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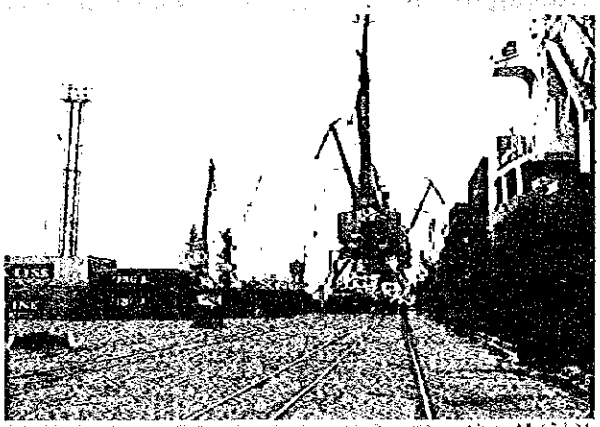

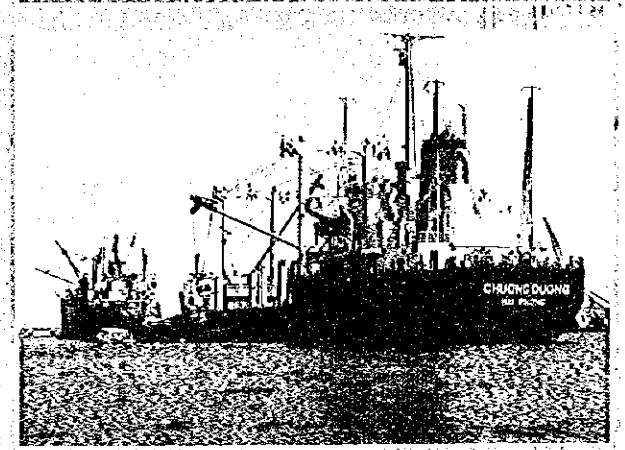

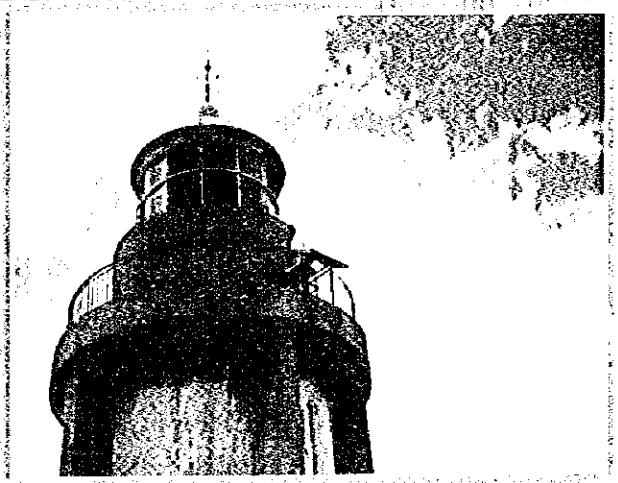

MASTER PLAN STUDY ON COASTAL SHIPPING REHABILITATION AND DEVELOPMENT PROJECT IN VIETNAM

Final Report

SUPPLEMENTARY REPORTS Vol.2

Fleet Development and Seafarers Education

March 1997

The Maritime International Cooperation Center of Japan (MICC)
Overseas Shipbuilding Cooperation Centre (OSCC)
ALMEC Corporation

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MINISTRY OF TRANSPORT (MOT), VIETNAM

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ALMEC CORPORATION

SUPPLEMENTARY REPORTS VOLUME 2

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GLOSSARY OF TERMS

ADB	Asian Development Bank
ARPA	Automated Rader Plotting Aid
ATN	Aids To Navigation
BOT	Building, Operation and Transfer
CCID	Cement Consulting, Investment & Development Corporation
CRS	Coastal Radio Station
DGPS	Differential Global Positioning System
DWT	Dead Weight Tonnage
EIA	Environmental Impact Assessment
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GPC	Government Pricing Committee
GRT	Gross Registered Tonnage
GSO	General Statistics Office
HP	Horse Power
IEE	Initial Environmental Examination
IMO	International Maritime Organization
IWB	Inland Waterways Bureau
JICA	Japan International Cooperation Agency
JV	Joint Venture
LASH	Lighter Aboad Ship
MARPOL	International Convention for the Prevention of Pollution from Ships
MOSTE	Ministry of Science, Technology and Environment
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
MTTS	Maritime Technical and Training School
NTSR	National Transport Sector Review
OD	Origin - Destination
ODA	Official Development Assistance
OECF	Overseas Economic Cooperation Fund of Japan
OPRC	International Convention on Oil Pollution Preparedness, Response and Cooperation
OSRAP	Oil Spill Response Action Plan ASEAN
RCC	Rescue Coordination Center

RO-RO	Roll-On Roll-Off ship
SAR	Search And Rescue
SOLAS	Safety Of Life At Sea
STCW	Standards for Training, Certification & Watchkeeping
TEDI	Transport Engineering Design Incorporation
TESI	Transport Economic Scientific Institute
UNDP	United Nations Development Program
VIMARU	Vietnam Maritime University
VINALINES	Vietnam National Shipping Lines
VINAMARINE	Vietnam National Maritime Bureau
VINASHIN	Vietnam Shipping Industry Corperation
VIRES	Vietnam Register of Shipping
VISAL	Vietnam Salvage Corporation
VMS	Vietnam Maritime Safety Agency
VNR	Vietnam National Railways
VRA	Vietnam Road Administration Bureau
VISHIPEL	Vietnam Ship Communications and Electronic Company
VTS	Vessel Traffic Service

SUPPLEMENTARY REPORTS VOLUME 2

PART 1

FLEET DEVELOPMENT

PART 1 FLEET DEVELOPMENT

1 Review of The Present Situation

Although the principal theme of this study is to outline future coastal shipping and related inland water transport systems, the study of shipbuilding and repairing industries was made in all shipyards and related industries not only for coastal service ships but also for ocean-going ships.

In this study, some difficulty was found with the statistical data supplied by various sources because they used different items and categories. It must be noted that some of the data in this report were adjusted or corrected in accordance with our field survey results or based on our own judgments which are believed to be in accordance with the directives of this study.

1.1 Vietnamese Fleet Characteristics

Total steel ship number and gross tonnage of all kinds of ships including barges which are classified by VIETNAM REGISTER OF SHIPPING (hereinafter called VIRES) are 591 ships and 623.061 GT as shown in Table 1.1.

The number of ships registered to VIRES including all types of general cargo ships (except cargo barges), tankers (except oil barges) and passenger ships, are shown in Table 1.2. The age distribution of these ship categories are analyzed from the classified list of ships by VIRES as shown in Table 1.3.

The number of new construction ships in Vietnam(Registered to VIRES and not including tug boats, barges and other miscellaneous ships) during the six years from 1990 to 1995 was 142 ships as shown in Table 1.4.

The figures in Table 1.1 and 2, clearly show that a large number of ships less than 1,000 GT are operating (ships including barges: 85% general cargo ships: 80% and tankers: 84%) and consequently the cargo movement by the coastal shipping and related inland water transport system is reaching a considerably high level.

The figures in Table 1.2, reveal that at present, only a relatively few number of tankers are operating due to the limited oil cargo movement. However, after the realization of the construction of the oil-refinery- chemical factory in Dung Quat Industrial zone, rapid increase of oil product transportation by coastal tankers can be expected.

For the figure in Table 1.3, many superannuated ships aged more than 16 years are still in operation (general cargo ships: 27.5%, tankers: 67% and passenger ships: 50%). From the view point of the marine safety and ship maintenance expenditure, the introduction of effective countermeasures for the rehabilitation of the Vietnam Fleet (for example, scrap and build system) is highly recommended.

From the figures in Table 1.4, supposing the size of coastal service ships is in the range of 1,000-3,000 DWT or GT from now on, the trend of new construction is quite inactive. This tendency is more remarkable for tankers: Only five tankers, the smallest 150 DWT and the largest 700 DWT, were built during the 6 years.

Table 1.1
VIETNAMESE FLEET NUMBER AND GROSS TONNAGE (REGISTERED TO VIRES)

Ship Size	Number	Gross Tonnage (GT)	Average Gross Tonnage (GT)
500 GT and below	418 (71%)	103,854	249
501 - 1,000 GT	81 (14%)	66,040	815
1,001 - 2,000 GT	37 (6%)	47,014	1,271
2,001 - 3,000 GT	19 (3%)	50,519	2,659
3,001 GT and above	36 (6%)	355,634	-
Total	591 (100%)	623,634	-

Source: Register of Ships 1994-1995, VIRES
Classified List of Ship & Their Main Particular, January 1996, VIRES

Note: Average Gross Tonnage for ship size 3,000 GT and above is inconsequential and therefore not shown.

Table 1.2
VIETNAMESE FLEET NUMBER BY TYPE OF SHIPS (REGISTERED TO VIRES)

Ship Size	General Cargo Ship	Tanker	Passenger Ship
500 GT and below	298 (68%)	11 (46%)	4 (100%)
501 - 1,000 GT	55 (13%)	9 (38%)	-
1,001 - 2,000 GT	32 (7%)	2 (8%)	-
2,001 - 3,000 GT	20 (4%)	-	-
3,001 - 4,000 GT	9 (2%)	-	-
4,001 - 5,000 GT	5 (1%)	-	-
3,001 GT and above	22 (5%)	-	-
Total	441 (100%)	24 (100%)	4 (100%)

Source: Register of Ships 1994-1995, VIRES
Classified List of Ships & Their Main Particular, January 1996, VIRES

Table 1.3
SHIP AGE OF VIETNAMESE FLEET (REGISTERED TO VIRES)

Ship Age	General Cargo Ship	Tanker	Passenger Ship
Less than 5 years	79 (18%)	3 (12%)	-
5 - 10 years	180 (41%)	4 (17%)	2 (50%)
11 - 15 years	60 (14%)	1 (4%)	-
16 - 20 years	49 (11%)	6 (25%)	1 (25%)-
21 - 25 years	22 (5%)	5 (21%)	-
More than 25 years	51 (11%)	5 (21%)	1 (25%)
Total	441 (100%)	24 (100%)	4 (100%)

Source: Register of Ships 1994-1995, VIRES
Classified List of Ship & Their Main Particular, January 1996, VIRES

Table 1.4
VIETNAMESE FLEET NEW CONSTRUCTION SHIP NUMBER BY TYPE DURING 1990-1995 (REGISTERED TO VIRES)

Ship Size	General Cargo Ship	Tanker	Passenger Ship
500 GT and below	118	5	3
501 - 1,000 GT	9	0	0
1,001 - 2,000 GT	6	0	0
2,001 - 3,000 GT	1	0	0
Total	134	5	3

Source: Classified List of Ship & Their Main Particular, January 1996, VIRES
Note: Average Gross Tonnage for ship size 3,000 GT and above is inconsequential and therefore not shown.

1.2. Shipbuilding and repairing industries

(a) New building and repairing capacity of shipyards and their distribution

Based on our survey results, 59 shipyards, except those of river service ships and wooden ships, are operating in Vietnam (Table 1.5). Almost all shipyards have both newbuilding and repairing facilities but a few have repairing facilities only. The distribution of these shipyards by area is shown in Table 1.6.

As for newbuilding facilities for large-sized ships, the distribution by area is rather concentrated in the northern part of the country and there are less newbuilding and repairing facilities in the central part of the country.

(b) Governmental organization

Among these 59 shipyards, ten are supervised by the Ministry of Defense, 13 by VIETNAM SHIPBUILDING INDUSTRY CORPORATION (VINASHIN) and the remaining 36 are Regional State owned shipyards. Almost all the major shipyards are included in the 13 supervised by VINASHIN. The organization structure relating VINASHIN is as shown in Figure 1.1

(c) Output of shipyards

All new construction ships registered to VIRES during 1990-1995 are shown in Table 1. 7, and also Table 1.6.

The rate of new construction ships less than 500 DWT or GT are calculated as shown below:

General cargo ship	80%
Tanker	80%
Passenger ship	100%

From the figures in Table 1.7 and the above rates, it is clearly shown that the demand for newbuilding of tankers and large-sized ships is almost next to none.

Table 1.5

LIST OF SHIPBUILDING AND REPAIRING YARDS IN VIETNAM

No.	Name of shipyard	Location	Newbuilding capacity	Repairing capacity
1	An phu shipbuilding Co.	HCM City	1,500 DWT	1,500 DWT
2	Ba son shipyard	HCM City	-	15,000 DWT
3	Binh chanh ship-repairing service	HCM City	-	1,000 DWT
4	CARIC Enterprise	HCM City	300 DWT	600 DWT
5	Constructional engineering works	HCM City	1,000 DWT	1,000 DWT
6	Dong tam mechanical factory	HCM City	250 DWT	400 DWT
7	Dong tien shipyard	HCM City	400 DWT	650 DWT
8	Hiep thanh enterprise	HCM City	400 DWT	300 DWT
9	Hoang lim ship-repairing yard	HCM City	300 DWT	300 DWT
10	Mechanical communication enterprise Dis. 4	HCM City	600 DWT	600 DWT
11	Mechanical factory No. 76 (CK 76)	HCM City	600 DWT	10,000 DWT
12	Nha be shipyard	HCM City	300 DWT	400 DWT
13	Rang dong yard	HCM City	250 DWT	250 DWT
14	Sai gon ship-building CO.	HCM City	1,000 DWT	4,000 DWT
15	Sai gon shipyard	HCM City	200 DWT	200 DWT
16	SHIPPLACOM	HCM City	-	10,000 DWT
17	Thanh da shipyard Co.	HCM City	800 DWT	2,000 DWT
18	Thong nhat cooperative	HCM City	400 DWT	600 DWT
19	Thong nhat - Nha be mechanical factory	HCM City	Ship 400 DWT (Barge 800 DWT)	
20	Bach dang shipyard	Hai phong	6,000 DWT	8,000 DWT
21	Ben kien shipyard	Hai phong	1,500 DWT	2,000 DWT
22	Cam river shipyard	Hai phong	650 DWT	650 DWT
23	Fishing ship-repairing and building enterprise	Hai phong	400 DWT	200 DWT
24	Hai phong shipyard	Hai phong	400 DWT	600 DWT
25	Ha long engineering factory	Hai phong	200 DWT	200 DWT
26	Ha long FISCOM	Hai phong	200 DWT	400 DWT
27	Nam trieu shipyard	Hai phong	500 DWT	5,000 DWT
28	Ship-repairing service enterprise No. 1	Hai phong	400 DWT	600 DWT
29	Pha rung shipyard	Hai phong	-	16,000 DWT
30	Technical and Professional College of Transport No. 2	Hai phong	500 DWT	300 DWT
31	Tam bac shipyard	Hai phong	600 DWT	300 DWT
32	Ben thuy shipbuilding factory	Nghe tinh	1,000 DWT	750 DWT
33	Nghe tinh repairing works	Hghe tinh	Ship 100 DWT (Barge 250 DWT)	Ship 400 DWT (Barge 600 DWT)
34	Fish mechanic Co.	Da nang		
35	Hoa sen shipyard	Da nang	30 DWT	30 DWT
36	SEATECCO	Da nang	120 DWT	300 DWT
37	Song Han shipyard	Da nang	600 DWT	600 DWT
38	Song Thu Co.	Da nang	400 DWT	2,000 DWT
39	Ha long shipbuilding enterprise	Quang ninh	1,000 DWT	1,000 DWT
40	Ha long shipyard	Quang ninh	5,000 DWT	3,500 DWT
41	Khanh hoa shipbuilding and repairing works	Nha trang	600 DWT	600 DWT
42	Ha noi shipyard	Ha noi	1,500 DWT	200 DWT
43	Nhat thanh shipyard	Thai binh	100 DWT	100 DWT
44	The enterprise of salvage and ship repair	Vung tau	-	3,000 DWT

45	Vung gau shipyard	Vung tau	-	200 DWT
46	Ship-repairing enterprise No. 81	Hai phong		
47	Works No. 69	Hai phong		
48	Works No. 173	Hai phong		
49	X-46 shipyard	Hai phong		
50	X-48 shipyard	Hai phong		
51	X-50 shipyard	Da nang	500 DWT	4,500 DWT
52	X-51 shipyard	HCM City	1,000 DWT	1,100 DWT
53	X-500 shipyard	Hai phong		
54	Nam ha shipyard	Nam ha	600 DWT	600 DWT
55	Song dao - Nam ha shipyard	Ham ha	600 DWT	300 DWT
56	Song Lo shipyard	Vinh phu	600 DWT	400 DWT
57	Mechanical enterprise No. 721	Can tho	500 DWT	500 DWT
58	Shipbuilding and repairing enterprise No. 627	Kien giang	400 DWT	400 DWT
59	1 - 89 Enterprise	Hai phong	500 DWT	400 DWT

Note: (1) No. 34: Newbuilding and Repairing capacity are unknown.

