100-500	500-1,000	1,000-1,800	Total
1978/77	650	12,400	7,250	11,550	31,850
1983/84	1,350	18,550	10,250	19,900	50,050
1990/91	3,850	35,900	14,750	39,600	94,100

The relation between the total demand and the production program both for new ship building is shown by Chart II-01.

Chart II-01 Production Curve of New Shipbuilding



2-1-2 Production Program for Ship Repairing

Total vessel holdings of Indonesia is estimated as 2,243,000 GT in 1983 and 3,199,000 GT in 1990 respectively.

With reference to the repairing records at the ordinary base in the world and the actual result in inspecting of small vessel, the demand for ship repairing can be considered as Case 1 as maximum demand and case 2 as minimum one. Using Table II-02 on the estimated demand by size of ship up to the year of 1990/91 the cases are likely that:

Table II-02 Estimated Demand of Ship Repairing Unit: GT

Yeor \ Size		0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000	Total
Cose 1	1978/79	3,900	120,300	101,500	391,000	631,100	1,248,800
	1983/84	8,200	174,300	106,700	761,700	934,300	1,985,200
	1990/91	23,300	305,100	149,000	991,300	1,352,000	2,820,700
Cose 2	1978/79	3,900	120,300	101,500	167,500	361,200	754,400
	1983/84	8,200	174,300	106,700	234,300	586,100	1,109,600
	1990/91	23,300	305,100	149,000	489,400	903,000	1,869,800

Case 1

a. As to the vessels of Indonesian flag of over 500 GT, 10% of them are estimated to be repaired in Singapore and other countries and therefore the rest are to be processed locally in Indonesia.

b. As to the vessels of 100 - 500 GT, the regular inspection for 50% of them are estimated to be carried out only once every two years. So that 75% of them may become the demand factor.

Case 2

a. As to the vessels of Indonesian flag of 500 - 1,000 GT, the base of estimation is the same as the above Case 1. Ocean-going regular liner and ocean-going tramper of over 1,000 GT are estimated not to be repaired locally.

b. As to the vessels of 100 - 500 GT, the base of estimation is the same as Case 1.

Production program of repairing by size of vessels is, if fulfillment-ratio of possible domestic production is set at some 70% in

1983/84 to just 100% in 1990 of the total needs in the Case 1, likely as TAble II-03. The relation of demand/production on repairing is as Chart II-02.

Chart II-02 Production Curve of Ship Repairing

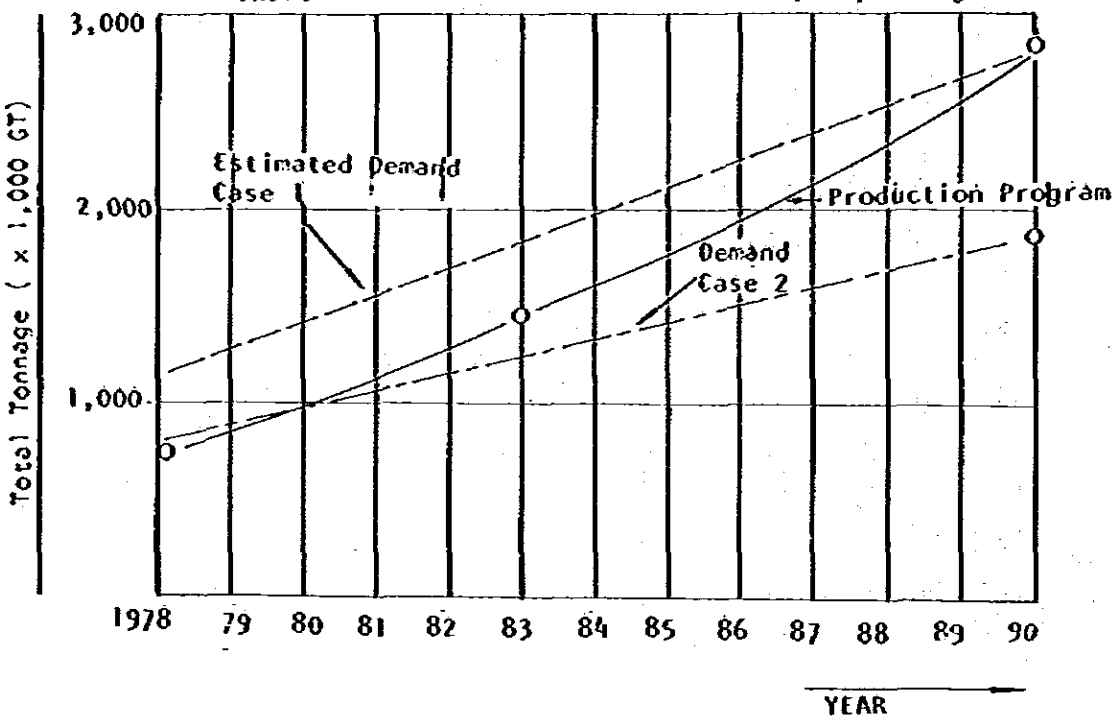


Table II-03 Production Program of Ship Repairing Unit: GT

Size / Year	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000	Total
1978/79	3,900	34,000	59,700	166,800	268,300	532,700
1983/84	8,200	120,000	106,700	491,300	667,900	1,394,100
1990/91	23,300	305,100	149,000	991,300	1,352,000	2,820,700

2-2 Reinforcement Plan for Shipbuilding Facilities

2-2-1 For new ship building

1) Occupancy ratio/production factor of dock-berth for new ship building;

Annual production capability is calculated by multiplying "E" as occupancy ratio at the stocks by "FK" as production factor of ship construction at the sited dock-berth.

E, ratio of average size of ships built over capacity of facilities, is extracted from demand/supply between the market condition on new ship building and the operating condition of shipyard. E will possibly increase when the allotment of ships to shipyards becomes more appropriate according to the size of vessels together with the increase of demand. FK contains the number of how many vessels can be constructed annually at per-berth. FK, therefore, indicates an efficiency ratio of the shipyard, in other words, a frequency ratio of the dock-berth.

"R" as an annual construction capability and "C" as an official capacity of facility are shown in the following equation, in connection with E and FK.

$$R = C \times E \times (FK)$$

Table II-04 shows E and FK in estimating the figures both of past records and possible increase of the ability in the future.

Table II-04 Estimated Occupancy Ratio/Production Factor

Range (GT)		0 - 100	100 - 500	500-1,000	1,000-5,000
E (%)		30	80	80	80
FK	1979-1983	3.0	2.4	1.3	1.3
	1984-1990	3.0	2.7	2.0	1.5

2) Facility capability and estimate of new ship building production at the existing docks and berths;

Based on the estimation for occupancy ratio and production factor in the paragraph 1), the production capability of existing facilities is as Table II-05 which shows the progress from 51,000 GT in 1983 to approximate 67,000 GT in 1990.

Corresponding to the capability in the aboved and the consequent prospective development in the demand for new ship building, the volume of new ship building requirement at the existing facilities is as Table II-06.

Table II-05 Production Capacity by Existing Facilities

Ronge (GT)	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	Total
Nominal Capacity of Equipment * (GT)	6,355	5,350	22,550	11,100	45,355
Number of Berths	65	11	24	4	104
Number of Shipyards	45	11	10	3	-
E (%)	30	80	80	80	-
FK 1979 - 1983	3.0	2.4	1.3	1.3	-
FK 1984 - 1990	3.0	2.7	2.0	1.5	-
Production Capacity (GT) 1979 - 1983	5,721	10,272	23,452	11,544	50,989
Production Capacity (GT) 1984 - 1990	5,721	11,556	36,083	13,320	66,677

Note: *Nominal capacity of equipment is referred from the information by Directorate of Shipbuilding Industry.

Table II-06 Production Program by Existing Facilities

Unit: GT

Year \ Ronge	0 - 100	100 - 500	500 - 1,000	1,000 - 1,800	Total
1978/79	650	10,250	7,250	11,550	29,700
1983/84	1,350	10,300	10,250	11,550	33,450
1990/91	3,850	11,550	14,750	13,350	43,500

Note: A part of surplus capacity of berths for 500 - 1,000 GT ships is to be utilized for those of 100 - 500 GT.

3) Number and production-estimate on additional berths of new shipbuilding;

In realizing the necessary volume of projected production of new ship building, the berths as Table II-07 are required additionally to the existing facilities.

Table II-07 Installation Plan for New Building Berths

Range (GT)	0 - 100	100 - 500	500 - 1,000	1,000 - 1,800
Average capacity of equipment (GT)	100 (exist ovr.)	260	900 (exist ovr.)	1,600
Number of berths 1979/80 - 1983/84	0	3	0	3
Number of berths 1984/85 - 1990/91	-8	33	0	8
Total number of new berths	-8	36	0	11

Note: The average capacity of new facilities is calculated in order to enable construction of new ships having the average GT based on the expected occupancy ratio according to the estimated demand for new ship building. The required beths in Table II-07 does not include the figure of new berths at P.T. PELITA BAHARI which are projected to be built under Japanese Government aid.

The volume of production by the additional facilities is as Table II-08 accordingly.

Table II-08 Production Program of New Ship Building by Newly Installed Facilities

Unit: GT

Year \ Range	0 - 100	100 - 500	500 - 1,000	1,000 - 1,800	Total
1983/84	-	8,250	-	8,350	16,600
1990/91	-	24,350	-	26,250	50,600

4) Reinforcement direction for new ship building facilities;
Reinforcement direction for new ship building facilities, including the ones indicated in Table II-07, are classified by ship-size as follows:

a. 0 - 100 GT

8 berths are in surplus in the year of 1990, despite of the building facilities mainly for fishing boats.
The surplus of these 8 units can be considered to grade up to 100 - 500 GT building facilities. It is necessary to suspend any reinforcement plan for 0 - 100 GT

facilities unless a specific condition such as regional development necessity is anticipated.

b. 100 - 500 GT

The facilities are mostly for local shipping and fishing boats and there is no need for new facilities up to 1981 if the facilities for 500 - 1,000 GT might be co-utilized. After 1986, however, the facilities would be insufficient so that it is necessary to add 3 berths at least by 1983/84 and 36 units until 1990 as Table II-07 indicates.

c. 500 - 1,000 GT

Because the facilities in excess will be continuously remained until 1990, newly installation for this class shall not be allowed .

Therefore, co-utilization for the facilities for 100 - 500 GT should be applied . Even though, taking disadvantages of such unbalance to apply them from the point of view of profit-efficiency in the shipyards, a partial grading-up of the facilities for new ship building of larger vessels should be projected.

d. 1,000 - 1,800 GT

As Table II-07 shows, 3 units by 1983/84 and 8 more by 1990/91 are additionary necessary.

2-2-2 For ship repairing

1) Estimated occupancy ratio in repairing docks and estimated factors in repairing;

The annual repairing capability at repairing docks can be calculated by E and FK (used as repairing factor instead of production factor) as like as the Paragraph 2-2-1 1). E and FK, analyzed from both actual result in the past and efficiency improvement by job experience, are estimated as in Table II-09

Table II-09 Estimated Occupancy Ratio and Repairing Factor

Ronge (GT)		0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000
E (%)		20	20	40	40	40
FK	1979 - 83	33.3	18.8	18.8	18.8	18.8
	1984 - 90	33.3	25.0	25.0	21.4	21.4

2) Capacity of facilities and estimate of repairing production volume in the existing docks and berths;

As Table II-10 indicates, construction capability in the existing facilities is estimated as approximate 581,000 GT in 1983 and some 672,000 GT in 1990.

Table II-10 Repairing Capacity by Existing Facilities

Range		0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000	Total
Nominal Capacity of Equipment		7,846	9,055	7,940	22,180	35,680	82,701
Nos. of Berth		86	27	9	11	3	136
E (%)		20	20	40	40	40	-
R	1979-1983	33.3	18.8	18.8	18.8	18.8	-
	1984-1990	33.3	25.0	25.0	21.4	21.4	-
Repairing Capacity (GT) 1979 - 1983		52,248	34,047	59,709	166,794	268,314	581,112
Repairing Capacity (GT) 1984 - 1990		52,248	45,275	79,400	189,860	305,420	672,203

A projected production volume in the existing facilities, comparing the above-mentioned repairing capacity of existing facilities with the estimated demand for ship repairing shown in Table II-02 is as in Table II-11.

Table II-11 Repairing Program of Ship Repairing by Existing Facilities

Unit: GT

Year \ Range	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000	Total
1978/79	3,900	34,000	59,700	166,800	268,300	532,700
1983/84	8,200	34,000	59,700	166,800	268,300	537,000
1990/91	23,300	45,300	79,400	189,850	305,400	643,250

3) Number of new docks and berths for repairing and estimate of repairing production volume;

In order to cover the prospective volume of ship repairing (Table II-02), the additional facilities as in Table II-12 are required to the existing ones.

Table II-12 Installation Plan of New Repairing Docks

Range (GT)	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000
Number of Docks 1979/80 - 83/84	-capacity-up 12	7 +12	3	6	3
Number of Docks 1984/85 - 90/91		29	1	10	3
Total Number of New Docks	-12	48	4	16	6

And, the repairing production volume in newly installed docks and berths is shown in Table II-13.

Table II-13 Repairing Program of Ship Repairing by Newly Installed Facilities

Unit: GT

Year \ Range	0 - 100	100 - 500	500 - 1,000	1,000 - 5,000	5,000 - 15,000	Total
1983/84	0	86,000	47,000	324,500	399,600	867,100
1990/91	0	259,800	69,600	801,450	1,046,600	2,177,450

4) Direction for the re-arrangement for ship repairing facilities; Including the figures of Table II-12, the following items for re-arrangement must be in mind.

a. 0 - 100 GT

The facilities are mostly for fishing boats and will be continuously in excess of supply even in 1990. Therefore, 12 units among the existing 86 are desirable to grade up to 100 - 500 GT class as early as possible.

b. 100 - 500 GT

The facilities are mostly for local shipping and fishing boats and are needed to enlarge to respond the increasing volume of repairing in each district of local Marine Navigation Bureaus. On the whole, enlargement for 12 units of the existing facilities for 0 - 100 GT class and 7 units of new installation at this class must be required by 1983/84 and additional 29 by 1990/91.

c. 500 - 1,000 GT

The facilities are mostly for RLS and interislands tankers. It is necessary to add 3 more units by 1983 and additionally 1 by 1990 to satisfy the demand.

d. 1,000 - 5,000 GT

The new installation indicated in Table II-12 is required.

e. 5,000 - 15,000 GT

The new installation shown in Table II-12 is necessary. As ocean-going vessels are included in this class, their routes and ports they call at should be fully examined for the purpose of selecting sites for new facilities.

5) Repairing volume after the addition of new facilities;
By adding repairing volume of the existing facilities and that of the new facilities, an estimated demand volume by size of vessels after completion of reinforcement is as in Table II-03.

