

9

**PROJECT IMPLEMENTATION BY STAGE  
(PHASE ARRANGEMENT)**



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In the light of realistic implementation of this project, the Optimum Plan proposed in the Study was diagnosed. It was divided into a two-phasing-plan from the view point of priority and viability.

**9-1 MAXIMUM UTILIZATION OF PRESENT FACILITIES  
(FIRST PHASE IMPROVEMENT)**

This stage is defined as follows:

"Maximum utilization of the existing facilities by providing required additional investment and training to make CDD financially viable."

Accordingly, the implementation of Plan "A" for ship repair and Plan "a" for steel structure shown in Chapter 5 corresponds to the first phase improvement.

The outline of these plans is summarized in Table 9-1-1, using the same method of analysis of the Optimum Plan in Chapter 6.

The calculation results of the financial internal rate of return (FIRR) for this phase are obtained as follows: (applying the same method of the calculation as done for the Optimum Plan)

	FIRR
Ship repair	7.4 %
Steel structure	4.7 %
Total	7.2 %

Cashflow statements for the above figures are given in Table 9-1-2 and 9-1-7.

**9-2 OPTIMUM BMR (SECOND PHASE IMPROVEMENT)**

The suggestion of the second phase is as follows:

"Optimum Balancing, Modernization and Rehabilitation (BMR) project including diversification of product lines with necessary additional investment keeping in view the financial viability and the incremental benefit of production & revenue earnings, to be undertaken in the second phase based on the evaluation of the operation and financial results of the first phase."

The implementation of the Optimum Plan shown in Chapter 6 corresponds to this stage.

Table 9-1-1 Outline of First Phase Improvement

Item	Ship Repair ( Plan "A" )	Steel Structure ( Plan "a" )																
1. Basic concept	Ship repair business both for sea-going vessels and for other small vessels shall be carried out at the existing dry dock with technical assistance from technically advanced country and provisions for additional facility.	Upgrading of productivity using the existing fabrication shop(2,160 m <sup>2</sup> ), by way of technical training and additional facility																
2. Training programme	(1) Training in overseas shipyards 7 trainees, total 48 man-months (2) Technical assistance from overseas shipyards 5 experts, total 54 man-months	(1) Despatch of an engineer to CDD for one year																
3. Additional facility	(1) Service utility piping (Compressed air, acetylene and oxygen, and water supply line) (2) Workshop machinery (Lathe machine, dynamic balancing machine, etc.) (3) Painting equipment (4) Foundry shop (Build. & equipment) (5) Tools	(1) Punching, shearing and angle cutting machines (2) Bending roller (3) Semiautomatic gas cutting machines (4) Automatic welding machines (5) Air tools, etc.																
4. Additional investment amount (Lac. taka)	<table border="0"> <tr> <td>Training</td> <td>391.2</td> </tr> <tr> <td>Facility</td> <td>878.7</td> </tr> <tr> <td>Consultant fee</td> <td>84.0</td> </tr> <tr> <td><u>Total</u></td> <td><u>1,353.9</u></td> </tr> </table>	Training	391.2	Facility	878.7	Consultant fee	84.0	<u>Total</u>	<u>1,353.9</u>	<table border="0"> <tr> <td>Training</td> <td>64.4</td> </tr> <tr> <td>Facility</td> <td>66.4</td> </tr> <tr> <td>Consultant fee</td> <td>10.0</td> </tr> <tr> <td><u>Total</u></td> <td><u>140.8</u></td> </tr> </table>	Training	64.4	Facility	66.4	Consultant fee	10.0	<u>Total</u>	<u>140.8</u>
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Item	Ship Repair ( Plan "A" )				Steel Structure ( Plan "a" )		
	Year	Seagoing No.	DWT	Small vessel No.	DWT	Year	Target tons / year
5. Annual production plan	1989/90	13	142,610	24	18,240	1989/90	320
	1992/93	19	210,200	12	9,120	1992/93	370
	1993/94	20	223,130	12	9,120	1993/94	430
	1997/98	28	296,540	15	11,400	1997/98	500
	2002/03	36	369,940	9	6,840	2002/03	550
	2007/08	38	385,790	9	6,840	2007/08	650
2012/13	38	385,790	9	6,840	2012/13	700	
6. Annual sales estimate (1,000 taka)	Year	Seagoing	Small vessel				
	1989/90	22,157	18,730	1989/90	14,060		
	1992/93	34,854	9,902	1992/93	16,150		
	1993/94	38,239	10,260	1993/94	18,970		
	1997/98	61,221	15,755	1997/98	22,200		
	2002/03	101,067	12,627	2002/03	24,290		
2007/08	121,536	14,583	2007/08	28,640			
2012/13	121,536	14,583	2012/13	30,800			
7. Manpower plan  (Figures in brackets show the subcontracted workers)	Year	Officers & Staff	Indirect Workers	Ship Repair	Direct Workers Machine Shop	Steel Structure	Total
	1989/90	301	55	133 (0)	17 (0)	52 (0)	558 (0)
	1992/93	307	55	152 (0)	18 (0)	52 (0)	584 (0)
	1993/94	307	55	152 (8)	18 (0)	52 (0)	584 (8)
	1997/98	307	55	152 (38)	18 (0)	52 (0)	584 (38)
	2002/03	311	56	180 (77)	20 (0)	52 (0)	619 (77)
2007/08	316	57	206 (88)	22 (0)	52 (0)	653 (88)	
2012/13	316	57	206 (88)	22 (0)	52 (0)	653 (88)	

Table 9-1-2 Cash Flow Statement for Ship Repair (With Phase I Project)  
(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000 ton)	Vessels	Seagoing	13	19	20	28	36	38	38
		Coastal	24	12	12	15	9	9	9
	DWT	Seagoing	142,612	210,197	223,132	296,537	369,942	385,787	385,787
		Coastal	18,240	9,120	9,120	11,400	6,840	6,840	6,840
Sales	Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536	
	Coastal	18,730	9,902	10,260	15,755	12,627	14,583	14,583	
	Total	40,887	44,756	48,499	76,976	113,694	136,119	136,119	
Operating Expenses	Material	Import	3,271	3,580	3,880	6,158	9,096	10,890	10,890
		Local	6,317	6,915	7,493	11,893	17,566	21,030	21,030
		Total	9,588	10,495	11,373	18,051	26,662	31,920	31,920
	Fuel & Power	3,292	3,756	3,950	4,714	6,368	7,274	7,274	
	Salary	Direct	4,847	6,307	6,622	8,049	11,823	16,950	21,633
		Indirect	7,840	9,587	10,066	12,236	16,324	21,836	27,869
	Total	12,687	15,894	16,688	20,285	28,147	38,786	49,501	
	Subcontracting	0	0	221	1,179	2,770	3,670	4,255	
	Maintenance	2,304	2,629	2,765	3,299	4,457	5,092	5,092	
	Other	2,787	3,277	3,500	4,753	6,840	8,674	9,804	
Total Cost	30,658	36,052	38,497	52,281	75,245	95,417	107,847		
Gross Profit			10,229	8,704	10,002	24,695	38,449	40,702	28,272
Profit After Tax			5,626	4,787	5,501	13,582	21,147	22,386	15,550

Source: Study Team

Table 9-1-3 Cash Flow Statement for Ship Repair (Phase I Project)  
(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000 ton)	Vessels	Seagoing	0	0	0	3	9	10	10
		Coastal	0	0	3	15	9	9	9
	DWT	Seagoing	0	0	0	22,326	66,978	74,420	74,420
		Coastal	0	0	2,280	11,400	6,840	6,840	6,840
Sales	Seagoing	9	128	242	10,443	37,129	51,472	51,472	
	Coastal	7	0	2,631	15,755	12,627	14,583	14,583	
	Total	16	128	2,873	26,198	49,756	66,055	66,055	
Operating Expenses	Material	Import	1	10	230	2,096	3,981	5,285	5,285
		Local	2	20	444	4,048	7,688	10,205	10,205
		Total	3	30	674	6,144	11,669	15,490	15,490
	Fuel & Power	1	-73	17	305	1,292	1,868	1,868	
	Salary	Direct	0	640	123	-811	-712	0	0
		Indirect	0	465	219	-396	-307	-29	-36
	Total	0	1,105	342	-1,207	-1,018	-29	-36	
	Subcontracting	0	0	221	1,179	2,770	3,670	4,255	
	Maintenance	1	-51	12	213	905	1,308	1,308	
	Other	0	101	127	663	1,562	2,231	2,289	
Total Cost	5	1,111	1,392	7,298	17,180	24,539	25,174		
Gross Profit			11	-983	1,481	18,900	32,576	41,516	40,881
Profit After Tax			6	-541	814	10,395	17,917	23,200	28,159

Source: Study Team

Table 9-1-4 Cash Flow Statement for Steel Work (With Phase I Project)  
(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000 ton)	320	370	430	500	550	650	700
Sales	14,060	16,150	18,970	22,200	24,290	28,640	30,800
Material Import	192	160	352	480	544	704	800
Local	9,880	11,354	13,382	15,640	17,222	20,422	22,040
Total	10,072	11,514	13,734	16,120	17,766	21,126	22,840
Fuel & Power	944	1,001	967	975	988	977	988
Salary Direct	1,974	2,285	2,399	2,916	3,722	4,751	6,063
Indirect	3,065	3,280	3,444	4,186	4,716	5,512	7,035
Total	5,039	5,565	5,843	7,102	8,438	10,263	13,098
Subcontracting	0	0	0	0	0	0	0
Maintenance	661	701	677	683	692	684	692
Other	1,672	1,878	2,122	2,488	2,788	3,305	3,762
Total Cost	18,388	20,659	23,343	27,368	30,672	36,354	41,379
Gross Profit	-4,328	-4,509	-4,373	-5,168	-6,382	-7,714	-10,579
Profit After Tax	-4,328	-4,509	-4,373	-5,168	-6,382	-7,714	-10,579

Source: Study Team

Table 9-1-5 Cash Flow Statement for Steel Work (Phase I Project)  
(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000 ton)	0	0	30	70	120	220	270
Sales	0	-50	1,480	3,300	5,390	9,740	11,900
Material Import	0	0	-32	0	64	224	320
Local	0	4	870	2,114	3,696	6,896	8,514
Total	0	4	838	2,114	3,760	7,120	8,834
Fuel & Power	-42	28	-6	2	15	4	15
Salary Direct	0	0	0	0	0	0	0
Indirect	0	-234	7	322	188	-7	-9
Total	0	-234	7	322	188	-7	-9
Subcontracting	0	0	0	0	0	0	0
Maintenance	-29	20	-4	1	11	3	11
Other	-7	-18	83	244	397	712	885
Total Cost	-79	-201	918	2,684	4,371	7,832	9,735
Gross Profit	79	151	562	616	1,019	1,908	2,165
Profit After Tax	79	151	562	616	1,019	1,908	2,165

