6-3-2 Steel Structure

(1) Function of Each Fabrication Shop

One engine shop and one machine shop are converted into two fabrication shops and the area of the converted shops (1,620 m2) and the existing fabrication shops (2,160 m2) become about 3,780 m2 in total, i.e. about 1.8 times as large as before.

The function of each fabrication shop is planned as follows, considering an efficient production and the present conditions of large machines in the fabrication shop.
Hereafter, the name of each fabrication shop is referred to as the building number as shown in Fig 5-2-1.

Building No.	Function
BD 38	Fabrication shop for steel plate cutting and bending to optimize press machine, bending machine, etc.
BD 37	Sub-assembly and assembly shop of steel structure Welding of pontoons, platforms, tanks, etc. is carried out. Frame bending machine is placed in this shop for fabrication of ship hull structures as before.
BD 44	Fabrication shop for cutting and drilling of steel section bar Band saw machine, pipe bender, drilling machine, etc. are reinstalled here.
BD 43	If mold lofting work is necessary, a temporary area is arranged in this shop.
BD 41	Welding shop for steel structures composed of steel section bars, i.e. electricity transmission towers, lighting towers, steel racks & ladders, portable bridges, etc.

(2) Facility Plan

The existing facility for steel structure is mentioned in Chapter 5, Section 5-2-1 "Planning Condition" and basic facility for manufacturing steel structure is available. Present manufacturing procedure is reviewed and additional facility including renewal ones to receive orders of steel structure stated in Chapter 5, Section 5-2-2 "Expected Future Work" are planned.

1) Analysis of manufacturing procedure

Work flow of steel structure is generally as mentioned below.

Design → Mold lofting ---→ marking → cutting →
└→ Material procure

Bending → Sub-assembly → Assembly → Trial erection → Drilling

Inspection & Test → Painting --→ Transportation →
Galvanizing
Site erection

The result of the analysis on each stage of the work flow is as follows:

a) Design

Fostering of design technology is imperative for CDD to accumulate their technical expertise and to obtain a position as a main contractor in the future.

For this, training of assigned designers should be carried out in overseas steel fabrication yards.

b) Marking

At the first stage of fabrication, the following marking on steel plates and section bars is carried out.

Steel plate: cutting line, bending line, joint line, hole center and circle, bevelling shape for welding, etc.

Section bar: cutting line, bending line and angle, hole center, dia., etc.

Marking is the most important stage and has a remarkable influence on the dimensional accuracy of the steel structures, especially in the site erection work requiring the joint hole accuracy of tower and bridge structures.

To have accuracy, such measures as drilling with a template, cutting section bars with a ruler and band sawing with a ruler are useful.

c) Cutting

i) Gas cutting

Gas cutting of steel with acetylene gas and oxygen is very popular.

As for the gas cutting torch, there are two kinds i.e. manual gas cutting torch and semiautomatic torch.
The feature of each torch is shown in Table 6-3-4.

Table 6-3-4 Feature of Gas Cutting Torch

	Manual gas cutting	Semiauto gas cutting
Workability	Easy movement	Some restriction within electric cable reach
Cutting position	Any position	Flat position only
Start	Quick start with simple preparation	Preparation necessary
Accuracy	Unstable	Stable
Cutting section	Rather rough	Smooth

The above comparison table shows that the cutting accuracy of a semiauto gas cutting is much better than that of a manual one except for workability.
The accuracy improvement in gas cutting has good influence on fitting and welding work in assembly at next stage and this fact brings finally good quality of products.

To achieve stable accuracy in gas cutting, the following measures are taken into account:

- Gas cutting area is fixed in the shop for easy preparation and assorting of raw material, and gas cutting slab made of section bars is arranged.
- Utilities i.e. a battery of valves for gases and receptacles are properly arranged around the gas cutting slab.
- Handy type semiauto gas cutting torch is adopted.

- Semiauto gas cutting tool with multitorch is adopted for cutting out flat bars.

- Magnetic ruler is used in manual gas cutting.

ii) Mechanical cutting

Mechanical cutting of section bar using band saw, disc saw, disc grinding cutter, etc. is much better in accuracy and section smoothness than gas cutting.

Improvement of workability for the exsisting 250 H band saw is achieved by installation of positioning device and fore and rear rollers

Spare parts and saw blade grinding machines are necessary for the band saw.

d) Drilling

In drilling work, to keep dimensional accuracy of hole center in pitch and alignment is very important.

A punching machine is suitable for a thin plate, and a drilling machine for a thick plate.

Installation of fore and rear rollers and positioning device are useuful for maintaining good accuracy and workability.

e) Welding

Welding is the most important work in manufacturing steel structures.

Poor appearance of welds and distortion of plates are a simple outward appearance defect, however such defects of welding as cracks, pinholes, blowholes, undercuts, craters, lack of fusion, etc. have a vital influence on the strength of the steel structures.

To find defects by using an inspection device is important after welding, however, adoption of a welding procedure to prevent defects is much more important.

The adoption of an automatic welding machine is one good way to avoid such defects of welds.
For example, improvement of the workability and quality by the application of an automatic welding is shown in Fig. 6-3-9.

Also, in the selection on type of welding machine, the availability of such welding materials as wire, flux, etc. is considered.

A welding positioner is adopted for the automatic welding of pipes .

f) Trial erection and field erection

A number of journal jacks for leveling and wrenches for bolting are prepared.

g) Material handling

Increasing production volume, the load of material handing becomes over the capacity of the exsisting O.T.C. The following measures are taken to work out this problem:

- O.T.C. of 3.2 tons installed in the store shop is removed and reinstalled in BD44 shop.
- Radial hoist crane is installed at the place of high frequency in material handling.
- Parts and material among shops are carried by traversing flat car on rails.

h) Manufacture for specific products

- Electricity transmission telescopic poles

  Cylindrical plates are bended by the exsisting 400 tons and 500 tons press machines with additional suitable mold and welded according to the procedure as shown in Fig. 6-3-10.

- Well pipes for irrigation

  Small bending roller is necessary to bend plates of well pipes.

i) Partition wall

As noise, dust, arc of welder are caused in steel structure shop, steel structure shop BD 44 and machine shop BD 43 are separated by partition wall made of brick.

Dimension : 50 m length x 4 m height = 200 m2

2) Utility improvement plan

Existing building without modification is used as a steel structure shop, however some rearrangement, for example the electric power distribution box, etc. is carried out to optimize the facilities.

a) Power distribution box and piping

With regard to convenience and safety, the following electric distribution boxes for welding machines and pipe line for compressed air & gas are arranged.
Their number and location are shown in Table 6-3-5.

- Electric distribution boxes for welding machines are arranged at proper distances in converted assembly shop BD 41.

- Pipes for distribution of compressed air, acetylene gas and oxygen are arranged at the main line of CDD.

Compressed air is distributed by a main pipe from a large compressor room through branch pipes leading to each shop.

Many bottles of acetylene gas and oxygen are installled at proper outdoor place at each shop.
These bottles are connected with manifolds and gas is distributed by pipes leading to each shop, and a battery of valves for each gas is arranged on the pipe at proper distances.

Table 6-3-5 New Devices of Power Distribution

Kind of power	Location			
	BD37	BD38	BD41	BD44
Electric box for welding	existing	existing	3	3
Air outlet valve	4	4	3	3
Gases manifold	1 set		1 set	
A battery of gas valves	4	4	3	3

3) New layout of fabrication shop

Based on the above plan, new arrangements of fabrication shops are laid out as shown in Fig. 6-3-11 and Fig. 6-3-12.