(2) No. 46 - 50, 53: Newbuilding and repairing capacity are not disclosed because these shipyards belong to the Navy.

Source: List of Vietnam's shipbuilding and repair yards, 1996.

VIRES brochures of shipyards and results of field survey questionnaire.

Table 1.6

SHIPYARDS DISTRIBUTION BY AREA AND SCALE

	Northern Part Haiphong, Thai Bunh, Quang Ninh, Nam Ha, Hanoi	**Central Part** Da Nang, Nha Trang, Nghe Tinh	**Southern Part** HCM City, Can Tho, Vung Tau, Kien Giang	Sub-Total	Total
Newbuilding					
999 DWT>	14	7	15	36	46
1,000DWT<	5 (2)	1	4	10 (2)	(2)
Repairing					
999 DWT>	14	6	14	34	52
1,000DWT<	6 (4)	2 (1)	10 (5)	18 (10)	(10)

Note: Numbers in brackets show shipyards with capacities of 3,000 DWT and above.

Source: List of Vietnam's Shipbuilding and Repairing Yards, 1996, VIRES

Brochures of shipyards and results of field survey questionnaire

Figure 1.1

VIETNAM SHIPBUILDING INDUSTRY COOPERATION
ORGANIZATION CHART

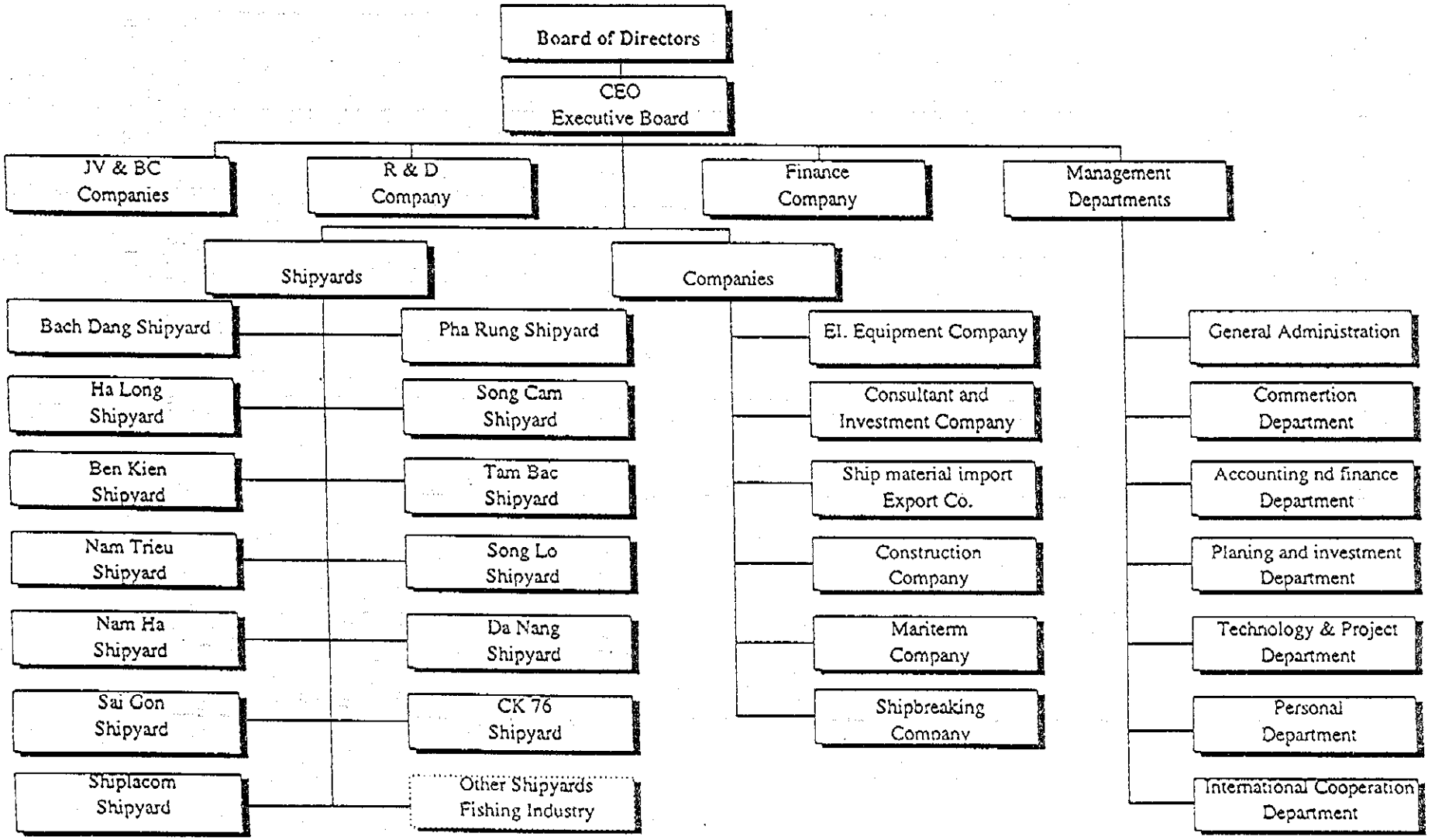


Table 1.7

NEW CONSTRUCTION SHIP NUMBER BY TYPE, DWT AND YEAR BUILT, DURING 1990-1995 (registered to VIRES)

SHIP SIZE (DWT)	1990	1991	1992	1993	1994	1995
(1) General cargo ship						
3,820	-	1	-	-	-	-
1,200 - 1,400	2	1	-	1	1	-
1,000 - 1,199	2	2	1	-	1	-
500 - 700	1	3	1	1	-	3
300 - 499	8	3	1	3	14	19
200 - 299	7	2	3	9	15	9
150 - 199	6	2	1	2	4	-
Unidentified	-	-	1	2	2	-
Total	26	14	8	18	37	31
(1) Total						134
(2) Tanker						
700	-	1	-	-	-	-
250 - 300	-	-	-	1	2	-
150	1	-	-	-	-	-
(2) Total						5
(3) Passenger ship						
160 - 200 GT	2	-	1	-	-	-
(3) Total						3
(4) Miscellaneous ships						
Floating crane	-	-	-	1	-	-
Supply boat	-	1	-	-	-	1
Tug boat	1	-	1	1	1	1
Barge	-	-	-	-	-	1
Pontoon	-	1	-	-	-	1
Unidentified	-	-	-	-	3	-
(4) Total						14
Total new construction ships during 1990 - 1995:						156

Source: LIST OF SHIP NEW CONSTRUCTION DURING 1990 - 1995, January 1996. VIRES

1.3. Major Shipyards

Referring to Table 1.8, major shipyards which are selected by their new-building and/or repairing capability among the 59 shipyards in Vietnam are the following seven shipyards.

	Newbuilding capacity	Repairing capacity
1) Bach Dang shipyard	6,000 DWT	8,000 DWT
2) Ha Long shipyard	5,000	3,500
3) Ben Kien shipyard	1,500	2,000
4) Pha Rung shipyard	-	16,000
5) Bason shipyard	-	15,000
6) Saigon Shipbuilding Company	1,000	4,000
7) Ship-Oil Platform repairing yard (SHIPPLACOM)	-	10,000

Four shipyards ((1)-(4)) are located in Hai Phong and Ha Long. The other three ((5)-(7)) are located in Ho Chi Minh City.

The facilities of the above seven shipyards for newbuilding and/or repairing are shown in Table 1.8.

Table 1.8

LIST OF SHIPBUILDING AND REPAIRING YARDS IN VIETNAM (1/4)

Name of Shipyard	Bach Dang Shipyard	Ha Long Shipyard
Location	Hai Phong	Ha Long
Year established	1964	1971 (Construction started) 1976 (Operation started)
Supervising organization	VINASHIN	VINASHIN
Total area	30 ha	25 ha
Number of working staff	2,000	650
	(190 - Engineers, 200 - Technicians and 5 ~ 600 Skilled Workers including 70 highly qualified welders)	70 - Engineers, 80 - Technicians and 60 highly qualified welders
Newbuilding capacity	6,000 DWT	5,000 DWT
Repairing capacity	8,000 DWT	3,500 DWT
Dock size and	70m x 16m x 1	-
Crane capacity	15 T x 1	
Slipway size and	120m x 20m x 1 ===> 25T	260m x 120m x1
Crane capacity	20 T x 1 x	(1,500 DWT x 2 ships or
	90m x 16m x 1 ===> 1	1,000 DWT x 3 ships)
	15 T x 1	20 T x 20m x 2
Mooring quay length	90 m	470m
and crane capacity	18 T x1	8T x 30m x 2
Floating dock size	100m x 23m x 13.5m	-
and crane capacity	4,500T - lifting weight (Up to 8,000 DWT) x 1 5T x 1 and 10T x 1	

Source: Brochures of shipyards and results of field survey questionnaire
List of Vietnam's Shipbuilding and Repairing Yards, 1996. VIRES

Table 1.8

LIST OF SHIPBUILDING AND REPAIRING YARDS IN VIETNAM (2/4)

Name of Shipyard	Pha Rung Shipyard	Ben Kien Shipyard
Location	Hai Phong	Hai Phong
Year established	1984	1976
Supervising organization	VINASHIN	VINASHIN
Total area	12 ha	13 ha
Number of working staff	750	450
	(110 - Engineers)	(56 - Engineers, 33 - Technicians and 270 - Skilled Workers including 30 - highly qualified welders)
Newbuilding capacity	-	1,500 DWT
Repairing capacity	16,000 DWT	2,000 DWT
Dock size and Crane capacity	Repair dock up to 16,000 DWT 156m x 25m x 1 15T x 1 Max. draft: High tide 7m Low tide 4.35m	80m x 14.5m x 1
Slipway size and Crane capacity	-	90m x 20m x 1 75m x 12m x 1
Mooring quay length and crane capacity	200m x 1 and 150m x 1 10 T x1	150m x 1 and 80m x 1 8T x 1
Floating dock size and crane capacity	-	-

Source: Brochures of shipyards and results of field survey questionnaire
List of Vietnam's Shipbuilding and Repairing Yards, 1996. VIRES

Table 1.8
LIST OF SHIPBUILDING AND REPAIRING YARDS IN VIETNAM (3/4)

Name of Shipyard	Bason Shipyard		
Location	Ho Chi Minh City		
Year established	About 130 years ago		
Supervising organization	Ministry of Defence (Navy Shipyard)		
Total area	22 ha (Bason Shipyard) 4 ha (Keppel Bason Shipyard and Engineering Ltd.)		
Number of working staff	2,000 (150 - Engineers)		
Newbuilding capacity	-		
Repairing capacity	15,000 DWT		
Dock size and Crane capacity	Repair dock up to 15,000 DWT		152m x 20 lm x 10.6m x 1 15T x 1
	Repair dock up to 200 DWT		37m x 8.4m x 4.7m x 1 10T x 1
Slipway size and Crane capacity	137.6m x 18m (Up to 700 DWT) x 1 20T x 1		
Mooring quay length and crane capacity	171m x 18m x 9m	15,000 DWT	32t x 1
	19m x 7m x 9m	5,000 DWT	
	185M x 20m x 5m	10,000 DWT	
	122M x 17.5m x 10m	15,000 DWT	16T x 1
	125m x 12.4m x 8m	12,000 DWT	
	130.5M x 12.4m x 5m	5,000 DWT	
Floating dock size and crane capacity	140m x 23.5m x 8m	8,500T - lifting (Up to 15,000 DWT) x 1	10T x 2
	87m x 14m	2,000T - lifting x 1	5T x 2
Floating crane	60T x 12m x 1		

Source: Brochures of shipyards and results of field survey questionnaire
List of Vietnam's Shipbuilding and Repairing Yards, 1996. VIRES

Table 1.8

LIST OF SHIPBUILDING AND REPAIRING YARDS IN VIETNAM (4/4)

Name of Shipyard	Saigon Shipbuilding Company	Ship-Oil Platform repairing yard (SHIPPLACOM)
Location	Ho Chi Minh City	Ho Chi Minh City
Year established	Base 1: 1976 Base 2: 1991	1977
Supervising organization	VINASHIN	VINASHIN
Total area	Base 1: 3.5 ha Base 2: 11 ha	Repairyard: 8 ha
Number of working staff	350 (40 - Engineers)	330 (30 - Engineers and Technicians)
Newbuilding capacity	Base 1: 1,000 DWT	-
Repairing capacity	Base 1: 1,000 DWT Base 2: 4,000 DWT	10,000 DWT
Dock size and Crane capacity	Base- 1: 51m x 17m x 4m x 1 30m x 12m x 3m x 4	85m x 23m x 4m x 1 90m x 23m x 4m x 2 60m x 23m x 4m x 1
Slipway size and Crane capacity	Base- 1: 50m x 4.5m x 4 Base 2: 100m x 4m x 1 (Up to 600 DWT)	50m x 5m x 1 130m x 20m x 1 5T x 2
Mooring quay length and crane capacity	Base- 1: 120m x 1	-
Floating dock size and crane capacity	163m x 14.5m x 14m 8,000T - lifting (Up to 4,000 DWT) x 1 2.5T x 1 and 2T x 1	130m x 30m x 14m 6,000T - lifting (Up to 10,000 DWT) x 1 5T x 2

Source: Brochures of shipyards and results of field survey questionnaire.
List of Vietnam's Shipbuilding and Repairing Yards, 1996. VIRES

1.4. Shipbuilding Technologies

(a) Present condition of shipbuilding industry

1) Shipbuilding record in Vietnam

The shipbuilding record of the past six years from 1990 to 1995 in Vietnam was 156 ships including barges, floating cranes, tug boats, etc.

The building record of general cargo ships above 1,000 DWT (approximately 990 GT) among the above 156 newbuilding ships are shown in Table 1.9. Furthermore, five oil tankers, the smallest 150 DWT and the largest 700 DWT, were built in Vietnam.

2) Technical Capability of Shipyards in Vietnam

Most ships built domestically are of types below 1,000 DWT in size although there is one shipyard which has a building capacity of up to 6,000 DWT (about 5,500 GT) type.

The time needed to build a cargo ship of 1,000 DWT class with a length of about 65 m is on average 15 months.

Technical backwardness in production efficiency, quality control and accuracy control was frequently noted during our shipyard survey. It seems that this is not so much a serious problem that needs to be solved urgently under the inactive newbuilding market, but is a most essential problem in the modernization of all shipyards in Vietnam building and repairing ships so that they may compete with shipyards in foreign countries.

VIETNAM REGISTER OF SHIPPING (VIRES) is responsible for survey and inspection of newbuilding ships during construction, but it seems that inspection, for example, on steel material and welding workmanship is not necessarily strict enough.

All the drawings and plans for newbuilding, from basic design drawings to working plans, are prepared by the Research and Design Institutes of Transport Industry (RDITI) of VIETNAM SHIPBUILDING INDUSTRY CORPORATION (VINASHIN) and are purchased by the shipyards, supplied by the shipyards, or supplied by owners.