Source: Study Team

Table 9-1-6

## Income Statement for CDD (With Phase I Project)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Sales	Dry Dock Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536
	Repair Coastal	18,730	9,902	10,260	15,755	12,827	14,583	14,583
	Total	40,887	44,756	48,499	76,976	113,894	136,119	136,119
	Afloat Repair	4,087	4,463	4,563	5,078	6,394	7,006	7,006
	Allied Product	17,575	20,188	23,713	27,750	30,363	35,800	38,500
Total Sales	62,549	69,406	76,774	109,804	150,450	178,925	181,625	
Operating Expenses	Material Import	3,463	3,740	4,232	6,638	9,640	11,594	11,690
	Local	16,197	18,269	20,875	27,533	34,788	41,452	43,070
	Total	19,660	22,009	25,107	34,171	44,428	53,046	54,760
	Fuel & Power	4,801	5,383	5,554	6,404	8,239	9,223	9,237
	Salary & Wage	6,821	8,592	9,021	10,966	15,545	21,700	27,696
	Subcontracting	10,905	12,867	13,510	16,422	21,040	27,348	34,903
	Maintenance	17,726	21,459	22,532	27,387	36,586	49,048	62,599
	Depreciation	37,943	37,943	46,837	46,837	46,837	24,927	17,672
Interest Payment	30,519	22,668	26,315	17,699	10,052	1,919	1,328	
Other	5,991	7,031	7,572	9,535	12,584	16,037	18,920	
Total Cost	134,366	137,951	156,448	169,420	195,311	203,247	227,115	
Gross Profit	-71,817	-68,545	-79,674	-59,616	-44,861	-24,322	-45,490	
Profit After Tax	-71,817	-68,545	-79,674	-59,616	-44,861	-24,322	-45,490	
Operating Ratio	2.15	1.89	2.04	1.54	1.30	1.14	1.25	

Source: Study Team

Table 9-1-7

## Fund Flow Statement for CDD (Phase I)

(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Source of Funds							
Profit After Tax	-71,817	-68,545	-79,674	-59,616	-44,861	-24,322	-45,490
Depreciation	37,943	37,943	46,837	46,837	46,837	24,927	17,672
Subtotal	-33,874	-30,602	-32,837	-12,779	1,976	605	-27,818
Long-term Debts, Foreign		89,090	29,020				
Local		26,940	0				
Short-term Debts	0	0	0	0	0	0	0
Total	-33,874	85,428	-3,817	-12,779	1,976	605	-27,818
Application of Funds							
Investment		116,030	29,020				
Decrease in Long-term Debts	77,677	77,677	80,371	83,065	85,759	5,906	5,906
in Short-term Debts	0	0	0	0	0	0	0
Total	77,677	193,707	109,391	83,065	85,759	5,906	5,906
Net Surplus/Loss	-111,551	-108,279	-113,208	-93,150	-78,395	-5,301	-33,723
Ending of Balance	-111,551	-219,830	-552,835	-953,706	-1,289,419	-1,514,653	-1,654,323
Debt Service Ratio	-0.44	-0.39	-0.41	-0.15	0.02	0.10	-4.71

Source: Study Team



**10**

**RECOMMENDATION**



## 10 RECOMMENDATION

For the smooth implementation and sound operation of the CDD Project, the requisite several supporting measures to be taken are recommended as follows:

### (1) Capital Restructuring

The Annual Development Programme (ADP) Loan is to be converted into share capital. The debenture issued in lieu of ADP Fund can be raised by the Government by contributing share capital to the extent that the past investment amount increased due to the exchange rate fluctuation. This will reduce the interest expense and principle repayment to relief from the present financial burden.

### (2) Promotion of Sales Activities

The business activities of a shipyard should be done on a scale that can secure a workload matching the capacity of its production. It is desired above all that every efforts to materialize a potential demand shall be made through direct contacts with clients. This is because these efforts make it possible for the shipyard to succeed in receiving job contracts from foreign as well as domestic customers, thus assuring the lasting patronage of the customers.

It is necessary for CDD to improve the sales activities more than ever, by not only depending on the Government's policies and waiting orders but also by contacting positively with shipowners and other customers.

### (3) Introduction of Necessary Incentives

Ship repair is an industry involving vast technology of a diversified nature which is to be performed at a high quality and within the shortest possible time. Ship repair services, being of international standard, demand a high degree of skill, know-how and dedication on the part of its workforce. However, the venture of ship repair of seagoing vessels being the first of its kind in Bangladesh, there is an acute shortage of skilled manpower in this sector.

Therefore, it should be considered for the employee of CDD to give special consideration to the salary structure, benefits, incentives, etc. in order to settle skilled manpower in CDD.

#### (4) Easy Procedural Formalities for Procuring Materials

Due to taking much time for procurement of materials, CDD is confronted with many difficulties in controlling production schedule. Especially, as to the imported materials, much time is consumed for clearing official procedures like budgeting, bidding, customs clearing, etc. This causes CDD a great deal of disadvantages in keeping their production schedule and in responding to urgent demands of customers.

In view of this situation, it should be considered to reduce lead time for material procurement by simplifying procedural formalities.

#### (5) Education and Training of Engineers and Workers

With the augmentation of work volume, it becomes necessary to conduct education and training to raise the level of engineers and to improve the skill of workers, as well as to improve the yard facilities.

To meet the above, the following measures should be taken through technical cooperation with advanced shipbuilding country.

- 1) Dispatch of engineers and workers to advanced shipbuilding country
- 2) Engagement of experts from the said country

The training subject should especially include design, total management technic, mechanical and electrical work skill, etc.

Furthermore, it is worth while considering to establish an advanced technical training center for the development of ship repair, shipbuilding, and steel structural engineering, as a national policy in the long run.

#### (6) Employment of Subcontractors

Ship repair is called a labour intensive industry, and needs many skilled workers of various fields by trade. In addition, an enterprise exclusively for ship repair is especially liable to suffer from fluctuations in workload which are natural to the industry.

Therefore, shipyards have to take measures to meet the situation. One of the countermeasures suggested to CDD is to foster cooperative companies and to make good use of them as subcontractors.

(7) Maintenance and Repair of Facilities under Good Equipped Condition

Some of the machinery is not utilized efficiently due to a shortage of spare parts, etc. The facilities of CDD, as being worn and superannuated with years, should be maintained and repaired periodically so as to be always in good condition.

(8) Provision of General Services for Customers

It seems that general services for customers are insufficient in commercial base management at CDD. For example, provision of advertisement of CDD by brochure, something good for a souvenir, conveniences to crew during their stay in the yards like telephone service, etc. should be considered, as the foreign shipyards usually do.

(9) Policy for Ship Repair and Shipbuilding, to be Enforced by the Government

With the implementation of the proposed plan in the Study, it is recommended that the rules and regulations for ship repair and shipbuilding, which are now in process, should be revised and strengthened in the following manner.

- Import ban up to 4,000 DWT vessel
- Continuation of Duty Draw Back system
- Obligatory docking of Bangladeshi flag vessels in CDD

(10) Project Implementation

Through a series of studies and analyses, several improvement plans were proposed and the Optimum plan was selected for the future improvement of CDD. And the financial and economic evaluation on the plan were conducted. Furthermore, to achieve easy implementation of the entire project, an idea of two phases implementation by stages was studied and reported.

With the view of materializing this project at the earliest, it is considered that the project implementation by stages would be the most appropriate, considering the investment amount, the fund allocation, priority, financial viability, etc., within the framework of the national development programme.



**ADDITIONAL STUDY FOR NEW SHIPBUILDING**





## **ADDITIONAL STUDY FOR NEW SHIPBUILDING**

### **1 POSSIBILITY FOR NEW SHIPBUILDING BY UTILIZING EXISTING DRYDOCKING FACILITY**

As stated in Chapter 3, Section 4 "Present Conditions of Chittagong Dry Dock", the existing drydocking facility is occupied by repair ships almost to full capacity. Monthwise dock occupation of CDD for these two years (1986-87, 1987-88) is as shown in Fig. 1-1 and in Fig. 1-2. According to these figures, it appears that the available free dock days are very limited.

Therefore, it is quite obvious that the construction of new ships by utilizing the existing drydocking facility will hamper the drydocking jobs for ship repair for a period of new shipbuilding.

A hull construction of 4,000 DWT class cargo ship on a berth, for example, normally takes two to three months in a standard shipyard of advanced shipbuilding countries.

As for ship repair and fabrication of steel structures like pontoons, some technic and experience has accumulated by work done at CDD in the past eight years. However, considering that CDD has no experience and technic in the field of new shipbuilding, it may take ten or more months to construct a hull structure of 4,000 DWT class cargo ship.

The bigger the size of the vessel, the longer construction period required. Therefore, it is actually not possible to build ships in the existing drydocking facility (Graving dock) without hampering drydockings for ship repair which are now done at the said dry dock.

Taking the fact into consideration that CDD was established to give drydocking and repairing facilities not only to the BSC fleet but also to all ships that touch Chittagong and Mongla port, it is concluded that new shipbuilding facility (another graving dock or shipbuilding berth) is indispensable to prepare a development plan for new shipbuilding at CDD.

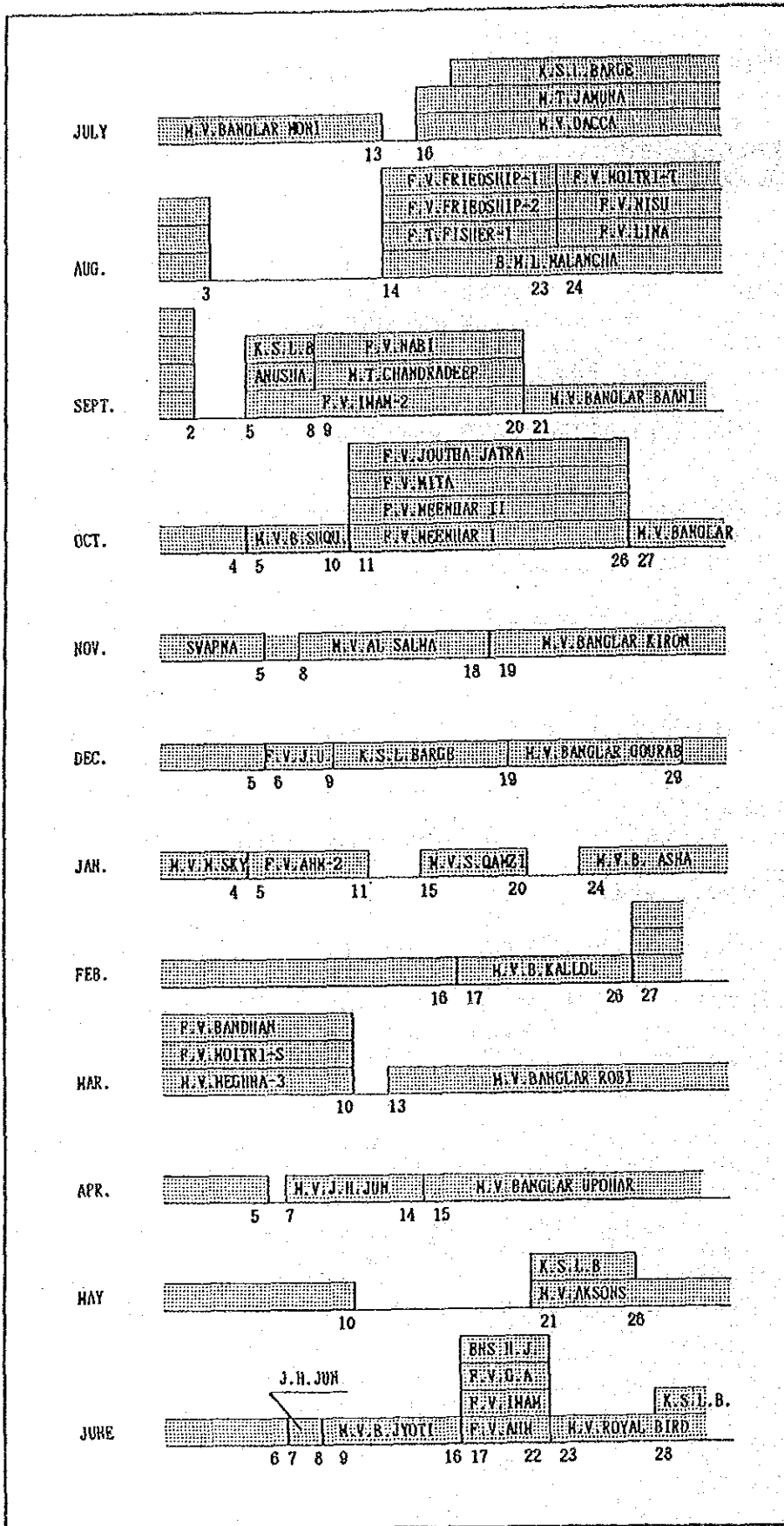


Fig. 1-1 Monthwise Dock Occupation (1987-88)