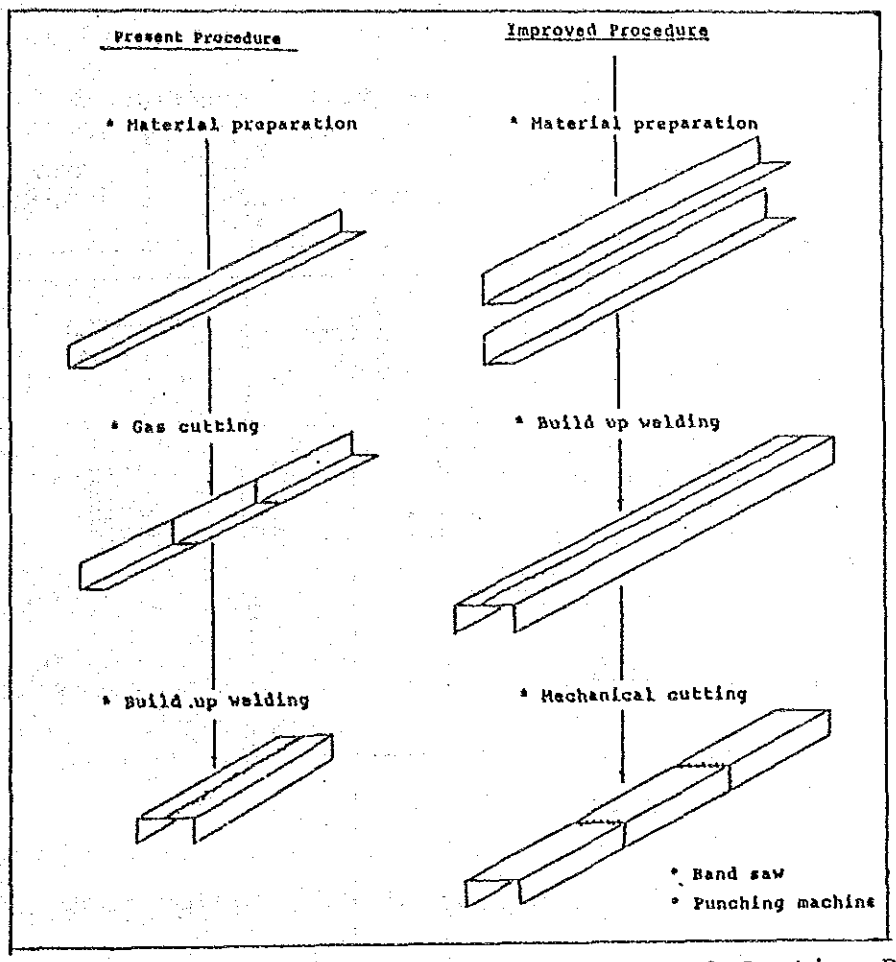


Fig. 6-3-9 Channel Shaped Bar Assembled by 2 Section Bars

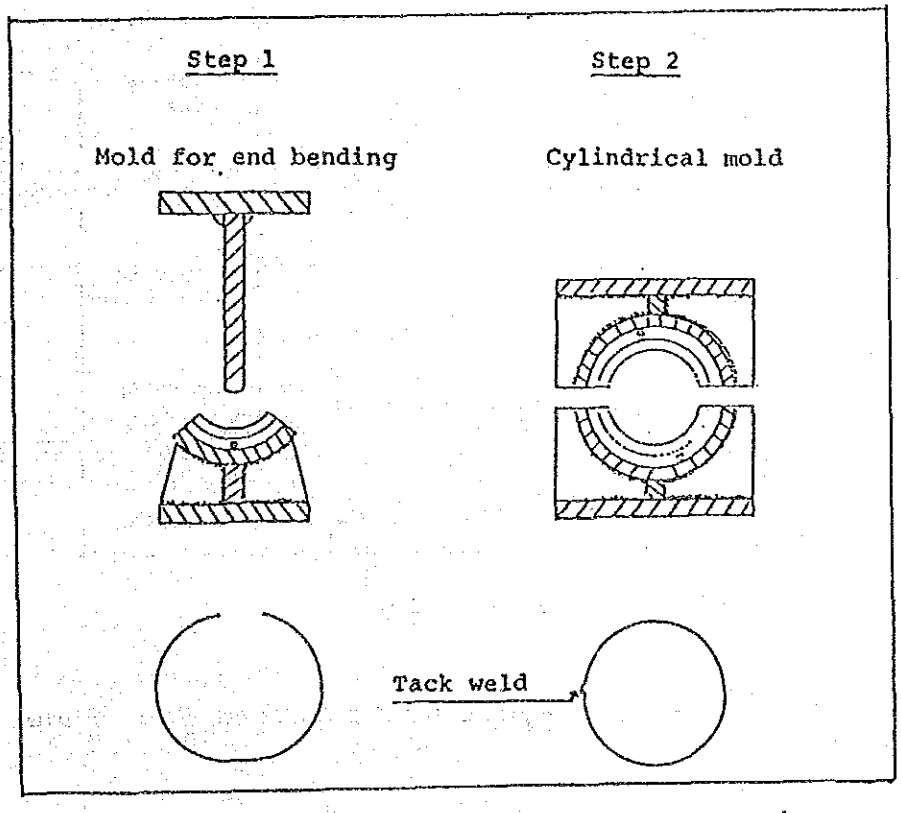


Fig. 6-3-10 Example of Press Mold Section

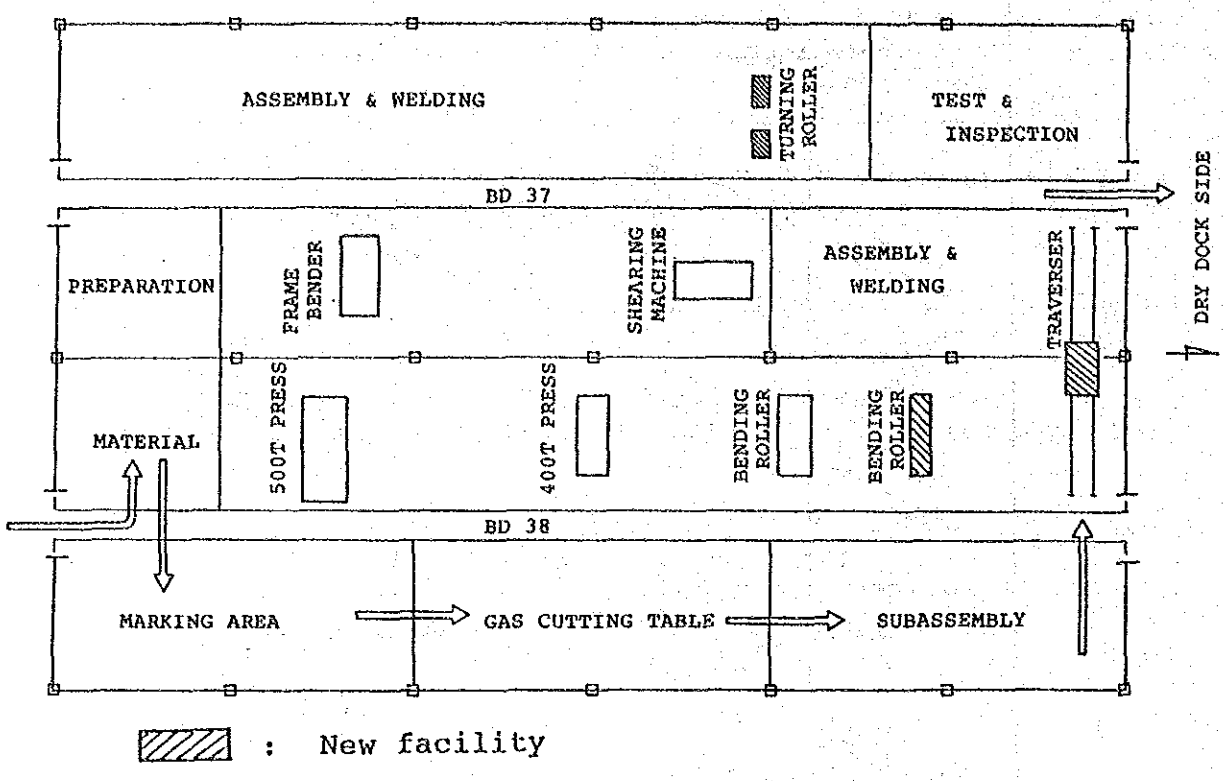


Fig. 6-3-11 Layout of Fabrication Shop

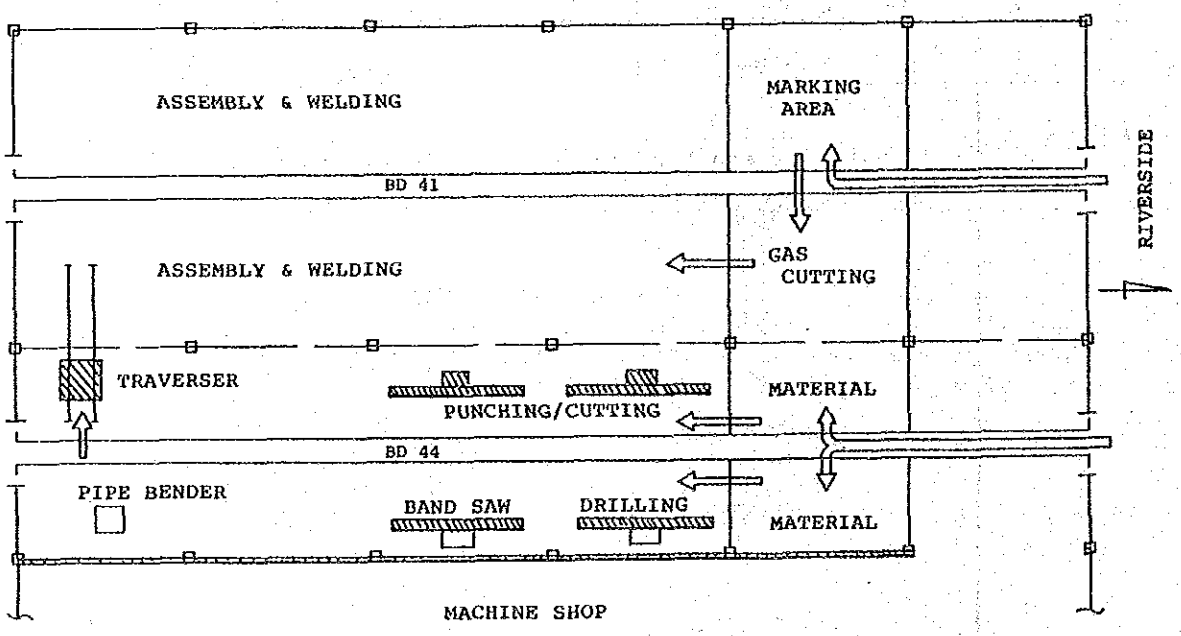


Fig. 6-3-12 Layout of Converted Fab. Shop

4) Additional facility list

Table 6-3-6 shows the list of additional facilities and tools for steel structure fabrication.

Table 6-3-6 Additional Facility List

No.	Item	Unit	Main particulars
A.	Partition wall	1	50 m x 4 m, brick made
B.	Power distribution box and pipng		Electric box 6 sets Air outlet valve 13 sets Gases manifold 2 sets Gas valves 13 sets
C.	Machines and tools		
1	Bending roller	1	6 t x 250 ϕ x 3 m
2	Punching, cutting mach.	2	PL 9 t x 125, 9.5-30 dia. L 9 t x 75 x 75 L 5 t x 100 x 50
3	Turning roller	2	Load, 5 tons
4	Semiauto. weld. mach.	2	CO2 welding
5	Semiauto. gas cutting machine	5	Portable type
6	Semiauto. parallel gas cutting machine	1	Portable type
7	Traverser	2	3.0 m(L) x 1.5 m(B)
8	Radial hoist crane	3	1 ton x 5 m span
9	Template unit for cutting machine	4	
10	Air tool	10	
11	Journal jack	20	Capacity 20 tons
12	Gas cutting slab	1	Area 250 m2
13	Transit	1	
14	Level	1	
15	Mold for press mach.	2	
16	Saw blade grind. mach.	1	Band saw, 15 -35 mm(B)

5) Galvanizing shop

Electricity transmission towers and portable bridges are the main products after the expansion of production capacity in steel structure shops and they are normally requested to be plated with zinc.

As a considerable investment is necessary to construct a new galvanizing shop, the study team has examined whether the zinc plating job can be left to the subcontractor by investigating two galvanizing shops in Chittagong and Dhaka. The following is their outline:

Karim Pipe Mill Ltd.

Location : 74-75 Sagarika Road, Pahartali, Chittagong
for 15-20 minutes from CDD by car

Main facility:

- Hot zinc bath	8.0 m(L) x 1.0 m(B) x 1.5 m(D)
- Crane	1-2 tons hoist crane
- Other	Pipe fabrication shop, etc.

National Tubes Ltd. (BSEC)

Location : Tongi Industrial Area, Dhaka
Main facility :

- Hot zinc bath	7 m(L) x 1.5 m(B)
- Other	Pipe fabrication shop, etc.

The galvanizing shops of both campanies are very busy and in full operation to galvanize pipes of their own and they can not afford to receive the galvanizing orders of steel structures from CDD.

Accordingly, CDD has to be equipped with galvanizing shop for their new products of steel structures.

Therefore, the general arrangement of galvanizing shop is made as shown in Fig. 6-3-13.

This shop is planned to have a hot-dip galvanizing capability of the following products, considering the dimensions of steel materials, the size of panel blocks for portable bridges, etc.

Length	: 6,000 mm max.
Width	: 600 mm max.
Depth	: 1,000 mm max.
Weight	: 1,000 kgs/1 piece max.

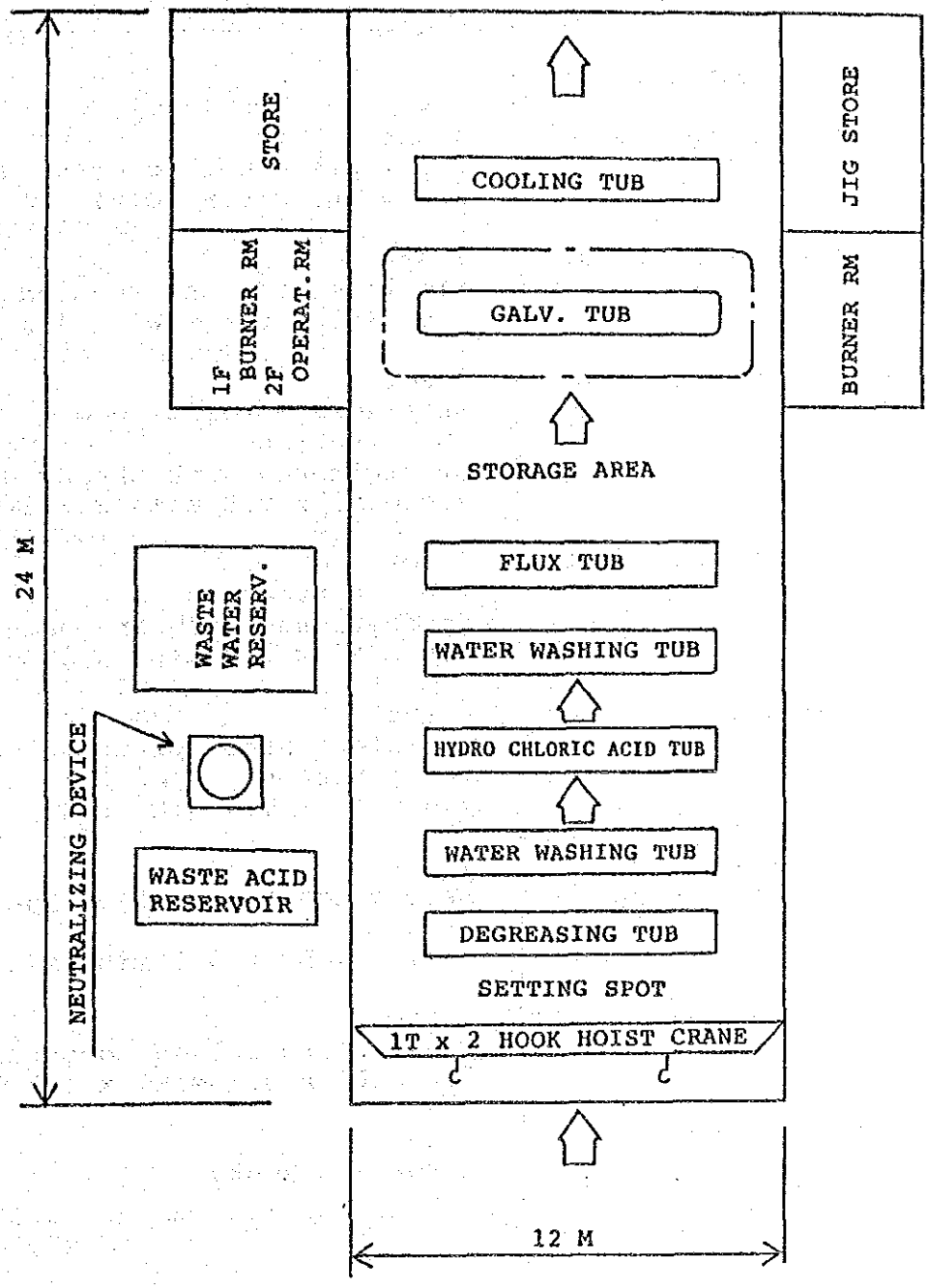


Fig. 6-3-13 General Arrangement of Galvanizing Shop

The outline specifications of galvanizing shop is shown in Table 6-3-7.