2-3 Projected Investment for Shipbuilding Facilities

Investments for shipbuilding facilities necessary for the development planning are classified into two, namely those for new ship building facilities and for repairing facilities. Then those for new shipbuilding facilities are classified further as follows:

1) Investment for construction of new berths and rehabilitation of work shops at existing shipyards.
2) Investment for construction of new shipyard.
3) Investment for reinforcement of facilities at existing shipyards for higher productivity.

Total amount of investment is distributed among shipyards classified as follows:

1) 4 model shipyards, explained as the priority projects in paragraph II-5.
2) 11 shipyards, except the above 4 shipyards and 3 shipyards belonging to PERTAMINA.
3) Other shipyards and brand-new shipyards if necessary.

The total amount of investment by 1990 and its breakdown by objective/yard are as in Table II-14.

Table II - 14 Projected Investment for the Facilities (Total by 1990)

Unit: Million Rp

Investment, classified by objective	Investment, classified by shipyard
Expansion and/or newly installed facilities for new ship building 144,400	4 model shipyards: 34,200
Dittos, but for repairing : 52,400	Other major 11 shipyards : 30,700
Up-grading of productivity for new shipbuilding : 16,800	Others: 148,700
Total: 213,600	

2-3-1 Investment for new facilities

The investment for (1) improvement of the existing shipyard, with new installation of building berth and additional improvement of factory is shown in Table II-15 and (2) establishment of new shipyard, is indicated in Table II-16. The cumulative of (1) and (2) is shown in Table II-17.

Beside the above, 16,800 mil. Rp for grading-up of productivity in the existing shipyard, without new installation of berth is required at the early stage before 1990.

2-3-2 Investment for repairing facilities

Work shops for new shipbuilding are commonly applicable for repairing work. Therefore, the repairing facilities are preferable to be installed inside shipbuilding yards, and investment for repairing facilities, accordingly only for such collateral facilities as slipways, docks and cranes, etc., is shown in Table II-18.

2-3-3 Investment in facilities for new ship building and repairing

Total investment required up to 1990 is 213,600 million Rp of which;

Amount for new facilities (144.4 +16.8): 161,200 Million Rp

Amount for repairing facilities : 52,400 Million Rp

2-4 Projected Requirement for Man-Power

The necessary man-power in connection with the projected production is roughly classified into 4 groups such as engineers, workers for new ship building, engineers, workers for repairing,

Table II–15 Investment for Improvement of Existing Shipyard with Newly Installation of Building Berth

(Unit : million Rp)

Year \ Range (GT)		100–500	1,000–1,800	Total
1983/84	Numbers	0	2	2
	Investment	0	5,400	5,400
1990/91	Numbers	17	0	17
	Investment	22,100	0	22,100
Total	Numbers	17	2	19
	Investment	22,100	5,400	27,500

Table II–16 Investment for Establishment of New Shipyard

(Unit : million Rp)

Year \ Range (GT)		100–500	1,000–1,800	Total
1983/84	Numbers	3	1	4
	Investment	7,800	7,500	15,300
1990/91	Numbers	16	8	24
	Investment	41,600	60,000	101,600
Total	Numbers	19	9	28
	Investment	49,400	67,500	116,900

Table II–17 Total Investment for New Shipbuilding Facilities

(Unit : million Rp)

Year \ Range (GT)		100–500	1,000–1,800	Total
1983/84	Numbers	3	3	6
	Investment	7,800	12,900	20,700
1990/91	Numbers	33	8	41
	Investment	63,700	60,000	123,700
Total	Numbers	36	11	47
	Investment	71,500	72,900	144,400

Table II–18 Investment for Repairing Facilities

(Unit : million Rp)

Year \ Range (GT)		100–500	500–1,000	1,000 –5,000	5,000 –15,000	Total
1983/84	Numbers	19	3	6	3	31
	Investment	6,650	1,350	6,700	7,950	22,650
1990/91	Numbers	29	1	10	3	43
	Investment	10,150	450	11,200	7,950	29,750
Total	Numbers	48	4	16	6	74
	Investment	16,800	1,800	17,900	15,900	52,400

design technicians, draftmen and other staffs.
Assumptions of (1) 2,000 working hours per year per head and (2) 85% of attendant ratio are applicable for all calculations hereinafter.

2-4-1 Man-power for new ship building

The present productivity of the hull fabrication is estimated as 303 hrs/steel-ton (working hours needed for fabricating one ton of steel. The ratio of working hours for hull construction over those for outfitting is about 6:4. Productivity of direct workers accordingly comes out to be around 500 hrs/steel-ton.
Assuming that the above-mentioned productivity remains the same until 1983, and increases by 30% by 1990, the number of necessary workers is obtained. Then the numbers of foremen and engineers are assumed to be 2.7% and 3.5% of workers, respectively. The total man-power requirement in 1983 and 1990 is illustrated in Table II-19.

Table II-19: Manpower Requirement for New Ship Building

Year	Nominal (Hr/ton)	Steel Fabricated (Steel ton/ year)	Number of Workers				Number of Engineers			Total
			Hull	Outfit	Foreman	Sub-Total	Hull	Outfit	Sub-Total	
1983	500	20,016	3,532	2,355	159	6,046	93	113	206	6,252
1990	380	37,636	5,048	3,365	227	8,640	133	162	295	9,230

2-4-2 Man-power for repairing

The labour productivity of repairing in this country is as in Chart II-03. Assuming that the productivity remains the same up to 1983 and increases by 30% by 1990, workers requirement is obtained using Chart II-03. The number of necessary foreman is assumed to be 2.5% of workers. Engineers requirement, however, is assumed to be 9% of workers since repairing works are usually short-term and need an extensive knowledge.

(1)-a:

Table II-20 Workers Requirement for Repairing in 1983/84

Item	Less 500 GT	500 - 1,000 GT	1,000 - 5,000 GT	Over 5,000 GT	Total
Annual Output (GT)	128,200	106,700	491,300	667,900	1,394,100
Hr./GT	30	21	7.5	2.5	
No. of Workers	2,263	1,318	2,167	982	6,730

(1)-b:

Table II-21 Workers Requirement for Repairing in 1990

Item	Less 500 GT	500 - 1,000 GT	1,000 - 5,000 GT	Over 5,000 GT	Total
Annual Output (GT)	328,400	149,000	991,300	1,352,000	2,820,700
Hr./GT	23	16	5.8	2.0	
No. of Workers	4,443	1,402	3,382	1,590	10,817

(1)-c: Foremen requirement

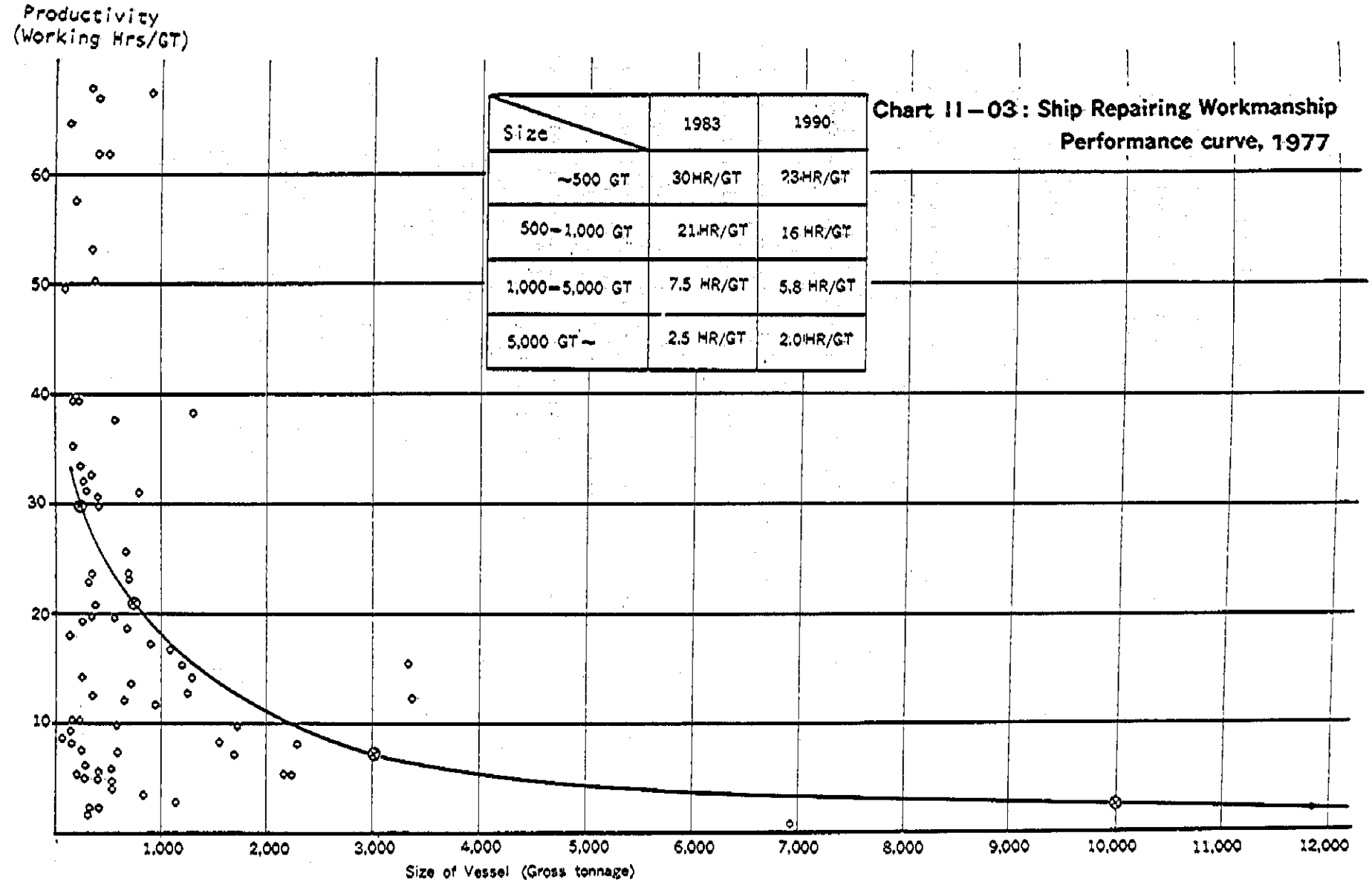
1983/84 169 Persons

1990/91 270 "

(2) Engineers requirement for repairing

1983/84 605 Persons

1990/91 974 "



Size	1983	1990
~500 GT	30HR/GT	23HR/GT
500~1,000 GT	21HR/GT	16 HR/GT
1,000~5,000 GT	7.5 HR/GT	5.8 HR/GT
5,000 GT~	2.5 HR/GT	2.0HR/GT

Chart II-03 : Ship Repairing Workmanship Performance curve, 1977

(3)

Table II-22 Total Requirement for Repairing

Years	Engineer	Foreman	Worker	Total
1983/84	605	169	6,730	7,504
1990/91	974	270	10,817	12,061

2-4-3 Man-power for designing

Personnel requirement for designing is as in Table II-23 and Table II-24. Basic ideas for designing and production-designing are as follows:

1. Designing for standard type ships is principally promoted.
2. Works of design and production-design are entrusted to 4 model shipyards.
3. Other 66 shipyards for steel vessels procure the standard-drawings.
4. Design staffs discuss the drawings with shipowners, representatives of Classification Society, revise them, and prepare for revised plans of repairing ships.

The number of necessary design staff in 1990 is supposed to be one and half times as many as that in 1983, considering the estimate that the number of newly-built ships would be doubled to 306 in 1990 from 146 in 1983 and the number of ships to be repaired would amount to 2,508 in 1990.

Table II-23 Design Staff Requirement by Shipyard

Division of Works	Leading Shipyard		Others	
	Engineer	Draftman	Engineer	Draftman
Hull - calculation	1	1		1
construction	1	1	1	
loft		3		
Outfit - deck	1	1	1	
Outfit - accommodation	1	1		
Machinery outfitting	2	1	1	
Electric outfitting	1	1		1
Coordination		4		1
Total	7	13	3	3

Table II-24 Total Design Staff Requirement

Year	Engineer	Draftman	Total
1983/84	226	250	476
1990/91	336	375	711

2-4-4 Personnel requirement in indirect department and production-control concerned is shown in Table II-25. It is obtained using the following ratios of personnel over total requirement of workers engaged in new shipbuilding;

Administration, Personnel, Material and Finance ... 12.7%

Safety 1.0%

Production Planning, Inspection and Power 7.6%

Table II-25 Personnel Requirement for others

Years	Indirect Department	Production Control	Safety	Total
1983/84	748	447	59	1,254
1990/91	1,068	639	84	1,791

2-4-5 Grand-total for the requirement

Table II-26 illustrates the total number of man-power necessary in this development plan.

Table II-26 Grand Total Man-Power Requirement

	New Shipbuilding		Repairing				
Year	Engineer	Foreman & Worker	Engineer	Forman & Worker	Design	Other	Total
1983/84	206	6,046	605	6,899	476	1,254	15,486
1990/91	295	8,640	974	11,087	711	1,791	23,498

2-5 Projected Development for the related Industry

2-5-1 Overview

Manufacturing materials for shipbuilding is very important not only as a supplier to shipbuilding industry but also as the key-industries for the development of industry as a whole.

The related industry to shipbuilding is an integration of industries that manufacture goods of about 200 kinds such as main engine and other machineries as well as outfitting equipments/components which amount to about 40% of the total price of a ship. The price, needless to say, must extensively affect international competition of shipbuilding industry. Merely diesel-engine producers (mainly knock-down producing) and small-scaled foundry factories are found in Indonesia at present.

Considering the urgent necessity for materials/equipments manufacturing development in the shipbuilding industry together with the related industry, it should be needed to domestically produce shipbuilding materials such as iron steel for shipbuilding at the first. It should be, in parallel with that, needed to rear the related insustries of which facilities and technics can be utilized not only in shipbuilding but also in broader machine manufacturing industry in the country.

From the point of this view, guide-lines for possible development by material/product are described in the following paragraph.

2-5-2 Guide-lines by item

(1) Iron-steel for shipbuilding.

There is one company, P. T. KRAKATAU STEEL, as the steel producer in Indonesia today. Their products, however, are mainly for land-use and the materials for marine-use that are needed in large quantities such as steel plate, pipe, etc., are not produced yet there.

It is expected to produce steel plate for ship, billet and steel wave as well as seamless steel pipe in the future, since the company is going to complete a direct reduction plant, billet mill and steel plate plant. Furthermore, a large-scaled foundry products such as stern frame, rudder stock, anchor, anchor-chain and stern-tube etc., together with a large-scaled precise machine processing products such as shaftings and crank-shaft etc., also can be expected to extend production there if the company intends to establish/enlarge additional new facilities.