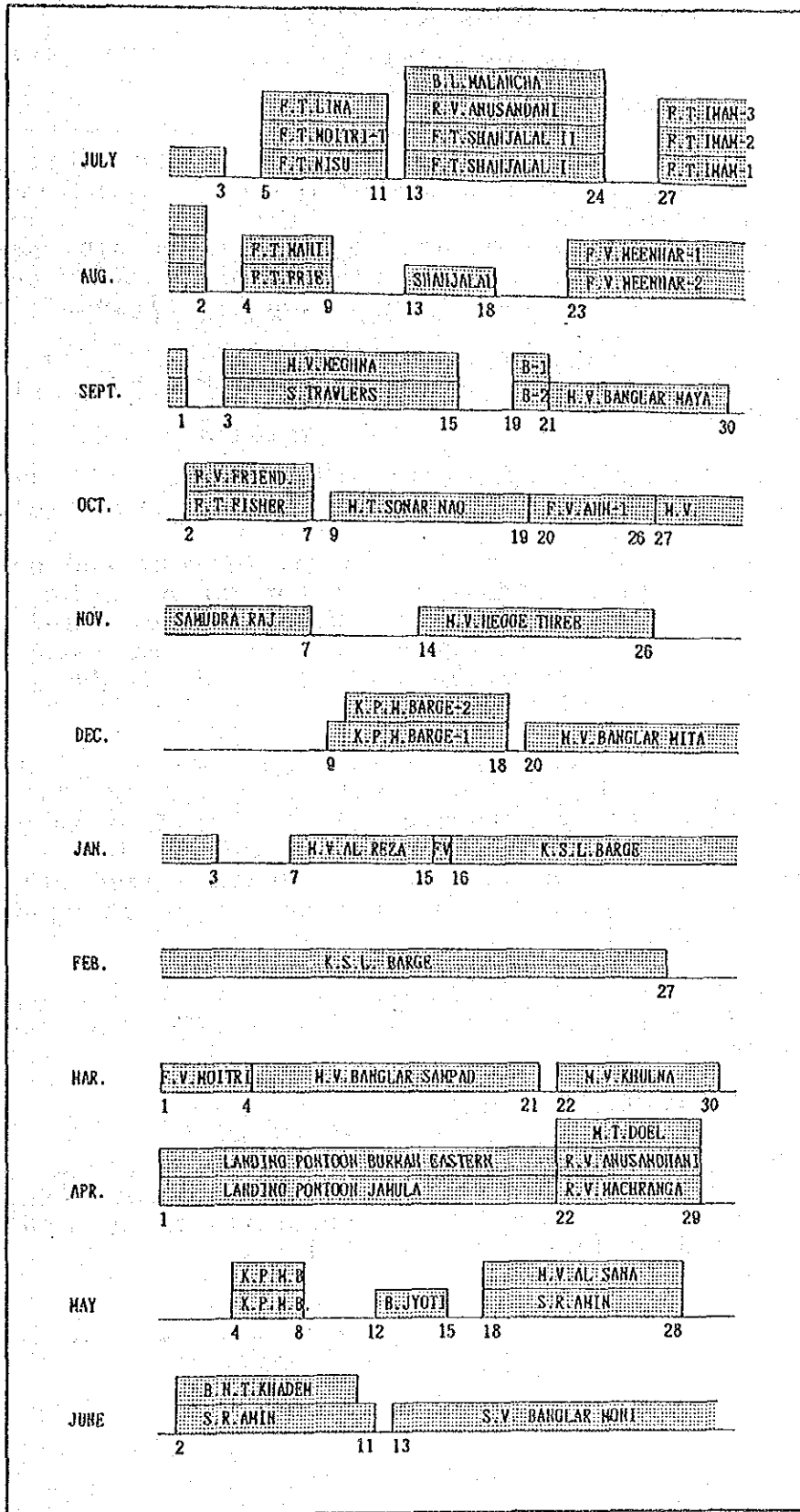


Fig. 1-2 Monthwise Dock Occupation  
(1986-87)

## **2 TYPE OF SHIPS TO BE CONSTRUCTED**

### **2-1 BASIC CONCEPT**

One of the specific features of shipbuilding is that shipbuilding demands a number of production process and many kinds of trade.

Accordingly, shipyards are required to be equipped with a capability of management, production technic and skill, in addition to adequate production facilities.

Considering the present capability of CDD, it is difficult and risky for CDD to build for large size ships from the beginning.

The construction of bigger size ships will require a larger facilities with a bigger initial investment.

From a view of minimum initial investment and capability of CDD, it is recommended that the construction of small sized vessels like inland water vessels and coastal vessels should be constructed at a first stage, then, gradual scaling up of vessel's size should be considered in a long term plan.

However, there exists a management policy of BSEC that small sized ships should not be taken by CDD because facilities for construction of this kind of ship already exist in KSY and DEW. From this point of view, CDD should start shipbuilding work with a medium sized ship market where no facilities exist for this type of shipbuilding in the country.

Therefore, keeping these points in mind, the preferable type of ships to be constructed in CDD are studied as follows:

### **2-2 CLASSIFICATION OF SHIPS**

Based on the present fleet position and future extension programme of BSC, BIWTC and private sector, etc., kinds and types of ships to be constructed at CDD can be classified as shown in Table 2-1.

Table 2-1 Classification of Ships

Class	Kinds of Ship	Type/Size of Ships
1	<u>Small sized ships</u> Inland passenger ship Inland cargo vessel Inland barge Inland workboats Fishing trawler	350GT Fishing trawler Loa = 50.0 m Lpp = 45.0 m B = 8.0 m D = 5.9 m  350DWT Cargo boat Loa = 50.0m Lpp = 48.0m B = 7.8m D = 3.0m
2	<u>Medium sized ships</u> Coastal cargo vessel Coastal tanker Inland container vssl.	4,000DWT Cargo vessel Loa = 100.0 m Lpp = 90.0 m B = 14.3 m D = 7.7 m  120TEU Container vessel Loa = 78.0 m Lpp = 74.0 m B = 13.0 m D = 3.6 m
3	<u>Large sized ships</u> Seagoing vessel	16,500DWT Cargo vessel Loa = 170 m Lpp = 160 m B = 21.6 m D = 13.0 m

## 2-3 DEMAND FOR NEW SHIPBUILDING

### (1) Small Sized Ships ( Class "1" )

According to the fleet expansion programme of BIWTC (Table 3-2-17 ), BIWTA (Table 3-2-18 ) and the results of forecast of the required number of fishing trawlers (Table 4-2-15 ), the expected work volume on new shipbuilding of small sized ships can be summarized as shown in Table 2-2.

Table 2-2 Demand for Small Sized Ships

Ship operator	Annual Required Number of Vessels
BIWTC	138 vsls/ 5 years = 28 vsls/year
BIWTA	23 vsls/ 5 years = 5 vsls/year
BFDC, Private (Fishing Trawler)	12 vsls/10 years = 1 vsl./year
	(Total 34 vsls/year)

### (2) Medium Sized Ships (Class "2") and Large Sized Ships (Class "3")

New shipbuilding demand for these classes can be obtained by adding the number of replaced vessels to the increase in number of fleet.

#### 1) Increase in number of fleet

According to the result of demand forecast on the vessels owned by BSC and private sector shown in Table 4-2-15 and 4-2-16, the number of required vessels for ten years from 1994/95 to 2003/04 are summarized as given in Table 2-3.

Table 2-3 Increase in Number of Fleet for 10 Years

Ship operator	Increase in number of vessels/10 years	
	Lifting share 30 %	Lifting share 40 %
BSC	35 - 26 = 9 vsls	40 - 29 = 11 vsls
Private sector	40 - 29 = 11 vsls	53 - 33 = 20 vsls
Total	20 vsls	31 vsls

2) Number of replaced vessels

Considering that ship's life is 30 years, these ships which were built from 1964 to 1973 would be replaced by new ships in the years from 1994 to 2003. According to the present fleet position in Table 3-2-6 and 3-2-8, the number of vessels to be replaced will be 8 vessels for BSC, 21 vessels for private sectors, and 29 vessels in total.

3) Number of newly required vessels per year

Table 2-4 shows the number of newly required vessels per year for ten years from 1994 to 2003.

Table 2-4 Number of Newly Required Vessels per Year

	Lifting share	
	30 %	40 %
No. of increased vessels	20 vsls/10 years = 2.0 vsls	31 vsls/10 years = 3.1 vsls
No. of replaced vessels	29 vsls/10 years = 2.9 vsls	29 vsls/10 years = 2.9 vsls
Total	4.9 vsls/year	6.0 vsls/year

On the one hand, the composition by ship's class of BSC and private sector is as shown in Table 2-5.

Table 2-5 Number of Vessels by Class

Ship operator	Class "2"		Class "3"	
	upto 2,000	2,001-4,000	4,001-8,000	above 8,000
BSC	2	0	0	21
Private sector	2	5	6	12
Total	4	5	6	33
Ratio	20 %		80 %	

When this composition ratio continues unchanged for these ten years, the number of required vessels by ship's class becomes as shown in Table 2-6.

Table 2-6 Number of Required Vessels by Class

Class	Lifting share	
	30 %	40 %
2	4.9 vsls/year x 0.2 = 1.0 vsl./year	6.0 vsls/year x 0.2 = 1.2 vsls/year
3	4.9 vsls/year x 0.8 = 3.9 vsls/year	6.0 vsls/year x 0.8 = 4.8 vsls/year

As for class "2" vessels, it can be said that about one vessel per year of shipbuilding work is expected from BSC and private shipowners. In addition to this, there is expectancy of business opportunity for CDD to build such ships as various workboats, inland container vessels, etc. from the other marine authorities in the country.

### 3 SHIPBUILDING PROGRAMME

Considering the present capability of CDD, the demand for new shipbuilding and the management policy of BSEC, the following two cases of shipbuilding programmes are prepared.

Case "A" : To build class "1" and class "2" vessels alternately

Case "B" : To build class "2" vessels continuously

Fig. 3-1 shows the shipbuilding programme of both cases, assuming that the building period for the first vessel of class "1" is twelve months and that of class "2" is eighteen months, and these periods decrease to nine months and fifteen months for the fourth vessel by improving productivity, etc.