All machines, equipment and steel material are imported from foreign countries, which results in diversity of quality depending on the country of origin. Small parts for outfittings are processed internally by the shipyard; however, the shipbuilding-related industry is not yet even at the embryo-stage in Vietnam.

As for price, there is almost no difference in price level among shipyards in spite of their difference in scale, facilities and capability. It seems a shipyard rarely makes a cost estimate on ship-ship basis. This background discourages investments in facilities and results in the deterioration of shipyards.

Generally speaking, the grade of specifications for accommodation quarters and machinery and equipment of ships are not high due to owner financial limitations.

Guarantee period for a ship after delivery in Vietnam is usually as short as six months, as opposed to one year in Japan.

Table 1.9
BUILDING RECORD OF GENERAL CARGO SHIP ABOVE 1,000 DWT (REGISTERED TO VIRES)

Year built	Dimension (L x B x D)	DWT
1990	66.40 x 11.64 x 4.80	1,400
1990	70.81 x 9.50 x 5.00	1,200
1990	65.00 x 11.80 x 4.82	1,120
1990	64.00 x 11.60 x 4.80	1,000
1991	64.00 x 11.64 x 4.80	1,000
1991	64.00 x 11.64 x 4.80	1,000
1991	65.00 x 11.80 x 4.82	1,364
1991	83.68 x 14.50 x 8.00	3,850
1992	64.00 x 11.20 x 5.20	1,000
1993	65.00 x 11.80 x 4.82	1,364
1994	65.00 x 11.80 x 4.82	1,364
1994	65.00 x 11.80 x 4.82	1,000

Source: List of Ship New Construction During 1990-1995, January 1996. VIRES

(b) Present condition of the design supply for new building ship

1) Design supply source

Recently, VIETNAM SHIPBUILDING UNION (VINASHUN) which had been under the control of MINISTRY OF TRANSPORT (MOT) was newly organized as VIETNAM SHIPBUILDING INDUSTRY CORPORATION (VINASHIN).

Research and Design Institute of Transport Industry (RDITI) which had been under the control of VINASHUN also became under the control of VINASHIN and is continuing design supply to ship owners and shipyards

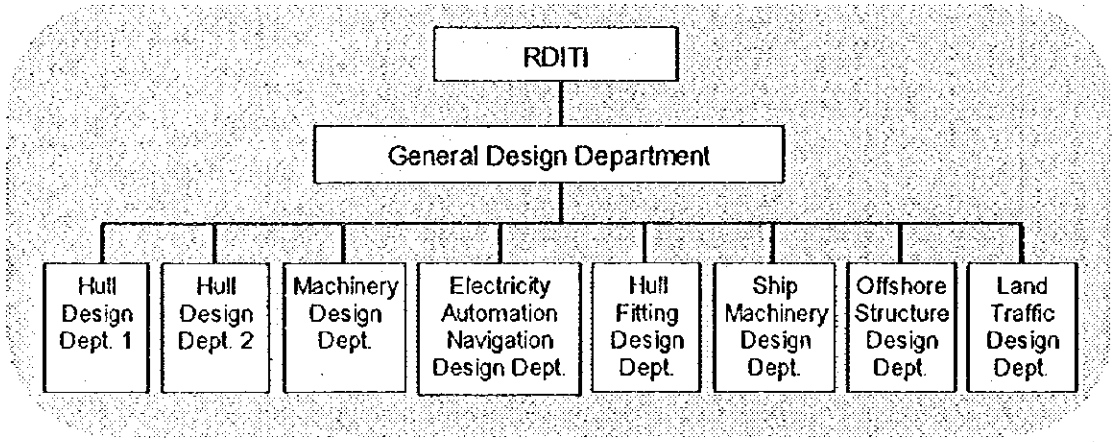
2) Research and Design Institute of Transport Industry (RDITI)

RDITI, now with more than 200 technical staff, has more than 100 types of ship designs in stock. Its activities range from preparation and supply of drawings to shipyards upon request, consulting work per owner's request, and negotiation with owners the behalf of shipyard, to technical advising to shipyards.

Though RDITI seemingly can afford to deal with the current level of demand for newbuildings, it will have to be strengthened so that it can comply with the requirements to be brought up by future increases in ship demand, and adoptions of the latest types of machinery and equipment.

In order to strengthen and prepare research work for a possible increase in demand for special purpose ships, RDITI has constructed a Ship Model Towing Tank (L=100m, B=6.0m and D=4.0m) in Hanoi city. However, these facilities remain to be completed as planned, including the installation of the planned facilities/equipment not yet provided, such as towing devices, testing/ measurement instruments and the planned addition of the 2nd and 3rd floors to the existing building in order to provide sufficient workspace for research personnel.

Figure 1.2
ORGANIZATION FLOW CHART FOR RDITI



(c) Present condition of the educational system for naval architects

Vietnam Maritime University (VIMARU) is located in Hai Phong, and the Naval Architecture Department is one of their eight departments.

The departments and number of students are shown below.

Nautical	500
Mechanice (Engineering)	400
Marine electronic, Electrical Radio	200
Communication	200
Sea Transport Economic	400
Naval Architecture	300
Port Hydro Engineering	100
Computer Center	40

VIMARU is 5-year school and class hours of the Naval Architecture Department is 3,920 hours in total (1school hour: 45 minutes).

The curriculum of the Naval Architecture Department is shown in Table 1.10.

The 60 graduates of the Naval Architecture Department are employed as follows:

- Maritime University, Naval Academy, Waterway College
- Civil and Naval ship design institutes
- Maritime Transport companies
- Shipyards
- Register of shipping companies
- Petroleum exploration company
- Engineering factories
- Sea and River ports and harbors

The site area of VIMARU is 12 hectares of which more than half are still undeveloped. The educational facilities and collection of books in the library does not appear to be in good condition.

The workshop course and the practice course are performed utilizing the facilities of other organizations.

Table 1.10
NAVAL ARCHITECTURE DEPARTMENT

No.	SUBJECT	Class hour
1	Philosophy	90
2	Economics	90
3	History	90
4	Physical Training	120
5	English	400
6	Mathematics	300
7	Applied Mathematics	90
8	Informatics and Computer studies	75
9	Physics	210
10	Electronics	60
11	Chemistry	75
12	Descriptive Geometry	60
13	Technical Drawing	60
14	Thermodynamics	60
15	Theoretical Mechanics	120
16	Strength of Material	140
17	Structure of Material	90
18	Metalography and Metal Processing	100
19	Electrotechnic	75
20	Mechanics of Machinery and Machinery detail	135
21	Mechanics of Fluid	90
22	Theory of Elastic	75
23	Mechanics of Ship Constructor	105
24	Safety at Working	30
25	Energetic Machines	75
26	Ship Electric	60
27	Economics in Ship Building	60
28	Naval Architecture I	95
29	Naval Architecture II	150
30	Ship Constructor	110
31	Strength in Vibration	90
32	Arrangement of Systems	110
33	Architecture of Designing	150
34	New Technology in Ship and Ship Repairing	120
35	Organizing in Ship Building	50
36	Measuring and Testing Equipment for Ship	30
37	Automation	50
38	Maritime Laws	30
	Total	3,920

1..5. Ship Inspection System

(a) General

Ship Inspection systems are basically related to ship construction processes and quality of equipment to be used on board and also with ship safety operations. The former is deeply concerned with quality management of shipyard and repair facilities and the latter is depending upon ship owner policy of quality system on their ship management, also master's (and his crew) recognition of safety of life at sea (SOLAS), prevention of pollution from ship (MARPOL) and relative convention, rules and regulations to be applied. Our study tour, therefore, accompanying with shipbuilding and it's technology group visited main facilities of shipbuilding/repairing concerned at Ho Chi Minh, Danang, and Hai Phong and on the way, also visited onboard some Vietnamese flag ship for condition evaluation and ship owner's office for confirming their knowledge of safety management system in the company.

(b) Law and Regulation

In Vietnam, the law governing the maritime field was established on June 30, 1990 and executed from January 1, 1991 as the "Vietnam Maritime Code" (hereinafter referred as "CODE"). The CODE mainly covers ship operation matters and in Article 24 of the CODE, the Government recognized the "Vietnam Register of Shipping" (hereinafter referred to as "VIRES") as the governmental organization to carry out the "registration activities" (refer to the below on VIRES) and also appointed the Vietnam Maritime Safety Inspectorate (hereinafter referred as "VMSI") to inspect and verify ships from the viewpoint of maritime safety and prevention of pollution. However, detailed procedure and technical requirements of ship construction and equipment, and technical procedures for ship inspection during construction and/or operation, and requirements of qualification of ship inspector, do not appear in the CODE and implementing procedure of international conventions which the government has to ratify also does not appear in the CODE.

On December 28, 1992, two government decisions concerning 1) Rule for the Organization and Sea-going Ship Registration Activities in Vietnam (No. 203/Ttg) (Appendix 1) and 2) Rules for the Organization and Activities of Vietnam Marine Safety Inspectorate (No. 204/Ttg) (Appendix 2) were enacted. These government decisions, authorize VIRES to carry out the "registration activities," i.e. technical supervision, classification, tonnage measurement, and issuance of relevant certificates including international convention which the government has ratified. VMSI, belonging to Vietnam National Maritime Bureau (VINAMARINE), was authorized to carry out marine safety inspection and protection of environment from pollution caused by ships in territorial waters of Vietnam.

As of 1995, Vietnam has ratified the following international conventions and set into action the National Regulation as practiced by VIRES.

SOLAS 60	26th May, 1965
SOLAS 74	18th March, 1991
SOLAS Protocol 78	12th January, 1993
ILLC 66	18th March, 1990
COLREG 72	18th December, 1990
TM 69	18th March, 1991
MARPOL 73/78	29th August, 1991
STCW 78	18th December, 1991
	(data from IMO Circular)

(c) Vietnam Register of Shipping (VIRES)

VIRES was founded in 1964 with its head office in Hai Phong city and 22 survey offices around the country. Some 380 technical staff, including 200 sea-going ship surveyors are a part of the organization. In addition to five other departments, VIRES is organized as follows:

- The Sea-going Ship Registration and Classification Department
- The Inland Ships Registration and Classification Department
- Offshore Department
- Rule Department
- Training Department

Complying with the requirement of SOLAS new Chapter IX (ISM-CODE), VIRES established the following two departments, in January, 1996:

- Ship Safety Management Department, and
- Internal Quality Audit Department

Now, 137 sea-going ship surveyors from the above 200 are placed in 13 out-offices. The Rules & Regulations of VIRES was first established in 1964 based on ex-USSR Register of Shipping. VIRES has recently started to modify it to meet current international requirements.

(d) Vietnam Marine Safety Inspectorate (VMSI)

The Safety Inspection Department of VMSI, with three staff members, is stationed in the VINAMARINE head office in Hanoi city and has an appointed Central Marine Safety Inspector in the VINAMARINE Hai Phong office and a Marine Safety Inspector is planned for the Ho Chi Minh office. However, systematic organization has yet to be set up.

In accordance with Article 59 of the CODE, the Ministry of Transport and Communication established 16 Port Authorities around the country. The power and duties are "to supervise the fulfillment of the rules and regulations on maritime

navigation safety, environmental pollution prevention, marine sanitation and order,," Vietnam has been a member of TOKYO MOU since December 1, 1993, when MOU was agreed on by the countries concerned, and the government agreed to eliminate all sub-standard ships from the Asian-Pacific area. However, systematic organization of 'port state control officers has yet to be set up in Vietnam.

(e) Ship Inspection

From the Register of Ships (1994-1995), 678 sea-going ships have been registered to VIRES. The classified data according to year of build are shown below.

Note: tug boats, fishing boats, marine structures without propulsion machinery like floating Docks, barges & etc. were excluded.

			in which Ocean-going	
Year of Built	No.	G/T	No.	G/T
>1960	8	16,369		
1961- 1970	51	97,440	8	30,099
1971- 1980	97	136,508	38	80,248
1981- 1985	66	82,140	14	53,474
1986- 1990	189	72,015	5	11,385
1991- 1995	86	33,968	6	8,288
Total	497	438,467	71	183,494

(Note: VIRE's Register of Ships 1994 - 1995)

Surveyors belonging to VIRES have surveyed Vietnamese flag vessels 1,164 times during 1995 according to VIRES Rule, and on Foreign Flagged vessels 90 times upon owner application for survey.

Materials, equipment, inventory, machines and welding materials to be used for ship construction and installation are not yet systematically approved by VIRES due to lack of supporting industry in Vietnam. Therefore, shipyards are obliged to accept to used imported parts which have been approved by foreign governments or by one of the International Classification Societies. Also, the following three workshops need to be established as soon as possible in compliance with internationally recognized conventions.

- Life-Raft regular maintenance work-shop
- Radio equipment including GMDSS equipments maintenance workshop
- Oil-Reception facilities to protect marine pollution

(f) Training

The training curriculum for qualified VIRES surveyors is curently undergoing re-scheduling. VMSI and Port Authorities are looking to send the necessary number of staff to the Tokyo MOU PSC Officer Study Seminar.

1.6. Evaluation on the Present Situation

(a) General condition of Repairing and Newbuilding Shipyards

Presently there are about 18 shipyards for repairing ships and 10 shipyards for newbuilding ships of 1,000 DWT and above located in the northern, central and southern areas. Among them, the following 6 shipyards can repair large size ships.

- Pha Rhung (16,000 DWT)
- Bach Dang (8,000 DWT)
- Ha Long (3,500 DWT)
- Bason (15,000 DWT)
- Shipplacom (10,000 DWT)
- Saigon Shipbuilding Co.(4,000DWT)

The other 12 can repair ships of 1,000 DWT and below.

The newbuilding shipyards are located only in the northern area and the following three shipyards can build large-size ships.

- Bach Dang (6,000 DWT)
- Ha Long (5,000 DWT)
- Ben Kien (1,500 DWT)

The estimated nationwide productivity of repairing and newbuilding shipyards are as shown below.

- Repairing ships: 1,000-16,000 DWT x approximately 220 ships p.a.
- Newbuilding ships: 1,000 DWT & above x 6 ships p.a.
  (From the newbuilding records of the past 11 years)

(b) Distribution circumstances of Repairing shipyards

1) Northern area (Hai Phong and Quang Ninh area):
Technical material facilities are comparatively sufficient.
The estimated capacity for repairing ships :
1,000 - 16,000 DWT x approximately 90 ships p.a.

2) Southern area (Ho Chi Minh and Vung Tau area):
The capacity of shipyards is small except for a few of them which are distributed separately, while the demand of repairing ships is very high. The estimated capacity for repairing ships:
1,000 - 15,000 DWT x approximately 110 ships p.a.

3) Central area (Da Nang area)
The estimated capacity for repairing ships:
1,000 - 4,500 DWT x approximately 20 ships p.a.

(c) Existing State of Repairing Shipyards

- It is obvious that there is a lack of modern facilities and equipment as well as technical skills, for repairing ships. Due to the existing outdated facilities and equipment, worn-out machine tools in the workshop, and other unfavorable conditions, the work scope of repairing-works is highly limited.
- The general repairing works for ships of 1,000- 5,000 DWT are available, but repairing works for ships of above 5,000 DWT can be done only by a few limited shipyards and the available work scope is at the utmost medium grade.
- The engine repairing works for medium and small size engines (below 2,500 HP) are available but only restricted small repairing and maintenance works can be done for new model engins with big capacities.
- Generally ship repairing technology is not yet improved and of low-standard. Consequently, the low labor efficiency causes longer repairing time and the working rate of equipment and machine tools are reduced to the level of 50-60% of their designed capacities.