A guide-line for iron steel requirement in the shipbuilding development, converted to the volume of it for ship building, indicates the figures of about 20,000 tons in 1983 and 37,600 tons in 1990 as an analyzed estimation.

(2) Welding rod

Welding rod for manual welding of mild steel has been locally produced with ample capacity of 9,800 tons per annum and will be extended to 18,000 tons in near future, enough to cover the total demand for shipbuilding.

But welding wires and filler metal for automatic or semi-automatic welding, for TIG, MIG, CO_2 or submerged welding are not produced yet in Indonesia.

Being aware of, the use of automatic welding machines will bring remarkable improvement of quality in

building work, so far, establishment of such welding material industry is prospected.

(3) Paint

Several kinds of paint for ship have been manufactured in Indonesia under licencing of Nippon Paint, Dana Paint, Oufay etc., and imported paints such as Hampeles are also available at ship owner's option. Further engineering services by paint manufactures concerning under-treatment, ambient temperature etc. are requested.

(4) Main engine

Table II-27 shows the demand on main engine for domestic shipbuilding in response to the possible requirement for new shipbuilding. It must be needed to enlarge 1,500 PS/unit of engines for vessels at the knock-down manufacturing as early as possible.

P.T. YANMAR DIESEL INDONESIA, P.T. BOMA BISMA INDRA, P.T. MESINDO etc. have been assembling and supplying marine diesel engines, and are requested to expand their possible range in the future.

(5) Shafts

The items of big forging in the series of shaft will have to be fully imported until completion of prospective billet plant of P.T. KRAKATAU STEEL. Both of propeller shaft and propeller are to be manufactured at nearer places for the machining of mutual connection.

(6) Electric facilities

Generator, main switchboard, motor, motor starter, and sub-switchboard are mostly imported. But, local assembling of imported parts and their own casting are possible for manufacturing of switchboard and motor starter.

(7) Electric accessories

Most of electric accessories are still imported. But depend on the increasing of such demand, local production will be expected.

Table II-27 Estimated Demand of Main Engine for Shipbuilding

(Nos. of Units x PS)

Year		Range Abt. 300	- 600	- 1000	- 1500	Total
1978/79	Nos.of Units	9	64	14	3	
	PS	2,700	38,400	14,000	4,500	59,600
1983/84	Nos.of Units	18	95	14	14	
	PS	5,400	57,000	14,000	21,000	105,200
1990/91	Nos.of Units	51	204	20	31	
	PS	15,300	122,400	20,000	46,500	204,200

(8) Pump

All of pumps have been imported. But, as those items are ranked as a very important position in the shipbuilding industry, it is preferred to be produced locally in Indonesia. And in case of local manufacturing, technical collaboration and stable supply of special casting will be required.

(9) Air compressor

The item, other than a part of blower and fan, has been imported. Prospective extension into local assembling of imported knocked-down components and local manufacturing of parts will be expected. Domestic manufacturing of blower and fan is not difficult if motor and spindle-holder are only initially imported.

(10) Lubrication oil purifier and oily water separator

The items, other than a part of conventional filters, have been imported, but local manufacturing of them are not promptly requested quantitywise.

(11) Heat/cool exchanger

The items concerned have been imported. Among them, heat exchangers of conventional type are the items to be

manufactured locally in Indonesia but not for others quantitywise for the time being.

(12) Steering gear

They are mostly imported ones except a manual compact-type one. It may require some time before local manufacturing of hydraulic steering gears, out of economical and technical point of view.

(13) Mooring and deck equipments

All of the items have been imported

Among several machineries for this industry, they are most suitable items to be converted into local assembling of imported knocked-down parts and then to local manufacturing.

(14) Anchor, anchor chain

They are mostly imported, except local, made smaller anchors and some jute-fiber ropes for smaller anchor cable. Local manufacturing of those items all depend on material supply by the extension of local steel mill.

(15) Cargo gear

Machanically operated hatch cover, derrick boom, chain block, cargo hook. Both of local made and imported ones have been applied.

Steel fabrication parts such as hatch cover itself, boom etc., other than machinery components, are advantageous to be made locally.

(16) Safety equipments

Life boat, life raft, life bouy, life jacket, boat davit .

Both of local made and imported ones have been applied, but, in conjunction with governmental approval on safety code, local manufacturing of all items will soon be requested.

(17) Fire extinguish equipment

The items concerned are mostly imported ones. But in the course of general industrialization, they will be gradually manufactured there.

(18) Valves

The items concerned are all imported at this stage. When the necessary materials will be available, local manufacturing of them will be possible without further difficulties, and it is expected depend on the progress of general industrialization in Indonesia.

(19) Nautical instruments

All of them have been imported and will continue so until total development of national industries in this fields.

(20) Radio equipments

Wireless transmitting and receiving equipment as well as other radio/wireless goods are all imported. Because of very important security concerns, they have been all imported and will be so too.

3. ECONOMIC EFFECTS

Projected production and investment programs as stated in the foregoing must substantially affect the national economy and play an important role in its development. The effects can be analyzed in the following four phases:

3-1 Increase in Production (Estimated Sales Volume)

Because of many uncertain factors such as vessel prices in the Indonesian and world markets, original costs per GT by type/size and repairing costs per GT, it is very hard to make it accurate in analysis, but rough estimates will be given in the following paragraphs:

3-1-1 New ship building

The conversion rates from GT to DWT are determined from current vessel records as follows:

1.00 for 0 ∿ 100 & 100∿500 GT vessels
1.33 for 500∿1,000 GT vessles
1.67 for 1,000∿1,800 GT vessels

The volumes of production by type/size (in terms of GT) in the projected production in Table II-01 are converted into DWT according to the above-mentioned conversion rates. Multiplying the projected production by unit prices per DWT shown in Chart II-04 gives the output as in Table II-28.

Table II-28: New Shipbuilding Production in 1983

Range (GT)	0∿100	100 ∿ 500	500 ∿ 1,000	1,000 ∿ 1,800	Total
Production (GT)	1,360	18,528	10,250	19,902	50,040
Production (DWT)	1,360	18,528	13,633	33,236	
Unit Price per DWT (Millions of Rp)	1.43	1.39	1.17	1.00	
Output (Millions of Rp)	1,945	25,754	15,951	33,236	76,886

Chart II-04 Unit Price of New Vessel, Classified by Size of Ship

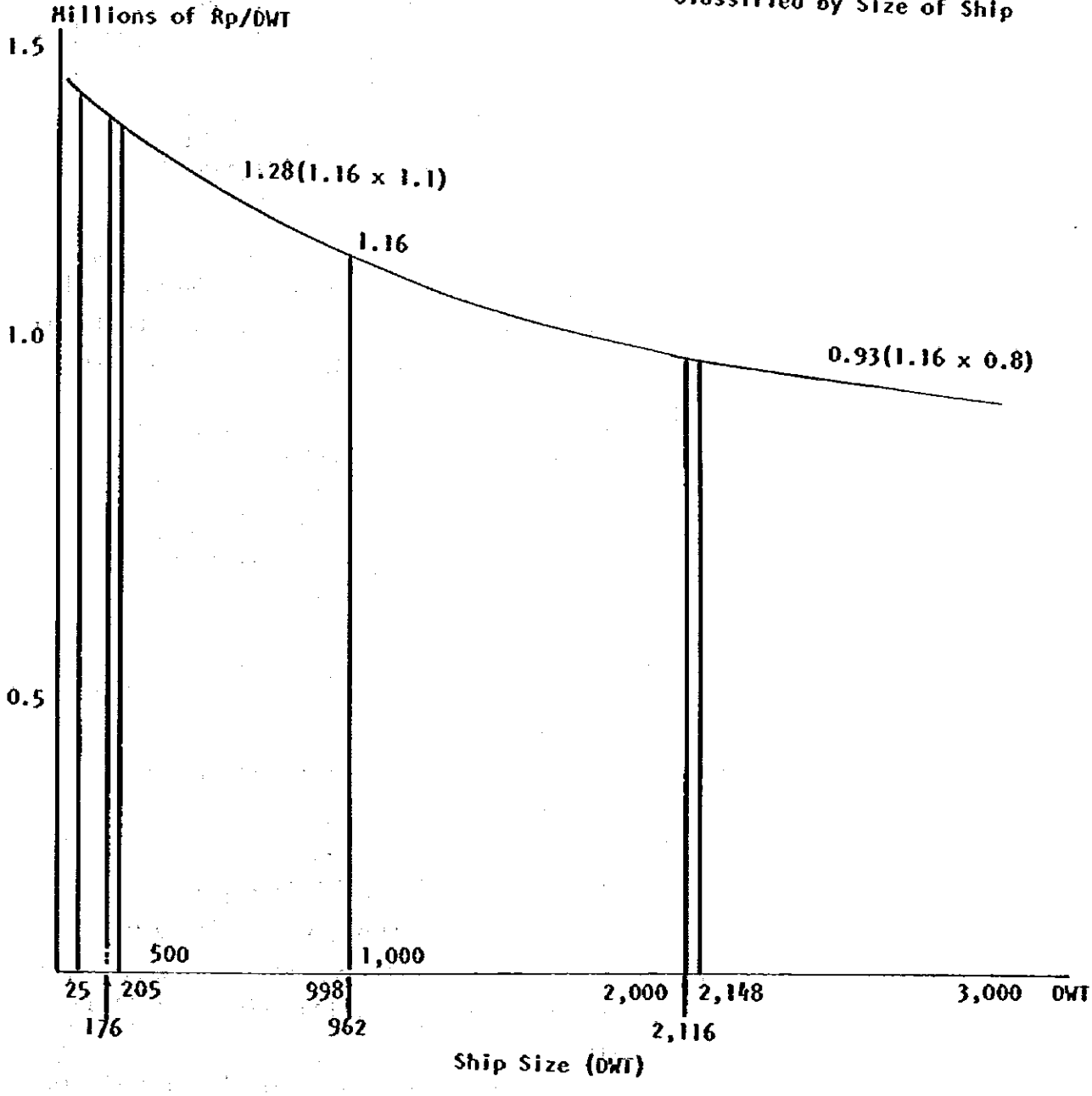


Table II-29: New Shipbuilding Production in 1990

Range (GT)	0∿100	100 ∿ 500	500 ∿ 1,000	1,000 ∿ 1,800	Total
Production (GT)	3,840	35,900	14,750	39,600	94,090
Production (DWT)	3,840	35,900	19,618	66,132	
Unit Price per DWT (Millions of Rp)	1.43	1.39	1.17	1.00	
Output (Millions of Rp)	5,491	49,901	22,953	66,132	144,477

3-1-2 Ship repairing

By the projected figures on ship repairing in Table II-03 is multiplied the unit repairing price per GT (See Footnotes 5, p. 68) to obtain output in repairing services as listed in Table II-30.

Table II-30: Output in Ship Repairing

Year	Production (GT)	Unit Price per GT (Million Rp)	Output (Million Rp)
1983	1,394,100	0.02	27,882
1990	2,820,700	0.02	56,414

3-1-3 Output in related industries

The calculation is made on the following assumptions:

$I = P \times Rm \times (1 - Ri)$

Where: -

I : Production amount by related industries.

P : Production amount by building or repairing of ships.

Rm : Ratio of materials costs to the price of building or repairing.

Rm is assumed to be 75% in shipbuilding and 30% in repairing.

Ri : Ratio of imported materials to all materials involved.

Ri is assumed to be 75% in 1983 and 70% in 1990.

Table II-31: Output in Related Industries

In Millions of Rp

Year	Industries related to Shipbuilding	Industries related to Ship-Repairing	Total
1983	14,319	2,091	16,410
1990	32,507	5,077	37,584

3-1-4 Aggregate output in the shipbuilding industry

From the foregoing calculations, total productions are estimated as listed on Table II-32.

Table II-32: Total Output

In Millions of Rp

Year	Shipbuilding	Ship-Repairing	Related Industries	Total
1983	76,886	27,882	16,410	121,178
1990	144,477	56,414	37,584	238,475

Based on the total output figures of the shipbuilding and repairing industry (excluding related industries) in 1976 by "STATISTIK INDUSTRI 1976 BAGIAN II", the average annual rate of growth (i) is presumed as follows:

1976 ∿ 1983 (76,886 + 27,882) ÷ 12,890 = 8.128
= P (F/p, 7, i)

Annual growth rate, i = Approx. 34%

1976 ∿ 1990 (144,477 + 56,414) ÷ 12,890 = 15.585
= P (F/p, 14, i)

Annual rate of growth, i = Approx. 21%

Even in the latter case, the 21% annual growth rate of shipbuilding and repairing industry can be substantial contribution to the whole industrial sector whose average annual growth is projected at 11% for PELITA III (The third 5-year plan).

3-2 Economy in Foreign Exchange

Although there are such variable factors as proper component cost for vessels, technological levels of related supplier industries and ratios of imports to the total requirement of materials, calculations have been made as production amount minus import material cost, on the assumptions as listed below, and results are indicated in Table II-33.

1. Should this reinforcement of the local shipbuilding industry not be materialized, those projected expansions in production have to be entirely replaced by import.
2. Ratios of materials costs to the total costs of shipbuilding and ship-repairing would be 75% and 30%, respectively.
3. Ratios of imported materials costs to the costs on the total requirements of materials would be 75% in 1983 and 70% in 1990.

Table II-33: Saving in Foreign Exchange

In Millions of Rp

Year	Shipbuilding	Ship-Repairing	Total
1983	33,411	21,609	55,020
1990	68,627	44,567	113,194

At an exchange rate of 415 Rupiah to the U.S. Dollar, the above saving in foregin exchange would come to US$133 million in 1983 and US$273 million in 1990.

While this does not mean increased receipts of foreign exchange, the projected industrial reinforcements should reduce outflows of foreign exchange and thus help improve the nation's international balance of payments to a considerable degree.

3-3 Expansion in Employment

3-3-1 Employment growth rate

The total employment required for this Reinforcement of the Shipbuilding Industry is estimated at 15,500 persons in 1983 and 23,500 persons in 1990, as indicated in Paragraph II-2-4 above.

As compared with 9,800 in employment in 1976 by "STATISTIK INDUSTRI 1976 BAGIAN I", the rate of growth is calculated as follows:

1976 ∿ 1983 15,500 ÷ 9,800 = 1.582 = P (F/p, 7, i)
Annual growth, i = Approx. 7%

1983 ∿ 1990 23,500 ÷ 15,500 = 1.516 = P (F/p, 7, i)
Annual growth, i = Approx. 6%

The growth of employment would contribute a great deal to the attainment of projected employment proportion by industries in PELITA III. In addition, construction of shipyards in sparsely populated districts meets the migration policy at present.

3-3-2 Capital/labor ratio

On the basis of the investment program and personnel plan in Paragraph II-2-3 and II-2-4 above, the capital/labor ratios are estimated as follows:

1983 43,350 ÷ 15,500 = 2.80 mil. Rp/labor
1990 213,600 ÷ 23,500 = 9.09 mil. Rp/labor

Because of those remarkable progress showing in both employment growth and capital/labor ratio, this promotion program will certainly serve the national interests of Indonesia.