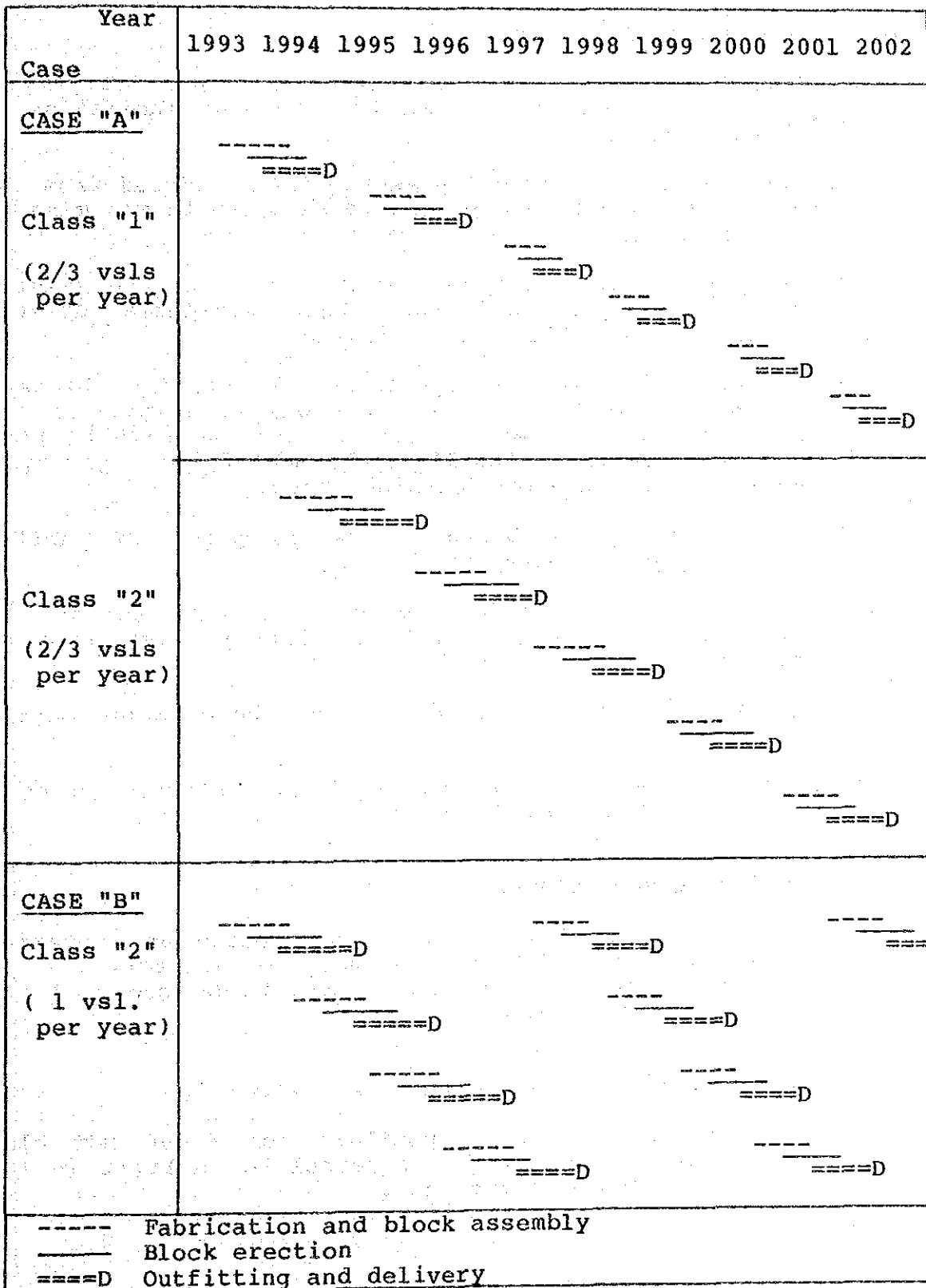


Fig. 3-1 Shipbuilding Programme

## **4 SHIPBUILDING PROCEDURE**

### **4-1 BASIC CONCEPT**

- (1) Ships are to be built utilizing the same slipway as planned in Chapter 6, Section 3 "New Facilities of Optimum Plan".
- (2) A straight line production system is considered from the steel stockyard to the shipbuilding berth to minimize transportation.
- (3) Fabrication and subassembly work is done in the existing fabrication shop, and the other available existing facilities are to be fully utilized.
- (4) Hull block construction system is adopted. Hull block up to the size of 6m by 6m and the weight of maximum 12.5 tons are to be assembled, considering the size of steel materials available locally and the lifting capacity of the existing starboard dockside crane.
- (5) Around and on the berth, necessary power and utility lines are to be arranged.
- (6) After completion of hull structural construction, the hull body will be launched by filling water into the semi-dry dock.
- (7) Outfitting works are mainly done at the existing mooring quay.
- (8) Final docking prior to sea trial and delivery is to be done at the existing dry dock.

### **4-2 PRODUCTION FLOW DIAGRAMME**

Flow diagramme of the production process and materials are shown in Fig. 4-1 and Fig. 4-2, respectively. Initial design and yard design are to be supplied from outside for the time being.

### **4-3 CONFIGURATION OF SHIPBUILDING ON SLIPWAY**

The configuration of shipbuilding of 4,000 DWT class cargo boat (Maximum scale of vessel to be built in this plan) is as shown in Fig. 4-3.

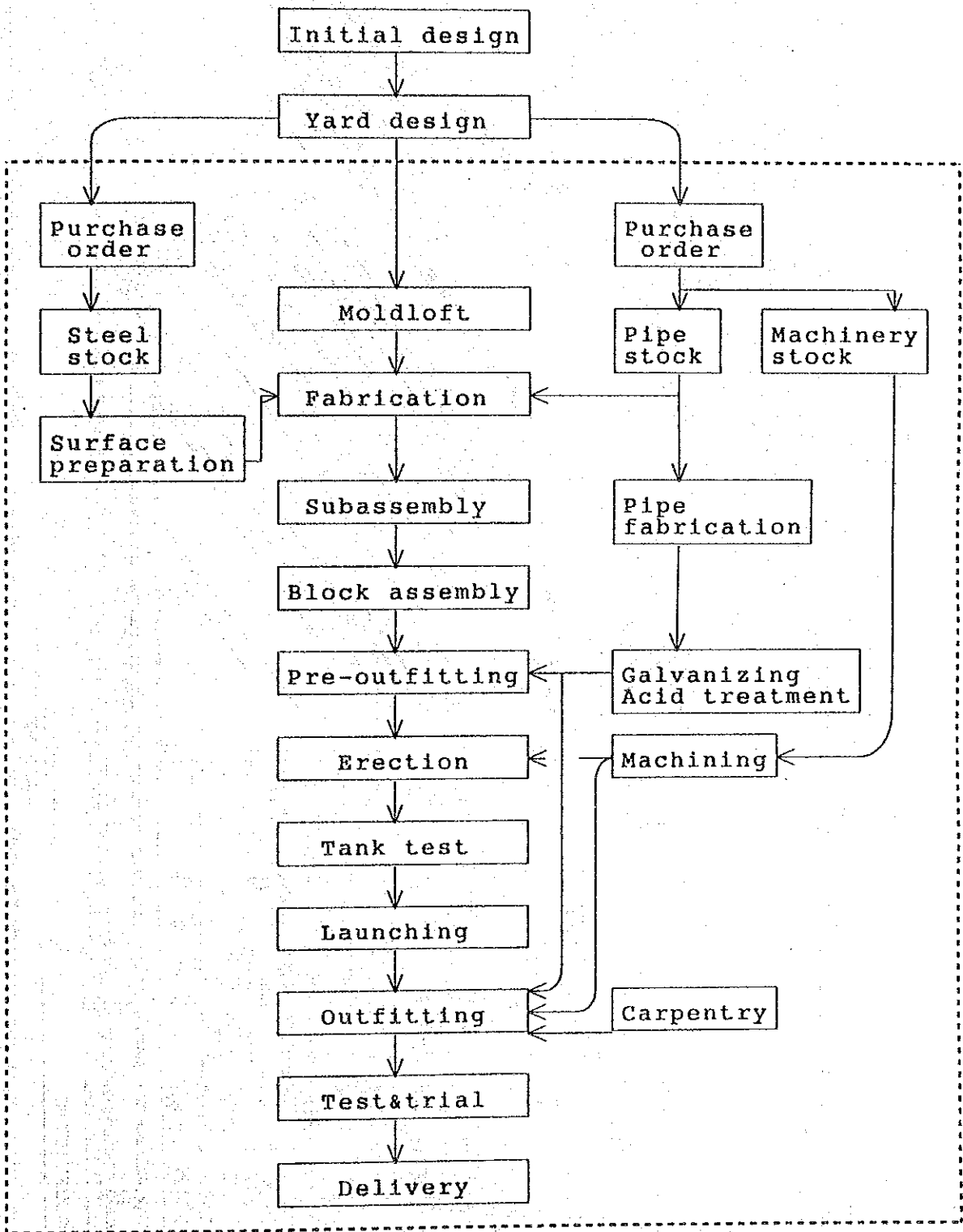


Fig. 4-1 Production Flow Diagramme

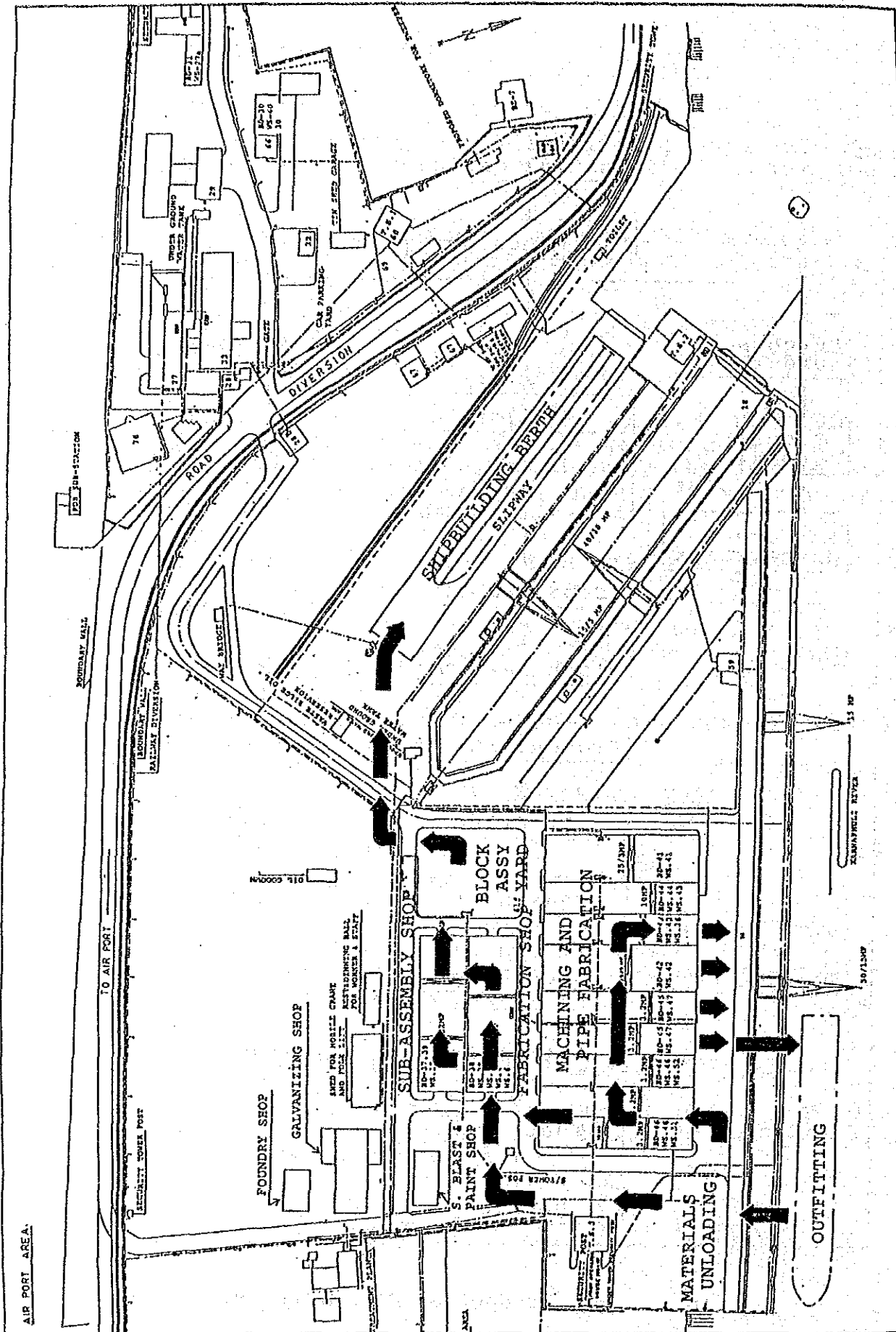


Fig. 4-2 Materials Flow Diagramme

Launching Particulars ( Vessel is floated by filling water after completion of hull body )