Table 6-3-7 Outline Specification of Galvanizing shop

Item	Q'ty and particulars
1. Main equipment	
(1) Degreasing tub	1 set Steel plate welded construction 7.0 m (L) x 0.8 m(W) x 1.3 m(D)
(2) Water washing tub	1 set Steel welded construction 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(3) Hydrochloric acid tub	1 set Anti-acid steel welded construction strengthened with shaped steel 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(4) Water washing tub	1 set FRP construction Strengthened with shaped steel 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(5) Flux tub	1 set Stainless steel plate welded construction 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(6) Galvanizing tub with combustion chamber	1 set Welded construction of special steel 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(7) Cooling tub	1 set Steel plate welded construction 7.0 m(L) x 0.8 m(W) x 1.3 m(D)
(8) Hoist crane	1 set 1 ton x 2 hooks

Item	Q'ty and particulars
2. Auxiliary equipment	
(1) Fuel oil storage tank	1 set(10 m3)
(2) Working jigs and tools	1 set
(3) Inspection apparatus	1 set
3. Waste water and acid neutralizing equip.	
(1) Waste water reservoir	1 set (30 m3) made of concrete
(2) Waste acid reservoir	1 set (10 m3) made of concrete
(3) Waste water feeding pump	1 set 500 liter/min, 3.7 KW
(4) Waste acid feeding pump	1 set 10 liter/min, 0.2 KW
(5) Neutralizing device	1 set
a) Tank	1 set (5 m3) made of concrete
b) Agitator	Anti-acid type, 0.75 KW
c) PH meter	Portable type
d) Rack of tank	Steel made

6-3-3 Civil and Building Work

(1) Slipway

1) Particulars of planned slipway

A. Vessel class	4,000 DWT Cargo boat (max draft: 2.6 m) 350 GT Fishing trawler (max draft: 4.2 m)	
B. Type of slipway	semi-dock type	
C. Dimensions of slipway	Depth	= 0 - 6.8 m
	Width	= 18.3 m
	Length	= 145.0 m
	Bottom slope	= 40/1000

2) Structural type of slipway

Figures from 6-3-14 to 17 show detail structure of the slipway. The soil strata at the planned site is composed of hard clay soil and the permeability of the layers is thought to be very low.

Considering the fact that the construction site is adjacent to an existing dry dock, the construction method of the slipway should be selected not to do harm to the operation of the existing one. Taking into consideration this, the type of structures are decided as follows:

a) Bottom slabs and retaining walls are designed as reinforced concrete because the construction material and equipment are obtained easily.

b) Considering the space of construction, the size of the structures are decided to be of minimum size as much as possible.

c) Bottom slabs and retaining walls are equipped with small drainage holes with gravel layers in order to eliminate the effect of water pressure.

d) Steel sheet pile walls are installed at the entrance of slipways to prevent the seepage of underground water from the outer area.

e) The seepage occurred inside of the slipway is guided through gravel layers to the pump room and pumped out. The following items should be taken into serious consideration when detail construction drawings are prepared.

- Seepage volume should be calculated by the result of seepage test and its analysis.

- Gravel layers should be designed carefully to make the seepage water run smoothly in the layers and not cause clogging.

- Because the slipway should be executed in a dry condition, a temporary cofferdam shall be constructed. The cofferdam should be designed safe and stable after careful soil investigation and studies.

- Demolition work of some part of slope protection concrete belonging to the existing dry dock shall be inevitable, but the demolition area should be minimized so as not to do harm to the stability at the part of the existing dock entrance.

- The siltation phenomena in the future at the slipway entrance area should be studied and suitable countermeasures shall be taken.

(2) Workshops

The workshops have been planned to offer maximum versatility in order to adapt to the needs of each production line, and to offer an optimally favorable working environment for each shop's employees.

A. Total floor space:
   1) Galvanizing shop: 396 m²
   2) Foundry shop : 160 m²

B. Structure : Steel frame one storey structure with steel truss roof

C. Exterior finish :
   Walls : block masonry, painted steel, ventilation louvre on crane top
   Roof : asphalt lining, corrugated steel plate
   Floors : mortar trowel finish
   Walls : block masonry
   Ceiling: none (heat insulating material below roof)

Fig. 6-3-18 and 19 show plan and section of workshops.

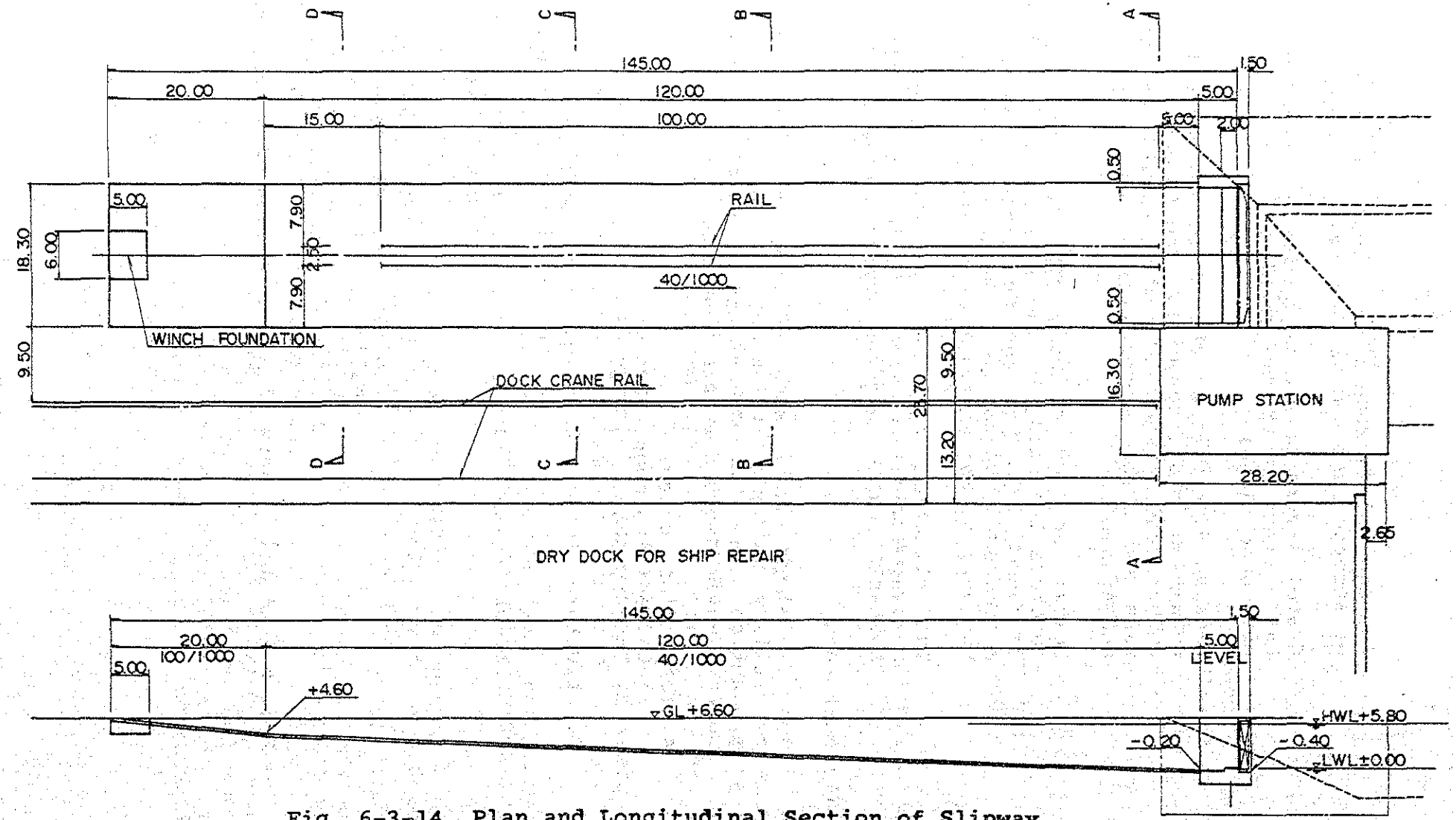
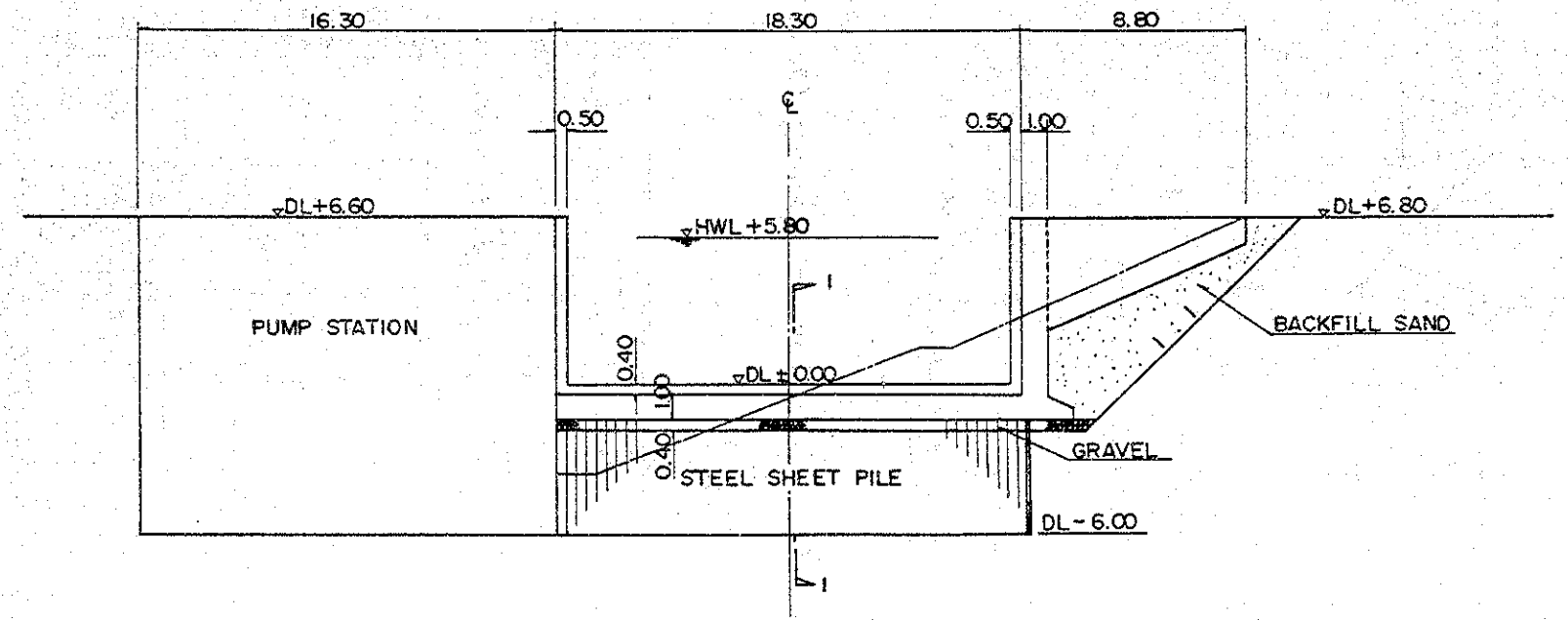