(d) Existing State of Newbuilding Shipyards

The newbuilding of general cargo ships (above 1,000 DWT) since 1984, was concentrated in Bach Dang and Ha Long shipyard as shown in the following building records (1984-1994)

YEAR	Total number	Bach Dang	Ha Long	Ben Kien	(unknown)
1984	2	2	-	-	-
1985	6	5	1	-	-
1986	5	2	1	-	2
1987	2	1	-	-	1
1988	3	3	-	-	-
1989	6	4	1	-	1
1990	4	2	1	-	1
1991	4	2	1	-	1
1992	1	-	-	1	-
1993	1	-	1	-	-
1994	2	-	2	-	-

The following problems were apparent in every shipyard covered by the survey:

- The technical backwardness in the production efficiency, quality control and accuracy control on all-over new ship construction works.
- The lack of construction standards and practice and inspection standards. (These introduce better production effects).
- The most basic flow of drawings and plans system for new ship building, detailed working plans for hull construction work and hull and machinery fitting work should be prepared to get better efficiency and quality. This system has not yet been introduced to the shipbuilding field in Vietnam.
- Almost all machines, equipment and materials for shipbuilding are imported from foreign countries. Related domestic industries are still far from becoming growth industries.
- The lack of modern facilities and equipment for newbuilding ships (This item is entirely the same condition as those for repairing ship).

The solving of the above problems is essential to the modernization of all shipyards in Vietnam. If these problems are eliminated, shipyards in Vietnam may compete with those of foreign countries. The following is representative of shipping companies in Vietnam:

"The ships built in the domestic shipyards are high in price and low in performance, while the used ships built in the foreign shipyards are of reasonable price, in good performance and are easy to operate."

(e) Existing State of Ship Inspection

VIRES has no testing laboratory at the present, and can't carry out mechanical and/or non-destructive examination. They are obliged to conduct these activities at outside institutions and/or shipyards. However, those facilities are also not properly operated due to lack of maintenance procedures and of parts and equipment (originally supplied from ex-USSR and/ or Eastern Europe countries). VIRES, therefore, has a plan to establish modern testing laboratories and is being asked to do so in cooperation with Vietnam Maritime University (VIMARU) in Hai Phong city. However, no financial support is expected at the moment. VIRES branch office has the responsibility of conducting safety inspections onboard ships but does not have enough equipment nor instruments to confirm safe working conditions.

During our survey tour we also found:

- Most machines and equipment used for shipbuilding and/or repairing work are out of operation due to difficulties in obtaining maintenance spare parts. Hence, accuracy of machine work can not be expected. In addition, there is a lack of interest in paying attention to "Quality Systems."

- Per our interviews of ship owners, masters, and crews onboard ships, we found that there is a lack of knowledge concerning SOLAS 74 Chp. IX (ISM-Code) which is required to be adopted (July, 1988 for 1st step and July, 2002 for 2nd step). A ship engaging in international voyage is well-equipped with safety equipment and marine pollution prevention measures as per international conventions, but coasting services, especially river service boats are found 1) over-loaded with cargo up to the deck lines (ignoring their free-board assignment) and 2) without safety equipment (i.e. navigation light, life raft, etc.)

2 Formulation of Development Plans

2.1. Development Directions

2.1.1 Planning Assumptions

In accordance with the Coastal Shipping Fleet Development Plan, 42 General Cargo Ships of 3,000 DWT and 118 General Cargo Ships of 1,000 DWT will become necessary as newly deployed vessels until the year 2010. These figures indicate almost 500% of the sum of newly built ships (above 1,000 DWT) for the past 10 years (Cf. Chapter 1.6. "Existing State of Newbuilding Shipyards", 34 General Cargo Ship (above 1,000 DWT) were built between 1985-1994).

For ship repairing, the following repairing capacities are expected until the year 2010.

Northern area (Quang Ninh - Thanh Hoa)
Ships of 1,000 DWT and above x 400 ships p.a.
Central area (Nghe An - Binh Thuan)
Ships of 1,000 DWT and above x 280 ships p.a.
Southern area (Dong Nai - Kien Giang)
Ships of 1,000 DWT and above x 600 ships p.a.

The above figures in total indicate almost 600% of the actual figure in 1995. [Cf. 2.1.2, "Repairing Shipyards" (a), (b) & (c)]

According to the above estimates, the rehabilitation and development plans for the modernization of shipyard facilities and machine equipment and the improvement of the technical skill and quality on repairing and newbuilding works should be realized without delay.

The problem for the modernization of all shipyards in Vietnam to build and repair ships competing with the shipyards in the foreign countries are quite clear as shown in the following articles.

Chapter 1.6.(c), " Existing State of Repairing Shipyards"
Chapter 1.6.(d), " Existing State of Newbuilding Shipyards"

2.1.2. Selection of Repairing Shipyards Subject to the Study

The rehabilitation and development plans for the modernization of shipyard facilities and machine equipment and the improvement of technical skill and quality for repairing works are to be concentrated on the repairing shipyards in the key economic areas which have big sea port system with high ship traffic density.

According to the National Economic Development strategy, these key economic areas are northern, central, and southern areas.

Northern area:	Nam Trieu Shipyard (Hai Phong) Nam Ha Shipyard (Nam Dinh, Nam Ha)
Central area:	Ben Thuy Shipyard (Nghi Xuan, Ha Tinh) Song Han Shipyard (Danang)
Southern area:	CK - 76 Shipyard (Ho Chi Minh city) Binh Trieu Shipyard of SHIPPLACOM (Ho Chi Minh city)

The above shipyards in each area (6in total) shall be selected as the qualified repairing shipyards to the Coastal Shipping Rehabilitation and Development plans in due consideration of the distribution of the size and number of coastal fleet ships (Ships up to 1,000-3,000 DWT) operating in each area and the observations on ship repairing works of each area as shown in the next page and also the specialization of these repairing shipyards for the coastal fleet ships up to 1,000-3,000 DWT shall certainly ensure the early and successful results to the improvement of repairing works both in quantity and quality and the shortening of repairing work time.

The facilities of these six-shipyards are shown in the Table 2.1.

(a) Northern area (Quang Ninh - Thanh Hoa)

The shipyards are concentrated in the Quang Ninh - Hai Phong area. This area has an almost complete mechanical network for ship repairing works. Therefore, in the development plan, the upgrading and widening of existing shipyards facilities shall be done to increase the receiving capacities for bigger ships and to improve productivity.

The expected repairing capacity in this area is as shown below:

- To the year 2010 - Ships of 1,000 DWT and above x 400 ships p.a.
- To the year 1995 - Ships of 1,000 DWT and above x 90 ships p.a.

Repairing ships up to 50,000 DWT

(b) Central area (Nghe An - Binh Thuan)

The present situation of this area is repairing ships only; newbuilding is not available. However, the location of this area is very close to the international maritime route, compared to other areas in the country, and it is possible to attract foreign flag ships operating in southeast Asian and north Asian sea areas. Furthermore, the state plan on

the economic development in the central area is to build large-scale factories and to improve port facilities.
The expected repairing capacity in this area is as shown below:

- To the year 2010 - Ships of 1,000 DWT and above x 280 ships p.a.
- To the year 1995 - Ships of 1,000 DWT and above x 20 ships p.a.

Repairing ships up to 200,000 DWT

(c) Southern Area (Dhong Nai - Kien Giang)

This area has the biggest market demand for repairing ships, but the shipyards are scattered and they do not possess high-level abilities.

The upgrading of existing shipyards facilities in Ho Chi Minh city shall be done and new shipyard for repairing ships and sea drilling platforms shall be built in Vung Tau - Thi Vai area.

The expected repairing capacity in this area is as shown below:

- To the year 2010 - Ships of 1,000 DWT and above x 600 ships p.a.
- To the year 1995 - Ships of 1,000 DWT and above x 110 ships p.a.

Repairing ships up to 20,000 DWT

Table 2.1. **FACILITIES OF SHIPYARDS FOR NEWBUILDING & REPAIRING**

Name of Shipyard	Nam Trieu Shipyard	Nam Ha Shipyard	Ben Thuy Shipyard	Song Han Shipyard	CK - 76 Shipyard	Binh Trieu Shipyard (SHIPPLACOM)
Location	Hai Phong	Nam Dinh, Nam Ha	Nghi Xuan, Ha Tinh	Da Nang	Ho Chi Minh City	Ho Chi Minh City
Year established	1969	1960	1971	1979	1976	1977
Supervising organization	VINASHIN	VINASHIN	VINASHIN	VINASHIN	VINASHIN	VINASHIN
Total area	9 ha	0.6ha	7.8 ha	5.5 ha	4.9 ha	8 ha
Number of working staff	404	300	145	88	352	330
	Engineers: 34	Engineers: 24	Engineers :7	Engineers/Technicians: 12	Engineers : 13	(Including 30-Engineers and Technicians)
	Technicians: 36	Technicians : 10	Workers : 125	Workers: 50	Technicians : 7	
	Experienced workers: 144	Experienced workers: 18	Administration staff: 13	Administration staff: 26	Experienced workers: 68	
	Workers : 132	Workers: 248			Workers : 244	
	Office Staff 58				Office staff : 20	
Newbuilding capacity	500 DWT	600 DWT	1,000 DWT	600DWT	600DWT	-
Repairing capacity	5,000 DWT	660 DWT	750 DWT	600DWT	10,000DWT(at anchorage)	1,000 DWT
Dock size and Crane capacity	110m x 20m -	-	-	-	-	90m x 23mx4mx2
	3,000 DWT x 1 (Under construction)					85mx23mx4mx1
						60mx23mx4mx1
Slipway size and Crane capacity	50m x 30m - 200LT x 1	125m x 3m - 400LT x 1	160m x 3.5m x 1	160m x 10m - 400LT x 1	40mx10m-500LTx1	130mx20mx1
		130m x 4.5m - 650LT x 1	100m x 3.5m x 3	70 x 8m - 100LT x 1		50mx5mx1
			48m x 36m x 1			
Mooring quay length and	20m x 1	20m x 1	200mx1	40m x 1	-	-
Crane capacity	5/10 T x 1			15m x 1		
Floating dock size and Crane capacity	-	-	-	-	-	-

Source: Brochures of shipyards and results of field survey questionnaire.

List of Vietnam's Shipbuilding and Repair Yards, 1996. VIRES

2.1.3. Selection of Newbuilding Shipyards Subject to the Study

It is no exaggeration to say that superannuated ships over 15 years are commonly operating in the coastal shipping of Vietnams.

The replacing of these ships is done after 17.4 years for general cargo ships and 13.5 years for tankers, according to the statistics in Japan where repairing and maintenance works are done comparatively well.

It is strongly suggested that superannuated ships in Vietnam be replaced with used ships sooner than the current policy of 20 years for general cargo ships, and 15 years for tankers. This will ensure safe navigation of coastal service ships.

The following technical improvements shall be required in the Vietnamese newbuilding shipyards so that they may build standard ships to replace the excessively superannuated ships.

- The welding works shall be done by the welders qualified by the classification society or by welders of equivalent skill level.
- The yard design shall be respectively developed in each shipyard with due consideration to their respective working practices, facilities, and capacity of work shop. Production sections are to establish their own proper working standards and practice to achieve higher work efficiency.
- The shipyard shall take full responsibility for the quality all products. The inspection department has to keep the autonomy in the organization of the shipyard and has full authority on matters which are related to quality and material control.
- The shipyard shall strictly control building schedule from keel laying to the completion of the ship, and shall also strictly respect the delivery times limit. The placing order of machinery and materials shall be done intentionally connecting to the building schedule.

The following three shipyards shall be selected as qualified newbuilding shipyards in the Coastal Shipping Rehabilitation and Development plans.

- Bach Dang Shipyard (Hai Phong)
- Ha Long Shipyard (Ha Long, Quang Ninh)
- Ben Kien Shipyard (Hai Phong)

The selection is made with due consideration to the following:

Facilities and technical potentials for the newbuilding of ships is superior to other shipyards as described in Chapter 1.3.

Location (northern area) has more high-mechanical and related industrial networks, and more efficient means of material procurement compared to southern and central areas.

Since 1984, newbuilding records of general cargo ships (Above 1,000 DWT) were almost all concentrated in these three shipyards (refer to Chapter 1.6(d)).

According to the above observations, the improvement of newbuilding works both in productivity and workmanship, the shortening of construction periods and the reduction of construction costs can be anticipated as necessary investment in facilities and equipment is comparatively lower for these three shipyards, than for others.

The facilities of the selected shipyards are shown in the Table 2.2.

Table 2.2

FACILITIES OF SHIPYARDS FOR NEWBUILDING & REPAIRING

Name of Shipyard	Bach Dang Shipyard	Ben Kien Shipyard	Ha Long Shipyard
Location	Hai Phong	Hai Phong	Ha Long
Year established	1964	1976	1971
Supervising organization	VINASHIN	VINASHIN	VINASHIN
Total area	30 ha	13 ha	25 ha
Number of working staff	2,000 (190 - Engineers, 200 - Technicians and 5 - 600 Skilled workers including 70 - highly qualified welders)	450 (56 - Engineers, 33 - Technicians and 270 - Skilled Workers including 30 - highly qualified welders)	650 (70 - Engineers, 80 - Technicians and 60 - highly qualified welders)
Newbuilding capacity	6,000 DWT	1,500 DWT	5,000 DWT
Repairing capacity	8,000 DWT	2,000 DWT	3,500 DWT
Dock size and Crane capacity	70m x 16m x 1, 15T x 1	80m x 14.5m x 1	-
Slipway size and Crane capacity	120m x 20m x 1 ===> 25T 20T x 1 x 90m x 16m x 1====>1 15T x 1	90m x 20m x 1 75m x 12m x 1	260m x 120m x 1 (1,500 DWT x 2 ships or 1,000 DWT x 3 ships) 20T x 20m x 2
Mooring quay length and Crane capacity	90 m 18T x 1	150m x 1 and 80m x 1 8T x 1	470m 8T x 30m x 2
Floating dock size and Crane capacity	100m x 23m x 13.5m 4,500T - lifting weight (Up to 8,000 DWT) x 1 5T x 1 and 10T x 1	-	-

Source: Brochures of shipyards and results of field survey. List of Vietnam's Shipbuilding and Repair Yards, 1996. VIRES

2.1.4. Introduction of Standardized Ships

From among the various types of ships of the fleet development program considered applicable to meeting future demands, 1,000 DWT and 3,000 DWT general cargo ships have been selected as standards types of ship.

A merchant ship to be used for commercial means of transportation should be designed, above all, from the angle of profitability. Therefore, what is required of shipyard designers is to develop the most economical design which can also satisfy given safety conditions and abide by related rules and regulations.

This standard ship-building system can achieve the most favorable effects when standardization of every stage in ship construction - designing, material arrangement, construction and inspection - is combined into one system.

Though the resulting merit of this building system will differ according to the extent to which the options for variation of the standard design are allowed, a considerable reduction in man-hours for design and construction work, as well as in material cost, will be realized, thus the total construction cost will be noticeably lowered, compared to the case of the conventional customized building method.