3-4 Stimulation for Local Communities

Impacts of this Reinforcement of the Shipbuilding Industry on the City of UJUNG PANDANG are presumed as follows among others:

3-4-1 Personal phase

According to this program, prospective numbers of employee and their family (with wife and 5 children) for the shipyard city will be as shown in Table II-34.

Table II-34: Estimated Numbers of Employee and Their Family in UJUNG PANDANG Shipyard Community

Year	1983	1987	1990
Employees	492	888	1,073
Their Family	2,952	5,328	6,438
Total	3,444	6,216	7,511

By 1990, other than 7,500 of employee and their family related to the shipyard, nearly the same number of employee and family for the related industries and those in indirectly related establishments, such as restaurants, retailers, and schools, will also be required. By the projected year, 15,000 citizens will benefit from the shipyard either directly or indirectly. This number represents 2.5% of the current population of 600,000 in UJUNG PANDANG.

And 492 employees for the shipyard in 1983 would account for a significant 4.3% of the industrial work force of 11,413 as of 1976. Furthermore, these employees for the shipyard would represent the above average educational level and provide better standards of living and education to the community.

3-4-2 Material phase

Assuming the total industrial output of this city will show annual growth rates of 13% up to 1978 and 11% after 1979 (in 1976 industrial output was about Rp 30,160 million), the importance of the shipbuilding industry is indicated in Table II-35 below:

Table II-35: Proportions of projected Output in the Shipbuilding Industry, as compared with the Total Industrial Output in UJUNG PANDANG

In Millions of Rp

Year	1983	1987	1990
Production Amount of All Industries (a)	64,935	98,636	135,065
Production Amount of Shipbuilding Industry (b)	4,411	11,803	14,593
Propotion: (b) to (a) (%)	6.8	12.0	10.8

Forming 12% of projected production amount of all industries in 1987 as listed above, the shipbuilding industry will greatly contribute to the economy of the city as a whole.

As the shipbuilding industry itself depends so much on a very wide range of the components of industries, chain-reactions from its development will provide effect leading to further developments of the nation.

4. ESTIMATED PROFIT AND LOSS

This is to assess the profit-and-loss that the capital investment project described Paragraph II-2-3 above will produce of the shipbuilding industry as a whole and of an individual shipbuilding concern.

As some parts of shipbuilding facilities can also be utilized in ship-repairing works, combined calculations of ship building and repairing are made in this paragraph. And also, while each facility has a different starting-up date, all new facilities are assumed to commence operation simultaneously in 1990 and to be utilized over a period of 15 years, for the convenience of calculation.

4-1 Profit and Loss on the projected Investment in Shipbuilding Facilities

Of all facilities to be reinforced, replaced or newly installed under this project, only docks and berths to be newly installed and reinforced are selected for examination of profit and loss. Thus, the profit-and-loss is determined by comparing total output against total capital in those selected items.

4-1-1 Total capital investment

Based on the figures given in Paragraph II-2-3 above, total investment in those facilities by 1990 are estimated to be:

213,600 - 16,800 = 196,800 mil. Rp

And the annual depreciation charges will be:

196,800 ÷15 = 13,120 mil. Rp.

4-1-2 Total production

Total production through those facilities is estimated as follows:

(a) Output in Shipbuilding

Range (GT)	100 ∿ 500	1,000 ∿ 1,800	Total	Reference
Number of Dock & Berth to be newly installed.	36	11		Table II-07
Production Factor	2.7	1.5		Table II-04
Mean GT per Vessel (GT)	176	1,267		Table VI-05
Production (GT)	17,107	20,906	38,013	Footnote 1
Production (DWT)	17,107	34,913	52,020	Footnote 2
Unit Cost of Vessel per DWT (Millions of Rp)	1.39	1.00		Chart II-04
Output (Million of Rp)	23,779	34,913	58,692	Footnote 3

(b) Output in Ship-repairing

Range (GT)	100 ∿ 500	500 ∿ 1,000	1,000 ∿5,000	5,000 ∿15,000	Total	Reference
Number of dock & berth to be installed	48	4	16	6		Table II-12
Repairing Factor	25.0	25.0	25.0	21.4		Table II-09
Mean GT per Vessel (GT)	218	716	2,369	8,119		Table VI-11
Production (GT)	261,600	71,600	811,146	1,042,480	2,186,824	Footnote 4
Average Unit Cost of Vessel per GT (Millions of Rp)					0.02	Footnote 5
Production Amount (Millions of Rp)					43,737	Footnote 6

Footnotes:

1. Output = (Number of dock & berth) x (Production factor) x (Mean GT per vessel)
2. Apply the conversion rate given in II-3-1-1.
3. Output = (Production) x (Unit price of vessel per DWT)
4. Output = (Number of dock & berth) x (Repairing factor) x (Mean GT per vessel)
5. In case of ship repairing, unit price per GT is related to the age of vessel rather than to the size of ship, that 20,000 Rp per GT is applied.
6. Output = (Production) x (Unit cost of vessel per GT)

4-1-3 Profit and loss

In case sales margin for shipbuilding is at 8, 10, 12 or 16% and that of ship-repairing at 14, 16, 18 or 20%, the internal rate of return in each combination is to be as per Table II-36.

Table II-36: Internal Rate of Return, Corresponding to Profit Margins
(Rate of Operating Profit to Net Sales)

	Shipbuilding				
	Sales Margins	8%	10%	12%	16%
Ship-repairing	14%	Rp10,818{4,695 / 6,123 Rp23,938 8.667%	Rp11,992{5,869 / 6,123 Rp25,112 9.480%	Rp13,166{7,043 / 6,123 Rp26,286 10.278%	Rp15,514{9,391 / 6,123 Rp28,634 11.830%
	16%	Rp11,693{4,695 / 6,998 Rp24,813 9.275%	Rp12,867 {5,869 / 6,998 Rp25,987 10.070%	Rp14,041{7,043 / 6,998 Rp27,161 10.862%	Rp16,389{9,391 / 6,998 Rp29,509 12.396%
	18%	Rp2,568{4,695 / 7,873 Rp25,688 9.873%	Rp3,742 {5,869 / 7,873 Rp26,862 10.663%	Rp14,916{7,043 / 7,873 Rp28,036 11.440%	Rp17,264{9,391 / 7,873 Rp30,384 12.956%
	20%	Rp3,442{4,695 / 8,747 Rp26,562 10.463%	Rp14,616{5,869 / 8,747 Rp27,736 11.242%	Rp15,790{7,043 / 8,747 Rp28,910 12.009%	Rp18,138{9,391 / 8,747 Rp31,258 13.509%

Note:

Upper column -- Sales margin (Shipbuilding) (Millions of Rp)
(Ship-repairing (Millions of Rp)

Middle column -- Cash inflow (Millions of Rp)

Lower column -- Internal rate of return (%)

In order to meet the current interest rate of 13.5% on borrowings over Rp500 millions from Indonesia Development Bank, operations will have to realize sales margins of so much as over 16% in shipbuilding and over 20% in ship-repairing.

Such high rates of margins could not be said to be impossible to attain but should be held to achieve. Should the interest rate be lowered to a more moderate 10%, operations of such dimensions as listed in the double-lined frame on Table II-36 would yield enough returns on investment and sufficient profit margins over the break-even points.

4-2 Profit and Loss on the projected Investment by Individual Shipyard

4-2-1 An individual investment

A shipyard with the following facilities is selected as a model. Capital investment for those facilities is estimated at Rp 14,438 millions calculated in the same manner as in Paragraph II-2-3.

1 unit of 3,000 DWT (equivalent to 1,800GT) building berth
1 unit of 7,000 DWT (equivalent to 4,550 GT) repair-dock
1 unit of 25,000 DWT (equivalent to 15,000 GT) repair-dock

4-2-2 Sales

(1) *Sales in new shipbuilding*

Estimation is made on these basis: 0.5 ship built in the first year of capital investment, 3 ships in the 5th year and 4 ships annually from the 8th year on as follows:

	Year		
	1st	5th	8th
No. of ships to be built	0.5	3.0	4.0
Production (DWT)	1,500	9,000	12,000
Unit price of vessel per DWT (Millions of Rp)	0.93	0.93	0.93
Sales (Millions of Rp)	1,395	8,370	11,160

(2) Sales in ship-repairing

Assuming the occupancy ratio to be at 40% for the first 15 years and the repairing factor to be 18.8 in the first year of the capital investment, and 21.4 in the 5th year and thereafter the sales are estimated as follows:

	Year		
	1st	5th	8th
Nominal Capacity (GT)	20,050	20,050	20,050
Occupancy Ratio (%)	40	40	40
Repairing Factor	18.8	21.4	21.4
Production (GT)	150,776	171,628	171,628
Unit Price per Vessel per GT (Millions of Rp)	0.02	0.02	0.02
Sales (Millions of Rp)	3,016	3,433	3,433

(3) Aggregate Sales

Accordingly, aggregate sales in shipbuilding and repairing will add up to these figures as shown below in Table II-37.

Table II-37: Total Sales

In Millions of Rp

Year	1st	5th	8th
Shipbuilding	1,395	8,370	11,160
Ship-repairing	3,016	3,433	3,433
Total	4,411	11,803	14,593

4-2-3 Costs

(1) Material cost

75% of sales in the case of new shipbuilding and 30% in ship-repairing are assumed to be material cost.

In Millions of Rp

	Year		
	1st	5th	8th
Shipbuilding	1,046	6,278	8,370
Ship-repairing	905	1,030	1,030
Total:	1,951	7,308	9,400

(2) Direct and indirect labor cost

Average monthly labor costs are assumed at Rp40,000 for factory workers and at Rp100,000 for office workers and the engineering staff.

a) Direct labor costs in shipbuilding

	Year		
	1st	5th	8th
Production (DWT)	1,500	9,000	12,000
Production (GT)	900	5,400	7,200
Steel Products (GT x 0.4)	360	2,160	2,880
Working Hours required per 1 Ton of Fabrications	500	380	380
Required Working Hours for Building	180,000	820,800	1,094,400
Total Annual Working Hours per Head	1,700	1,700	1,700
Required Number of Workers	106	483	644
Labor Costs (Millions of Rp)	51	232	309

b) Direct labor cost in ship-repairing

	Year				
	1st		5th		8th
Nominal Capacity (GT)	4,550	15,500	4,550	15,500	
Annual Volume of Production (GT)	34,216	116,560	38,948	132,680	
Working Hours per 1 Ton of Steel Fabrication	7.5	2.5	5.8	2.0	
Required Working Hours for Repairing	256,620	291,400	225,898	265,360	
Total required Working Hours	548,020		491,258		491,258
Annual Working Hours per Head	1,700		1,700		1,700
Required Number of Workers	322		289		289
Labor Costs (Millions of Rp)	155		139		139

c) Indirect labor costs

	Year		
	1st	5th	8th
Required Number of Workers a) + b)	428	772	933
Number of Indirect Staff Members Equivalent to 15% of Factory Workers	64	116	140
Indirect Labor Costs (Millions of Rp)	77	139	168

(3) Depreciation

Weighted average of economic lives of various facilities is arrived at 15 years. Annual depreciation charge of Rp963 millions is provided with the straight line method on the assumption that the estimated salvage value is negligible.

(4) Overhead expenses

Such expenses as maintenance, light and fuel are estimated at 6% of the total sales.

(5) General administrative expenses

10% of the total sales is allotted to the sales and administrative expenses in 1983 and this amount is to be increased in the subsequent years at a rate corresponding to one half of the growth rate of sales volume.

4-2-4 Profit and loss

Estimated on the basis of the sales and cost figures described in Paragraphs II-4-2-2 and 3, operating profits are listed in the accompanying Table II-38:

Table II-38: Estimated Profit and Loss on the Model Shipyard Operations

In Millions of Rp

Year	1st	5th	8th
Sales Volume	4,411	11,803	14,593
Deductive Items:			
Material cost	1,951	7,308	9,400
Labor cost	206	371	448
Indirect labor cost	77	139	168
Depreciation	963	963	963
Overhead expenses	265	708	876
General administrative expenses	441	811	907
Total	3,903	10,300	12,762
Operating Profits	508	1,503	1,831

Assuming the operating profits to grow in a linear curvature from the 1st to the 5th year and from the 5th to the

8th year, and then to stay at the 8th year's level, the relation between operating profits and cash inflow (operating profits plus depreciation charges) over a period of 15 years is illustrated in the accompanying Table II-39.

Table II-39: Cash Flow Projection

In Millions of Rp

Year	1	2	3	4	5	6	7	8-15
Operating Profit	508	757	1,006	1,255	1,503	1,612	1,721	1,831
Cash Inflow	1,471	1,720	1,969	2,218	2,466	2,575	2,684	2,794

The internal rate of return is estimated at about 13% from the above.

Considering the assumption of the highest efficiency in this sample shipyard's management and production and the forecasted outflow of cash as corporate tax, etc. in the years when its business is profitable, the interest rate of lower than 10% seems to be reasonable for an individual shipyard to operate profitably.

The above calculation is so rough that a study in more detail shall be necessary at the later stage when this plan would be realized.

Remarks: Internal Rate of Return (r) is given from the following equation:

$$\sum_{t=1}^{N} \frac{Rt}{(1+r)^t} - C = 0$$

where R is cash flow,

C is initial investment for facilities,

t is year.

5. BASIC PLAN FOR PRIORITY PROJECTS

5-1 Basic Plan for Reinforcement of 4 Model Shipyards

As specified in I-5-1, 4 model shipyards namely P. T. MENARA, P. T. IKI MAKASSAR, P. T. INTAN SENGKUNYIT and P. T. PAKIN, were given priority as model plants for reinforcement.

According to geographical conditions and potentialities of each shipyard as discussed in I-5-1, basic plans have been drawn up for each shipyard. Basic notions for reinforcement are as follows:

a) In order to make it possible to adjust working schedules, facilities are to be so installed as to enable both shipbuilding and repairing operations.

b) Based on the past record of each shipyard, a gradual expansion is planned so that for more reinforcements of facilities can be started smoothly without causing sudden changes in normal patterns of operations.

c) Introduction of extremely modernized facilities alone should be avoided principally to effect gradual, steady improvements of operating efficiency.

The basic plan for reinforcement of each shipyard consists of principal policy, plant layout and schedule for the execution of reinforcement programs through 1990. Vital details of the program for each concern are listed on Table II-40, with the amount of investment estimated on the basis of Japanese market prices.