Fig. 6-3-14 Plan and Longitudinal Section of Slipway

ENTRANCE OF SLIPWAY
S = 1 : 200



SECTION I - I

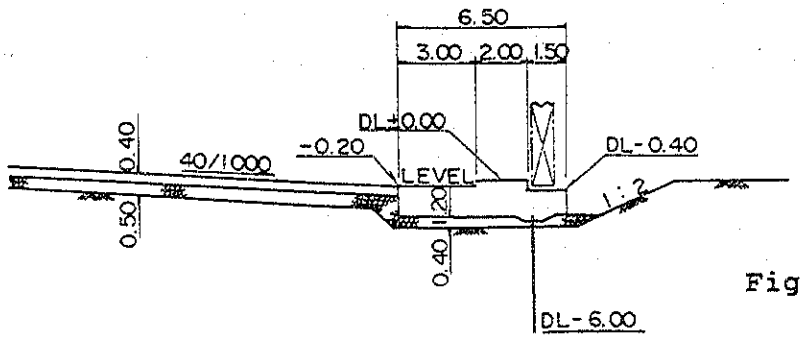


Fig. 6-3-15 Entrance of Slipway

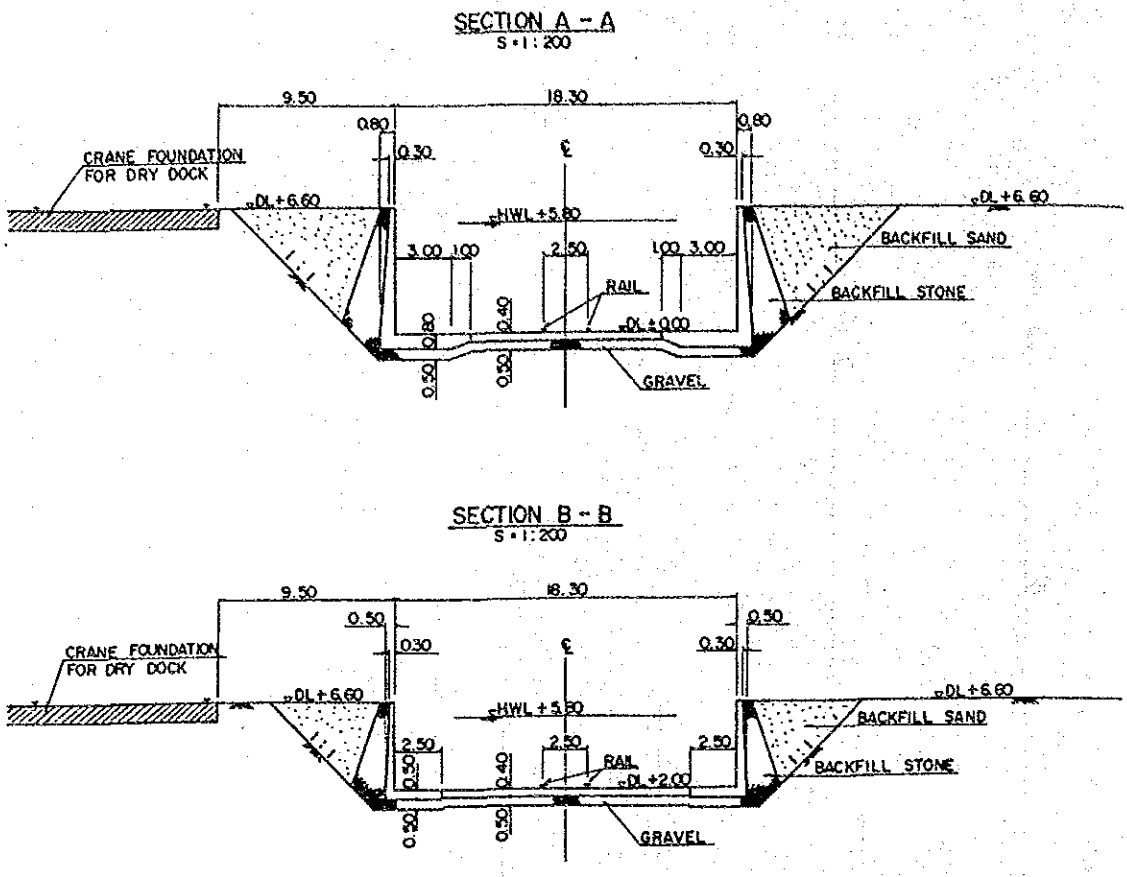


Fig. 6-3-16 Typical Cross Section of Slipway (1/2)

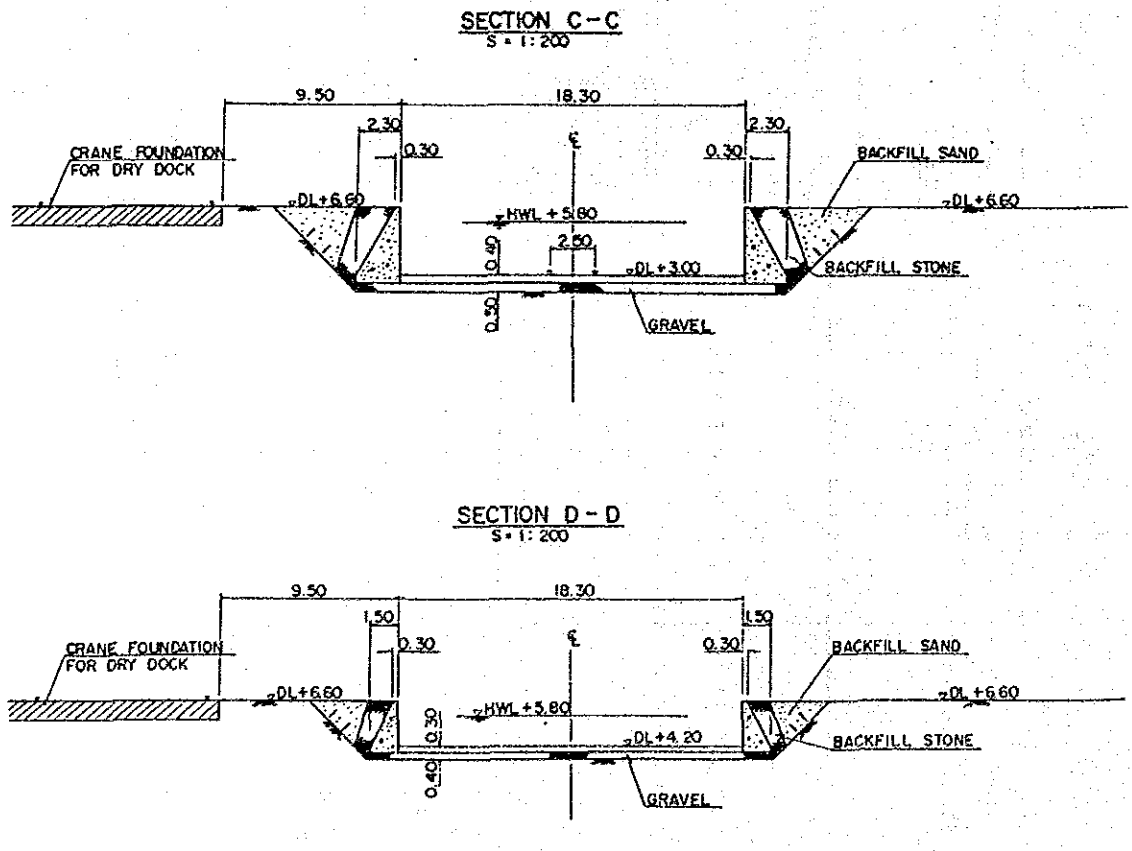
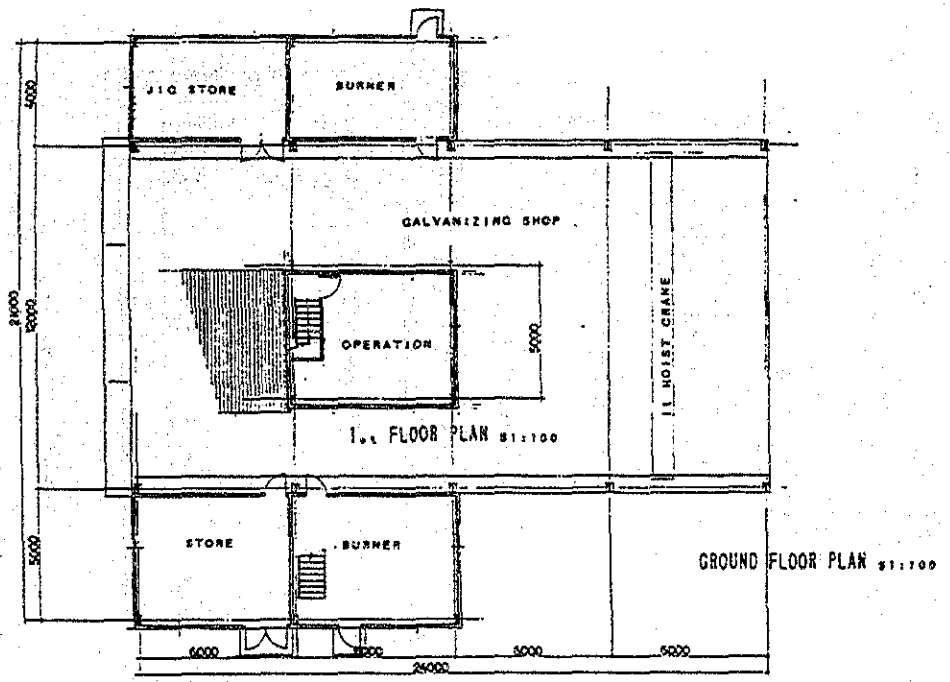
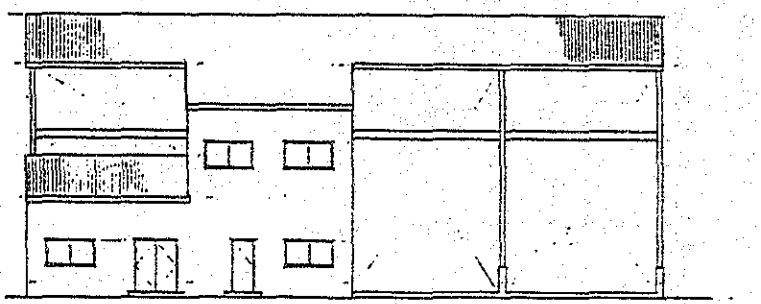
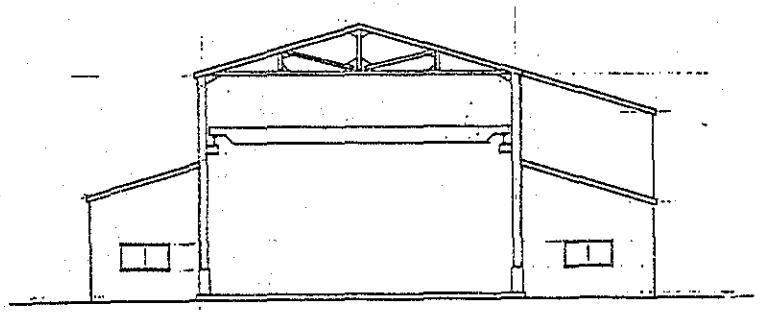


Fig. 6-3-17 Typical Cross Section of Slipway (2/2)







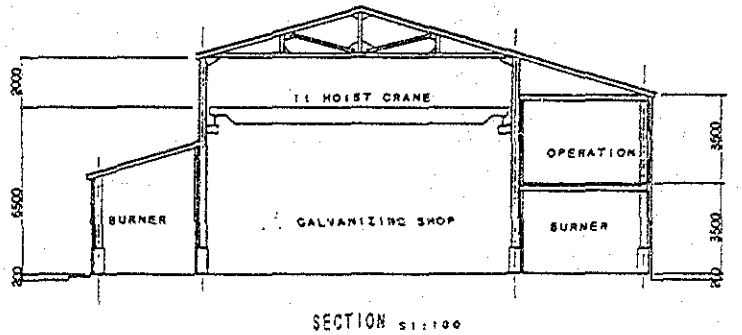
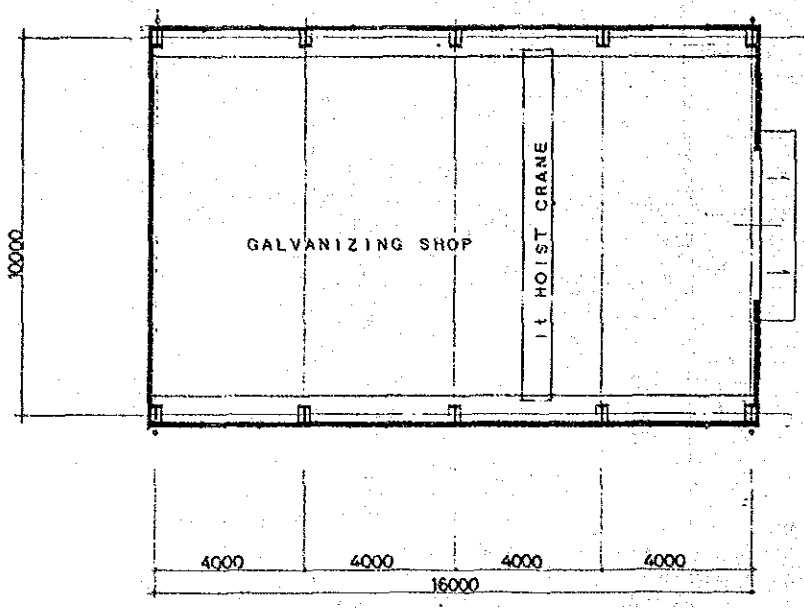
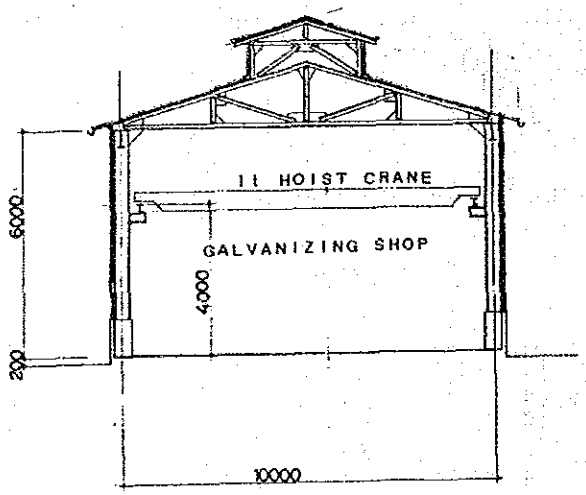


Fig. 6-3-18 Galvanizing Shop



GROUND FLOOR PLAN S1:100



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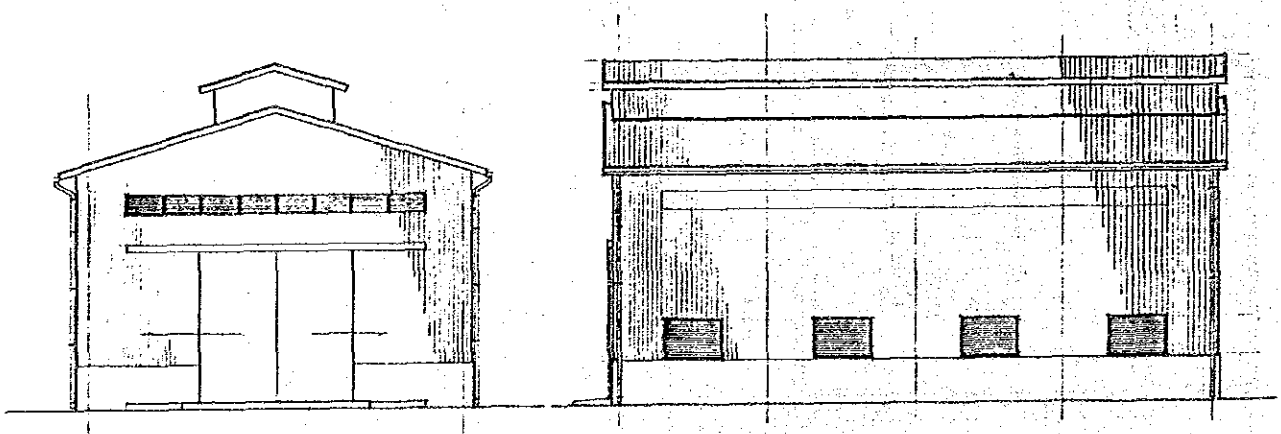


ELEVATION S1:100

ELEVATION S1:100

Fig. 6-3-19 Foundry Shop

6-4 IMPLEMENTATION SCHEDULE AND INVESTMENT AMOUNT

6-4-1 Implementation Schedule

Fig. 6-4-1 shows an implementation schedule of the selected optimum plan, expecting the construction work and technical training commence on July, 1992.