Lpp = 90.00 m  
 B = 14.30 m  
 D = 7.70 m ( Ballast 30 tons in APT )

df = 0.58 m ( df = 0.40 m )  
 da = 2.62 m ( da = 2.83 m )  
 Trim = 2.04 m ( Trim = 2.43 m )  
 Launching = 1,220 tons ( 1,250 tons )  
 weight

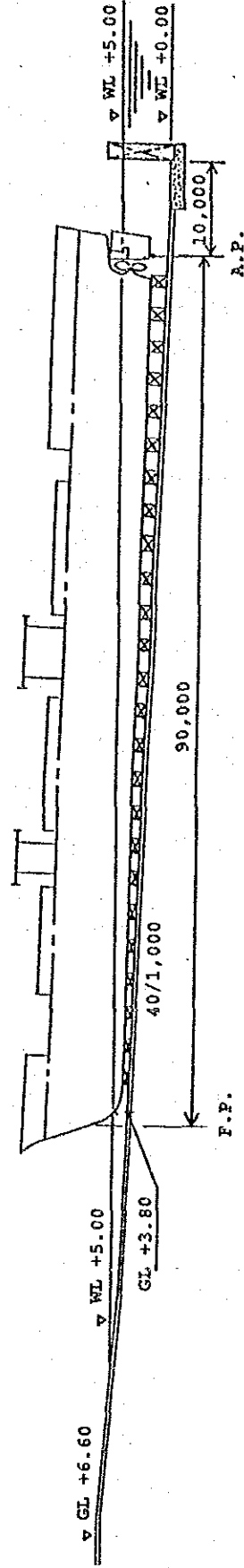


Fig. 4-3 Configuration of Shipbuilding for 4,000 DWT Class Cargo Boat

## 5 FACILITY PLAN FOR NEW SHIPBUILDING

### 5-1 BASIC PLANNING

In addition to the available existing facilities, the following is planned for shipbuilding.

#### (1) Mold Loft Shop

As for the mold lofting, the area in which a body plan and fairing of a planned ship can be drawn is necessary. Considering 4,000 DWT class cargo vessels, the area about 50 m by 12 m is kept in the existing fitter and metal work shops.

#### (2) Sand Blast and Paint Shop

Prior to steel fabrication, it is desirable to remove millscale and rust on steel materials and to apply a shop primer coating. Therefore, a sand blast and paint shop with the area of 16 m by 10 m is to be disposed adjacent to the existing material stockyard.

#### (3) Steel Stockyard

The total hull steel weight of a 4,000 DWT class cargo boat is approximately 1,100 tons. Assuming that fabrication period is 4 months and scrap ratio is 15 %, monthly stock volume of steel materials is:

$$1,100 \text{ tons} / 4 \text{ months} \times 1.15 = 316 \text{ tons/month}$$

When 3 m<sup>2</sup> of area is required for stocking 1 ton of steel material, the total necessary stock area is as follows:

$$316 \text{ tons} \times 3 \text{ m}^2/\text{ton} = 948 \text{ m}^2$$

The existing steel stockyard which has an area of approximately 1,000 m<sup>2</sup> can afford enough room for stocking steel materials

#### (4) Fabrication Shop

The existing fabrication shop is available for this purpose. Bending roller, hydraulic press etc. are useful for steel fabrication. The conventional simple manual marking method using drawings or tables is adopted. Some additional equipment, such as flame cutting slab, bending slab, portable flame cutting machine etc. is newly quipped with.

#### (5) Subassembly Shop

The existing subassembly workshop is utilized.

(6) Block Assembly Shop

Prior to the hull block assembling, seam line welding of steel plates is done at the existing assembly shop. The open area in front of the existing fabrication and assembly shop is to be allocated for block assembly.

(7) Shipbuilding Berth

Ships are to be built on the same berth as planned for small sized ship repair (Slipway). The launching of a ship is done by filling water into the semi-dock type berth.

(8) Welding Machine

CDD, at present, has a considerable number of welding equipment. This can be utilized for shipbuilding work. However, considering the necessary number of fitters and welders engaging in the work, some additional number of welding machines are required as shown in Table 5-1.

Table 5-1 Welding Machine

Kinds of machine	No. of possession	No. of necessity	No. of addition
1. AC Arc welding machine	120	150	30
2. Gravity welding equipment	12	12	0
3. Submerged arc welder	6	6	0
4. Welding box	20	20	0
5. Arc air gouging machine	2	6	4

**5-2 OUTLINE OF MAIN FACILITIES**

The outline of the main facilities necessary for new shipbuilding work is shown in Table 5-2, not including the existing facilities.

Table 5-2 Outline of Main Facilities

No.	Item	Unit	Main Particulars
1	Mold loft shop	1	25m x 12m, wooden floor
2	Sand blast & paint shop (1) Building (2) Hoist crane (3) Sand blast machine (4) Airless spray unit	1 2 4 4	16m x 10m 1 ton
3	Fabrication shop (1) Gas cutting slab (2) Bending slab (3) Portable flame cutting machine (4) Bending jig	- - 10	Steel made 30 m <sup>2</sup> , honey comb
4	Shipbuilding berth (1) Keel block (2) Side block (3) Stairway tower (4) Scaffolding (5) Ventilation fan	1 75 90 1 7	Wood, steel & concrete made steel made 130 m <sup>3</sup> /min. x 2 55 m <sup>3</sup> /min. x 5
5	Transport equipment (1) Trailer (2) Truck (3) Forklift	1 2 2	15 tons 6 tons and 2 tons 3 tons
6	Welding machine (1) AC arc welder (2) Arc air gouging mach.	30 4	300A x 10, 500A x 20 600 A
7	Painting machine (1) Airless spray unit	10	



No.	Item	Unit	Main Particulars
8	Pipe fabricating machine (1) Pipe cutter (2) Hyd. pipe bender (3) Bending slab (4) Hydraulic test pump	1 1 - 1	100 A 100 A 5 m <sup>2</sup> , honey comb
9	Generator testing equip. (1) Water resister tank (2) Reactor	1 1	500 kw 300 kw
10	Shafting machine (1) Boring bar machine	1	Boring range abt. 250 to 500 mm
11	Service utilities (1) Elect. welding switch box (2) Elect. wiring (3) C <sub>2</sub> H <sub>2</sub> /O <sub>2</sub> pipe line (4) Compressed air line (5) Water line	50 - - - -	220 v
12	Tools and jigs (1) Mold lofting tools (2) Marking tools (3) Gas cutting tools (4) Bending tools (5) Fitting tools (6) Welding tools (7) Painting tools	- - - - - - -	Draftmans hand tools Draftmans hand tools Gas cutter, O <sub>2</sub> & C <sub>2</sub> H <sub>2</sub> hose, etc. Heating torch, jack, etc. Air grinder, hammer, chain block, etc. Cabtire, holder, etc. Disc grinder, spray gun, etc

No.	Item	Unit	Main Particulars
	(8) Electrician tools	-	Hand tools, tester, etc.
	(9) Mech. fitter tools	-	Measuring tools, torque wrench, etc.
	(10) Carpenter tools	-	Carpenter hand tools
	(11) Safety equipment	-	Portable fire extinguisher, helmet, etc.
13	General service facility		
	(1) Business car	1	
	(2) Micro bus	1	
	(3) Workers house	1	

## 6 MANPOWER AND TRAINING PLAN

### 6-1 MANPOWER PLAN

The necessary manpower plan is estimated on the basis of the shipbuilding programme and the following conditions.

- Necessary working hour for building of the first vessel is estimated as follows, based on the data of actual working hours in KSY and the other shipyards.

	Hull construct. (hours)	Outfitting (hours)	Total (hours)
50m class cargo boat	128,000	192,000	320,000
3,000 DWT cargo boat (Average)	440,000	440,000	880,000

- The productivity in 2012/13 is expected to be three times as good as that in 1994/95 by improving technology.
- Individual working hour per year is estimated to be 2,480 hours.

Table 6-1 indicates the estimated annual working hours and the necessary manpower.

Table 6-1 Estimated Annual Working Hours and Manpower

Year	Expected improvement of productivity	Shipbuilding programme			
		Case "A"		Case "B"	
		Working hours	No. of workers	Working hours	No. of workers
1993/94	1.00	106,600	40	220,000	90
1994/95	1.00	800,000	325	880,000	355
1997/98	1.50	533,300	215	586,600	240
2002/03	2.20	363,600	150	400,000	165
2007/08	2.80	285,700	115	314,200	130
2012/13	3.00	266,000	110	293,300	120

No. of workers = Annual working hours / 2,480 hours/person

In addition to the above direct workers, the following persons are required considering that the ratio of these persons is to be 20% of direct workers in the year 2012/13.

- Administrative personnel : 24 persons
- Indirect workers : 24 persons

## 6-2 ORGANIZATION

When CDD goes for a new shipbuilding business, new organization and additional manpower is required. In this respect, it is recommended to organize a new department for shipbuilding activity. The organization and manning plan is shown for reference in Fig. 6-1.