Table II-40: Basic Plan for Reinforcement of Four Model Shipyards

Name of Location of selected Shipyards	Outline of Reinforcement	Max. Accommodation of Ship-Size (DWT)		Building Capacity (GT per Annum)		Repairing Capacity (GT per Annum)		Capital (In Millions of Rp)	Projected Number of Employees
		Building	Repairing	Current	Projected	Current	Projected		
P. T. MENARA Tegal, Java	Substantial modification	1,000	3,000	1,200	2,880	752	16,408	3,510	576
P. T. IKI MAKASSAR Ujung Pandang, Selawesi	Almost renewal	3,000	25,000	560	7,272	3,384	176,120	14,438	1,200
P. T. INTAN SENGKUNYIT Palembang, Sumatra	Partial modification	3,000	3,000	1,840	11,520	2,444	20,408	7,086	1,400
P. T. PAKIN Jakarta, Java	Relocation & renewal	1,500	1,500	840	6,560	3,384	7,000	9,400	800

5-1-1 P. T. MENARA

(1) Principal policy for planning

Because of limited space available for expansion of premises, installation of shipbuilding of larger capacity can hardly be expected.

As to shipbuilding, continuous mass-production of 1,000-DWT vessels by the existing 1,000-DWT building berth will be better for improvement of efficiency of the shipyard operations as a whole. In the case of ship repairing, preferrably the existing 1,000-DWT dock and canal should be improved and expanded so as to accommodate 3,000-DWT vessels.

(2) Layout

The existing facilities indicated on Chart II-06 should be modified as per Chart II-05, by means of the above-mentioned installation of new repairing dock, expansion of work-shops and replacement of the 200-DWT berths.

(3) Schedule for execution of reinforcement programs

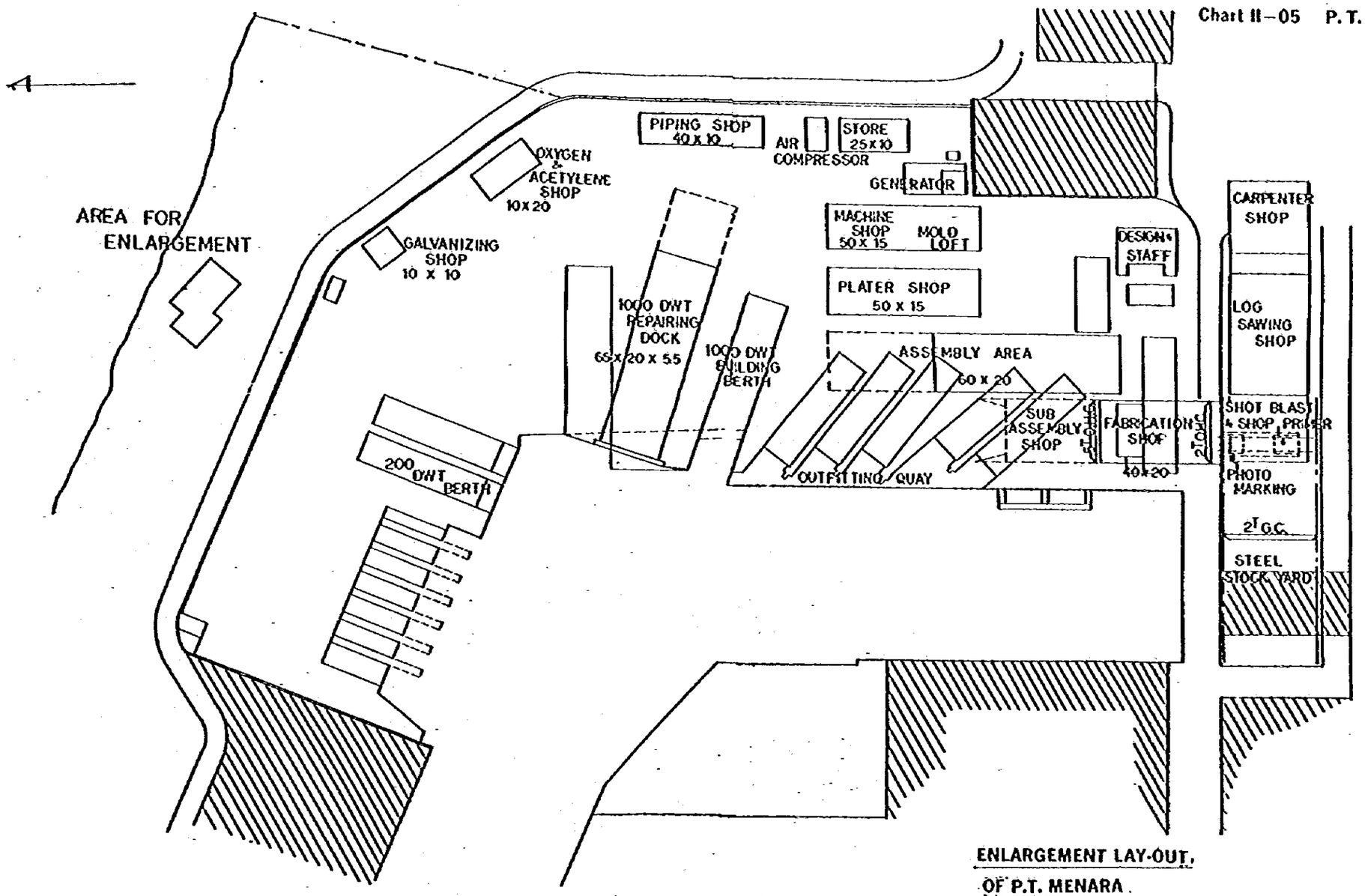
The schedule for reinforcement of this shipyard and plans for production and personnel are provided in the accompanying Table II-41.

Table II – 41

P.T. MENARA SHIPYARD — Rehabilitation Plan & Schedule of Shipbuilding & Repairing

YEAR	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
a) Rehabilitation Plan				Shops & Layout Rehabilitation									
				Installation for 1,000DWT Repairing Dock							Repairing Dock Enlargement from 1,000DWT to 3,000DWT		
b) Schedule of Shipbuilding													
	(200 GT) 300DWT B.Berth ×5			(200GT) 300DWT B.Berth × 2		Number of ships to be built/Year/Berth (taken account of occupancy ratio & production factor)							
	1	1	1.5	1.5	2	2.4	2.7	2.7	2.7	3	3	3	4
		(500GT) 1,000DWT B.Berth × 1						300DWT B.Berth × 2 1,000DWT B.Berth × 1					
Production Amount (GT)	1,200	1,200	1,440	1,080	1,440	1,728	1,944	1,944	1,944	2,160	2,160	2,160	2,880
c) Schedule of Repairing													
	(200GK) 300DWT Slip Way × 1					(500GT) 1,000DWT	Repairing Dock×1						(1,800GT) 3,000DWT Repairing Dock×1
Repairing Amount	752				752	2,632	3,500					3,500	16,408
d) Nos: of Engineers & Workers													
*Direct Workers	141+14	170+14		127+14	170+14	203+47	174+47	174+47	174+47	193+47	193+47	193+47	258+222
△Total of Direct & Indirect Eng & Workers	186	221		170	221	300	265	265	265	288	288	288	576

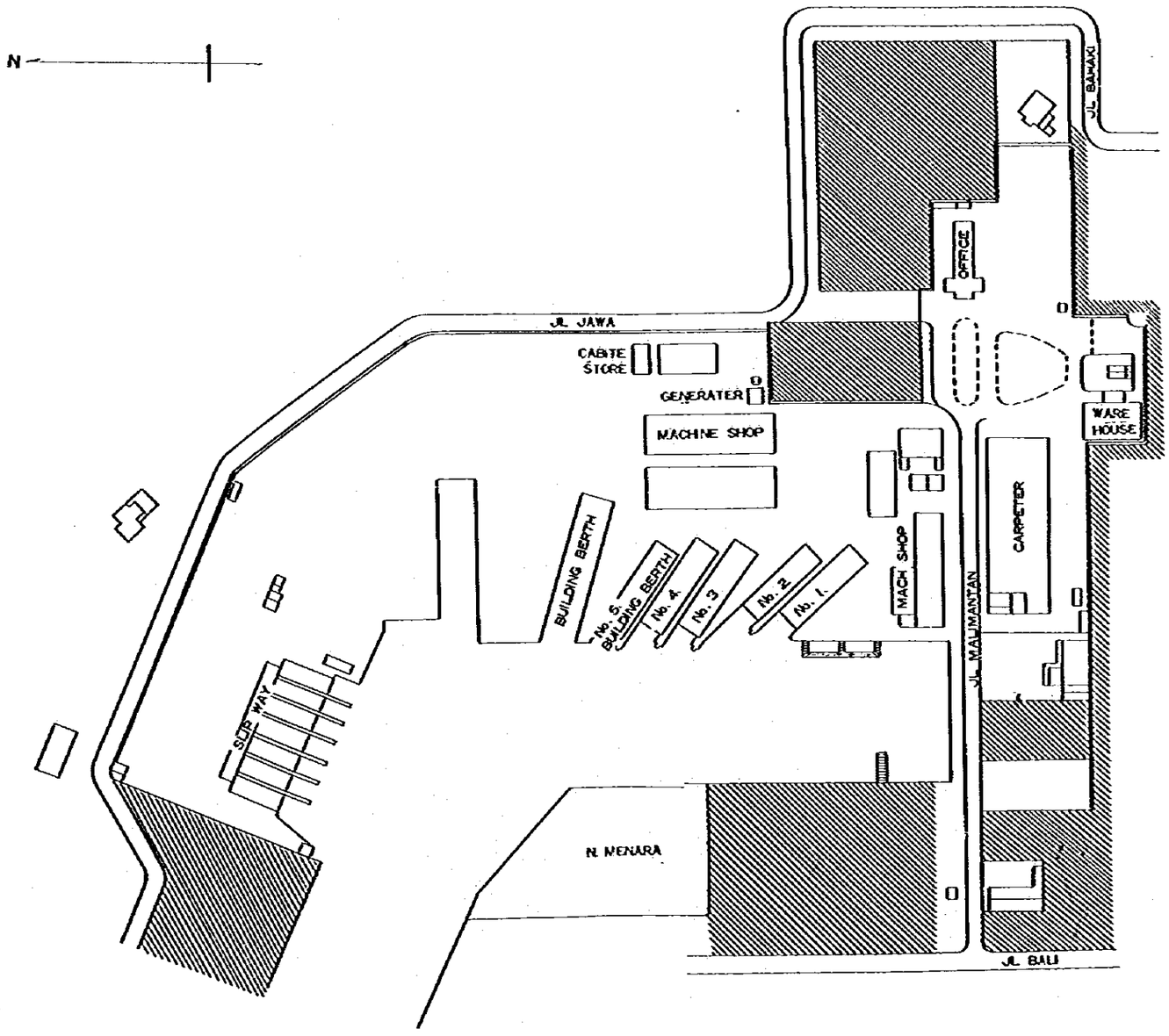
Note: Productivity = Use the present value up to 1983 and up grade in and after 1984.
* Direct Workers = (Nos' of workers, for new shipbuilding + nos of workers for repairing)
△ Total Numbers = 1.2 × Direct Workers.



(SCALE: 1/1000)

ENLARGEMENT LAY-OUT,
OF P.T. MENARA.
FOR NEW BUILDING & RE PAIRING

Chart II–06 **P.T MENARA**
Existing Lay-out
(SCALE: 1/2000)



5-1-2 P. T. IKI MAKASSAR (formerly named as G. K. MAKASSAR)

(1) Principal policy

New facilities, consisting of a 3,000-DWT building berth and 7,000-DWT and 25,000-DWT repairing docks with related plants, can be constructed on the 140,000m^2 reclaimed land at the opposit side of the existing small-vessel repairing plants. For the present, establishment of a continuous, concentrated production system is desired to build 3,000-DWT vessels. As engineering and technological potential and level are upgraded, however, further expansion of building facilities will be carried out as layout plan shown in Chart II-07 shows. There is more than sufficient space on the land for such expansion.

(2) Layout

The current layout indicated in ChartII-08 is to be expanded with an ideal arrangement for the flow of physical distribution as shown in Chart II-07.

(3) Schedule

Details are provided in Table II-42.

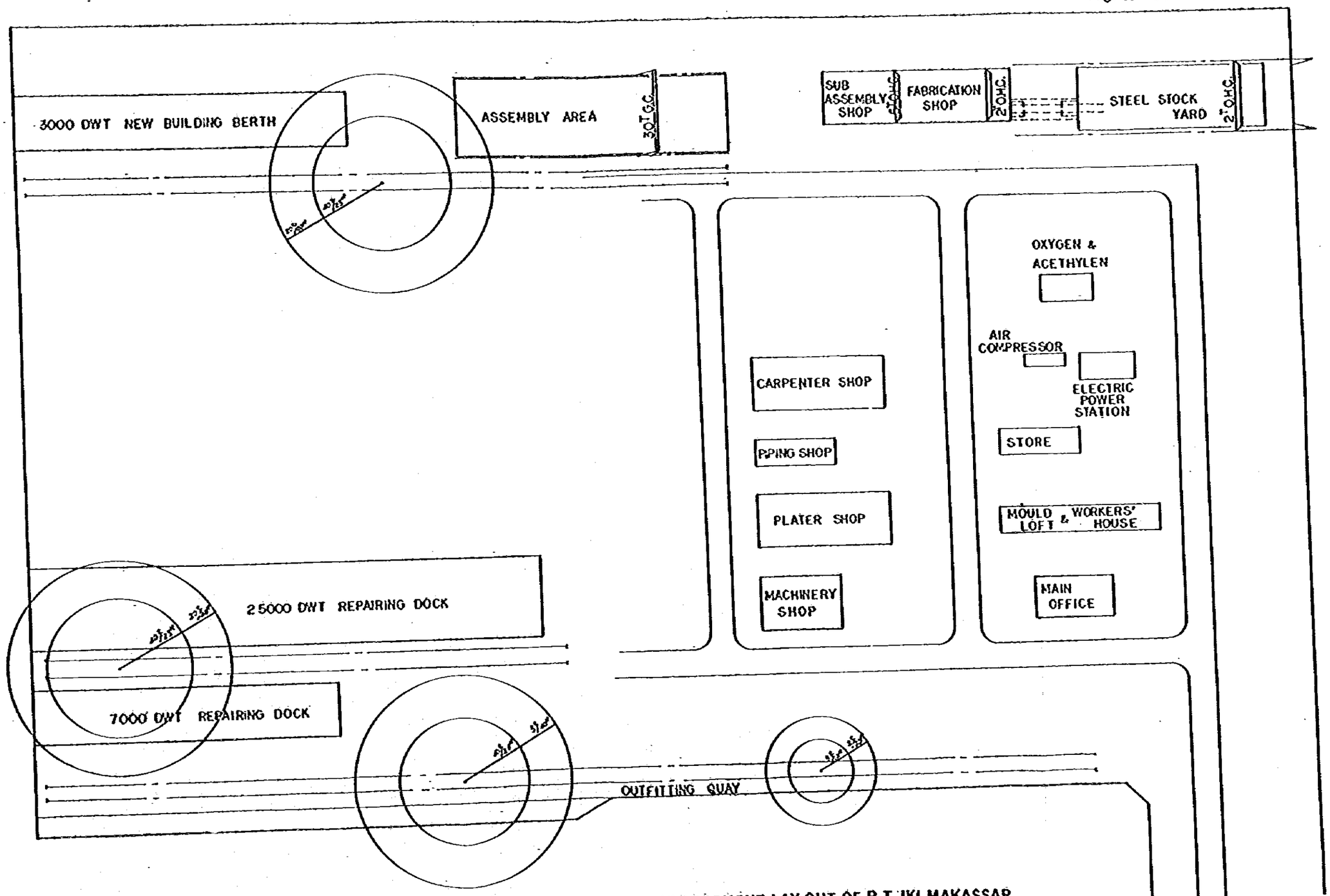
Table II–42

P.T. IKI. MAKASSAR SHIPYARD — Plan of New Plant & Schedule of Shipbuilding & Repairing