However, in case early line up of finance is possible for train up of personnel for improvement of CDD's present activities, some components of training not related to the creation of new facilities proposed may be implemented at the earliest before the implementation of the investment plan.

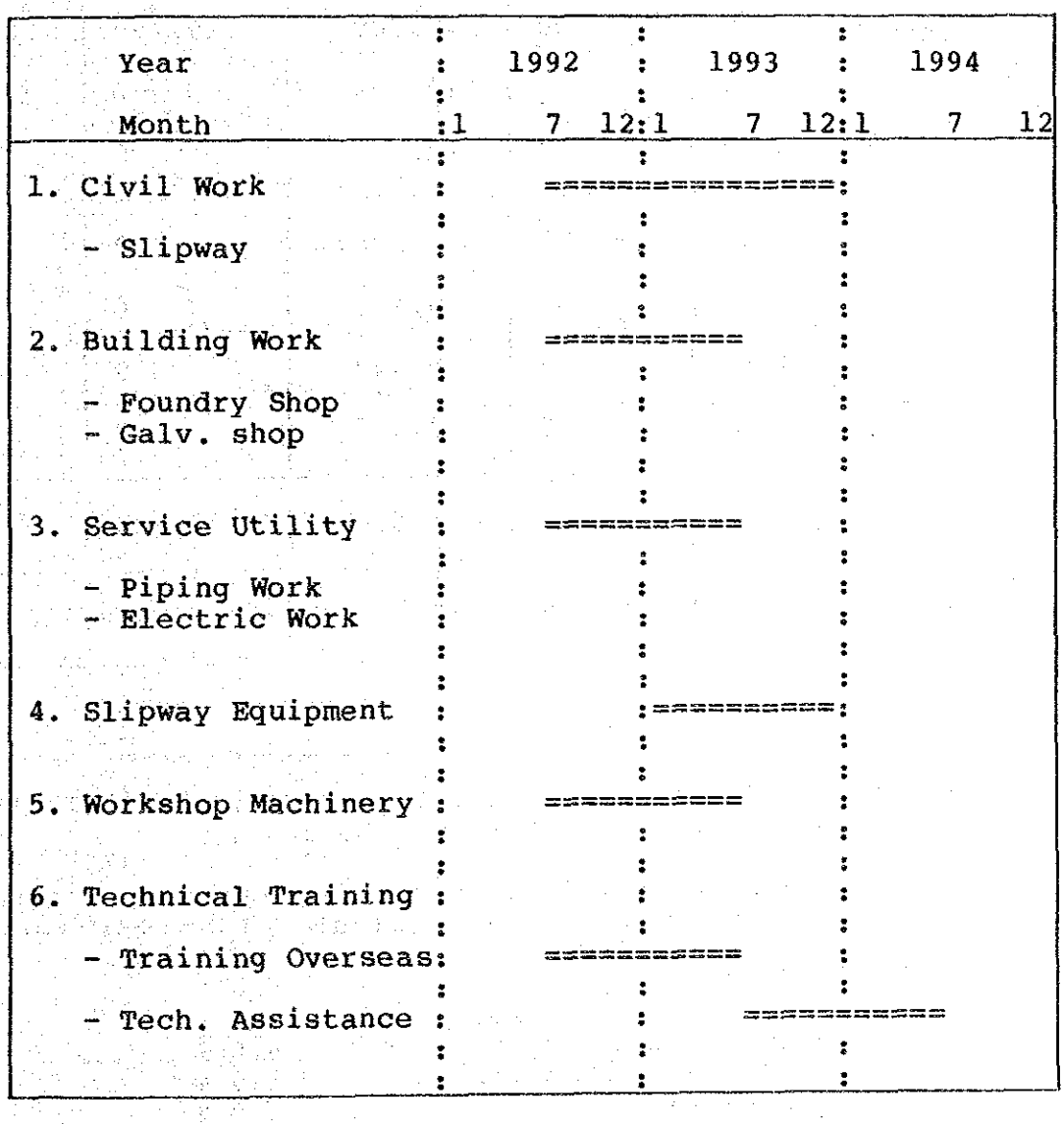


Fig. 6-4-1 Implementation Schedule

6-4-2 Investment Amount

The estimated total investment for the implementation of the selected optimum plan is as shown in Table 6-4-1.

Table 6-4-1 Estimated Total Investment Amount

(Unit : 1,000 taka)

Item	Ship Repair		Steel Structure	
	Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion
Civil&Build.	30,230	330	7,100	0
Equipment	27,220	70,700	10,190	20,030
Tech. Assist.	0	10,100	0	17,100
Consultant Fee	0	12,000	0	4,500
Civil&Build.	28,120	330	0	0
Equipment	3,950	6,180	0	0
Tech. Assist.	0	29,020	0	9,700
Consultant Fee	0	3,000	0	0
Total	89,520	131,660	17,290	51,330
	221,180		68,620	
	289,800			

These figures are based on values as of September, 1989.
(Exchange rate : 1 taka = 4.35 Yen)

The duties, taxes and other charges imposed on imported materials and equipment are calculated at the ratio of 30.5 % of C & F price.

- Import duty	15.0 %
- Import license fee	2.5 %
- Development surcharge	8.0 %
- L/C opening charge	1.0 %
- Insurance	1.0 %
- Port charges, etc.	3.0 %
Total	30.5 %

The breakdown of the investment amount is given in Table 6-4-2 and 6-4-3.

Table 6-4-2 Breakdown of Investment Amount
(For ship repair)

(Unit: 1,000 Taka)

Item	Local Currency Portion	Foreign Currency Portion	Total
1. Civil work	51,130	600	51,730
- Slipway	(49,750)	(600)	(50,350)
(Duties & charges)	(1,380)	(0)	(1,380)
2. Building	1,920	0	1,920
- Foundry shop	(1,780)	(0)	(1,780)
- Air compressor room	(100)	(0)	(100)
(Duties & charges)	(40)	(0)	(40)
3. Service utilities	3,450	5,400	8,850
- Compressed air line	(970)	(5,020)	(5,990)
- C2H2/O2 line	(80)	(220)	(300)
- Industrial water line	(700)	(160)	(860)
(Duties & charges)	(1,700)	(0)	(1,700)
4. Slipway incidental work	7,170	6,630	13,800
- Hauling equipment	(1,920)	(5,880)	(7,800)
- Semi-dock gate	(2,000)	(570)	(2,570)
- Relocation of elect. cable, etc.	(1,160)	(180)	(1,340)
(Duties & charges)	(2,090)	(0)	(2,090)

(Unit: 1,000 Taka)

Item	Local Currency Portion	Foreign Currency Portion	Total
5. Work shop equipment	19,070	61,190	80,260
- Ship repair equip.	(350)	(59,910)	(60,260)
- Foundry shop	(50)	(1,280)	(1,330)
(Duties & charges)	(18,670)	(0)	(18,670)
Sub total	(82,740)	(73,820)	(156,560)
6. Contingencies	6,780	3,720	10,500
- Civil work (10%)	(5,110)	(60)	(5,170)
- Building work (10%)	(190)	(0)	(190)
- Mach. & equip. (5%) of Item No. 1 - 5	(1,480)	(3,660)	(5,140)
7. Technical training	0	39,120	39,120
- Training overseas	(0)	(10,100)	(10,100)
- Technical Assistance skill	(0)	(29,020)	(29,020)
8. Consultant fee (Tender preparation & Supervision)	0	15,000	15,000
Grand total	89,520	131,660	221,180

Table 6-4-3 Breakdown of Investment Amount
(For steel structure)

(Unit: 1,000 Taka)

Item	Local Currency Portion	Foreign Currency Portion	Total
1. Building	6,460	0	6,460
- Galv. shop	(6,200)	(0)	(6,200)
- Partition wall	(110)	(0)	(110)
(Duties & charges)	(150)	(0)	(150)
2. Workshop equipment	9,710	19,080	28,790
- Fabrication shop	(1,480)	(10,380)	(11,860)
- Galv. shop	(2,630)	(8,700)	(11,330)
(Duties & charges)	(5,600)	(0)	(5,600)
Sub total	(16,170)	(19,080)	(35,250)
3. Contingencies	1,120	950	2,070
- Building work (10%)	(640)	(0)	(640)
- Mach. & equip. (5%) of Item No. 1 & 2	(480)	(950)	(1,430)
4. Technical training	0	26,800	26,800
- Training overseas	(0)	(17,100)	(17,100)
- Technical assistance	(0)	(9,700)	(9,700)
5. Consultant fee (Tender preparation & Supervision)	0	4,500	4,500
Grand total	17,290	51,330	68,620

7 FINANCIAL ANALYSIS

7 FINANCIAL ANALYSIS

7-1 OBJECTIVES OF THE STUDY

The basic objective of the financial analysis is to determine whether the proposed investment would generate a stream of future income sufficient to meet the minimum financial return requirements of the sponsor in a time frame acceptable to him. Since alternative investment opportunities normally are available to most investors, the rational sponsor will place his funds in an activity which promises to generate a future stream of income that meets or exceeds the opportunity cost of capital in alternative investments.

CDD was originally conceived to carry out repair of seagoing vessels arriving at Chittagong port. The project was started with an allocation of foreign credit but the actual requirement of investment was much more than initially expected. Consequently, there has been delay in the implementation of the project. In the meantime, due to devaluation and world-wide price escalation, the project cost had gone up. The implementation of the CDD project was scheduled to be completed by 1982 with an investment cost of 118.41 crore taka. However, the project was prolonged up to 1985 and thus, the actual investment cost of the project stood at 167.82 crore taka.

The most difficulty lies with such huge investment and with the existing activities predominantly centered round ship repair activities, the chance of the project to attain viability is limited. Therefore, the objective of study is to realize the prospects of maximization of the capacity utilization of the project through implementation of the Optimum Plan.

Structure of Financial Statements

The financial feasibility shall be examined in accordance with the process as shown in Fig. 7-1-1. The annual production volume shall be determined by the formulation of the investment plan (Investment Fund Account). The inflow of the revenue and the outflow of the operating expenses shall be incurred according to the production volume (Income statement). The balance between the revenue and the operating expenses inflows as a part of the internal fund in the fund flow account. The amount of the external fund shall be determined by its procurement conditions and the amount of the internal fund, that is, profitability of operating activity.