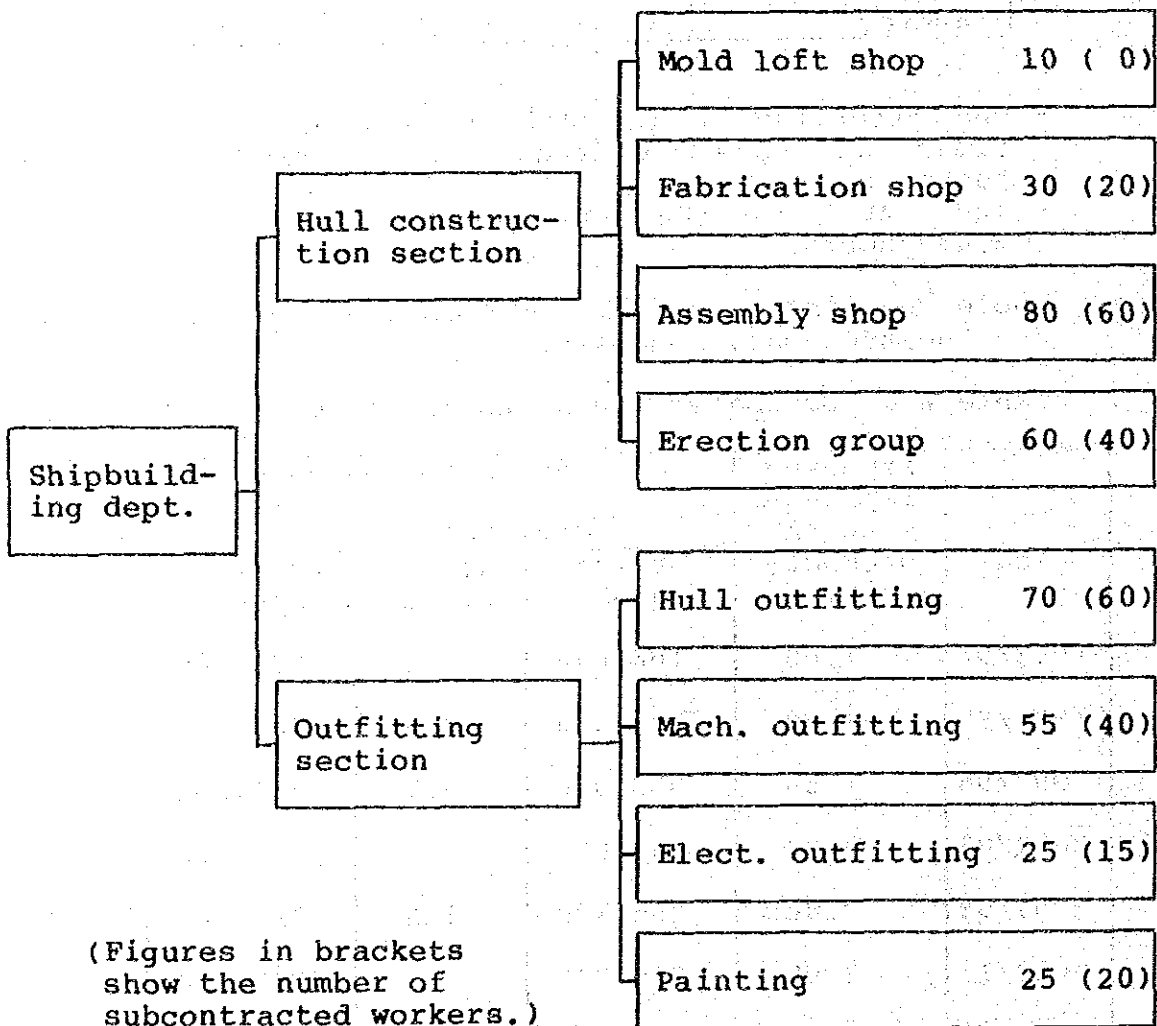


Fig. 6-1 Organization and Manning Plan

**6-3 TECHNICAL TRAINING PLAN**

Although some expertise and experience on ship repair has accumulated at CDD since its founding, CDD has no experience on a commercial basis of shipbuilding. Even if technically skilled shipbuilding personnel is shifted from KSY and DEW to CDD, adequate education and training programmes have to be implemented for both engineers and workers.

The education and training is implemented in the following manner:

- dispatch of engineers and workers to advanced shipbuilding country,
- technical assistance from technically advanced country,
- cultivation of skilled workers at domestic training center.

Table 6-2 gives a technical training plan for new shipbuilding development.

Table 6-2 Technical Training Plan ( 1/2 )

(1) Training at Overseas Shipyard			
Training Item	Number of Trainee	Period (Month)	Man Month
Production drawing	2	6	12
Mold loft	2	6	12
Marking/Gas cutting	2	6	12
Bending	2	6	12
Welding	4	6	24
Block assembling	2	6	12
Block erection	2	6	12
Hull outfitting	2	6	12
Mech. fitting	2	6	12
Elect. fitting	2	6	12
<b>Total</b>	<b>22</b>		<b>132</b>

Table 6-2 Technical Training Plan ( 2/2)

(2) Technical assistance from overseas shipyard		
Technical fields	Number of Expert	Period (Month)
Management, Material, Cost, Schedule	1	10
Production Drawings	1	6
Mold loft	1	6
Marking and Cutting	1	6
Bending and Line heating	1	6
Welding	1	6
Block Assembling, Erection	1	10
Machine Fitting	1	6
Hull Outfitting	1	6
Elect. Fitting	1	6
Total	10	68

## 7 INVESTMENT AMOUNT

The estimated investment amount for the development of new shipbuilding is summarized in Table 7-1. The conditions for the estimate, such as exchange rate, custom duties, etc., are adopted on the same basis as shown in Chapter 6, section 4.

Table 7-1 Estimated Investment Amount

(Unit: 1,000 Taka)

Item	Local Currency Portion	Foreign Currency Portion	Total
1. Building	2,210	450	2,660
- Mold loft shop	(250)	(450)	(700)
- Sand blast & paint shop	(1,780)	( 0)	(1,780)
(Duties & charges)	(180)	( 0)	(180)
2. Service utilities	590	950	1,540
(Duties & charges)	(290)	( 0)	(290)
3. Machinery & equipment	18,040	32,020	50,060
- Sand blast & paint shop	(40)	(3,540)	(3,580)
- Fabrication shop	(670)	(2,060)	(2,730)
- Shipbuilding berth	(4,750)	(1,980)	(6,730)
- Transport equipment	( 0)	(5,510)	(5,510)
- Welding machine	( 0)	(2,310)	(2,310)
- Painting machine	( 0)	(570)	(570)
- Pipe fab. machine	( 0)	(2,500)	(2,500)
- Generator testing equipment	(340)	(910)	(1,250)
- Shafting machine	( 0)	(1,140)	(1,140)
- Tools and jigs	(2,300)	(11,500)	(13,800)
(Duties & charges)	(9,940)	( 0)	(9,940)

(Unit: 1,000 Taka)

Item	Local Currency Portion	Foreign Currency Portion	Total
4. General service facility (Duties & charges)	4,090 (420)	1,100 ( 0)	5,190 (420)
5. Contingencies	1,350	1,740	3,090
- Building work (10%)	(220)	( 40)	(260)
- Mach. & equip. (5 %) of Item No. 1 - 4	(1,130)	(1,700)	(2,830)
6. Technical training	0	64,500	64,500
- Training overseas	( 0)	(27,700)	(27,700)
- Technical assist.	( 0)	(36,800)	(36,800)
7. Consultant fee	0	10,500	10,500
Grand total	26,280	111,260	137,540

Table 7-2 shows the yearwise investment amount, which are to be invested in 1992/93 and 1993/94.

Table 7-2 Yearwise Investment Amount

(Unit: 1,000 taka)

Item	1992/93	1993/94
1. Building	2,660	0
2. Service utilities	0	1,540
3. Machinery & equip.	25,670	24,390
4. General service	5,190	0
5. Contingency	1,800	1,290
6. Technical training	27,700	36,800
7. Consultant fee	8,400	2,100
Total	71,420	66,120



## 8 FINANCIAL EVALUATION

### 8-1 SALES ESTIMATE

The market price of new shipbuilding varies to a large extent on the demands for vessels which fluctuate according to the world economy and also on the supply capacity of shipyards. It is also influenced by the shipping and shipbuilding policies for each country, the technological innovations, wars, etc. It is therefore difficult to forecast the market price of a vessel over long term period.

Moreover, the prices of ships vary with the size, the ship's type, the performance, the grade of equipment, etc.

In view of the above, reviewed on the prices of conventional ships ever built in the past in Bangladesh and/or in Japan, the standard prices for this study are assumed as follows:

- Class "1", 350 DWT cargo ship : 345 Lac. taka/ship
- Class "2", 3,000 DWT cargo ship : 2,300 Lac. taka/ship

(At 1989 Price)

Based on this prices and aforementioned shipbuilding programme, the estimated sales amount per year are shown in Table 8-1 and 8-2.

### 8-2 COST ESTIMATE

The cost of new shipbuilding is estimated as below.

#### (1) Material Cost

The following materials are considered to be locally procured and they are measured on local market prices.

- Steel plates up to 12.5 mm in thickness
- Small sized steel sections and pipes
- Welding rods
- Electric cable, paint, wooden materials, etc. available locally

Main engine, auxiliary machinery, marine cable, electric equipment, etc. are estimated to be imported.

The estimated material cost is as follows:

For class "1" ship : Imported materials 98.8 Lac. Tk  
Local materials 83.4 Lac. Tk  
For class "2" ship : Imported materials 1,159.0 Lac. Tk  
Local materials 278.0 Lac. Tk

(2) Design Fee

Purchasing cost for a set of design is assumed to be 34 lac. taka for class "1" and 276 lac. taka for class "2". The design fee is incurred for purchasing to consider the standardization of ship, every 3 ships.

(3) Duties and Charges, etc.

As for imported materials, no imported duty nor sales tax are included, but the amount of 11 % of C & F price is estimated for handling charges and marine insurance.

**8-3 FINANCIAL EVALUATION**

The results of financial internal rate of return (FIRR) for Case "A" and "B" are obtained as follows, applying the operating condition of CDD after the implementation of Optimum Plan and the same calculation method as for Optimum Plan.

	New Ship Building	Ship Repair	Steel Struct.	Total
Case "A"	0.5 %	8.4 %	6.0 %	5.7 %
Case "B"	5.4 %	8.4 %	6.0 %	6.8 %

Cashflow statements for the above figures are presented from Table 8-1 to 8-6.

Table 8-1

Cash Flow Statement for Ship Building Project, Case A  
(1000 taka)

		1989/90	1993/94	1994/95	1997/98	2002/03	2007/08	2012/13	
Production	Class 1	0	0.33	0.67	0.67	0.67	0.67	0.67	
	Class 2	0	0.00	0.67	0.67	0.67	0.67	0.67	
Sales	Class 1	0	11,500	23,000	23,000	23,000	23,000	23,000	
	Class 2	0	0	153,300	153,300	153,300	153,300	153,300	
	Total	0	11,500	176,300	176,300	176,300	176,300	176,300	
Operation Expenses	Material	Import	0	3,658	93,138	93,138	93,138	93,138	93,138
		Local	0	2,780	24,100	24,100	24,100	24,100	24,100
	Total	0	6,438	117,238	117,238	117,238	117,238	117,238	
	Fuel & Power	0	1,066	8,000	5,333	3,636	2,857	2,660	
	Salary	Direct	0	2,144	5,257	5,476	6,762	8,370	10,683
		Indirect	0	2,254	5,397	5,517	6,094	7,263	9,270
	Total	0	4,398	10,654	10,993	12,856	15,634	19,953	
	Design Fee	0	1,100	6,900	6,900	6,900	6,900	6,900	
	Subcontracting	0	0	6,983	3,676	1,799	626	484	
	Maintenance	0	746	5,600	3,733	2,545	2,000	1,862	
	Other	0	1,265	14,848	14,097	13,807	13,835	14,220	
	Total Cost	0	15,013	170,223	161,971	158,782	159,090	163,316	
	Gross Profit	0	-3,513	6,077	14,329	17,518	17,210	12,984	
	Profit After Tax	0	-3,513	3,343	7,881	9,635	9,466	7,141	

Source: Study Team

Table 8-2

Cash Flow Statement for Ship Building Project, Case B  
(1000 taka)

		1989/90	1993/94	1994/95	1997/98	2002/03	2007/08	2012/13	
Production	Class 1	0	0.00	0.00	0.00	0.00	0.00	0.00	
	Class 2	0	0.25	1.00	1.00	1.00	1.00	1.00	
Sales	Class 1	0	0	0	0	0	0	0	
	Class 2	0	57,500	230,000	230,000	230,000	230,000	230,000	
	Total	0	57,500	230,000	230,000	230,000	230,000	230,000	
Operation Expenses	Material	Import	0	32,177	128,725	128,725	128,725	128,725	128,725
		Local	0	6,950	27,800	27,800	27,800	27,800	27,800
	Total	0	39,127	156,525	156,525	156,525	156,525	156,525	
	Fuel & Power	0	2,200	8,800	5,866	4,000	3,142	2,933	
	Salary	Direct	0	2,144	5,257	5,476	6,762	8,370	10,683
		Indirect	0	2,254	5,397	5,517	6,094	7,263	9,270
	Total	0	4,398	10,654	10,993	12,856	15,634	19,953	
	Design Fee	0	2,300	9,200	9,200	9,200	9,200	9,200	
	Subcontracting	0	1,379	6,983	4,475	2,339	1,251	967	
	Maintenance	0	1,540	6,160	4,106	2,800	2,199	2,053	
	Other	0	4,864	18,912	18,197	17,852	17,875	18,243	
	Total Cost	0	55,808	217,234	209,363	205,572	205,826	209,874	
	Gross Profit	0	1,692	12,766	20,637	24,428	24,174	20,126	
	Profit After Tax	0	931	7,021	11,351	13,436	13,295	11,069	