YEAR	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
a) Construction Plan													
	Survey		Construction		Inspection & Test								
				3,000DWT	B.Berth×1								
			7,000DWT, 25,000DWT, R.Dock×1										
			(All of Facilities are Newly) Installed.										
b) Schedule of Shipbuilding													
			(500GT) 1,000DWT×1 300DWT×1 (200GT)	B.Slip Way									
	1	1	1.5	1.5	2	2.4	2.7	2.7	2.7	2.7	2.7	2.7	2.7
								3,000DWT×1 (1,800GT)	B.Berth				
						1	1.3	1.5	2	2.5	3	3	4
		560	840	840	1,120	2,784	3,384	3,672	4,392	5,112	5,832	5,832	7,272
c) Schedule of Repairing													
			(500GT) 1,000DWT×1 300DWT×2 (200GT)	R.Slip Way									
								7,000DWT(4,550GT)×1 25,000DWT(15,500GT)×1		R.Dock			
		3,384			3,384	154,160	176,128						176,120
d) Nos: of Engineers & Workers													
Direct Workers			99+60	99+60	132+60	328+482	303+350	329+350	393+350	457+350	521+350	521+350	650+350
Total of Direct & Indirect Eng. & Workers			191	191	231	972	784	815	892	969	1046	1046	1200

Note: Productivity = Use the present value up to 1983 and up grade in and after 1984.
* Direct Workers = (Nos' of workers for new shipbuilding + nos of workers for repairing)
∧ Total Numbers = 1.2 × Direct Workers.

Fig. II–07 P.T. IKI MAKASSAR



ENLARGEMENT LAY-OUT OF P.T. IKI MAKASSAR

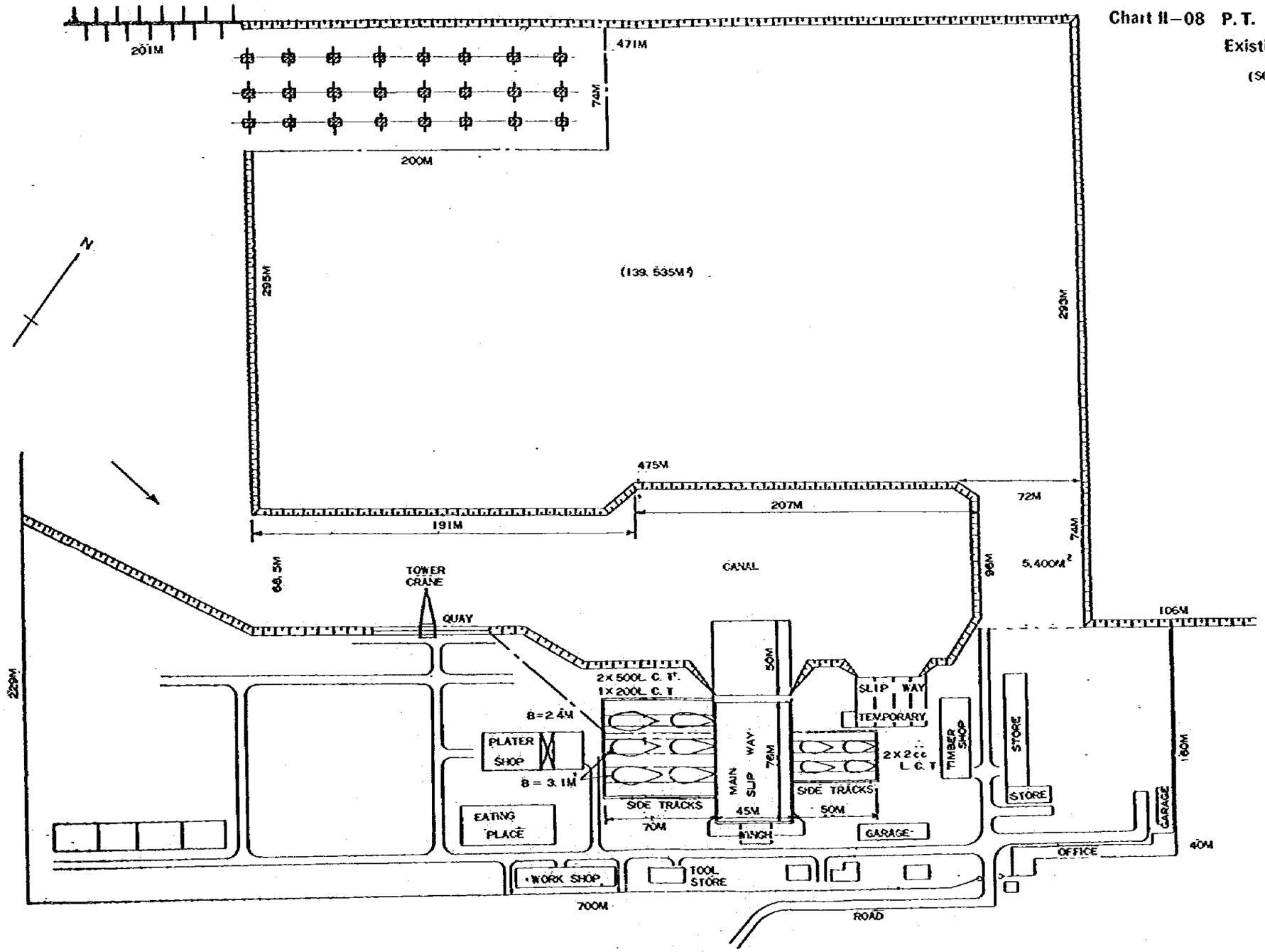
FOR NEW BUILDING & REPAIRING

(SCALE: 1/1000)

Chart II–08 P.T. IKI MAKASSAR

Existing Lay-out

(SCALE: 1/2500)



5-1-3 P. T. INTAN SENGKUNYIT

(1) Principal policy

Compared with other shipyards in Indonesia, this plant is well equipped, and partial modifications, such as improvement of existing berths and shipyards for building and repairing of 3,000-DWT vessels and new installation of outfitting quay, and a stockyard for steel products will be necessary to improve the overall efficiency of this shipyard.

(2) Layout

Layouts for the current and projected facilities are provided in Fig. II-10 and II-09.

(3) Schedule

Details of this modification schedule are summarized in Table II-43.

Table II-43

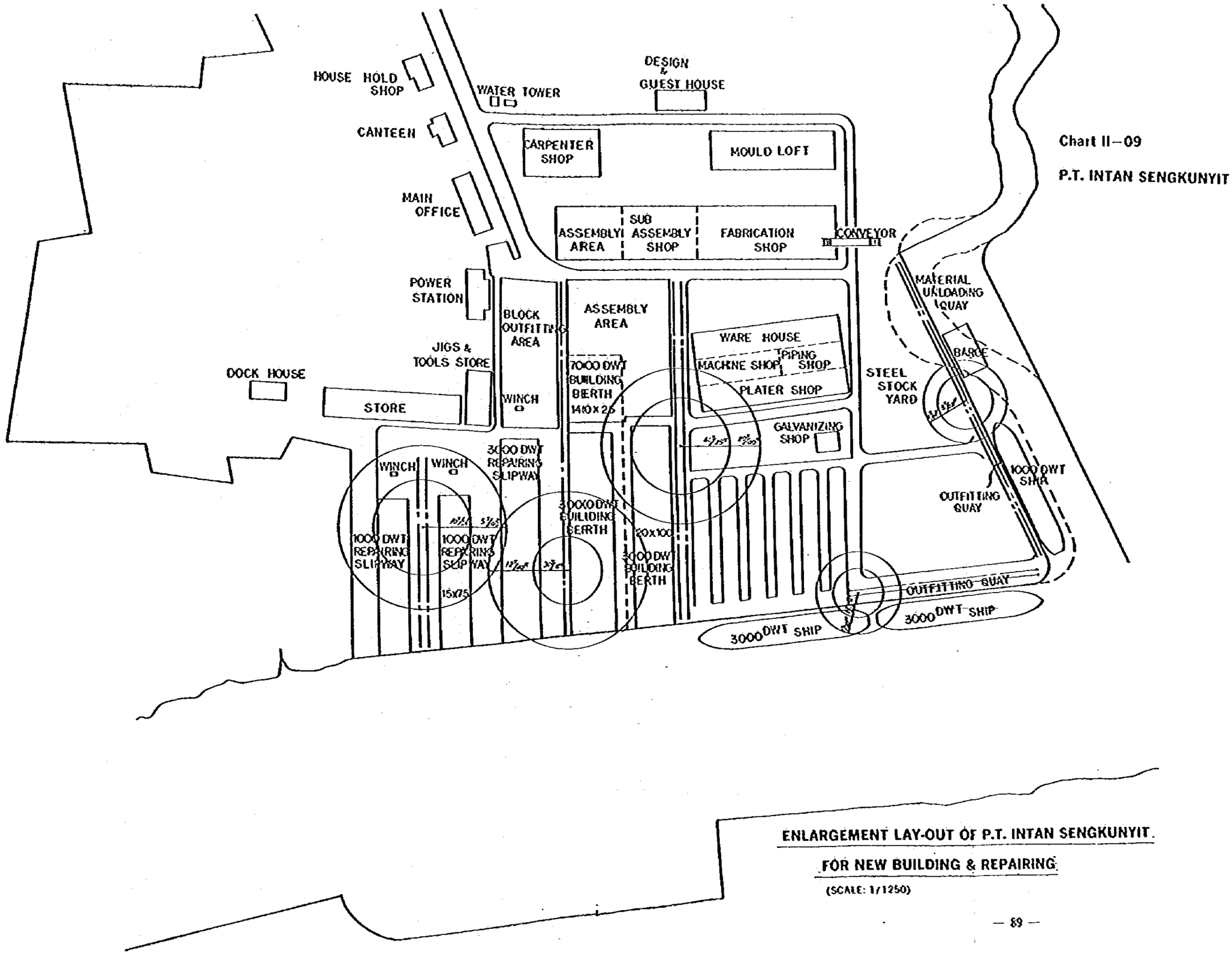
P.T. INTAN SENGKUNYIT SHIPYARD Rehabilitation Plan & Schedule of Shipbuilding & Repairing

YEAR	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
a) Rehabilitation Plan													
	Survey		Construction		Inspection & Test								
			3,000DWT B.Berth×2										
			1,000DWT R.Slip Way×2										
			3,000DWT R.SlipWay×1										
b) Schedule of Shipbuilding													
			(1800GT) 3,000DWT×1 1,000DWT×1 (500GT) B.Berth			3,000DWT×2 B.Berth							
		1	1	1.3	1.3	1.3	1.5	1.5	2	2.5	3	3	4
		1	1.5	1.5	2	3.744	4,320	4,320	5,760	7,200	8,640	8,640	11,520
		Production Amount 1,840	2,040	2,472	2,672								
c) Schedule of Repairing													
		(500GT) 1,000DWT×1 250DWT×1 (150GT) R.Slipway						(500GT) 1,000DWT×2 3,000DWT×1 (1,800GT)		R. Slipway			
		Repairing Amount 2,444	815	0	0	17,296	20,408						20,408
d) Nos' of Engineers & Workers													
Direct Workers			240+15	291+0	315+0	441+126	387+121	387+121	515+121	644+121	773+121	773+121	1030+121
Total of Direct & Indirect Eng.& Workers			306	350	378	681	610	610	763	918	1,073	1,073	1,381

Note: Productivity = Use the present value up to 1983 and up grade in and after 1984.
* Direct Workers = (Nos' of workers for new shipbuilding + nos of workers for repairing)
Λ Total Numbers = 1.2 × Direct Workers.

Chart II–09

P.T. INTAN SENGKUNYIT

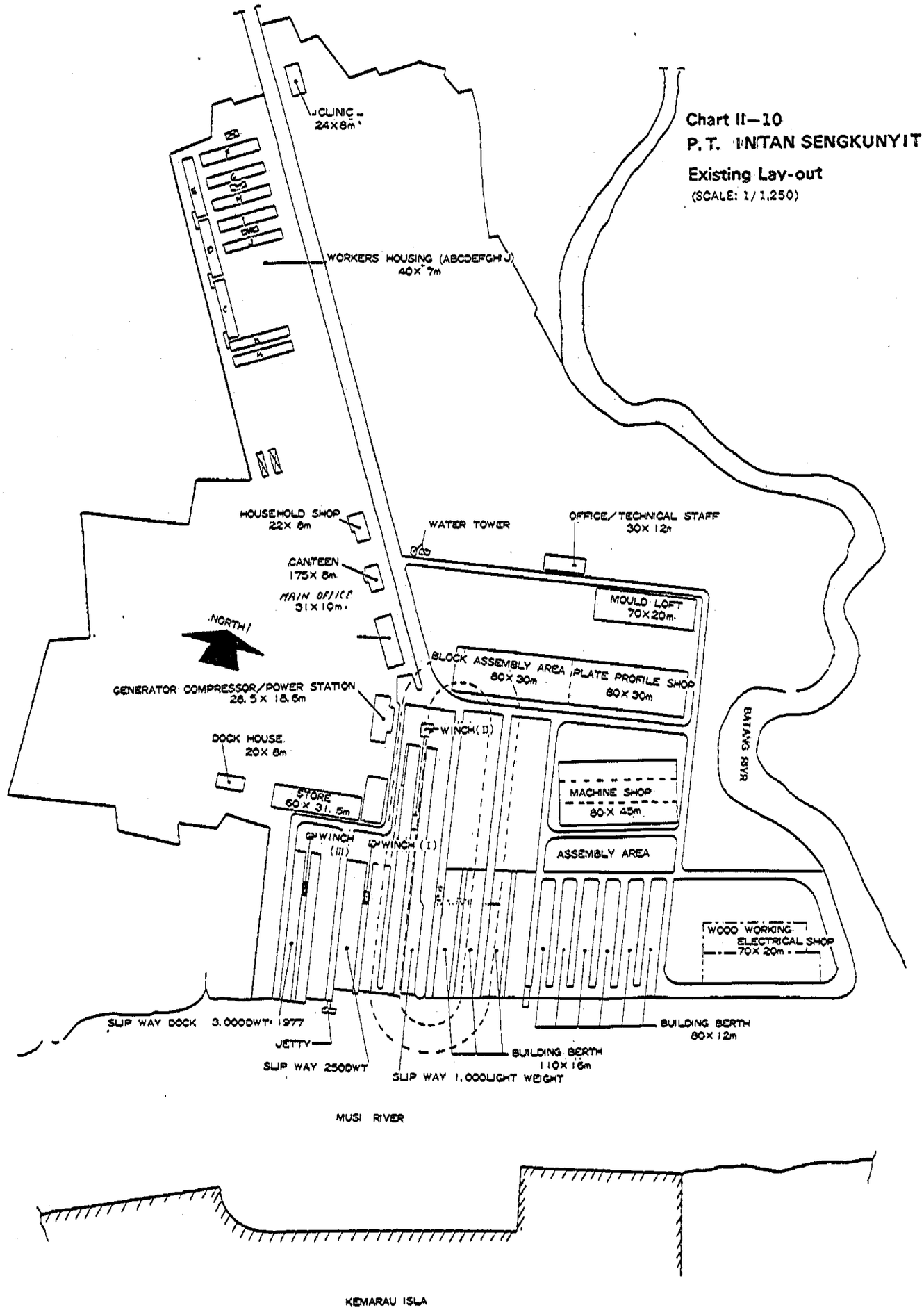


ENLARGEMENT LAY-OUT OF P.T. INTAN SENGKUNYIT.