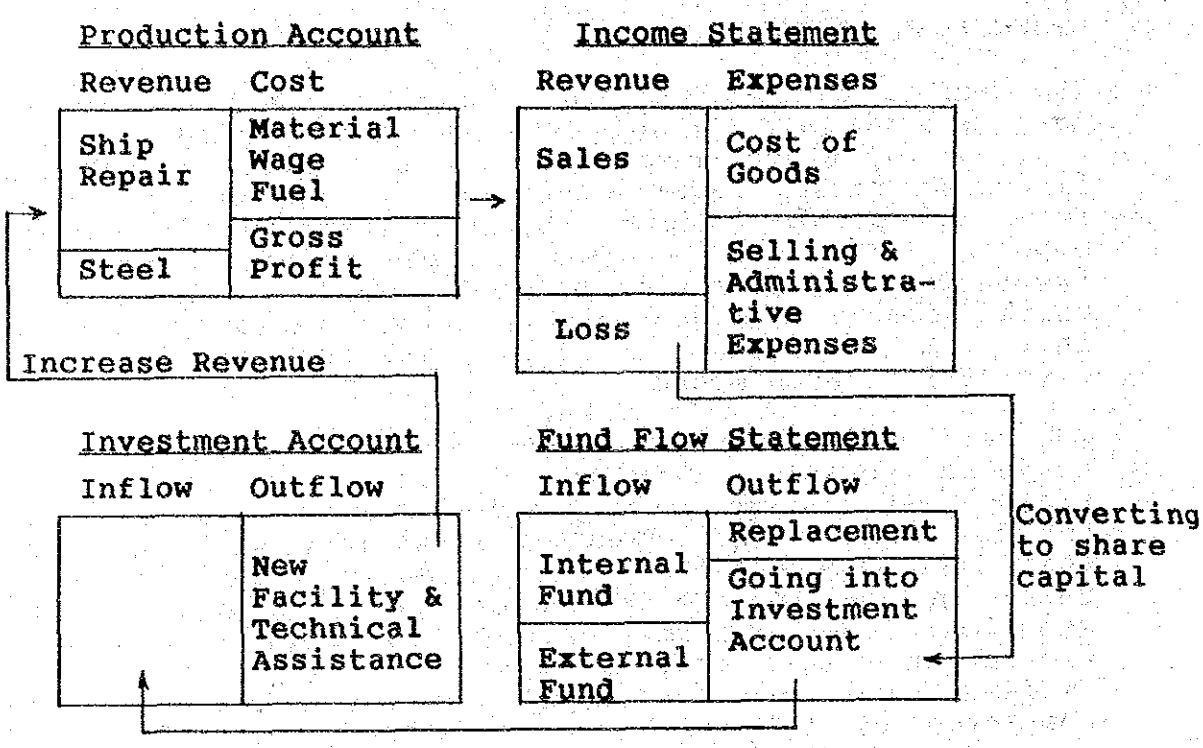


Fig. 7-1-1 Fund Flow Diagram

The functional relationship of the fund flow diagram is explained as shown in the following equations:

$$P = f(INV) \quad \ldots\ldots (1)$$
$$R = f(P) \quad \ldots\ldots (2)$$
$$C = f(P) \quad \ldots\ldots (3)$$
$$IF = R - C \quad \ldots\ldots (4)$$
$$EF = f(IF) \quad \ldots\ldots (5)$$
$$INV = IF + EF \quad \ldots\ldots (6)$$

where, P : Production Volume
R : Revenue
INV: Investment Amount
C : Operating expenses
IF : Internal fund
EF : External fund

Of the relationship described above, the method to overcome present difficulties is to select the followings.

First, at present the expenses are too much large in comparison with the size of sales due to the huge amount of interest and principal repayment. Therefore, CDD intend to convert this huge investment amount into ADP fund and issued the debenture may be repaid by the Government by contributing share capital. Then, the interest on ADP loan may be written off by reducing the ADP loan and its interest payment.

Second, CDD should increase its size of production by taking either diversification of products or expansion of work items for existing activities by selecting the higher value added products as shown in the equation (1), (2) and (3) or thirdly to reduce the operating expenses per unit volume (tonnage) as shown in the equation (3). The decrease of the operating expenses will give rise to the increase of the investment fund (the possible amount of the investment) resulting in the increase of the amount of the internal fund and the external fund.

7-2 SCOPE OF ANALYSIS

7-2-1 Method

Financial analysis should be studied by following four steps.

(1) Analysis of present performance
(2) Financial Projection without Project (Base Case)
(3) Financial Projection with Project (Optimum Plan)
(4) Financial Analysis of Project
(5) Accounting impacts of Project implementing

The study procedure of financial analysis is shown in Fig. 7-2-1.

Analysis of present performance is described in Section 3-4. By following the present activities, financial projections about CDD's performance without projects should be conducted in the following respects.

- Annual Production
- Sales Amount
- Cost of Production
- Other Operating Cost
- Preparation of Fund Flow Statement

Then, CDD's production activities should be projected when the plans are implemented as scheduled. Therefore, financial projection "without project" can describe such future CDD's outlooks as at present if there would not be taken any particular measures (input).

Financial projection "With Project" can describe future CDD's outlooks which had solved some of important difficulties.

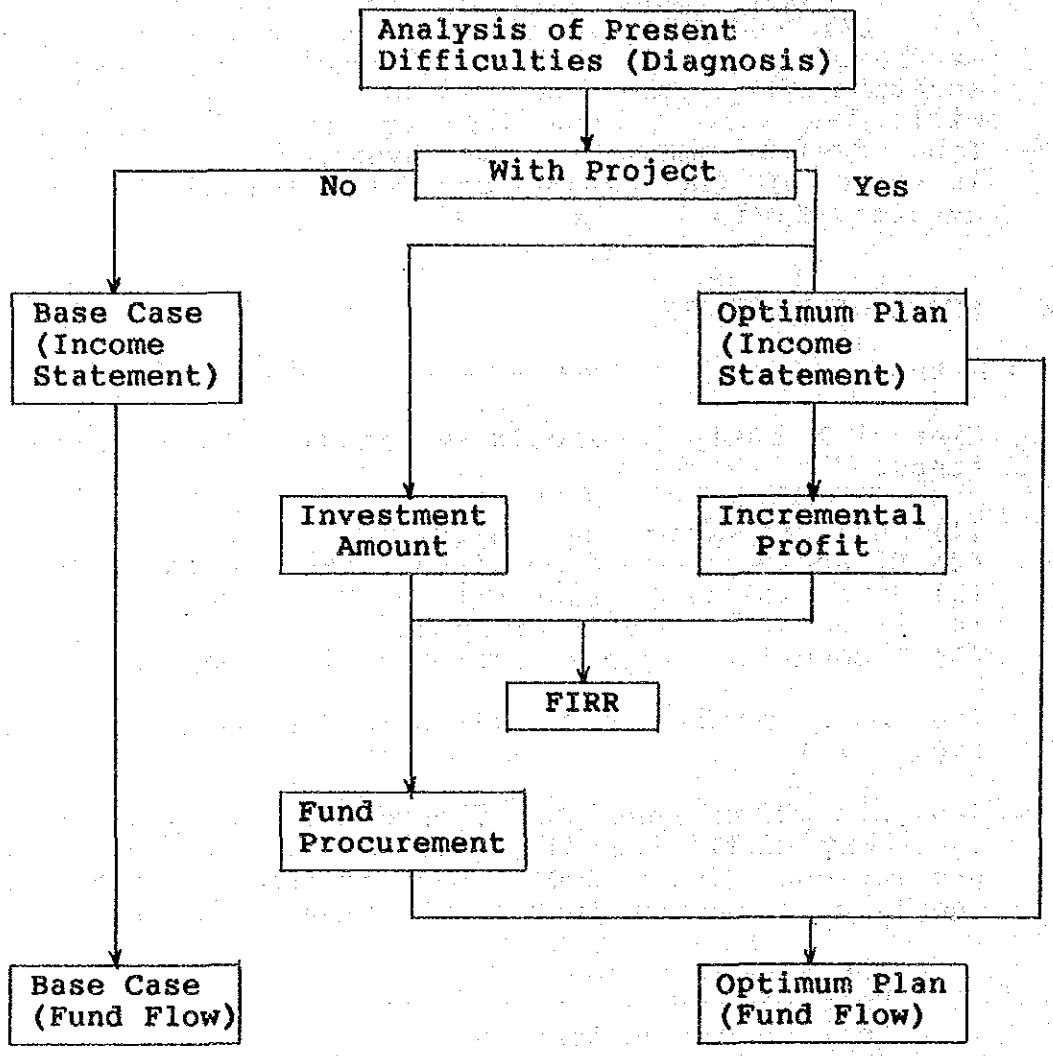
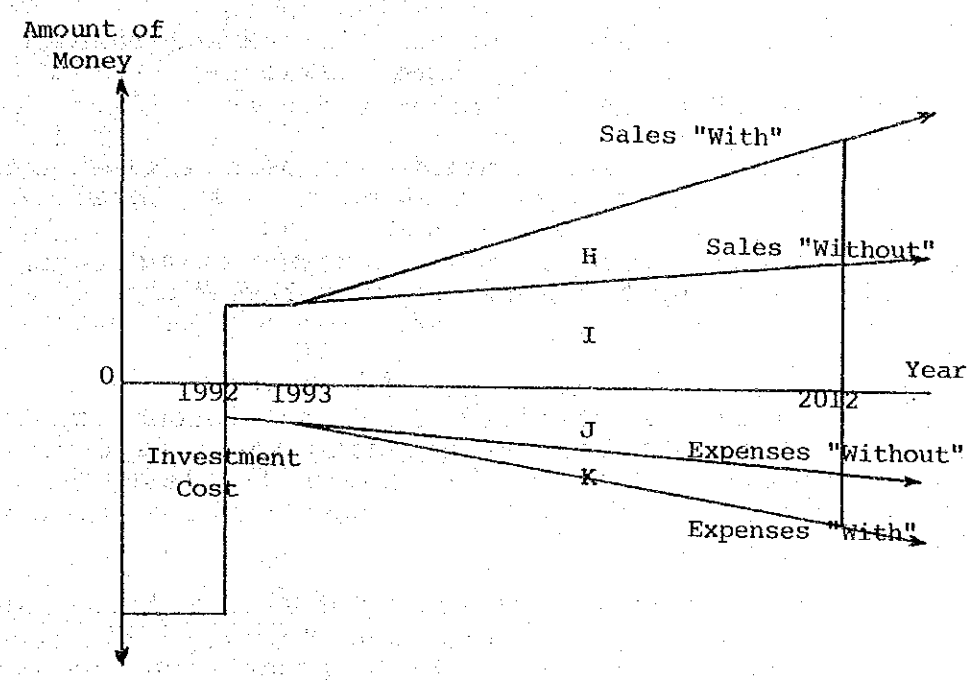


Fig. 7-2-1 Study Procedure of Financial Analysis

Profits obtained by subtracting projection "With Project" from projection "Without Project" regards as the attribution of the project.



where, Area H: Incremental sales
I: Sales "Without Project"
J: Cost "Without Project"
K: Incremental Cost

Fig. 7-2-2 Incremental Analysis

During the period from the in-service of projects (1992/93) until 2012/13, the incremental profit is accrued to the expanded portion of sales (Area H) minus cost (Area K). If Area I subtracts Area J, profits for Base Case will be obtained. FIRR of project will be calculated by using investment amount and incremental profits. Since this FIRR describes the returns on additional investment, there are some cases that higher FIRR can obtain even though the future perspectives by implementing optimum plan will not expected so brightly. Therefore, impacts of plan on accounting position changed should be considered. The higher FIRR does not promise the higher profitability of CDD with the "Optimum Plan".

Many projects involve the purchase of machinery, equipment and other items to modernize and balance a production line to reduce primarily the future operating expenses. The appraisal techniques for such projects are the same as for output expanding ventures, except that project benefits are now cost reductions rather than revenue increases.

7-2-2 Tools of Analysis

The following three financial statements and indexes are presented as the results of study:

- Income statement ..... Operating ratio
- Cash flow statement .. Financial internal rate of return (FIRR)
- Fund flow statement .. Debt service ratio

A cash flow statement consists of cash inflow and outflow. Cash inflow is considered as total revenue derived from the new investment. Cash outflow is classified into investment costs and operating expenditure to be incurred by the project under the Study.

(1) Operating Ratio

This criteria is obtained from an income statement. This ratio is obtained by dividing total expenditure by total revenue. This ratio should be less than 1.0, which means that the total revenue must be larger than the total expenditure.

When this ratio is calculated by dividing total cost of production by total sales, the value might reach at least around 50-60 (%). With production volume increased, the share of depreciation and interest payment will increase. Thus, a measures must be taken to reduce the share of operating expenditure for expansion of supply volume.

(2) Financial Internal Rate of Return (FIRR)

This value is compared with the interest rate of lending funds from banks and the government. CDD has procured its fund by around 15% of interest rate per year on the average. Thus, the value of 15% is considered as a minimum value of FIRR for project feasibility in terms of the current price base.

(3) Debt Service Ratio

This value is obtained from a fund flow statement. This is calculated by dividing Internal Reserve (Net Income plus Depreciation) by "Repayment of loan". This value should be at least 1.3 for the public corporation.

The other criterion derived from this statement is "Accumulated Surplus" (Ending of Balance) which must be positive as early as possible. If this is negative, CDD must procure the short-term loan, which will create a burden on profits.

7-3 SALES ESTIMATE

7-3-1 Ship Repair

(1) Dry Docking

The repair price of a ship depends on the type and age of the ship and the nature of the repair work. It is deeply influenced also by the shipping market, demand for ship repairs, dockyard capacity for repairs, shipping and shipbuilding policies, technical innovations, etc.