Source: Study Team

Table 8-3

Cash Flow Statement for Ship Repair (Optimum Plan)  
With Building

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13	
Production	Vessel	Seagoing	13	19	20	28	36	38	38	
		Coastal	24	12	19	30	29	30	30	
	DWT	Seagoing	142,612	210,197	223,132	296,537	369,940	385,790	385,790	
		Coastal	18,240	9,120	14,440	22,800	22,040	22,800	22,800	
Sales		Seagoing	22,148	34,726	38,333	61,426	101,216	121,331	121,331	
		Coastal	18,723	9,902	16,248	31,505	40,679	48,608	48,608	
		Total	40,871	44,628	54,581	92,931	141,895	169,939	169,939	
Operation Expenses	Material	Import	3,271	3,580	4,366	7,434	11,352	13,595	13,595	
		Local	6,317	6,915	8,433	14,358	21,923	26,256	26,256	
		Total	9,588	10,495	12,799	21,792	33,275	39,851	39,851	
		Fuel & Power	3,291	3,830	4,198	5,201	7,109	8,135	8,135	
	Salary	Direct		4,847	6,076	6,409	8,942	13,444	19,557	24,961
			Indirect	7,840	9,296	8,228	8,880	12,371	17,214	21,970
		Total	12,687	15,372	14,637	17,822	25,815	36,772	46,931	
		Subcontracting	0	0	441	1,304	3,130	4,254	4,932	
		Maintenance	2,304	2,681	2,939	3,641	4,976	5,695	5,695	
		Other	2,787	3,238	3,501	4,976	7,430	9,471	10,554	
		Total Cost	30,657	35,615	38,516	54,735	81,735	104,178	116,099	
Gross Profit			10,214	9,013	16,065	38,196	60,160	65,761	53,840	
Profit After Tax			5,618	4,957	8,836	21,008	33,088	36,169	29,612	

Source: Study Team

Table 8-4

Cash Flow Statement for Ship Repair (Slipway Project)  
With Building

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13	
Production	Vessel	Seagoing	0	0	0	3	9	10	10	
		Coastal	0	0	10	30	29	30	30	
	DWT	Seagoing	0	0	0	22,326	66,976	74,423	74,423	
		Coastal	0	0	7,600	22,800	22,040	22,800	22,800	
Sales		Seagoing	0	0	336	10,648	37,278	51,267	51,267	
		Coastal	0	0	8,619	31,505	40,679	48,608	48,608	
		Total	0	0	8,955	42,153	77,957	99,875	99,875	
Operation Expenses	Material	Import	1	10	716	3,372	6,237	7,990	7,990	
		Local	2	20	1,384	6,513	12,045	15,431	15,431	
		Total	3	30	2,100	9,885	18,282	23,421	23,421	
		Fuel & Power	0	0	265	792	2,034	2,730	2,730	
	Salary	Direct		0	409	-89	82	909	2,608	3,328
			Indirect	0	174	-1,620	-3,751	-4,260	-4,650	-5,935
		Total	0	583	-1,709	-3,669	-3,351	-2,042	-2,607	
		Subcontracting	0	0	441	1,304	3,130	4,254	4,932	
		Maintenance	0	0	186	555	1,424	1,911	1,911	
		Other	0	61	128	887	2,152	3,027	3,039	
		Total Cost	3	674	1,411	9,753	23,670	33,301	33,425	
Gross Profit			-3	-674	7,544	32,400	54,287	66,574	66,450	
Profit After Tax			-2	-371	4,149	17,820	29,858	36,982	42,222	

Source: Study Team

Table 8-5

Cash Flow Statement for Steel Work (Optimum Plan)  
With Building

(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	320	370	480	700	950	1,050	1,100
Sales	14,060	16,150	28,190	47,770	70,240	79,450	83,400
Material Cost	192	160	3,690	8,380	13,660	16,010	17,160
Import							
Local	9,880	11,350	15,440	23,430	32,620	36,270	37,920
Total	10,072	11,510	19,130	31,810	46,280	52,280	55,080
Fuel & Power	967	1,030	1,594	1,841	2,103	2,201	2,207
Salary	1,974	2,285	2,977	4,104	5,759	7,409	9,456
Direct							
Indirect	3,065	3,334	3,776	3,993	5,119	6,174	7,880
Total	5,039	5,619	6,753	8,098	10,878	13,583	17,335
Subcontracting	0	80	745	1,366	2,051	2,586	3,046
Maintenance	677	721	1,116	1,289	1,472	1,541	1,545
Other	1,676	1,896	2,934	4,440	6,278	7,219	7,921
Total Cost	18,431	20,856	32,271	48,843	69,062	79,409	87,135
Gross Profit	-4,371	-4,706	-4,081	-1,073	1,178	41	-3,735
Profit After Tax	-4,371	-4,706	-4,081	-1,073	648	22	-3,735

Source: Study Team

Table 8-6

Cash Flow Statement for Steel Expansion Project  
With Building

(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	0	0	80	270	520	620	670
Sales	0	-50	10,700	28,870	51,340	60,550	64,500
Material Cost	0	0	3,306	7,900	13,180	15,530	16,680
Import							
Local	0	0	2,928	9,904	19,094	22,744	24,394
Total	0	0	6,234	17,804	32,274	38,274	41,074
Fuel & Power	0	63	627	874	1,136	1,234	1,240
Salary	0	0	578	1,188	2,037	2,658	3,392
Direct							
Indirect	0	-180	339	130	591	655	836
Total	0	-180	917	1,318	2,628	3,313	4,228
Subcontracting	0	80	745	1,366	2,051	2,586	3,046
Maintenance	0	44	439	612	795	864	868
Other	0	1	896	2,197	3,888	4,627	5,046
Total Cost	0	8	9,858	24,170	42,772	50,898	55,502
Gross Profit	0	-58	842	4,700	8,568	9,652	8,998
Profit After Tax	0	-58	842	4,700	8,038	9,634	8,998

Source: Study Team

**SUGGESTION FOR NEW SHIPBUILDING BUSINESS**

To promote the development plan for new shipbuilding of CDD smoothly, various policies and measures should be taken and enforced. The desirable measures to be taken are suggested as follows:

(1) Requisition on KSY and DEW for Skilled Shipbuilding Personnel

As for ship repair and fabrication of steel structures, some technic and experience have accumulated by work done at CDD in the past. However, considering that CDD has no experience and technic in the field of new shipbuilding, it should be considered that requisite technically skilled shipbuilding personnel of KSY and DEW, operated in this field under the administration of BSEC, should be placed in CDD for shipbuilding work, when required.

(2) Standardization of Ships to be Built in CDD

Standardization of ships makes it possible for shipbuilders to simplify their production process, due to a similar type ship effect (experience effect). This produces a good effect on shipowners by offering ships of economical price, good quality, stable performance, shorter delivery, etc.

In view of the fact, it is desirable for CDD to develop their standard type ships, in compliance with the demand of shipowners.

(3) Adoption of Package Deal Supply for Shipbuilding Work

As CDD is insufficient in technology and experience of shipbuilding, it is recommended that a package deal supply system should be adopted at the first stage of embarkation on a new shipbuilding business, wherein the design drawings, component parts and materials, training abroad, experts services, etc. can be supplied to CDD by a foreign supplier.

## **APPENDIX**

- 1. LIST OF EXISTING FACILITIES AND MACHINERY**
- 2. SUPPLEMENTARY DATA OF GDP**
- 3. FUTURE HANDLING CARGO VOLUME**





**APPENDIX 1 LIST OF EXISTING FACILITIES AND MACHINERY**

Remark: O/O - Out of order, repair is impossible  
 O/R - Now out of order, repair is necessary  
 W/R - Now working but repair is necessary  
 N/C - Not yet commissioned

Item	Unit	Main Particulars	Remark
1. Dry Dock	1	183 x 27.4 x 13.1m Graving type	
Dock gate	1	Floating caisson type	
Main pump	3	6,000 T/h	
Pen stocks	2	Electro-hydraulic sluice gate	W/R Leak
Crane, port side	1	40/10T x 24.3/37.2m	O/R
stbd side	1	15/5T x 30.5/37.5m	
Capstan	2	20T	
	2	15T	
Winch	1	15T	
Center keel blocks	110	Fixed type	
Bilge blocks	22	Electro-hydraulic	
2. Quay	1	342m length	
Crane	1	50/15T x 24.3/37.2m	W/R
	1	15/5T x 30.5/37.5m	
3. Sub Assembly Work-shop	1		
Overhead crane	1	3.2T	
	1	12.5/3.2T	
DC Arc welder	2	330A diesel engine driven	
Welding rectifier	120	DC 600A	
Welding transformer	120	AC 650A	
Welding box	20		
Gravity welding equipment	12	Weld. rod 4-7mm dia.	

Item	Unit	Main Particulars	Remark
Submerged arc welder	6		
Shearing machine	1	10t x 2,600mmL	
Frame bender	1	250T	
4. Plate/Bar/Pipe Workshop	1		
Overhead crane	2	3.2T	
Bending roller	1	20t x 3,050mmL	
Hydraulic press	1	400T	
	1	500T	W/R
Tig welder	17	DC/AC 300A	
Double grinder	5	150mm dia.	
Disc cutter	2	305mm dia.	
Air compressor	1	100L/min x 7kg/cm <sup>2</sup>	
Pipe cutting pantograph	1	370-520mm dia.	
Spindle press	1	1.5t, hand operated	
Semi-auto gas cutter		Capacity 5-100mmt	
Support grinder	1	Grinding depth 75mm	
Pipe bender	1	Max. 50A	
Tube expander	1	50.8-100.9mm dia.	
Drilling machine	2	32mm dia.	
Lever shear	1	6mmt	
5. Sheet Metal/Boiler/Insulation/Blacksmith/Rigging Workshop	1		
Overhead crane	2	3.2T	
Radial drilling machine	1	50mm	O/R

Item	Unit	Main Particulars	Remark
Bending roller	1	1.2t x 2,000mmL	
Band saw, horizontal	1	Max dia. 250mm	
Flanging machine	1	Max 1mmt	
Duplicating pantograph	2	Max 150mmt	O/R
Wire rope cutter	1	40mm	
Lever shear	1	Max 6mmt	
Angle bending machine	1	Max 1mmt	
Tube cleaning machine	1	13-95mm	
Drilling machine	2	32mm dia	
6. Machine Workshop	2		
Overhead crane	1	25/5T	
Universal lathe	1	Center distance 11m Center height 660mm	
Universal lathe	1	Center distance 5m Center height 910mm	
Universal lathe	4	Center distance 1.2m Swing dia. 210mm	
Radial drilling machine	1	Max dia. 95mm	W/R
Bench grinder	1		
Band saw, horizontal	1	Max dia. 250mm	
Horizontal boring & milling machine	1	Spindle travel 900mm	
7. Machine/Maintenance Workshop	1		
Overhead crane	1	10T	
Slotter machine	1	Max. ram stroke 410mm	

Item	Unit	Main Particulars	Remark
Vertical milling machine	2	Travel 920 x 350 x 450mm	
Cylindrical grinding machine	1	Max. dia. 63mm, distance 2,000mm	
Vertical lathe	1		
Universal tool sharpener	1	Distance 650mm	
Soldering machine	1		
Surface plate	1	900 x 1,200 x 250mm	
Universal milling machine	1	Travel 750 x 270 x 400mm	
Shaping machine	2	Stroke 770mm	
Twin chamber oven	1	1,000-1,300 C	
Tool maker's milling machine	1	Travel 750 x 300 x 450mm	
Drilling machine	2	Max dia. 32mm	
Horizontal milling machine	5		
Shaping machine	1		
8. Mechanical/Electrical Workshop	1		
Overhead crane	1	10T	
Hydraulic press	1	100T	
Disc cutter	2	405mm dia.	
Band saw	1	Max capacity 225mm	
Lapping machine	1	Twin disc	
Grinding machine for injector cone	1	Max dia. 15mm	
Horning machine	1	600mm dia x 1,500mmL	N/C
	1	80mm dia x 300mmL	N/C