FOR NEW BUILDING & REPAIRING

(SCALE: 1/1250)

Chart II—10
P. T. INTAN SENGKUNYIT
Existing Lay-out
(SCALE: 1/1.250)



5-1-4 P. T. PAKIN

(1) Principal policy

A complete removal from the present inconvenient location far from the shore to a new site near the canal mouth is scheduled.

In view of the space, available at the projected new location, maximum capacity of shipbuilding would be for 1,500-DWT vessels, and that of ship repairing would be for 1,000-DWT vessels. And, because of the limited width of the canal adjoining the new site, 1 unit of side-track-type slip-way is to be provided, along with building berths for 1,500-DWT x 1 and 1,000-DWT x 2 and repairing berths for 1,000-DWT x 1 and 750-DWT x 2.

(2) Layout

The layout of the existing facility is shown in Chart II-12. A tentative layout of new installations at the new site is given in Chart II-11.

(3) Schedule

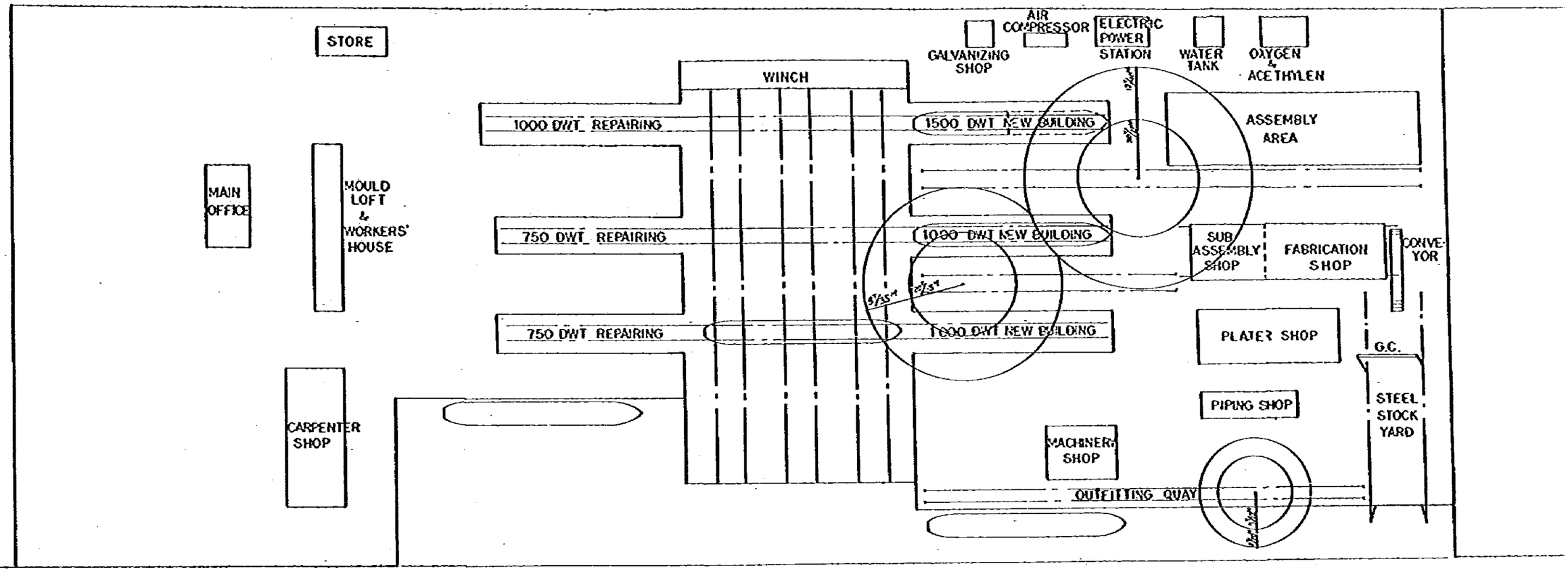
Details are summarized in Table II-44.

Table II–44

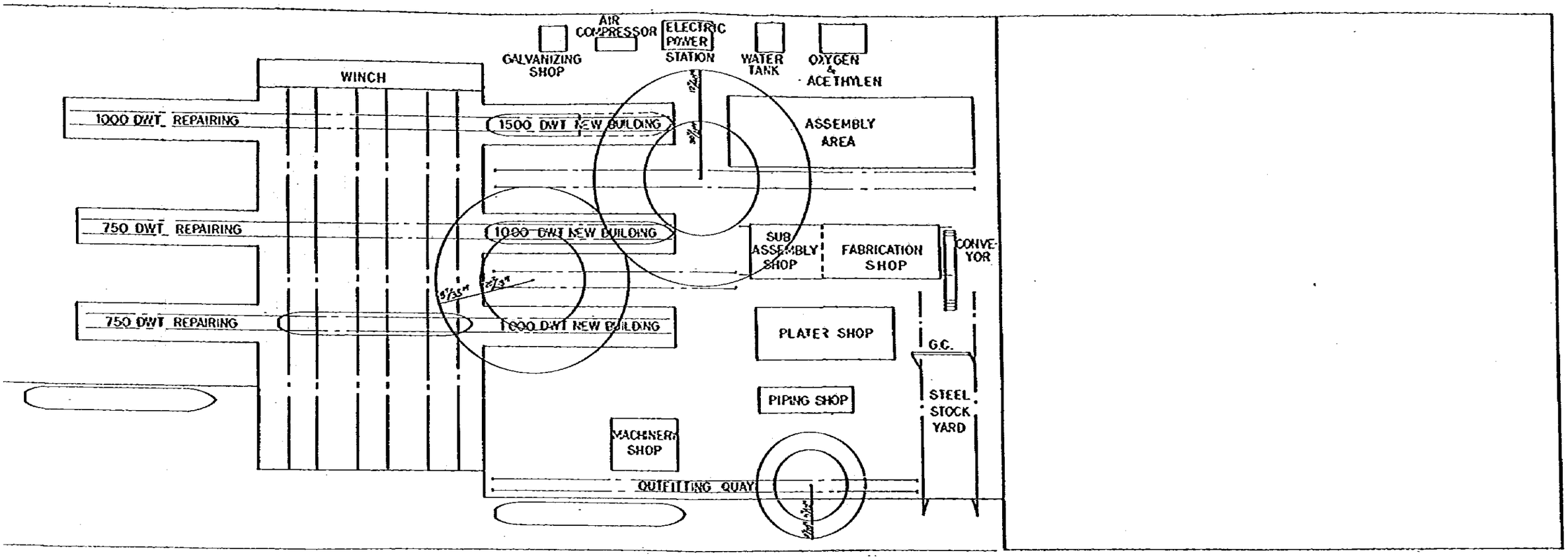
P.T. PAKIN SHIPYARD — Construction Plan & Schedule of Shipbuilding & Repairing

YEAR 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
a) Construction Plan	Survey	Construction		Inspection & Test								
			1,500DWT×1 1,000DWT×2 B.Slip Way									
			1,000DWT×1 R.Slipway 750DWT×2									
			(Include installation for Shops & Facil)									
b) Schedule of Shipbuilding		(1,050GT) 1,500DWT×1 B.Berth					(1,050GT) 1,500DWT×1 1,000DWT×2 (500GT) B.Slip Way					
	1	1	1.3	1.3	1.3	1.5	1.5	2	2.5	3	3	4
	Production Amount				2.4	2.7	2.7	2.7	3	3	3	4
		840	1,092	1,092	3,012	3,420	3,420	3,840	4,500	4,920	4,920	6,560
c) Schedule of Repairing		(450GT) 750DWT×2	R.Dock.				(500GT) 1,000DWT×1 750DWT×2 (450GT)		R. Slipway			
	Repairing Amount											
	3,384			3,384	5,264	7,000						7,000
d) Nos: of Engineers & Workers												
Direct Workers		99+60	129+60	129+60	355+93	306+95	306+95	344+95	403+95	440+95	440+95	587+95
Total of Direct & Indirect Eng.& Workers		191	227	227	538	481	481	527	598	642	642	819

Note: Productivity = Use the present value up to 1983 and up grade in and after 1984.
* Direct Workers = (Nos' of workers for new shipbuilding + nos of workers for repairing)
^ Total Numbers = 1.2 × Direct Workers.

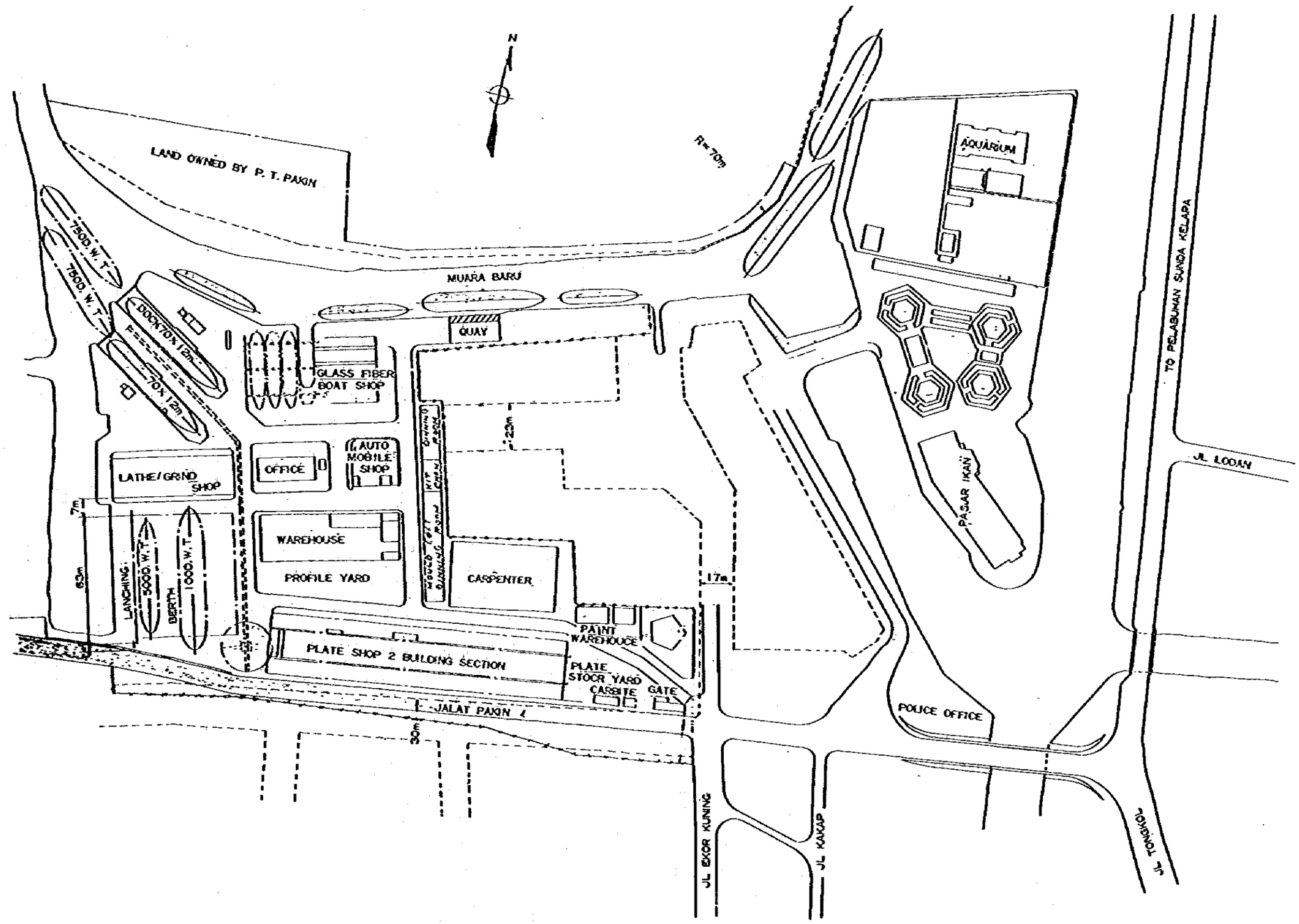


LAY-OUT PLAN OF NEW PLANT AT SITE



LAY-OUT PLAN OF NEW PLANT AT SITE

Chart II—12 P. T. PAKIN, EXISTING LAY-OUT (SCALE: 1/2000)



5-2 Establishment of the "Materials Center"

5-2-1 Necessity, function and effect of the "Materials Center"

(1) Necessity

In case of materials are imported, it usually takes a considerable time before the shipyard can take delivery of the imports. The major bottleneck causing this delay is necessary but very complicated procedure of customs clearance.

Past records on the lag between the day an order was placed and the day the imports were delivered to the shipyard show that the longest one was 16 months in case of auxiliary engines and the shortest lag was 6 months in a case of broadside windows.

In other cases, 4 months to 14 months were required simply for the customs clearance.

Such prolonged delays in acquisition of necessary imported materials have caused disruptions in the manufacturing process. Such disturbance in turn leads to delay in delivery of ships from the yard. In extreme cases, shipyards had no other way but to order from local sources, thus duplicating orders and increasing production costs.