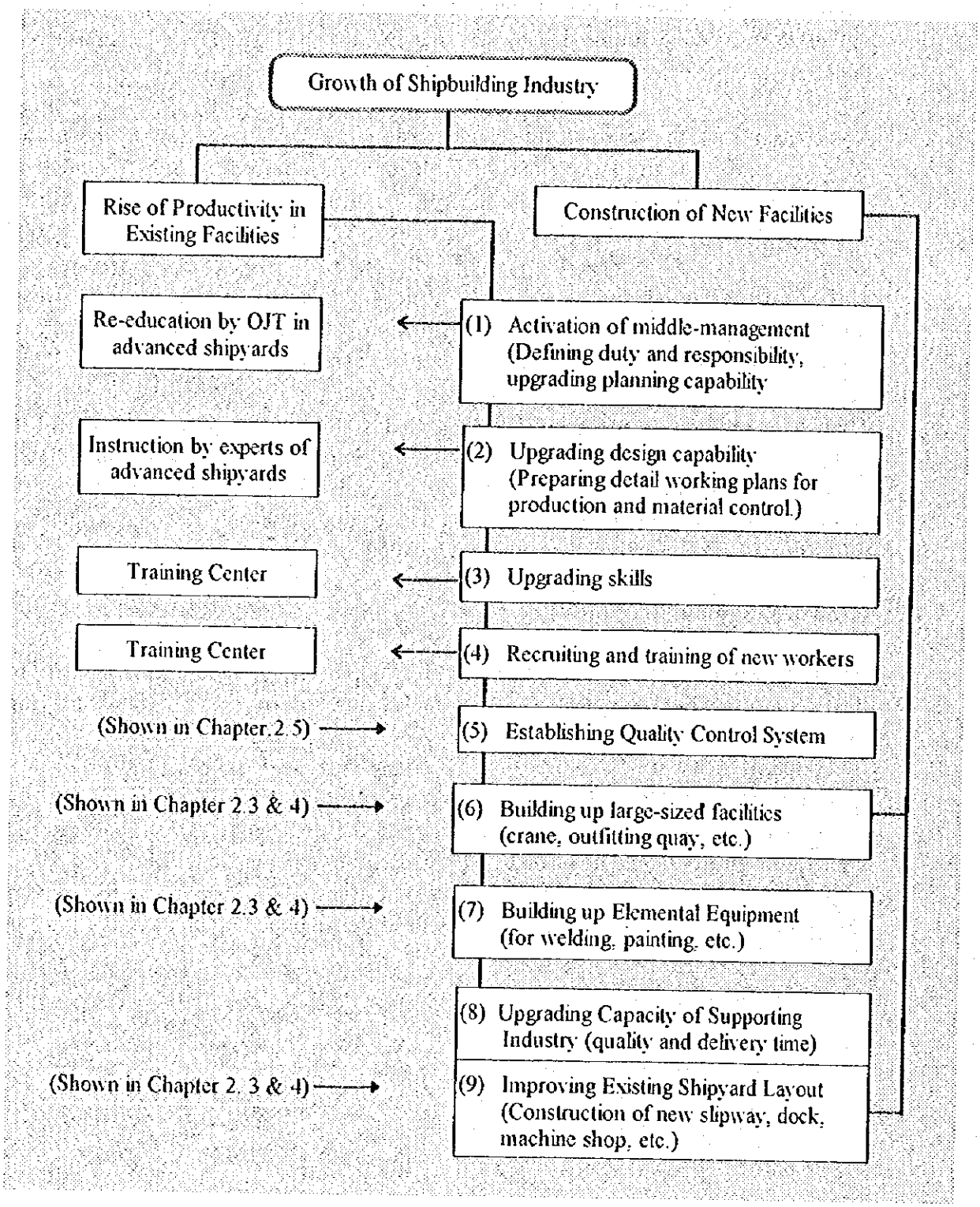
2.1.5. Growth of Shipbuilding Industry

As mentioned in every related article, the present capacity of shipbuilding industry in this country is not sufficient for the implementation of the programs for the modernization of the coastal shipping fleet.

To achieve the expected objective, it is necessary not only to increase productivity within the existing facilities, but to also add new facilities. Great, steady and enthusiastic efforts should be made by all organizations and personnel concerned.

Suggestions on how to implement the growth of the shipbuilding industry is shown in Figure 2.1.

Figure 2.1
GROWTH OF SHIPBUILDING INDUSTRY



2.2. Design of the Standardized Ships

2.2.1. Type Setting

From among the various types of ships for the fleet development program considered applicable to meeting future demands, 1,000 DWT and 3,000 DWT general cargo ships have been selected as standards types of ships for the following reasons:

- To be more suitable for the coastal transportation in Vietnam, ships should have shallow draft to enable their entry into as many river ports as possible, and also to be suitable for mainly transporting general cargo and container cargo in packages or in bulk.
- In view of increasing profitability, ships should be larger to load as much cargo as possible, whenever allowed, while keeping good speed, sea-keeping and stability.
- Ship size must be selected with consideration given to the possibility of domestic construction operating conditions and future repairing needs.
- Ship type has to satisfy river transport in the Mekong delta and the north delta area.

Basic designs of these standard ships will be explained in subsequent sections.

2.2.2. Expected Advantages

A merchant ship to be used for commercial means of transportation, should be designed, above all else, from the angle of profitability. Therefore, what is required of shipyard designers is to develop the most economical design which can satisfy given safety conditions and abide by related rules and regulations. Today, ship design work is highly computerized and can hardly be developed without the use of computers. In order for design work to be computerized as a system, every aspect of the work should be standardized so that it will be as simplified as possible. Such standardization should, of course, firstly be directed toward the designing and building of high-quality ships at minimum costs.

In contrast with the customized production system conventionally adopted to accommodate the design and specifications requirements of individual customers, a standard ship building system is one where a shipbuilder, based on his own market study, develops a standardized design which he considers the most suitable to market demand, builds consecutively in large number, and sells to as many unspecified customers as possible. This stands for an application of the system for design, production and marketing of cars and airplanes.

This standard ship building system can achieve the most favorable effects when standardization in every stage of construction - designing, material arrangement, construction and inspection - is combined into one system.

Though the resulting merit of this building system will differ according to the extent to which the options for variation of the standard design are allowed, a considerable reduction in design and construction work man-hours, as well as in material cost, will be realized. Thus the total construction cost will be noticeably lowered, compared to the case of the conventional customized building method.

Merits of the standard ship building system can be enumerated as follows:

- Reduction of construction period.
- Diminution of man-hours in design and construction work.
- Upgrading of quality of work (skill of workers will be improved by repetitious works).
- Saving of man power in indirect jobs such as design and production control.
- Easy and simple maintenance works for the standardized ship in service.
- Contribution to stabilized production of products of shipbuilding-related industries.
- Possibility for standardizing cargo packing and discharging systems at port.
- Better condition for the management of port and channel.

2.2.3. Features of Vietnamese Domestic Vessels

The ship is liable to safely transport passengers and cargo without trouble. Therefore, the worse characteristics of the ship, such as the insufficiency of stability during navigation, hull structure strength and running speed, the unbearable level of rolling, pitching and vibration, and the defect of maneuverability ,are not acceptable to the ship owners.

Secondly, the favorable commercial balance between the freightage earnings and construction, operating, and maintenance costs and other expenses linked to the durable years of the ship, is indispensable to ship owners.

In addition to the above required conditions on the performance and affordability of the ship, coastal service ships have to be adaptable to sea conditions of, weather, ports, and the types of cargo packing and other things which are particular to the coastal area of the country.

The following facts were found during our previous survey work and are to be taken into the specification of standard ships as the special feature of Vietnamese coastal service ships. We are expecting further facts to become available during our upcoming survey work.

(a) Principal Particulars

The draft of ships built in Vietnam have a tendency to be shallower than those built in Japan and breadth and length have to be optimized according sea-keeping, stability and speed.

(b) Ship's Facilities

- The number of crew is almost twice that of Japanese ships, therefore accommodation quarters becomes larger. The crew live continuously on board, and therefore, living conditions are to be well considered.
- Almost all the existing ships do not have cargo gears and depending on the cargo gears of port facilities or the stevedoers. However the ships equipped with cargo gears are preferable, because there are many ports without sufficient loading and unloading facilities and cargo handling works by stevedoers are quite inefficient. The ship owners select deck crane type cargo gears due to easy handling and high efficiency.
- The disasters at the coastal sea area in Vietnam were mostly caused by operation miss. Easy handling and durable navigational equipment are to be selected.

(c) Hull Structure

The rusting on the shell and deck plates arising from the insufficiency of corrosion control techniques are remarkably found. It would be better to increase the rule requirement for corrosion margin of these plates.

2.2.4. Principal Particulars of the Standardized Ships

The standard design of 1,000 DWT and 3,000 DWT general cargo ships is developed by applying the results of the local survey for coastal shipping vessels and the following design conditions.

(a) Complement

Number of officers and crew and the capacity of cabins for each class are decided according to the present state of the Vietnamese coastal ships.

(b) Ship speed

Service speed is selected considering the economical efficiency of the ship, such as the operating expenditures, and the peculiar conditions of the tide and wind in Vietnamese coastal sea area.

(c) Optional items

A choice of several of optional items in the specifications is reserved for ship owners, for example:

- Installation of top and/ or bottom-side tanks in cargo holds; and
- No cargo gear to be installed or cargo derrick system instead of deck crane.

(d) Draft

Shallower draft to meet design criteria of sea-keeping, stability and propeller diameter, is applied.

(e) Water ballast tanks

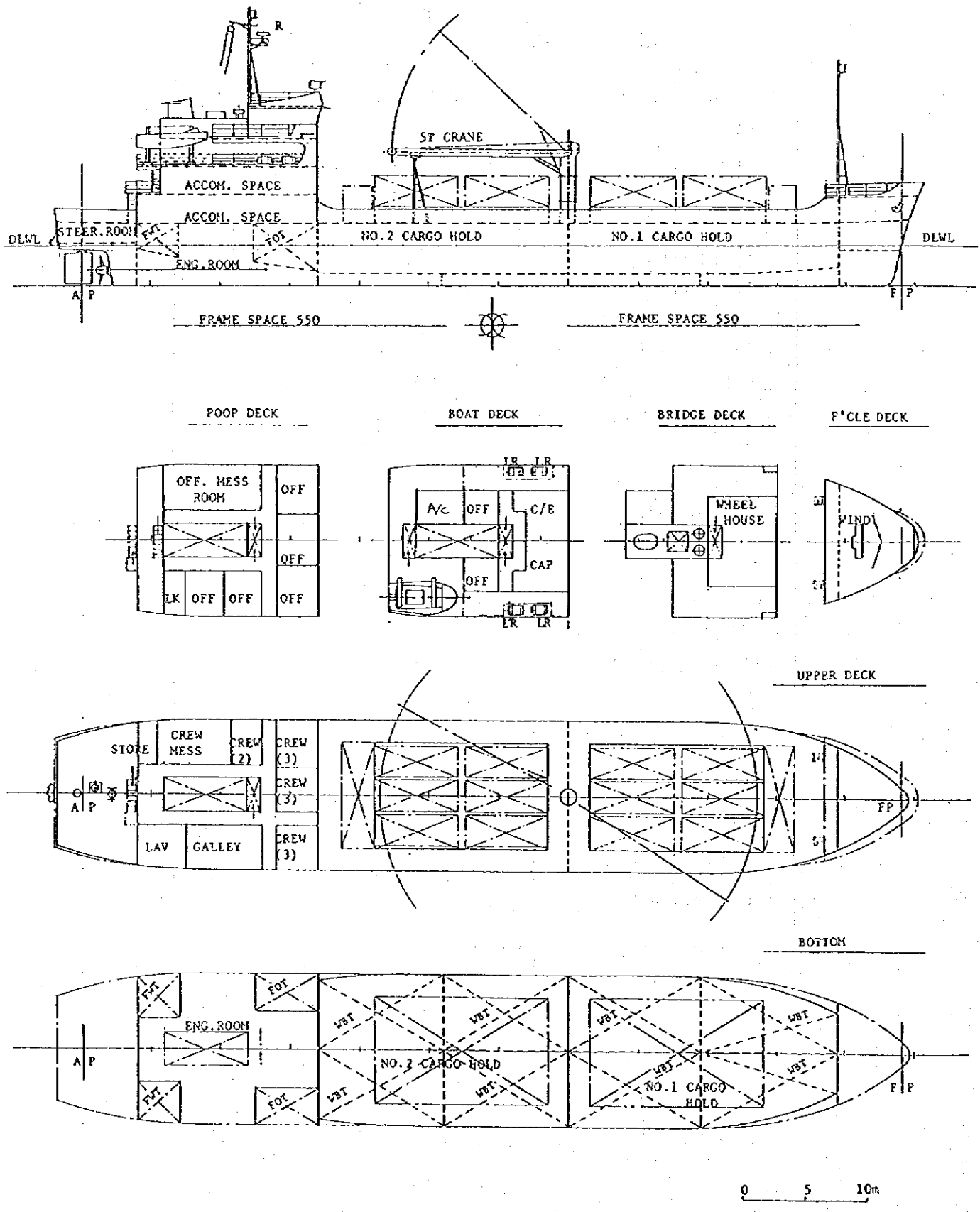
Double-bottom water ballast tanks are designed to have enough capacity for the trim adjustment at special loading conditions.

The construction cost of the standard ships are estimated on the outline specifications and on the basis of the first ship to be built in the domestic shipyard and all machinery, equipment and materials to be supplied from Japan.

Table 2.3
PRINCIPAL DIMENSION OF CARGO SHIP

Item/Type of Ship	1,000 DWT	3,000 DWT
Length (O.A.)	abt. 69.50 m	abt. 90.00 m
Length (P.P.)	65.00 m	85.00 m
Breadth (mld)	12.00 m	14.50 m
Depth (mld)	5.00 m	7.50 m
Draft design (mld)	3.20 m	5.00 m
Displacement (ton)	abt. 1,800	abt. 4,300
Light weight (ton)	abt. 800	abt. 1,300
Dead weight (ton)	1,000	3,000
Cargo hold cap. (bale)	abt. 1,300 m3	abt. 3,700 m3
Gross tonnage (ton)	abt. 1,000	2,800
Complement	20	28
Engine gear (PS)	980	1,800
Speed (Service)	11.0	11.0
Endurance (S.M.)	2,000	2,000
Tank cap.		
F.O.T. (t)	45	80
F.W.T. (t)	30	70
Cargo gear (option)	5t x 1	10tx2
Container (8' - 6" x 8' x 20') (option)	12	24
Hatch covers	Single pull steel	Single pull steel
Cost of the Cargo Ship (1,000 Yen) (excluding option)	247,000	439,000

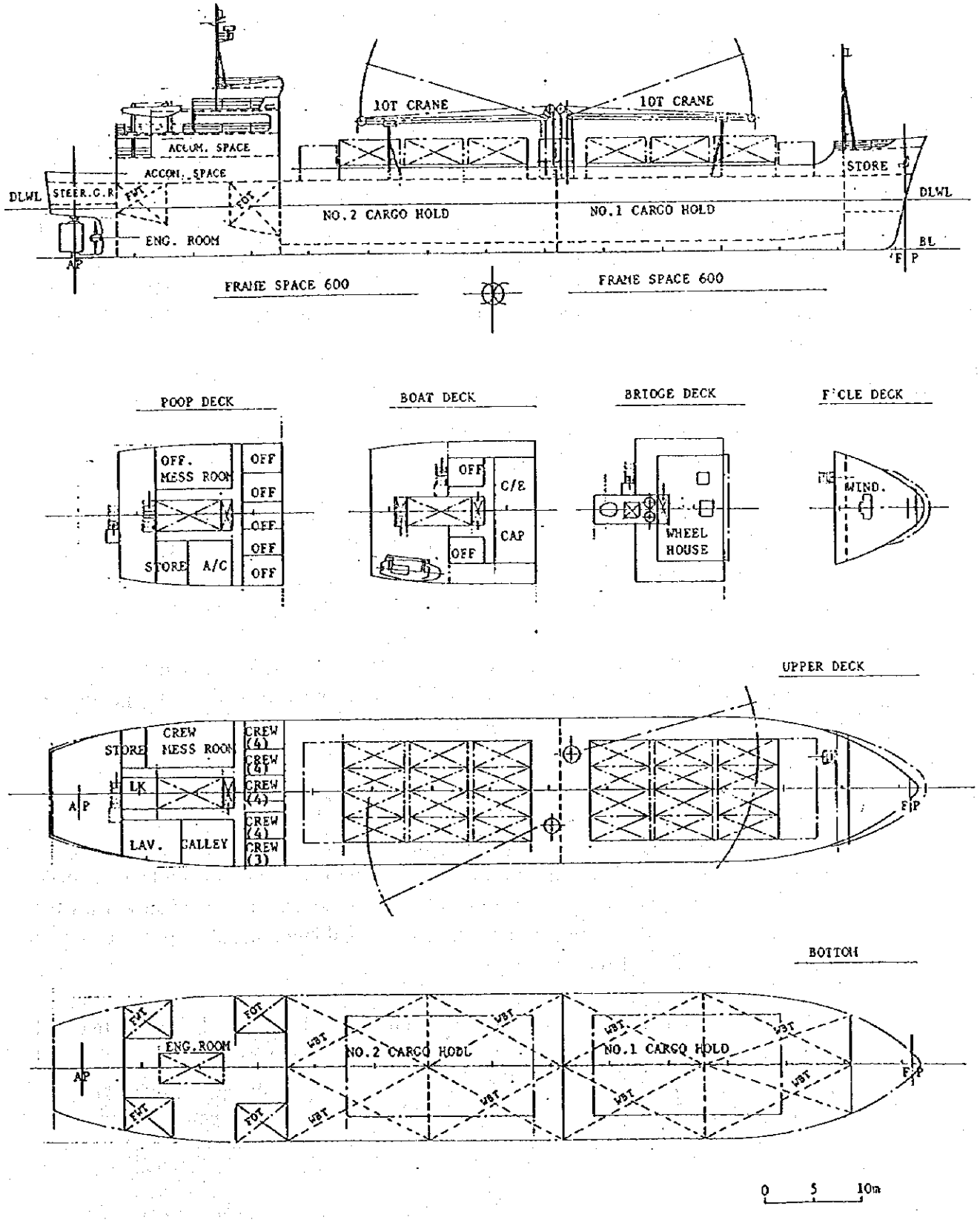
Figure 2.2
1,000 DWT CARGO SHIP GENERAL ARRANGEMENT



1,000 DWT CARGO SHIP GENERAL ARRANGEMENT

Figure 2.3

3,000 DWT CARGO SHIP GENERAL ARRANGEMENT



2.3. Newbuilding Shipyards

The following ship numbers are shown in the Coastal Shipping Fleet Development Plan as newly deployed vessels up to 2010.