Item	Unit	Main Particulars	Remark
Lever shear	2	Max 6mm	
Injector test pump	1	Max pressure 1,000kg/cm <sup>2</sup>	N/C
Injector pump test desk	1	500	N/C
Boring bar machine	1	Boring 400-800mm dia. Facing 400-1,000mm dia. (In case of stern frame boring)	N/C
Boring bar machine	1	Boring 180-400mm dia. Facing 150-550mm dia. (In case of stern frame boring)	
Taper boring bar	1	Bore 250-350mm dia.	
9. Engine Repair Workshop			
Overhead crane	1	25/5T	
Boring machine	1	165mm dia. x 500mmL	
10. Painting Workshop/Store			
Paint spray unit	1	503L/min.	
High pressure water gun	1	100L/min. x 500kg. cm <sup>2</sup>	W/R
Compressor, diesel eng. driven	1	0.5m <sup>3</sup> /min. x 10.5kg/cm <sup>2</sup>	
Pail cover mixer	4		
Transport carriage	1	1,000kg	
11. Carpenter Workshop			
Circular saw	1		
Sewing machine	1		
Wood planer	1		
12. Laboratory			
X-ray device	1		

Item	Unit	Main Particulars	Remark
Accessories for X-ray device	1		
Crack tester	1	Range 0.05-50mm -90mm	
Magnet crack tester	1		
Ultrasonic device	2		
Liquid penetrant tester	1		
Camera	1	Single lens reflex 50mm x F1.2 Double lens reflex 80mm x F2.8	
Photo enlarger	1		
Binocular	1		
Electric thickness measuring apparatus	1	1-200mm	O/O
13. Foundry			
White metal oven	2	150kg x 500 C	N/C
Electro-magnetic separator	1	Max 20T/h	
14. Other Areas/Stores			
Stand-by generator	2	250 KVA	
Fork lift truck	4	1.5T x 3m	
	1	6T x 3m, side type	
Mobile crane	3	16T x 3m	
Truck	1	4.5T	
Diving equipment	2		
High lift hand truck	2	1.5T	O/O
Pressure test pump	1	150kg/cm <sup>2</sup>	
Chain block	1	1.5T	

Item	Unit	Main Particulars	Remark
Flat pick up truck	5	1T	
Motor van	2	2T	
Portable fire pump	1	10kg/cm <sup>2</sup> x 0.8m <sup>3</sup> /min.	
Portable fire extinguisher	50		
CO2 fire extinguisher	50		
Firemen's suit	10		
Hydraulic press	1	15T	
Mobile stage	2		O/R

1 GDP at Current Prices

Year	(Million taka)			
	1983/84	1984/85	1985/86	1986/87
Agriculture	169,328	169,970	188,382	219,761
Mining	4	4	3	4
Industry	30,945	40,112	43,563	47,631
Construction	18,095	22,518	26,058	28,839
Power	1,939	2,348	2,713	3,545
Transport	26,013	42,941	52,726	58,387
Trade	28,513	37,275	40,891	45,017
Housing	24,867	32,444	37,066	40,988
Public Administration	13,984	17,694	19,810	23,735
Banking	5,152	6,889	8,935	10,116
Misc. Service	31,082	34,942	46,031	59,666
Total	349,922	407,137	466,178	537,589

APPENDIX 2 SUPPLEMENTARY DATA OF GDP

A 1 5

2 Sectoral GDP at Constant 1984/85 Price

Year	Sectoral GDP at Constant 1984/85 Price													
	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
Agriculture	142,416	159,807	175,219	168,529	162,593	185,311	191,322	184,285	182,611	181,463	192,917	206,041	169,970	176,058
Mining	4	6	4	5	5	5	5	14	4	7	4	4	4	2
Industry	14,072	14,630	16,629	21,400	23,526	24,034	29,536	32,269	34,133	34,101	35,504	33,543	40,112	41,097
Construction	7,604	10,173	11,506	14,769	16,139	16,486	18,433	15,712	19,991	21,530	19,445	20,065	22,518	22,858
Power	650	420	268	510	646	660	915	1,039	1,143	1,309	2,097	2,162	2,348	2,634
Transport	9,868	10,038	8,338	15,571	18,635	18,535	16,803	17,932	25,819	28,610	29,888	26,601	42,941	45,065
Trade	20,038	24,036	23,474	30,296	30,373	31,291	31,405	33,836	33,449	31,545	31,532	33,277	37,275	38,944
Housing	12,111	14,243	14,839	23,776	22,130	21,927	24,322	26,363	26,868	26,367	25,055	27,365	32,444	33,393
Public Administration	4,757	6,378	5,038	7,614	9,385	9,334	6,862	7,199	12,529	12,918	13,467	15,631	17,694	18,174
Banking	2,802	2,309	2,070	2,630	2,807	2,792	4,383	5,276	6,669	5,734	5,662	5,759	6,889	8,675
Misc. Service	15,336	15,998	10,413	15,324	17,911	19,641	20,734	24,220	26,381	28,700	30,786	3,211	34,942	37,730
Total	226,226	253,919	262,158	297,380	302,259	327,056	341,837	346,315	369,561	372,961	386,772	402,138	407,137	423,798

44,281 27,462 4,061 50,796 40,211 35,701 19,365 9,297 44,745 449,786

**APPENDIX 3 FUTURE HANDLING CARGO VOLUME**

2 Future Handling Cargo Volume (1,000 tons)  
(BSC Own Ships), 40%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	299 52 351	542 80 622	875 106 982
USA	Import Export Total	39 11 50	71 16 88	115 22 137
Far East	Import Export Total	227 3 233	411 10 422	665 14 678
Asia	Import Export Total	220 5 225	399 8 407	645 11 656
Pak & Wag	Import Export Total	18 1 19	32 1 33	51 2 53
Feeder	Import Export Total	34 1 35	62 2 64	101 2 103
Other	Import Export Total	0 1 1	0 3 3	0 4 4
Total	Import Export	836 78	1,518 121	2,452 160
	Total	915	1,639	2,612

1 Future Handling Cargo Volume (1,000 tons)  
(BSC Own Ships), 30%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	256 45 300	434 64 498	730 89 818
USA	Import Export Total	34 9 43	57 13 70	96 18 114
Far East	Import Export Total	194 6 200	329 8 337	554 11 565
Asia	Import Export Total	188 5 193	319 6 326	537 9 546
Pak & Wag	Import Export Total	15 1 16	26 1 27	43 2 45
Feeder	Import Export Total	29 1 30	50 1 51	84 2 86
Other	Import Export Total	0 1 1	0 2 2	0 3 3
Total	Import Export	717 67	1,214 97	2,044 133
	Total	784	1,311	2,177

4 Future Handling Cargo Volume (1,000 tons)  
(Private ships), 40%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	8 4 11	12 5 17	25 9 33
USA	Import Export Total	36 0 36	58 0 58	116 0 116
Far East	Import Export Total	97 2 99	155 2 157	313 4 316
Asia	Import Export Total	407 0 407	647 0 647	1,306 0 1,306
Pak & Wag	Import Export Total	181 31 211	287 42 328	579 69 648
Feeder	Import Export Total	131 53 184	208 72 280	420 119 539
Other	Import Export Total	96 0 96	152 0 152	307 0 307
Total	Import Export	481 48 529	1,518 121 1,639	3,065 200 3,266

3 Future Handling Cargo Volume (1,000 tons)  
(Private Ships), 30%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	7 3 10	11 5 16	16 6 22
USA	Import Export Total	32 0 32	52 0 52	78 0 78
Far East	Import Export Total	85 1 87	139 2 141	208 3 211
Asia	Import Export Total	356 0 356	582 0 582	871 0 871
Pak & Wag	Import Export Total	158 27 185	258 37 296	386 45 432
Feeder	Import Export Total	115 47 161	187 65 252	280 79 359
Other	Import Export Total	84 0 84	137 0 137	204 0 204
Total	Import Export	481 48 529	1,366 109 1,475	2,044 133 2,177

6 Future Handling Cargo Volume (1,000 tons)  
(BSC Chartered Ships), 40%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	196 3 199	231 3 234	311 4 314
USA	Import Export Total	338 10 348	399 10 409	537 11 548
Far East	Import Export Total	0 13 13	0 13 13	0 14 14
Asia	Import Export Total	475 88 563	649 97 746	874 107 981
Pak & Wag	Import Export Total	416 0 416	568 0 568	765 0 765
Feeder	Import Export Total	92 31 123	126 34 160	170 37 207
Other	Import Export Total	0 0 0	0 0 0	0 0 0
Total	Import Export	1,444 143	1,672 157	2,657 173
		1,586	1,829	2,830

5 Future Handling Cargo Volume (1,000 tons)  
(BSC Chartered Ships), 30%

	1989/90	1994/95	1999/00	2004/05
UK-CONT	Import Export Total	169 3 172	182 3 185	213 3 216
USA	Import Export Total	292 9 301	314 10 323	413 10 422
Far East	Import Export Total	0 12 12	0 12 12	0 12 12
Asia	Import Export Total	475 88 563	511 90 601	599 89 689
Pak & Wag	Import Export Total	416 0 416	447 0 447	525 0 525
Feeder	Import Export Total	92 31 123	99 31 131	117 31 148
Other	Import Export Total	0 0 0	0 0 0	0 0 0
Total	Import Export	1,444 143	1,553 145	1,821 145
		1,586	1,698	1,957
				2,044
				133
				2,177



8 Future Handling Cargo Volume (1,000 tons)  
(Foreign Flag Ships), 40%

	1989/90	1994/95	1999/00	2004/05	
UK-CONT	Import Export Total	2,238 221 2,460	2,595 243 2,839	3,112 248 3,360	3,752 245 3,997
USA	Import Export Total	1,631 161 1,792	1,891 177 2,069	2,268 181 2,449	2,734 178 2,913
Far East	Import Export Total	293 29 322	339 32 371	407 32 439	490 32 522
Asia	Import Export Total	1,390 137 1,527	1,611 151 1,762	1,932 154 2,086	2,330 152 2,482
Pak & Wag	Import Export Total	190 19 209	221 21 241	264 21 285	319 21 340
Feeder	Import Export Total	856 85 940	992 93 1,085	1,190 95 1,285	1,435 94 1,528
Other	Import Export Total	717 71 788	831 78 909	997 79 1,076	1,202 78 1,280
Total	Import Export	7,314 8,038	8,481 9,276	10,170 10,980	12,262 13,062

7 Future Handling Cargo Volume (1,000 tons)  
(Foreign Flag Ships), 30%

	1989/90	1994/95	1999/00	2004/05	
UK-CONT	Import Export Total	2,238 221 2,460	2,705 254 2,958	3,298 263 3,560	4,377 286 4,663
USA	Import Export Total	1,631 161 1,792	1,971 185 2,156	2,403 191 2,595	3,190 208 3,398
Far East	Import Export Total	293 29 322	354 33 387	431 34 465	572 37 610
Asia	Import Export Total	1,390 137 1,527	1,679 157 1,837	2,048 163 2,211	2,718 177 2,895
Pak & Wag	Import Export Total	190 19 209	230 22 251	280 22 303	372 24 396
Feeder	Import Export Total	856 85 940	1,034 97 1,131	1,261 100 1,361	1,674 109 1,783
Other	Import Export Total	717 71 788	866 81 947	1,056 84 1,140	1,402 92 1,493
Total	Import Export	7,314 8,038	8,839 9,668	10,777 11,635	14,305 15,239