In the mean time, in view of underdeveloped situation of local related suppliers, most materials for shipbuilding have to be imported. Furthermore, along with the progress of the local shipbuilding industry, imports of those materials must increase substantially. Solution of troubles due to customs clearance, therefore, is categorical imperative for the Reinforcement Plan to be carried out smoothly. As a means of solution, a "Materials Center" should

be established, which agency, representing shipbuilding concerns, will handle import transactions in materials, customs clearance, and also keep an adequate stock of standard-materials and -equipment and replacement parts most commonly used in repairing locally manufactured ships.

(2) Functions

As indicated above, the principal functions of this institution are: handling collective import orders for shipbuilding materials and equipment, and keeping an adequate stock of important materials and equipment. Through such facilities, this agency will help streamline the distribution of shipbuilding materials and thus alleviate shipyards' troubles in purchase of materials and supplies.

A function of processing center may also be considered for this agency to make preliminary working on basic steel products and to place collective orders for outfits.

(3) Effects

Through establishment of "Materials Center", following effects can be expected.

a) To shorten the shipyard's time involved in manufacturing because of quicker and smoother delivery of imported materials and parts.

b) To lessen the period of time necessary in repairing process as replacement parts will be delivered in a shorter period time.

c) The stock of materials and supplier kept by the Center for shipbuilding concerns should help shipbuilders to decrease inventories of materials and thus to reduce working capital requirements.

d) To reduce material cost by collective orders.

5-2-2 Description of the "Materials Center"

(1) Location

Jakarta is one of the largest international ports in Indonesia and has a relatively large number of shipyards concentrated there. Accordingly, it might be better to establish the Center in Jakarta for the present. Branch centers are to be organized in other major ports later as necessary to meet growing needs.

(2) Inventories

Based on the figures provided in Table II-01 on the projected number of ships to be built and VI-05 on average gross tonnage by type of ship, the number of new ships to be built in 1983 are estimated as follows:

Size (GT)	0 ~100	100 ~ 500	500 ~1,000	1,000 ~ 1,800
Number of vessels to be built	18	92	15	16

The quantity of materials required for the above shipbuilding is estimated to accommodate needs equivalent to those for 70 vessels of 1,000-DWT in 1983, and then expanded to 140 units of vessels in 1990.

Therefore, on the assumption that reasonable inventories of materials are equivalent to 30% of the 1983 annual consumption kept for a period of 2 months, the monthly inventories of steel products work out to be 800 tons.

(3) Facilities

To accommodate inventory requirements discussed in the preceding paragraph, the following facilities are required for the Center:

Steel products -, stockyard for - shapes (steel-plate and the like, piping)	approx. 2,900m^2
Replacement parts - warehouse for supplies (valve, wire, parts)	approx. 400m^2
1 workshop	approx. 1,000m^2
1 office building	approx. 500m^2

1 set of 2-ton-out-door-type crane and some fork-lifts must also be provided.

(4) Capital investments

Except for the land costs, initial fixed investments in connection with the establishment of this Center will work out at RP800 millions approximately.

(5) Organization

Apparently there is no other way but for the Government to bear initial outlays for the organization of this Center and related administrative and operating expenses in its early stage.

The pricing on materials and replacement parts to be shipped from the Center to each shipyard should be determined in due consideration of necessary costs and expenses at the Center's side and considerable merits to be gained on the part of shipyards. Such pricing policy cannot be disadvantageous of all for the shipbuilding concerns when those various facilities and benefits as discussed previously - for instance, contraction in expenses related to import transactions and procedures - are taken into account. Needless to mention, the prices thus determined should not be such that shipbuilders feel exacting, in view of the character of the Center.

5-3 Establishment of "Training Center" for Shipbuilding Workers

5-3-1 Necessity, function and effect of Shipbuilding Training Center

(1) Necessity

In order to accomplish production target in this total development plan, performance of ships produced would have to be excellent enough to satisfy customers' requirements.

Therefore, expansion and installment of new facilities are not enough, but training of engineers competent to operate these facilities efficiently, control the plan, and build ships excellent enough to satisfy required functions and performance is needed too. And also training of management personnel able enough not only to operate the shipbuilding company with these facilities as a successful enterprise but to create comportable conditions in the company for employees willing to work, is required naturally with expansion of scale of shipbuilding industry.

In Indonesia, 3 colleges and 4 engineering high schools are available for the professional education of shipbuilding engineers. In particular, graduates from those colleges are numbered only 82 for the past 10 years and 19 of them, namely 26%, are working at shipyards.

And, 55 and 81 of engineering staffs have studied or trained abroad on shipbuilding engineering respectively, but only a part of them are working at shipyards.

On the other hand, HIOC, Material Research Institute and Industrial Work Training Center have only recently

set up training course of welders with each maximum accommodation of 30 persons, to prepare for getting certificates of qualifications by BKI or Lloyd's Classification Association.

For proceeding both shipbuilding and repairing along with this development plan, 1,300 of engineers and design staffs and 13,000 of skilled workers will be required by 1983/84 and another 700 and 6,800 each must be recruited by 1990/91. But, those requirements will be scarcely covered by only expansion of the above-mentioned colleges, schools and training organizations. Under such circumstances, establishment of "shipbuilding training center proper for training of shipbuilding engineers and skilled workers with joint cooperation of the government and industry is certainly required.

By the way, in view of futurs prospect of shipbuilding and shipping industries, the management personnels will have to be educated with high level carriculums and carriculums needed for top management in general business management. For the time being, we have to apply various training institutes abroad for it.

(2) Functions

The required functions of shipbuilding training center are to educate leaders of each shipyard and to train engineers and skilled workers in practical manner for each level and position. And graduates from the center will engage in education and training at their shipyards, and are expected to play leading role in future Indonesian shipbuilding industry.
The education and training at this center will have to be of most practical way to improve the current

industrial level. At the early stage of the center technical mission from abroad and local candidate lecturers, along with training, design standard types of ship and edit guidance books for various designing standards, working standards and quality assurance standards. These books will be used for text books in the center in future.

Thus, the center intends to be a practical education training institute, rather than that of academic technology of other colleges and institutes, with such principals as to build their own engineering basis in Indonesia and to provide the shipbuilding industry with the most practical personnels of this common engineering basis.

(3) Effect

Establishment of this center will directly affects on stable supply of well trained labor forces to the shipbuilding industry and by which improvement of engineering level and reputation of the industry along with and reliance of users on it will be accordingly expected. And further more, the provision of design of standard modelships and guidance books for several standards will be helpful to maintain high engineering level and to save the losses of each individual shipyard, and also those mutual study and cooperation will benefit to further development of the industry.

5-3-2 Contents of shipbuilding training center

The trainees are to be classified into design and engineer course and worker course, and educated by lectures and working studies.

(1) Description of the education

(a) Design & engineer course

This course is for education of design staff and working engineers for hull/outfit, and available for high school graduates with 2 ∿ 3 years experiences at shipyard and college graduates.

Term of education: 6 months

lecture - 88 days & working studies - 32 days for hull

lecture - 68 days & working studies - 52 days for outfit

Numbers of trainee:

20 persons/6 months for each hull and outfit

Total 80 persons for a year

The curriculums and hours of lectures are as per Table II-45.

(b) Worker course

This course is for education of foreman and asst. foreman, especially for training of each technique and study of professional know-how as per Table II-46, and available for high school graduates or equivalent to them.

Term of education: 3 months

Numbers of trainee:

100 persons/3 months

Total 400 persons for a year

(c) Task force

Designing of standard model ships and edition of guidance books for several standards by a task force consisting of the invited technical mission group from abroad, candidates for instructors and

some selected trainees is desired to be carried out. This is to say, both of development of standard model ships suitable for local conditions and the teaching based on the related standards of those model ships, by the hands of those prospective leaders themselves will be worthy enough for their extensive practices. And it is preferred that those candidates for instructors are 10 - 20 numbers of experience designing engineers in each field of hull fabrication, outfitting, engine installation and wiring, and have studied abroad before starting up to this Center.

(2) Location

The center is desirable to be located in one of the 4 model shipyards, selected by this development plan to be preferentially improved, in consideration of practical effects.

(3) Capacity and facility

Capacity: -

Trainee	Design & engineer course	-- 40
	Worker course	-- 100
Instructors and assistants		-- 30
Others		-- 10

Facility: -

Lecture room	2 for 100 numbers each	$300m^2$ x 2
Class room		$20m^2$ x 4
Drawing room	1 for 20 numbers	$200m^2$
Drilling site	indoor	$500m^2$
	outdoor	$500m^2$
Visual and auditory room		$36m^2$

Library	$20m^2$
Instructors room	$180m^2$
Office	$50m^2$

Besides than the above-mentioned, dormitory, dining room, utilities etc. are to be required and minimum floor space of those buildings is estimated about $5,300m^2$.

(4) Investment

Except the land cost, total investment for the initial facility is estimated approximately 3,100 million Rp.

(5) Management

In view of public character of this center, the initial investment for establishment will have to be covered by the government, while the running cost including fees for lecturers, general expenditures for management, expense for maintenance of facility and others will be preferably borne by the benefitting parties in the industry.

For reference, Table II-47 shows the schedule of this center.

Table II-45: Curriculums and Hours of Lectures for Design Staff & Engineer Course

Lecture: -

a.	General curriculums	Total 170 hours
	1. Introduction to shipbuilding	40 hr.
	2. Laws & regulation	20 hr.
	3. Harbour & shipping	20 hr.
	4. Production management	30 hr.
	5. Repair	20 hr.
	6. Fishing boat & working boat	40 hr.
b.	Professional curriculums for hull	Total 230 hours
	1. Applied ship dynamics & calculation	50 hr.
	2. Basic design	40 hr.
	3. Hull design	40 hr.
	4. Drawing & moulding plan	20 hr.
	5. Hull construction process	40 hr.
	6. Welding process	40 hr.
c.	Professional curriculums for outfit	Total 170 hours
	1. Marine engine & electricity	50 hr.
	2. Basic design	40 hr.
	3. Outfitting design	40 hr.
	4. Outfitting process	40 hr.

d. Total

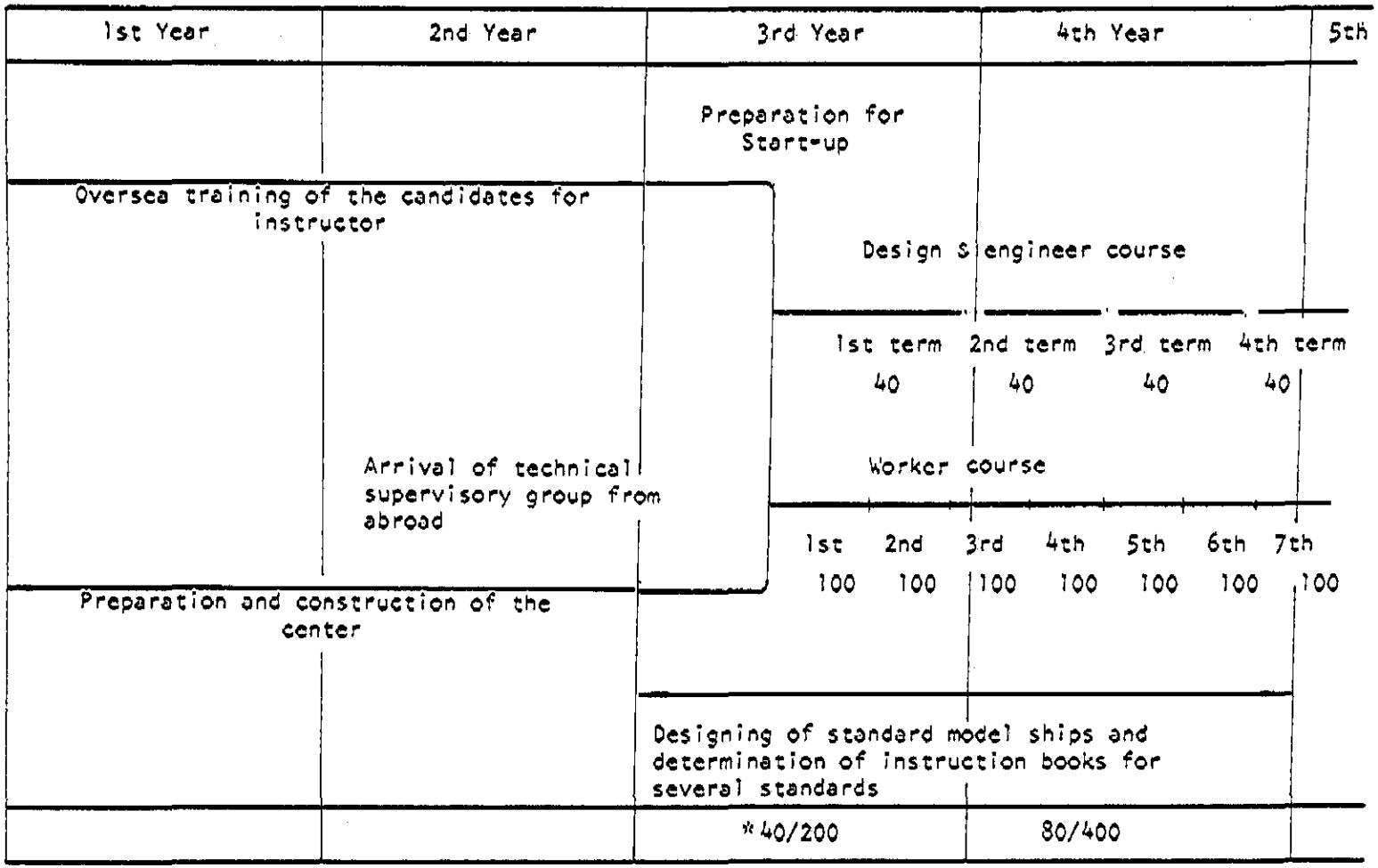
Hull 400 hours -- 80 days -- 4 months approx.

Outfit 340 hours -- 68 days -- 3 months approx.

Table II-46: Curriculums and Hours for Worker Course

a.	General curriculums (lecture)	Total	40 hours
	1. Shipbuilding in general		10 hr.
	2. Hull in general		10 hr.
	3. Outfit in general		10 hr.
	4. Production control		10 hr.
b.	Drilling curriculums (general for all trainees)	Total	100 hours
	1. Gas cutting		20 hr.
	2. Welding		40 hr.
	3. Material handling		20 hr.
	4. Handling of machinery and tools		20 hr.
c.	Professional curriculums (lecture and working studies)		
	1. Drawing & marking		160 hr.
	2. Welding		160 hr.
	3. Iron works		160 hr.
	4. Plate fabrication		160 hr.
	5. Engine mechanic		160 hr.
	6. Piping		160 hr.
	7. Wiring		160 hr.
d.	Total		
	As total per head 300 hours -- 3 months approx.		

Table II-47: Operational Schedule of Shipbuilding Training Center



*Graduates: D & E course/Worker course