- General Cargo Ships of 1,000 DWT x 118 ships
- General Cargo Ships of 3,000 DWT x 42 ships

As a matter of course, these newbuilding vessels should be supplied by the domestic shipyards because the support to the domestic shipping industry is the most essential role of the Vietnamese shipbuilding industry.

As mentioned in Chapter 2.1.3. "Newbuilding Shipyards," it is believed that the realization of newbuilding programs of these 1,000 DWT and 3,000 DWT general cargo ships is possible in the following three shipyards by implementing the rehabilitation and development plans for the improvement of shipyard facilities and machine equipment.

- Bach Dang Shipyard (Hai Phong)
- Ha Long Shipyard (Ha Long, Quang Ninh)
- Ben Kien Shipyard (Hai Phong)

Although the shipyard facilities and technical potentials for newbuilding ships of these three shipyards are not sufficient, they are tolerable, and therefore, the large-scale improvement of shipyard facilities and machine equipment is not necessary. The adequate reinforcement to their existing condition shall be implemented.

In order to keep the delivery of ships on schedule, all materials, equipment and parts should be supplied on time without any mistakes in terms of quality and quantity as specified.

Purchasing activity for all components of the ship is very complicated and the well-organized and experienced management in the shipyard may be relied upon. Therefore , it is advised that major equipment and parts should be imported from reliable sources and those of ships with the same specifications should be handled totally by one single trading company. This is a good way to obtain components in compliance with the specifications and delivery time for keeping the shipbuilding schedule especially in case of series construction of standard ships.

The major items included in the above purchasing scheme are large forging and casting, deck machinery including cargo handling gears, hatch covers, air conditioning systems, refrigerating plants, fire fighting equipment, main engines, diesel generator sets, pumps and other auxiliary machines in the engine room, navigational equipment, etc..

The contents of such purchasing schemes can be changed or made less according to the development of supporting industry in Vietnam, when their capacity will satisfy the requirements with respect to quality, quantity and delivery time. The scheme must be utilized as a chance for the technical transfer to the relating industry of shipbuilding.

The reduction of shipbuilding cost due to the merit of series construction of standard ships is assumed to be as shown below. These figures may be slightly conservative compared to the results of shipyards in the advanced country. These figures are subject to great change depending on the learning effects of the shipyards.

1st and 2nd year from the start of newbuilding	:	1.00
3rd year	:	0.96
4th year	:	0.92
5th year	:	0.89
6th year	:	0.87
7th year and beyond	:	0.85

According to the field survey and meeting with the shipyard management of the above three yards, the following rehabilitation and development plans for the improvement of facilities and machine equipment are to be proposed for each shipyard, in order to build standard general cargo ships of 1,000 DWT and 3,000 DWT with higher productivity, better quality, and less building cost.

BACH DANG SHIPYARD (Hai Phong)

(a) Improvement Plan of shipyard facilities

The following improvement in facilities shall be implemented

MACHINING SHOP

• Universal lathe	1250 dia x 12000	2 sets
	400 dia x 1400	2 sets
	150 dia x 750	2 sets
• Crank shaft grinder		1 set
• Face milling cutter		1 set
• Gap type bed lathe		2 sets
• Formed milling cutter		1 set
• Grinder (various kinds)		8 sets
• Shaping machine (various kinds)		3 sets
• Metal cutting saw		1 set
• Shearing machine		1 set
• Pressing machine (various kinds, 40-100 T)		3 sets
• Table drilling machine		6 sets
• Propeller balanced support		1 set
• Furnace (various kinds)		4 sets

- Frame cutting support 2 sets
- Electrical test pressure table 1 set
- Power trial plant 1 set
- Overhead crane (various type, 15 T) 3 sets
- Propeller shaft boring mill 1 set
- Cylinder grinding machine 1 set

PLATE SHOP

- Automatic cutting machine 1 set
- Measuring equipment (various kinds) 5 sets
- Micro meter 6 sets
- Automatic shortblasting-painting-drying line 1 set
- Hydraulic press 1 set
- Rolling machine and conveyor 1 set
- Overhead crane (25 T x 30m span) 2 sets
- Plasma cutting machine 10 sets
- Automatic welding machine (various type) 10 sets
- Semi-automatic welding machine (CO_2) 20 sets

PIPING SHOP

- Oil burning furnace 2 sets
- High frequency piping bending machine 1 set
- Hydraulic pipe bending machine 1 set
- Middle frequency piping machine 1 set
- Shear cutting machine 2 sets
- Steel plate bender 2 sets
- Resistance welding machine 2 sets

(b) Budget for Improvement Plan

• Supply of new equipment in MACHINING SHOP	VND	41,840
• Supply of new equipment in PLATE SHOP	VND	17,680
• Supply of new equipment in PIPING SHOP	VND	3,740
Total amount of Budget	**VND**	**63,260**

HA LONG SHIPYARD (Ha Long, Quang Ninh)

(a) Improvement Plan of Shipyard Facilities

The following improvement in facilities shall be implemented.

MACHINING SHOP

• Universal lathe	1250 dia x 12000	2 sets
	400 dia x 1400	2 sets
	150 dia x 750	2 sets
• Crank shaft grinder		1 set
• Face milling cutter		1 set
• Planing mill		1 set
• Gap type bed lathe		2 sets
• Formed miller cutter		1 set
• Grinder (various kinds)		9 sets
• Shaping machine (various kinds)		3 sets
• Metal cutting saw		1 set
• Hydraulic press (various kinds, 40-100T)		3 sets
• Table drilling machine		6 sets
• Propeller balanced support		1 set
• Furnace (various kinds)		3 sets
• Frame cutting support		2 sets
• Electrical test pressure table		1 set
• Power trial plant		1 set
• Propeller shaft boring mill		1 set

PLATE SHOP

• Automatic cutting machine	1 set
• Measuring equipment (various kinds)	5 sets
• Micro meter	6 sets
• Automatic shotblasting-painting-drying line	1 set
• Hydraulic press	1 set
• Rolling machine and conveyor	1 set
• Overhead crane (25 T x 30m span)	2 sets
• Plasma cutting machine	10 sets
• Automatic welding machine (various type)	10 sets
• Semi-automatic welding machine (CO_2)	20 sets

PIPING SHOP

• Oil burning furnace	2 sets
• High frequency piping bending machine	1 set
• Hydraulic pipe bending machine	1 set
• Middle frequency piping machine	1 set

- Shear cutting machine 2 sets
- Steel plate bender 2 sets

(b) Budget for Improvement Plan

• Supply of new equipment in MACHINING SHOP	VND	36,560
• Supply of new equipment in PLATE SHOP	VND	17,680
• Supply of new equipment in PIPING SHOP	VND	3,370
Total amount of Budget	**VND**	**57,610**

The newbuilding capacity of Standard General Cargo ships in these 3-ship-yards will be increased by the implementing the above mentioned Improvement Plan as shown below.

Table 2.4
NEWBUILDING SHIP NUMBERS/YEAR OF STANDARD GENERAL CARGO SHIP

	1,000 DWT		3,000 DWT	
	Case-A	Case-B	Case-A	Case-B
Bach Bang Shipyard	4 ships	8 ships	2 ships	4 ships
Ha Long Shipyard	4 ships	6 ships	1 ship	8 ships
Ben Kien Shipyard	1 ship	4 ships	-	-

Note: Case-A: Newbuilding ship numbers/ year capable by the existing shipyard facilities.
Case-B: Newbuilding ship numbers/ year capable by the improve shipyard facilities.

The above increased newbuilding capacity will be adequate to the anticipated newly deployed vessels of the Coastal Shipping Fleet up to 2010 as mentioned at the top of this Article and also shown below.

- General Cargo Ships of 1,000 DWT x 118 ships
- General Cargo Ships of 3,000 DWT x 42 ships

Necessary numbers of 1,000 DWT and 3,000 DWT general cargo ships for the Coastal Shipping Fleet can be built within 10 years after the implementation of the above Improvement Plan.

BEN KIEN SHIPYARD (Hai Phong)

(a) Improvement plan of shipyard facilities

The following improvement in facilities shall be implemented.

MACHINING SHOP

• Universal lathe	1,250dia x 12,000	1 set
	400dia x 1,400	1 set
	150dia x 750	1 set
• Crane shaft grinder		1 set
• Face milling cutter		1 set
• Gap type bed lathe		1 set
• Formed milling cutter		1 set
• Grinder (various kinds)		3 sets
• Shaping machine (various kinds)		1 set
• Metal cutting saw		1 set
• Hydraulic press (100T)		1 set
• Table drilling machine		2 sets
• Propeller balanced support		1 set
• Furnace (various kinds)		1 set
• Frame cutting support		1 set
• Power trial plant		1 set
• Propeller shaft boring mill		1 set

PLATE SHOP

• Automatic cutting machine	1 set
• Measuring equipment (various kinds)	3 sets
• Micro meter	2 sets
• Automatic shotblasting-painting-drying line	1 set
• Hydraulic press	1 set
• Rolling machine and conveyor	1 set
• Overhead crane (25 T x 30m span)	1 set
• Plasma cutting machine	4 sets
• Automatic welding machine (various type)	4 sets
• Semi-automatic welding machine (CO_2)	8 sets

PIPING SHOP

• Oil burning furnace	1 set
• High frequency piping bending machine	1 set
• Hydraulic pipe bending machine	1 set
• Middle frequency piping machine	1 set
• Shear cutting machine	1 set
• Steel plate bender	2 sets

(b) Budget for Improvement Plan

	(Unit: million)
• Supply of new equipment in MACHINING SHOP	VND 21,570
• Supply of new equipment in PLATE SHOP	VND 12,110
• Supply of new equipment in PIPING SHOP	VND 2,240
Total amount of Budget	**VND 35,920**

2.4. Repairing Shipyards

The need to reinforce domestic ship repairing capacity will intensify with the increase of repairing ship numbers in each northern central and southern area up to year 2010 as described in Chapter 2. 1. 1 & 2.

Especially for the coastal service ships, the following number of operating ships up to 3,000 DWT are shown in the Coastal Shipping Fleet Development Plan.

General Cargo Ships		Year 2000	Year 2010
300 DWT	x	87 ships	161 ships
1,000 DWT	x	50 ships	118 ships
3,000 DWT	x	19 ships	42 ships

In order to ensure the timely and successful results in the improvement of productivity, quality, and of costs for these coastal service ships, one well-equipped and balanced shipyard to act as the "Key Yard" to the coastal service ships shall be selected in each area (north, central and south).

The following yards are selected as proper candidates for "Key Yard" in each area, and the rehabilitation and development plans for the modernization of these shipyard facilities and their machine equipment shall be implemented.

- Northern area: Nam Trieu Shipyard (Hai Phong)
- Central area: Song Han Shipyard (Da Nang)
- Southern area: CK - 76 Shipyard (Ho Chi Minh city)

The result of implementation to the above Key Yards shall be carefully reviewed and evaluated and then successively implemented to the other qualified repairing shipyards shown in Chapter 2. 1. 2 and the total amount of budget for improvement plans for these repair shipyards is roughly as follows:

Total Budget Amount **VND 90,000 million**

According to the field survey and meetings with the shipyard management of the Key Yards, the following rehabilitation and development plans for the modernization of shipyard facilities and machine equipment are to be proposed for each respective shipyard.

NAM TRIEU SHIPYARD (Hai Phong)

(a) Existing State of Shipyard Facilities

At present, the average volume of repairing of ships above 1,000 DWT is 24 ships per year. The productivity rate of 10 - 12 % per year will be increased to meet repairing demands of domestic and foreign ships operating in the area.

The existing facilities are shown on Table 2.1. The dry dock for ships of 3,000 DWT, now under construction, is expected to be completed and put into operation in the 1st quarter of 1997. Aside from this new dry dock, other workshops and buildings have been in use for 30 years and although repairing activities have been carried out, buildings are dilapidated and machine capacities are low (6-workshops of 3,028 m^2 and old offices no longer have any depreciation value). Equipment is also insufficient and out of date; especially machines for repairing ships, the crane, lifter, etc.

The factory would not be able to meet increasing demand without overall replacement of existing machines in the coming several years. With the replacement, the factory can enjoy expanding ship repairing capacity up to 3,000DWT. At present, the number of berths is insufficient.

(b) Improvement Plan of shipyard facilities

The following improvement in facilities shall be implemented to allow for synchronous repairing of vessels up to 3,000 DWT at dock and berths possible.

- Upgrading and prolonging existing mooring berth on both sides with width of 18 m and length of 90 m.
- Constructing new repairing berth with length of 100 m and width of 10 m.
- Upgrading and constructing workshops.

  Upgrading: 3,508 m^2
  Construction: 2,200 m^2
- Upgrading slipway system for repairing ships up to 1,000 DWT.
- Degrading water area in front of dock, berths and slipway (135,000 m^2)
- Installing equipment and machines.