The figure for last four years (1985/86 - 1988/89) of CDD on BSC owned, Private Bangladesh flag and foreign flag vessels are shown in Table 7-3-1.

Table 7-3-1 Sales Amount per Unit Vessel

(Lac. taka)

	1985	1986	1987	1988	Average
1. Dry Docking					
1) Seagoing	17.9	17.0	17.5	18.7	17.8
BSC Own	22.8	18.0	21.5	19.7	20.5
Private	15.0	15.7	11.8	16.9	14.8
Foreign	10.7		7.5		9.1
2) Coastal/Trawler	10.6	5.7	5.3	8.6	7.5
2. Afloat					
BSC Own	0.4	0.2	0.2	0.2	0.3
Private	0.3	0.1		0.3	0.2
Coastal	0.4	0.2	0.9	0.2	0.4

Source: CDD

With execution of this optimum plan, it is expected that CDD can get more repair work such as overhauling of main engines, auxiliary machinery, various steel works, etc.

The growth of the future average sales per vessel can be estimated as the same proportion as the increased work volume by ship repair contents presented in Table 5-1-6 and 20.

Regarding to trawlers and coasters, average sales value per vessel in 1987 is set at 7.5 Lac. taka based on the past performance in Table 7-3-1.

Average Sales value per DWT during the same period are calculated in Table 7-3-2.

Table 7-3-2 Average Sales Amount per Dead Weight Tonnage

	BSC	Private	Foreign	Small
Average price per vessel (lac. taka)	20.5	14.8	9.1	7.5
Average DWT per vessel	12,904	9,629	9,028	760
Sales price per DWT (taka)	159	154	101	987

Source: CDD

Table 7-3-3 Sales Amount per Vessel

(Lac. taka)

Work Contents	Seagoing	Coastal & Trawlers
1. Dock Hire Charge	2.00	0.50
2. Hull Cleaning & Painting	7.80	2.35
3. Valves & Piping Work	1.25	0.30
4. Plate Work	2.75	0.75
5. Rudder, Shafting Work	2.60	1.20
6. General Service	3.75	1.00
7. Anchor, Chain Locker & Tanks	1.00	0.10
8. Cathodic Protection	0.35	0.20
9. Misc.	0.30	0.10
10. Electrical Repair	0.25	0.10
11. Main Engine	3.00	1.50
12. Afloat Repair	0.50	0.50
Total	25.05	8.10

Source: Project Proforma 1989

CDD assumed in its project proforma 1989 that CDD's present capacity can be fully utilized in 1992. That is, sales for seagoing will increase from 17.8 to 25.05 Lac. taka and that for coastal & trawler will increase 7.5 to 8.1 Lac. taka. The Study assume that CDD's assumption in Table 7-3-3 can be achieved in the year 2007 for seagoing vessels and in the same year for coastal & trawlers in case of "without project".

(2) Afloat Repair

Sales amount of afloat repair will be estimated by the past performance. That is, sales of afloat repair shares about 10% of dry dock repair showing as follows:

(Lac. taka)

	1983/84	1984/85	1985/86	1986/87	1987/88
Dry Dock	309.9	356.7	394.5	393.9	482.5
Afloat	23.6	31.5	40.8	35.6	48.9
Share (%)	7.6	8.8	10.3	9.0	10.1

Therefore, sales of afloat repair assumes to share 10% of dry dock repair sales. However, afloat repair works will not be expected to increase in the same proportion as that of dry dock repair (with Optimum Plan) since afloat work is positioned as a side job for CDD. Therefore, sales from this repair assumes about 10% of dry dock repair amounts of "without project" case, which will apply for that of "optimum plan" case, too.

7-3-2 Allied Products

(1) Steel Structure

Sales amount of steel products are estimated on the basis of the present marked price presented in Table 5-2-1. Sales amount for optimum plan (Plan b) based on this table is presented in Table 5-2-6.

Sales estimation of galvanizing as shown in Table 7-3-4 "Sales Estimation of Galvanizing Shop" is based on the production volume of Table 6-2-4 "Galvanizing Volume Forecast".

Table 7-3-4 Sales Estimation of Galvanizing Shop (Optimum Plan)

(Lac. taka)

	Year	1989/ 90	1992/ 93	1993/ 94	1997/ 98	2002/ 03	2007/ 08	2012/ 13
Sales amount		0	0	42.9	95.7	153.4	181.5	198.0

Note: Galvanizing price per ton = 16,500 taka/ton.

(2) Other

Since sales amount of steel structure shares 80% of the total allied products in the past. Other sales amount assumes to share 20% of the total allied products for both Base Case (without Project) and Optimum Plan throughout the planned period.

7-4 OPERATING EXPENSE

7-4-1 Material Cost

(1) Ship Repair

It is assumed that the annual costs of materials for ship repair are as follows:

Locally available materials: 15% of the sales amount

Imported materials : 4% of the sales amount

(2) Steel Structure

Production cost of each product is estimated on cost per ton basis. Actual cost of galvanizing is estimated on the basis of operation cost of the galvanizing shop.

1) Electricity transmission towers

- Imported zinc plated bolts and nuts of 50 kg per ton are used:

  100 Taka/kg x 50 kg/ton x 200% = 10,000 Taka/ton

- Raw materials:

  25,000 Taka/ton x 1.07 x 1.03 = 27,500 Taka/ton
  Where, 1.07 = (1 + scrap ratio 7%), 1.03 = (1 + transportation fee 3%).

- Indirect material (welding material, etc):
  485 Taka/ton x 1.03 = 500 Taka/ton

- Field erection cost: 10,000 Taka/ton x 1.03
  = 10,300 Taka/ton

- Total cost per ton : 48,300 Taka/ton

2) Portable bridges

- Imported checkered plates of 100 kg/ton are used;
  16 Taka/kg x 100 kg/ton x 200% = 3,200 Taka/ton

- Raw material of local procurement:
  25,000 Taka/ton x 1.07 x 1.03 = 27,500 Taka/ton

- Local procured material of 10 kg/ton is used.
  39 Taka/kg x 10 kg/ton x 1.03 = 400 Taka/ton

- Indirect materials of 10 kg/ton are used:
  68 Taka/kg x 10 kg/ton x 1.03 = 700 Taka/ton

- Field erection cost: 5,200 Taka/ton

- Total cost per ton : 37,000 Taka/ton

3) Other products

- Local procured raw materials:
  25,000 Taka/ton x 1.07 x 1.03 = 27,500 Taka/ton

- Local procured materials: 500 Taka/ton

- Indirect materials:
  68 Taka/kg x 30 kg/ton x 1.03 = 2,200 Taka/ton

- Total cost per ton: 30,200 Taka/ton

4) Galvanizing cost

- Imported raw materials:

Raw zinc	:		75,000 Taka/ton
Import duty	:	75,000 x 0.5	= 37,500 Taka/ton
Other charges:		75,000 x 0.15	= 11,250 Taka/ton
Subtotal	:		123,750 Taka/ton

When the consuming ratio of zinc to product weight is 8%, the cost of raw zinc to product tons becomes:
123,750 x 0.08 = 9,900 Taka/ton

- Locally procured raw materials

Chemicals and consumables (Caustic soda, Hydrochlolic acid, chloride ammonium, inhibitor, wire, etc.):
1-2% of cost for raw zinc

7-4-2 Salary and Wages

Employees of CDD are classified as follows: Managing Director (MD), General Manager (GM), Officers, Staff and Workers. Their average salary/wages per personnel are presented in Table 7-4-1. Growth rate per year in current price and constant price (1984/85) are shown in Table 7-4-2. In 1984-85, salary increased 45% on the average and increased 12% between 1985 and 1988 in current prices. However, an annual growth rate in constant price calculated by dividing consumer price indexes of Chittagong industrial worker (1984-85; 8%, 1985-86; 11.9%, 1986-87; 5.6%), recorded only 2%.

Table 7-4-1 Salary and Wage per Personnel in Current Price

	1984	1985	1986	1987	1988
M.D/G.M	0.90	1.40	1.47	1.55	1.69
Manager	0.64	0.93	0.98	1.08	1.19
Sr. Officers	0.37	0.62	0.66	0.72	0.79
Jr. Officers	0.24	0.33	0.35	0.38	0.42
Staff	0.12	0.21	0.23	0.26	0.28
Skilled Workers	0.19	0.20	0.23	0.26	0.29
Unskilled Workers	0.12	0.15	0.15	0.17	0.20
Total	0.16	0.24	0.25	0.29	0.33

Source: Project Proforma 1989

Table 7-4-2 Growth Rate of Salary and Wages per Personnel

	Current Price				Constant Price (1984/85)
	1981-84	1984-85	1985-88	1988-92	1985-87
M.D/G.M	1.09	1.56	1.06	1.00	0.97
Manager	1.05	1.46	1.08	1.01	0.99
Sr. Officers	1.07	1.70	1.08	0.99	0.99
Jr. Officers	1.12	1.36	1.08	1.00	0.99
Staff	1.07	1.70	1.10	0.98	1.01
Skilled Workers	1.06	1.08	1.12	0.93	1.05
Unskilled Workers	1.05	1.23	1.11	0.97	0.99
Total	1.06	1.45	1.12	0.97	1.02

Source: Study Team

Salary and wages per personnel should be increased to introduce necessary incentives in accordance with the increment of production volume since the ship repairing business is of a vulnerable nature from the point of view of its economic operation. This is also a job involving vast technology of a diversified nature which is to be performed at high quality and within the shortest possible time by working around the clock. Ship repair services being of an international standard, demand a very high degree of skilled know-how. But there is an acute shortage of skilled manpower in this sector. Therefore, exodus of local skilled manpower of this sector may be prevented by giving special consideration to the salary structure, benefits, incentives etc. to the employees.

Therefore, the increasing rate of real term is assumed to be at 5% every year throughout the planned period. Wages for subcontractors are assumed to be at a slightly lower growth rate, that is, 3% throughout the planned period.

7-4-3 Fuel and Power Cost

Fuel and power cost incurred is shown in Table 7-4-3.

Table 7-4-3 Fuel and Power Cost

(Lac. taka)

Items	1984/85	1985/86	1986/87	1987/88	1988/89
Electricity	17.97	26.52	32.83	35.98	42.40
Oil	9.17	7.57	4.27	6.21	5.84
Gas	5.86	6.18	9.48	7.01	7.50
Coal				0.18	0.10
Other					
Subtotal	33.00	40.26	46.58	49.38	55.84
Skilled Worker	80	136	136	133	125
Unskilled Worker	232	210	210	182	138
Fuel & Power Cost per Labour Hour(taka)	5.1	5.7	6.5	7.6	10.3

Source: Project Proforma 1989

Fuel and power cost will increase as production volume expands. Major items sharing fuel and power cost are electricity (75% of total cost), utilized for material processing, machines and lighting. This cost was increased 14% per year between 1984/85 and 1988/89. This cost shows increasing tendencies when this cost is divided by labour hours (skilled and unskilled workers) on the assumption that each of them engaged in a job for 2,056 hours per year on the average. Therefore, 10 taka per labour hour of skilled and unskilled workers shall be applied for the financial projection by assuming that increase's from 5 taka in 1984/85 to 10 taka in 1988/89 resulted in inflation.

7-4-4 Maintenance Cost

Maintenance cost incurred is shown in Table 7-4-4. From this table, 7 taka per labour hour of skilled and unskilled workers shall be applied for the financial projection by assuming that increases from 3 taka in 1984/85 to 7 taka in 1988/89 resulted in inflation.

Table 7-4-4 Maintenance Cost

(Lac. taka)

	1984/85	1985/86	1986/87	1987/88	1988/89
Maintenance Cost	21.82	26.06	27.55	43.97	40.22
Per Worker	0.482	0.190	0.119	0.183	0.166
Per labour hour (taka)	3.4	3.7	3.9	6.8	7.4

Source: Project Proforma 1989

7-4-5 Other Expense

Contents of other expenses are comprised of depreciation, interest payment, taxes and etc. shown in Table 7-4-5.

Table 7-4-5 Other Expenses

(Lac. taka)

	1984/85	1985/86	1986/87	1987/88	1988/89
Machine Depreciation	134.67	31.73	30.67	73.84	219.10
Building Depreciation	57.31	72.30	73.24	102.77	160.33
Interest Payment		355.58	353.44	353.48	343.35
Foreign Fund		142.04	139.90	139.94	140.23
Local Fund		213.54	213.54	213.54	203.12
Misc.	49.70	75.28	79.82	116.87	123.69
Unforeseen	21.40	17.42	8.04	13.94	14.71
Taxes	11.62	12.65	8.10	10.45	10.28
Subtotal	274.7	564.96	553.31	671.35	871.46
Total Expense	465.53	923.01	1024.41	1184.19	1397.61

Source: Project Proforma 1989

Other expenses excluding depreciation and interest payment shall be applied for calculation of cash flow statement. This expense incurred in the past five years shared 9 - 18% to total expenses. On the assumption that this expense decreased according to the expanded expansion business activity, 9% of the total cost excluding depreciation and interest payment shall be applied for the projection.