Crane alongside dry dock	15T x 1 set
Crane in slipway and yard	3 - 5t x 2 sets
Crane in hull and engine shop	3 - 5T x 2 sets

MACHINERY AND SPECIALIZED MACHINES IN WORKSHOPS

• Plasma cutter	1 set
• Long band lathe	1 set
• Steel sheet roller	1 set
• Vertical boring machine	1 set
• Measuring machines (various kinds)	3 sets

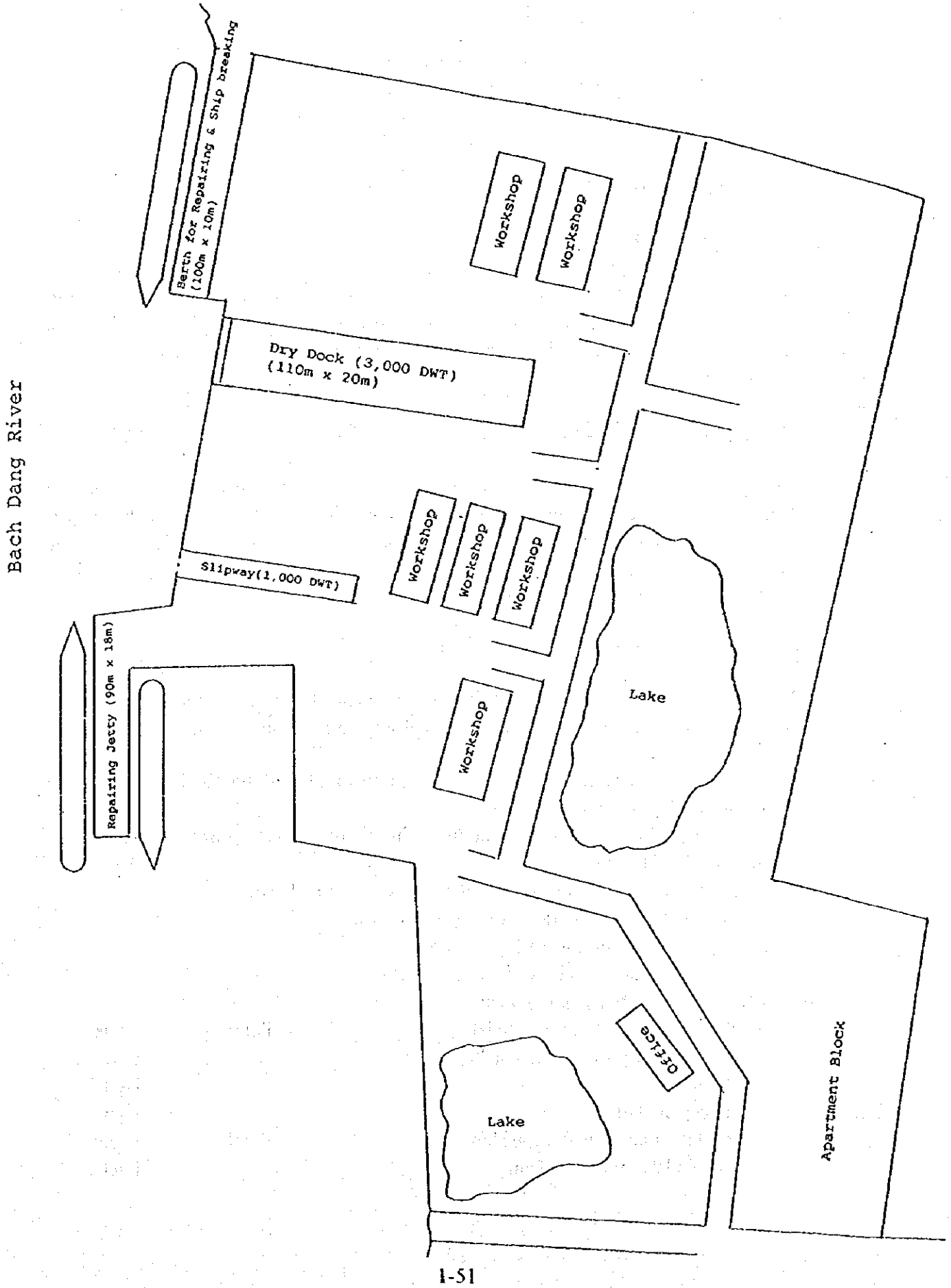
- Welding machines (various kinds) 16 sets
- Medium multi-purpose lathe 2 sets
- High air compressor system 2 sets
- High pressure water ejector 2 sets
- Paint spraying system 2 sets
- Sand spraying system 2 sets
- Lift truck 2 - 3 T 2 sets

The layout of the shipyard after implementation of the Improvement Plan is shown in Figure 2.4.

(c) Budget for Improvement Plan

• Upgrading and prolonging existing repairing berth for mooring at berth sides with width of 18 m and length of 90 m.		VND	10,500 million
• Construction new berth for repairing with length of 100 m and width of 10 m		VND	10,000 million
• Upgrading and constructing workshops. Upgrading: 3,508 Construction: 2,200 m^2		VND	6,500 million
• Upgrading slipway system for repairing ship up to 1,000 DWT		VND	1,900 million
• Dredging water area in front of dock, berth and slipway (135,000 m^2).		VND	3,300 million
• Installing equipment and machinery		VND	15,350million
Crane alongside dry dock	15T x 1 set		
Crane in slipway and yard	3-5T x 2set		
Crane in hull and engine shop	3-5 T x 2 sets		
Machinery and specialized machines	at request		
Total amount of Budget		**VND**	**47,550 million**

Figure 2.4
LAYOUT OF NAM TRIEU SHIPYARD



SONG HAN SHIPYARD (Danang)

(a) Existing State of Shipyard Facilities

Da Nang port is the biggest sea and river port in Central area with high density of ships. At present, coastal shipping fleet of central provinces is as follows.

Ship tonnage		Number of ships
200 DWT	x	150
300-400 DWT	x	70
600 DWT	x	15
1,600 DWT	x	6

In the next coming 10-15 years, the economic condition in Central area will reach to high level therefore the demand of sea transportation by coastal shipping fleet will increase and the coastal services ships of 1,000-3,000 DWT will take place of those of 200-600 DWT.

The existing facilities are as shown on Table 2.1. The slipway with length of 160 m is suffering unequal sagging along and across the slipway base and trouble of wheels of carriage. The repairing berth has many rotten parts in it's steel structure, the operating length of carriage in mechanical shop is scarcely reaching half length of the shop is scarcely reaching half length of the shop and almost of all machines and equipment in workshops have been used more than 15 years and are not working due to lack of replacing spares for worn out parts.

(b) Improvement Plan of Shipyard Facilities

The following improvement in facilities shall be implemented to reinforce the repairing capacity for the increasing demand of coastal shipping fleet in Central area.

- Construction new slipway system with length of 110 m and breath of 20 m for repairing ship up to 3,000 DWT
- Upgrading and prolonging existing repairing berth (35 m length) to length of 75 m and width of 15 m.
- Dredging water area in front of slipway and repairing berth.
- Upgrading and construction of workshops
  - Upgrading of machine shop: 1,800 m^2
  - Construction of hull shop: 1,500 m^2
- Supply machinery and equipment

Lathe machine (various kinds)	Total	3 sets
General purpose milling machine		1 set
Planer		1 set
Faceplate lathe		1 set
Grinding machine (various kinds)	Total	3 sets
Steel plate cutting machine		1 set

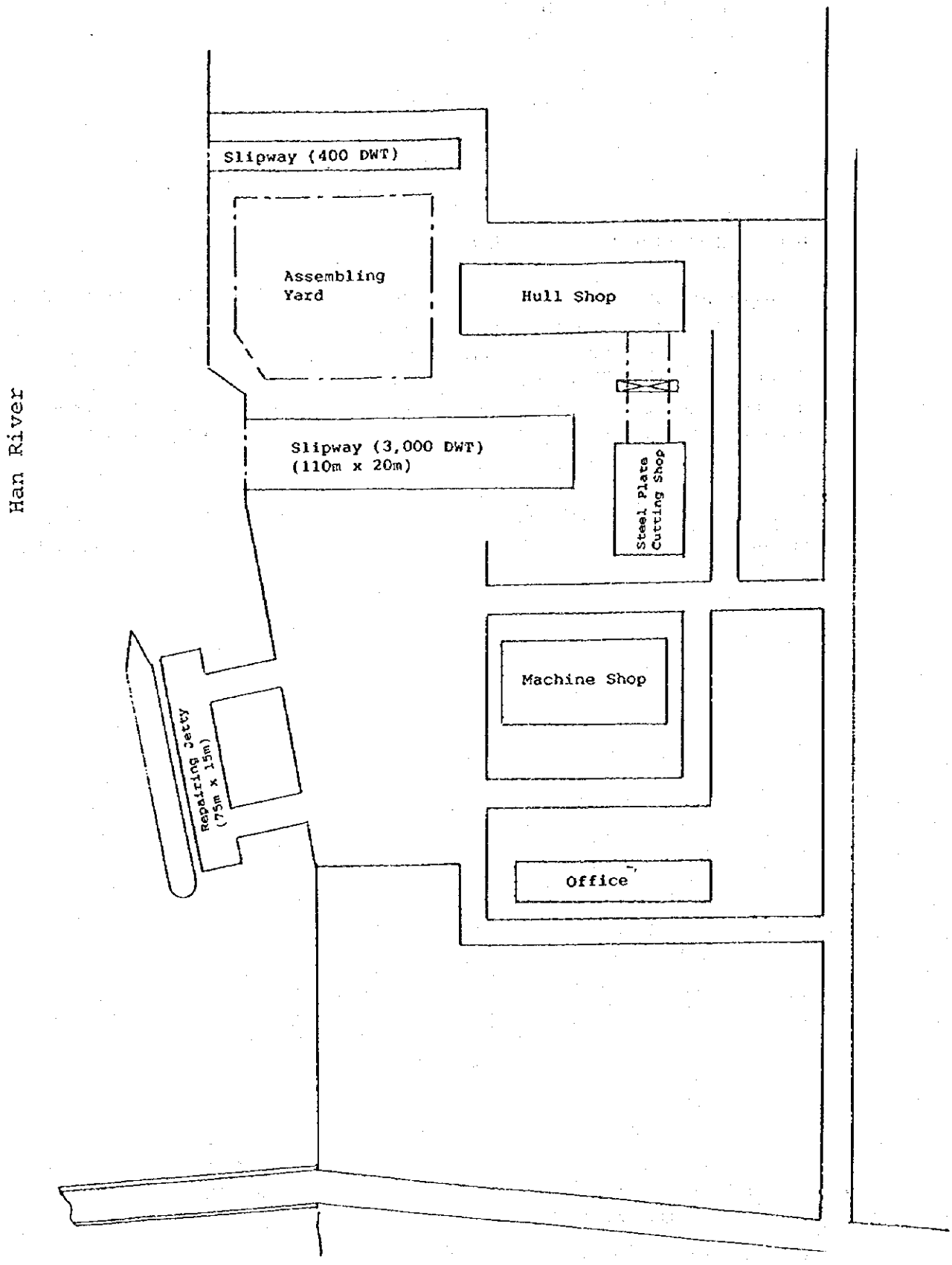
Sand blasting machine	1 set
Paint spraying machine	1 set
Lorry crane (16 T)	1 set
Automatic welding machine	2 sets
Welding machine (various kinds)	10 sets
Pipe bender	1 set
High power steel plate bending machine	1set

The layout of the shipyard after implemented Improvement Plan is shown in Figure 2.5.

(c) Budget for Improvement Plan

• Construction new slipway system with length of 110 m and breadth of 20 m for repairing ship up to 3,000 DWT	VDN	14,000 million
• Upgrading and prolonging existing repairing berth (35 m length) to length of 75 m and width of 15 m.	VND	3,500 million
• Dredging water area in front of slipway and repairing berth.	VND	1,000 million
• Upgrading and construction of workshops Upgrading of machine shop: 1,800 m^2 Construction of hull shop: 1,500 m^2	VND	3,200 million
• Supply machinery and equipment	VND	9,000 million
Total Budget Amount	**VND**	**30,700 million**

Figure 2.5
LAYOUT OF SONG HAN SHIPYARD



CK-76 SHIPYARD (Ho Chi Minh city)

(a) Existing State of Shipyard Facilities

The existing facilities are as shown in Table 2.1. The slipway with lifting capacity of 500 T became obsolete and other existing facilities and equipment are worn and old. In order to meet the increasing market in the southern area, the improvement of shipyard facilities and equipment, such as dry docks, slipways, and workshops with new machinery and equipment are inevitably necessary.

(b) Improvement Plan for Shipyard Facilities

The following improvement in facilities shall be implemented without delay.

- Construction of new dry dock with length of 80 m and breadth of 18 m.
- Construction of new slipway system with length of 148 m and width of 28 m and combined repairing berth with length of 48 m and width of 9 m.
- Dredging water area in front of dock, slipway and berth.
- Upgrading and construction of hull shop (1,500 m^2), repairing shop (394 m^2) and machine & electric shop (540 m^2 & 405 m^2).
- Supply machinery and equipment

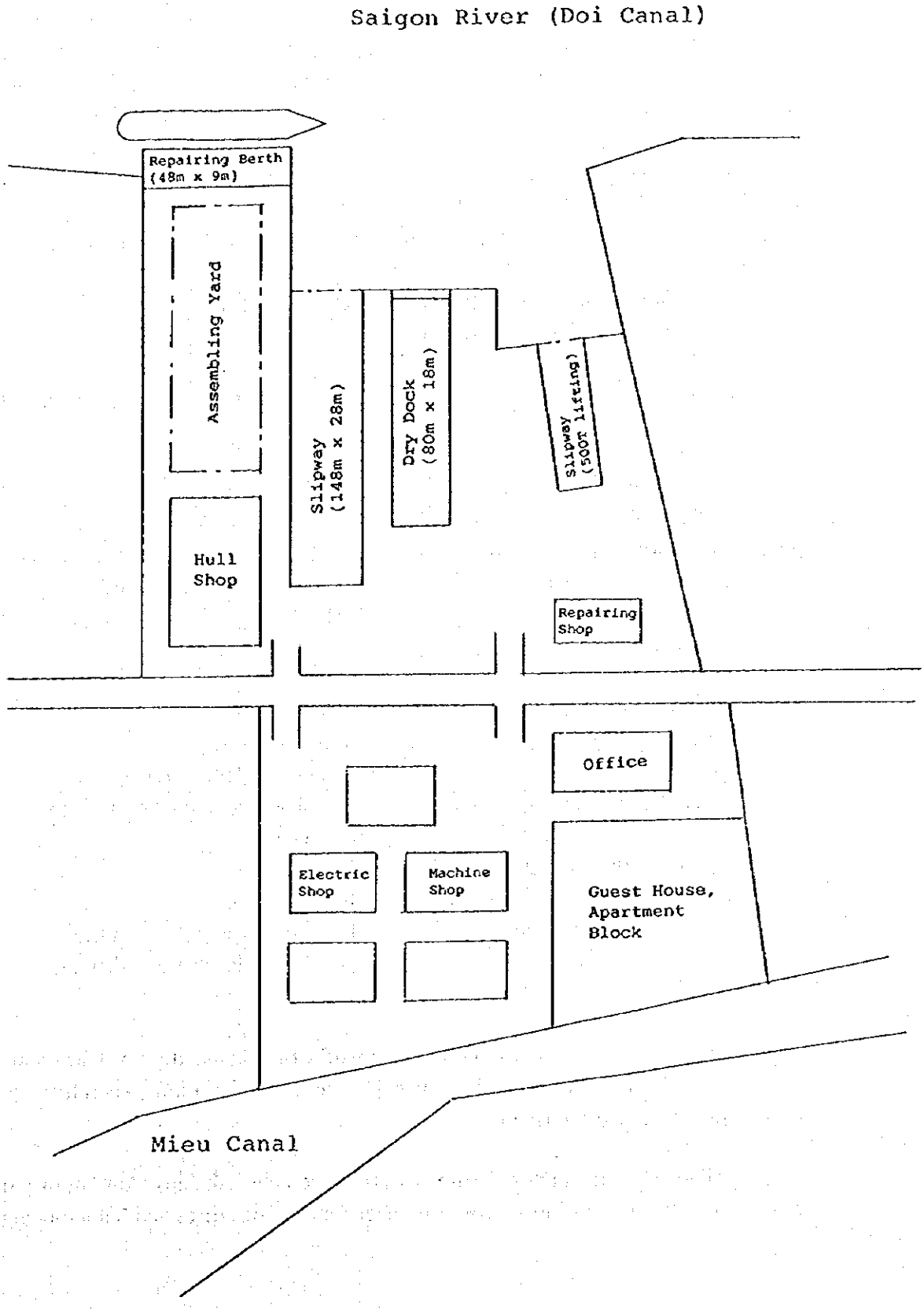
Winch (2 tons)	2 sets
Winch (5 & 20 tons)	1 set each
Cutting machine	1 set
Bending machine	2 sets
Hydraulic pressing machine (400 tons & 80 tons)	1 set each
Crane (5 & 10 tons)	1 set each
Punching machine	1 set
Sandblasting machine	2 sets
Painting machine	1 set
Semi-automatic welding machine	1 set

The layout of the shipyard after the implementation of the Improvement Plan is shown in Figure 2.6.

(c) Budget for Improvement Plan

• Construction of new dry dock with length of 80 m and breadth of 18 m.	VND	7,320 million
• Construction of new slipway system with length of 148 m and width of 28 m and combined repairing berth with length of 48 m and width of 9 m.	VND	7,352 million
• Dredging water area in front of dock, slipway and berth.	VND	584 million
• Upgrading and construction of hull shop (1,500 m^2), repairing shop (394 m^2) and machine & electric shop (540 m^2 & 405 m^2).	VND	2, 018 million
• Supply machinery and equipment	VND	1,850 million
Total amount of Budget	**VND**	**19,124 million**

Figure 2.6
LAYOUT OF CK-76 SHIPYARD



2.5. Ship Inspection System

2.5.1. Rehabilitation Plan for Ship Inspection while Operation

(1) Periodic surveys, including docking and occasional repair work surveys, are suggested for ships in operation. When carrying out any survey onboard, the following equipment and tools are to be prepared to ensure the safety of the environmental conditions of works, and also to determine the dimensions of the work area.

- Inflammable gas detector: to confirm safety working environment
- Oxygen-gas detector: to confirm safety working environment
- Ultra-sonic thickness detector: to confirm thickness of corroded steel plates which are to be replaced
- Magnetic particular tester: to confirm metal surface defects
- Ultra-sonic flaw detector: to confirm defects inside steel products

These are to be provided at both Hai Phong (Head Quarter) and Ho Chi Min (Local Center)

(2) Welding work is important for not only ship construction work but repair work as well. The quality of welding materials and welder qualifications, therefore, are to be given first priority for improvement and at least confirmation of necessary equipment is to be provided to the inspection/survey organization's testing laboratories (hereinafter referred to as "Testing Laboratory") in both Hai Phong (head quarters) and Ho Chi Minh (local center).

• Universal testing machine:	500 KN class
• Charpy impact testing machine:	300 J class
• Hardness tester:	Rockwell, Brinnel type
• X- ray examination equipment:	Portable type and laboratory for examination
• Ultra-sonic flaw detector:	Portable type
• Vacuum type leakage detector:	Portable type
• Sample making machine:	Lath, rotary metal saw, surface-polisher milling cutter, shaping machine & etc.

Note: Qualification licenses will be requested of x-ray examination & Ultra-sonic flaw detector operators which will be given by the Administration. Therefore, training curriculum must be established.

(c) There are many high pressure vessels in use onboard ships. Any rupture trouble of pressure vessels may cause serious damage on hull structures and human-being.

It is necessary to periodically calibrate the pressure gauges used on major pressure vessels, i.e. boiler, air-reservoir and major hydraulic/ pneumatic controllers.

For this purpose, the following testing equipment are to be provided at both Hai Phong and Ho Chi Minh Testing Laboratories.

- Standard pressure gauge: Precision class
- Pressure gauge tester: Counter-weight balance type

(d) Periodic calibration of major electrical instruments are also to be conducted to protect against any electrical miss-operations and damages. For this purpose the following equipment is to be provided to both Testing Laboratories.

- Standard voltmeter, Voltmeter calibrator: Precision class
- Standard ammeter, Ammeter calibrator: Precision class
- Standard watt meter: Precision class
- Standard resistance conductor: Precision class
- Insulation resistance tester: 500-2,000 V class

(5) Any inflatable life rafts installed onboard the vessel as a part of life-saving equipment must undergo periodic maintenance checks at service stations recognized by both the life raft manufacturer and the administration. In the IMO Resolution A.761 (18) (Appendix 3), "Recommendation on Conditions for the Approval Servicing Stations for Inflatable Life Rafts," it is recommended that the periodic maintenance of inflatable life rafts for coastal service ships are to comply with these requirements. In Vietnam, approval procedure of service stations has not yet been established. Once modern service stations that comply with the requirement of IMO Resolution A.761 (18) are provided, the government can recognize them as "Model Service Station of Inflatable Life Rafts" and establish the approval procedure for service stations in the country.

These stations should be fully enclosed and have ample room for the number of rafts expected to be serviced. Ceilings should be sufficiently high as to allow life rafts to be serviced and to be turned over. Direct sunlight should not be allowed to enter the work-space and the temperature and the relative humidity should be sufficiently controlled and efficiently ventilated. The following tools and equipment should be provided.

Air leak test for raft chamber

- Accurate manometers, pressure gauges, thermometers
- Air pumps for inflating and deflating life raft
- Air ventilator for cleaning and drying life raft
- Testing water-basin capable for air leak test

Gas-cylinder test

- Scale for weighing inflation gas cylinders
- Tools for dismounting inflation gas-cylinders

Test chamber for auto-release device

Floor seam test supports

Models of inflatable life-raft

- One complete sets of life-raft each
- Supporting frame for each type of life-raft
- Automatic-release device

Spare inventory including pyrotechnics

Servicing and repair work should only be carried out by qualified persons who have been adequately trained and certified by the life raft manufacturers. Therefore it is also recommended that qualification training for service staff be established at both Testing Laboratories (refer to "training procedure" below).

(6) Periodic maintenance checks on radio equipment, installed onboard vessels for navigation and maritime safety communication, should be established. In order to adopt the IMO's guidelines on Resolutions A.739(18) "Guideline for the Authorization of Organizations Acting on Behalf of the Administration," it is recommended that the model Radio Installation Inspection Service Company be provided at the Hai Phong Testing Laboratory and that that procedures for authorizing radio inspectors be established. The following equipment should be prepared:

- Measuring equipment for frequency, voltage, current , and resistance
- Measuring equipment for output and reflect effect on VHF and MF/HF transmitters
- Syncroscope
- Acid tester for checking specific gravity of lead batteries
- EPIRB Tester for checking correct output from Satellite EPIRB
- Sealed Room arrangement for maintenance work of Satellite EPIRB

2.5.2. Development Plan for Ship Inspection during Construction

(1) Updating the rules and regulations for the survey and construction of steel ships, and the procedure for approval and type approval of materials and equipment for marine use is recommended.

For this purpose, it is necessary to invite expert(s) from leading maritime countries who shall cooperate with VIRES for establishing the International Level Rule, Regulation Guidance, and Procedures.

(2) Renovation of "National Standard" and "Quality Standards": Vietnam has already commenced adopting the Japanese Industrial Standard (JIS) into its "National Standard". It is recommended that inter-governmental assistance be requested of the Government of Japan for an early renovation program of the "National Standard."

(3) Testing Laboratory to be provided in governmental organizations like VIRES

For the purpose of establishing up-to-date ship inspection procedures/practices and their maintenance, the Testing Laboratory of which recommended on item 1-2 of the above should be provided with additional testing equipment as specified below.

The service station for inflatable life rafts and radio installations should be belong to the Testing Laboratory as the "Model Service Station" for establishing governmental approval procedures for licensing service stations countrywide. For this purpose, a Testing Laboratory should be provided to and managed by VIRES.

- Surface profile projector
- Optical micro-scope
- Radiographic (x-ray) examination equipment
- Ultra-sonic flaw detector
- Magnetic particular flaw detector
- Noise measurement equipment
- Torsional vibration measurement equipment
- Material spark emission analyzer
- Fuel-oil quality analyzing set
- Lube-oil quality analyzing set

To be provided in the Testing Laboratory of Hai Phong Head Quarter

(4) Implementation of International Convention into National Rule & Regulation: For establishing up-to-date National Rules and Regulations for the maritime field, it is recommended that requirements of the International Convention be adopted to the national ones, as much as is practical. For this purpose, it is recommenced that expert(s) from leading maritime countries be invited.

2.5.3. Total Budget

Total budget excluding human resources is estimated at about 142,000,000 Yen.

2.6. Relative Facilities for Shipbuilding and Repairing

2.6.1. Shipyard Quality System

To upgrade quality in the shipbuilding and repairing industry, it is necessary to update the management system. In VINASHIN, the following systems are to be established

and maintained at each north, central, and south zones of the country, and are to be controlled at all shipyards within those territories.

(a) Quality Management Department

A quality management department, separate from the organization and having direct access to the management, should be provided with the following responsibilities and authority:

- To establish a quality manual and to ensure its implementation by the related departments.
- To prepare a plan of process standards, discuss implementation standards of the plan with the related departments in the shipyard, and to establish process standards.
- To carry out an internal inspection to the relative department according to the quality manual and process standard. When find any non-conformity, a corrective action are to be conducted.
- To carry out periodic review of the quality manual and the process standard for further improvement and development of the system.
- For timely implementation of the above quality system, consultation with expert(s) of quality management from leading ship building countries is recommended.

(b) Safety Management Center

To establish a safety management center for safety control at the work site. For this purpose, the following instruments are to be provided to the center:

- Inflammable Gas Detector
- Oxygen Content Master
- Ultrasonic Thickness Gauge

(c) Instrument Control Center

To establish an instrument control center to manage accuracy of instruments which are to be used for production in the shipyard for keeping quality productivity. The following standard weights and measures are to be provided at the center.

- Block gauge
- Micro meter, inside/outside
- Precious weight scale
- Pressure gauge tester

(d) Material Testing Center

To establish a material testing center to 1) manage and test proper materials to be used in the shipyard, 2) carry out qualification tests of welders.

- Universal Testing Machine 500 KN class
- Charpy Impact Test Machine 300 J class
- Hardness Tester Rockwell/Brinnel type
- X-ray Examination Equipment (portable type)
- Ultrasonic Flaw Detector
- Vacuum Leak Tester

(e) Total Budget

Total budget is estimated at 62,790,000 Yen.

2.6.2. Ship Model Towing Tank

The coastal shipping fleet expansion and modernization program is suggesting the fleet replacement plan up to 2010 as shown below.

General Cargo Ship (300-10,000 DWT)	366 ships
Cement Pure Carrier (5,000-7,000 DWT)	16 ships
Semi Container Ship (2,000 DWT)	2 ships
Ro-Ro Ship (5,000 DWT)	2 ships
Oil Tanker (2,300-80,000 DWT)	12 ships

The ship owners always intend to transport various kinds of cargo safely and economically. In order to do so, not only the improvement of the shipbuilding technology in the production field, but also the development work for a more economical hull form for each kind of ship, and the research work on the navigation safety of ships, are to be positively promoted as the technology of the coastal shipping fleet in Vietnam.

At present the construction work of the Ship Model Towing Tank and the Research & Development Center of RDITI (VINASHIN) is stagnated and remains uncompleted. In order to remedy this, the advice of an expert of the research & development of shipbuilding industry, should be sought.

2.6.3. Shipbreaking Yard

It is no exaggeration to say that more safety and higher efficiency of ship navigation is expected by the replacing of superannuated ships with newly built ships.

At present, one large-sized shipbreaking yard, which is capable of breaking 300,000 DWT tankers, is operating in the central area of Vietnam. During the shipbreaking

process, plenty of machinery, equipment and fittings are taken away and stored for long use. However, the importation of these machines, equipment and fittings of the foreign flag ships are prohibited by the government and the golden opportunities for their reutilization in Vietnam are fading away.

2.7. Training of Shipbuilding Engineers and Ship Inspectors

2.7.1. Shipbuilding Engineers

(a) Invitation of Foreign Experts

- In order to improve the present situation as mentioned in Chapter 1.6.3 "Existing State of Repairing Shipyard," a ship repairing expert who is knowledgeable of both hull and machinery parts repair, (if not available, one expert for hull and one for machinery parts is recommended) shall be invited as quickly as possible to the qualified repair shipyard in both the north and south regions. The expert(s) shall provide suggestions for modernizing facilities and equipment, as well as for updating skills required in the ship repair sector.
- The ship repairing experts shall be invited to also take part in the formulating of a future development plan for the qualified shipyards of the areas.
- Experts will give effective technical guidance for on the job training (OJT) of engineers and foremen as well as constructive suggestions for the improvement of the facilities, equipment, and mechanical tools, to respective shipyard management.

(b) Training of shipbuilding engineers and foremen

The standard ships of coastal service which will be built in Vietnamese shipyards shall have to compete with those built in neighboring countries both function and price-wise. The following of the Standard Ship Newbuilding Scheme is proposed as the concrete plan.

- 1,000 DWT general cargo ships shall be selected as the prototype of Standard Ship Newbuilding and the first ship shall be built by the qualified shipyard in the countries of advanced shipbuilding industry.
- Design engineers for functional plans and working plans, production engineers for hull and machinery parts, and foremen will be carefully selected form the Vietnamese newbuilding shipyard where the second ship will be built and shall be dispatched to the yard of the first ship where they will be trained on building techniques through OJT during the construction period of the first ship.
- The second ship shall be built by the qualified shipyard in Vietnam, and during the construction period, the design and production experts and the foremen from the first ship shall be invited to give constrictive guidance in cooperation with the Vietnamese engineers and foremen who received OJT during the building of the

first ship. They shall also make suggestions for the improvement of facilities, equipment, and machine tools.

- All the newbuilding techniques learnt during the construction of the first ship shall be instituted in the other shipyards around the country. The engineers and foremen of the second ship shall be involved with disseminating these techniques as will the staff of the first ship. These newbuilding techniques will also be used in the successful newbuilding of 3,000 DWT general cargo ships and all others.

2.7.2. Ship Inspectors

- VIRES has already established training curriculum of ship inspection from the maritime safety and marine pollution prevention viewpoints. But due to lack of opportunities to carry out particular jobs, and lack of objectives inspections, results are ineffective. It is recommended that VIRES invite expert(s) from leading maritime countries or send staff to participate in training courses organized by those countries.
- State port control officers (Inspectors of VMSI and Port Authority officers) need to be knowledgeable of Tokyo MOU standards. Therefore, it is recommended that the leader from the Tokyo MOU be invited to Vietnam or that staff be sent to participate in the training course for PSC officers organized by the Tokyo MOU.
- Trainer(s) from life raft manufacturers should be invited to the Testing Laboratory to promote the qualification of serviceman for inflatable life rafts.
- Experienced radio inspectors should be involved in the promotion of qualified radio inspectors including inspection for GMDSS equipment.

2.8. Conclusion

Within the Improvement Plan, immediate actions are suggested for the development of inspection facilities and equipment (including the ship model towing tank) and repairing facilities and equipment for small and medium sized, ships with consideration to the security of life and property at sea and the protection of ocean environment.

Although it depends on the affordability of fleet operation, the replacement of fleet by newbuilding ships shall be strongly recommended, with care given to navigation safety and the convenience of operation and maintenance works.

There shall be two cases of raising funds for the implementation of the above Improvement Plans. For the first case, the grant aid from the advanced countries shall be expected to be utilized in the development of the inspection facilities and equipment (including the ship model towing tank), from which profit earnings are not expected. For the second case, soft loans from foreign countries shall be used in the development of the shipbuilding and repairing facilities and equipment, from which profit earnings shall be expected.

Although the shipbuilding and repairing industry is promised further growth in the future, its facilities and equipment, and the level of technical skill can not allow for the abolishment of out-dated conventional methods. Funds for improvement are also insufficient. Therefore, the two-step loan which is devised to provide stable long and middle-term funds for financially-strapped countries at low interest rates, shall be the effectual means.

Considering the actual situation of shipbuilding and repairing sectors in Vietnam, Vietnam Shipbuilding Industry Corporation (VINASHIN) shall be recommended to be the loan-receiving body for maintaining all information on management and capacity of affiliated shipyards and for monitoring loan repayment.