7-4-6 Depreciation

The Board meeting held in BSEC discussed the method and rates of depreciation for CDD.

After a threadbare discussion, the Board approved a straight line method at the scheduled rates for charging depreciation, as recommend by the Director (Finance). In this connection, the project was advised to have a complete inventory of all assets including machinery showing their cost and location and incorporated in the register to be properly maintained. The Project was also advised to book depreciation charges from the date of completion of the workshop.

Rate of depreciation of each assets by category are shown in Table 7-4-6.

As a convenience for calculation, the following formula is adopted to depreciate every year.

- Civil works
  Investment amount excluding duties and charges x 2.8%

- Equipment
  Investment amount excluding duties and charges x 7%

Investment amount excluding duties and charges are presented as follows derived from Table 6-4-2.

(1000 taka)

	Ship Repair	Steel Work
Civil Works	52,230	6,310
Equipment	80,450	23,190

Table 7-4-6 Schedule Rates of Depreciation

No.	Particulars of Assets	Rates of Depreciation
A.	BUILDING AND STRUCTURAL CONSTRUCTION	
1.	Administration Building (1st Class Brick Building)	2.5%
2.	Apprentice School Building (- do -)	2.5%
3.	Canteen Building (- do -)	2.5%
4.	Garage Building (- do -)	2.5%
5.	Pump House (- do -)	2.5%
6.	Power Station (Gear House) (- do -)	2.5%
7.	Underground Tank	2.5%
8.	Temporary Construction	2.5%
9.	Temporary barbed Wire Fencing	5.0%
10.	Transformer House(1st Class Brick Building)	2.5%
11.	Temporary Security Building (C.I. Sheet Roof, 2nd Class Brick Building)	5%
12.	Wall (boundary Wall)	5%
13.	Internal Road and Drainages	NIL
B.	PLANT, MACHINERY & FACTORY EQUIPMENT	
1.	Plant and Machinery	7%
2.	Welding Cables	10%
3.	Fresh Water System	10%
4.	Electricity and Telephone Installation	10%
C.	TOOLS	
1.	Loose Tools	-
D.	FURNITURE & FIXTURES	
1.	Furniture	6%
2.	Furniture (DOCKSAP)	6%
E.	OFFICE EQUIPMENT (Typewriter, Calculating Machine, etc.)	
1.	Office Equipment	15%
F.	TRANSPORT VEHICLES	
1.	Transport Vehicles	20%
G.	VESSELS	
1.	Floating Crafts	10%
H.	SOFT FURNISHING & CROCKERIES	
1.	Soft Furnishing & Crockeries	20%
I.	BOOK	
1.	Book	20%
J.	MISCELLANEOUS	
1.	Tent and Tarpulines	20%
2.	Firearms	NIL

7-5 FINANCIAL EVALUATION

7-5-1 Cash Flow Analysis

Here, financial internal rate of return (FIRR) is reviewed on the basis of the revenue estimation and the cost estimation described in the preceding sections. Tables 7-5-1 through 7-5-6 show the cash flow statement from which the internal rate of return is calculated to review the financial viability of projects by the incremental analysis method. The internal rate of return*1 for the projects are shown below, which is nearly the same as the currently prevailing market interest rate for long term lending in Bangladesh. This project itself (FIRR with Tax) is therefore found very viable to be implemented in Bangladesh. The FIRR of CDD on total projects basis including the past investment cost are calculated as under in accordance with data supplied by Project Proforma 1989.

Department	Project	FIRR
Ship Repair	Slipway Project	13.7%
Steel Works	Expansion Project	7.7%
	Total Project	12.4%
CDD Total (without Project)		-191.0% *2
CDD Total (with Optimum Plan)		1.1% *3

Since analyzing the internal rate of return, projects are to be implemented by CDD. FIRR for CDD should include the tax as an item of cash outflow. Although the government has financed CDD's equity, CDD as a public corporation is obliged to pay tax in actual practice. In respect to these results, projects stand very much attractive to CDD with enormous possibility of contributing to the future preferable financial state of CDD, as well as improving the present situation.

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*1: A discounting factor which equates the cost and benefit (revenue) estimated at 1989 prices.

*2: Net Present Value at 15% of discount rate
= Benefit - Cost
= 217,515,000 taka - 1,005,292,000 taka
Benefit Cost Ratio = 0.22

*3: Net Present Value at 15% of discount rate
= 323,217,000 taka - 1,097,081,000 taka
Benefit Cost Ratio = 0.3

Sensitivity Analysis

The sensitivity of the financial internal rate of return of the project to cost or benefit fluctuation is seen in the following:

Sensitivity of FIRR for Slipway Project

Unit: %

Decrease in Revenue	Increase in Initial Investment Cost				
	100%	105%	110%	120%	130%
100%	13.7	13.1	12.5	11.5	10.6
95%	12.0	11.4	10.9	9.9	9.0
90%	10.1	9.6	9.1	8.2	7.4
80%	5.8	5.3	4.9	4.2	3.5

Sensitivity of FIRR for Steel Expansion Project

Unit: %

Decrease in Revenue	Increase in Initial Investment Cost				
	100%	105%	110%	120%	130%
100%	7.7	7.2	6.8	5.9	5.1
95%	5.1	4.7	4.2	3.4	2.6
90%	0.0	-0.05	-0.9	-1.8	-2.6

The analysis is based on the assumption that the price structure as of 1989 will prevail throughout the project life. Therefore, the changes in revenue can be interpreted as changes in tariff structure or changes in degree of production volume.

Considering the foregoing results, it could be said that the profitability of projects can withstand various severe changes in circumstances. 5% cost increase brings better results than the 5% revenue decrease. In case of 10% revenue reduction for the Slipway Project, FIRR gets down to 10.1%. In case of 10% revenue reduction for the Steel Expansion Project, FIRR gets down to 0.0%.

7-5-2 Analysis of Income Statement

Since CDD has several other projects within the period of FFYP, it is impossible to review the impact of the projects in relation to those other projects with regard to the financial position of CDD. It is felt beneficial for BSEC/CDD, however, to carry out income statement analysis limited to the projects so as to grasp the financial impact.

Based on the review of the cash flow statement, the income statement will be prepared only for CDD without project and with optimum plan and in Table 7-5-7 and 8. It is seen that the profit goes into black as early as 8 years from the commencement of the services in "With Optimum Plan" while the profit will never be generated till the year 2012/13 in "Without Project".

Table 7-5-1 Cash Flow Statement for Ship Repair (Without 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	25	27	28	28
		Coastal	24	12	9	0	0	0	0
	DWT	Seagoing	142,612	210,197	223,132	274,211	302,964	311,367	311,367
		Coastal	18,240	9,120	6,840	0	0	0	0
Sales		Seagoing	22,148	34,726	37,997	50,778	63,938	70,064	70,064
		Coastal	18,723	9,902	7,629	0	0	0	0
		Total	40,871	44,628	45,626	50,778	63,938	70,064	70,064
Operating Expenses	Material	Import	3,270	3,570	3,650	4,062	5,115	5,605	5,605
		Local	6,315	6,895	7,049	7,845	9,878	10,825	10,825
		Total	9,585	10,465	10,699	11,907	14,993	16,430	16,430
	Fuel & Power		3,291	3,830	3,933	4,409	5,075	5,406	5,406
	Salary	Direct	4,847	5,667	6,499	8,860	12,535	16,950	21,633
		Indirect	7,840	9,122	9,847	12,631	16,631	21,864	27,905
		Total	12,687	14,789	16,346	21,492	29,166	38,814	49,538
	Subcontracting		0	0	0	0	0	0	0
	Maintenance		2,304	2,681	2,753	3,086	3,553	3,784	3,784
	Other		2,787	3,176	3,373	4,089	5,279	6,443	7,516
	Total Cost		30,654	34,941	37,105	44,983	58,065	70,877	82,673
Gross Profit			10,217	9,687	8,521	5,795	5,873	-813	-12,609
Profit After Tax			5,620	5,328	4,687	3,187	3,230	-813	-12,609

Source : Study Team

Table 7-5-2 Cash Flow Statement for Ship Repair (Optimum Plan)

(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	35	61	69	73	73
	DWT	Seagoing	142,612	210,197	223,132	296,537	369,942	385,787	385,787
		Coastal	18,240	9,120	26,600	46,360	52,440	55,480	55,480
Sales		Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536
		Coastal	18,730	9,902	29,856	63,846	96,645	118,478	118,478
		Total	40,887	44,756	68,095	125,067	197,712	240,014	240,014
Operating Expenses	Material	Import	3,271	3,580	5,448	10,005	15,817	19,201	19,201
		Local	6,317	6,915	10,521	19,323	30,547	37,082	37,082
		Total	9,588	10,495	15,969	29,328	46,364	56,283	56,283
	Fuel & Power		3,291	3,756	4,773	6,208	8,596	9,892	9,892
	Salary	Direct	4,847	6,076	7,230	9,903	15,278	22,134	28,249
		Indirect	7,840	9,296	9,725	12,086	16,340	21,669	27,655
		Total	12,687	15,372	16,955	21,990	31,617	43,802	55,904
	Subcontracting		0	0	524	1,490	3,634	4,880	5,657
	Maintenance		2,304	2,629	3,341	4,346	6,017	6,924	6,924
	Other		2,787	3,225	4,156	6,336	9,623	12,178	13,466
	Total Cost		30,657	35,478	45,718	69,698	105,851	133,959	148,126
Gross Profit			10,230	9,278	22,377	55,369	91,861	106,055	91,888
Profit After Tax			5,627	5,103	12,307	30,453	50,524	58,330	50,538

Source : Study Team

Table 7-5-3 Cash Flow Statement for Ship Repair (Slipway 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	26	61	69	73	73
	DWT	Seagoing	0	0	0	22,326	66,978	74,420	74,420
		Coastal	0	0	19,760	46,360	52,440	55,480	55,480
Sales		Seagoing	9	128	242	10,443	37,129	51,472	51,472
		Coastal	7	0	22,227	63,846	96,645	118,478	118,478
		Total	16	128	22,469	74,289	133,774	169,950	169,950
Operating Expenses	Material	Import	1	10	1,798	5,943	10,702	13,596	13,596
		Local	2	20	3,472	11,478	20,669	26,257	26,257
		Total	3	30	5,270	17,421	31,371	39,853	39,853
	Fuel & Power		0	-74	840	1,800	3,521	4,486	4,486
	Salary	Direct	0	409	731	1,043	2,743	5,184	6,616
		Indirect	0	174	-122	-545	-291	-195	-249
		Total	0	583	609	498	2,451	4,988	6,367
	Subcontracting		0	0	524	1,490	3,634	4,880	5,657
	Maintenance		0	-51	588	1,260	2,464	3,140	3,140
	Other		0	49	783	2,247	4,344	5,735	5,950
	Total Cost		3	537	8,614	24,715	47,785	63,082	65,453
Gross Profit			13	-409	13,855	49,574	85,989	106,868	104,497
Profit After Tax			7	-225	7,620	27,266	47,294	59,143	63,148

Source : Study Team

Table 7-5-4 Cash Flow Statement for Steel Work (Without Project)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production		(1000 ton)	320	370	400	430	430	430	430
Sales			14,060	16,200	17,490	18,900	18,900	18,900	18,900
Operation Expenses	Material	Import	192	160	384	480	480	480	480
		Local	9,880	11,350	12,512	13,526	13,526	13,526	13,526
		Total	10,072	11,510	12,896	14,006	14,006	14,006	14,006
	Fuel & Power		986	973	973	973	973	973	973
	Salary	Direct	1,974	2,285	2,399	2,916	3,722	4,751	6,063
		Indirect	3,065	3,514	3,437	3,864	4,528	5,519	7,044
		Total	5,039	5,799	5,836	6,780	8,250	10,270	13,107
	Subcontracting		0	0	0	0	0	0	0
	Maintenance		690	681	681	681	681	681	681
	Other		1,679	1,896	2,039	2,244	2,391	2,593	2,877
	Total Cost		18,466	20,859	22,425	24,684	26,301	28,523	31,644
Gross Profit			-4,406	-4,659	-4,935	-5,784	-7,401	-9,623	-12,744
Profit After Tax			-4,406	-4,659	-4,935	-5,784	-7,401	-9,623	-12,744

Source : Study Team

Table 7-5-5 Cash Flow Statement for Steel Work (Optimum Plan)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production		(1000 ton)	320	370	560	930	1,300	1,400	1,520
Sales			14,060	16,150	31,670	59,310	86,990	99,350	104,740
Operation Expenses	Material	Import	192	160	3,690	8,880	14,320	16,870	18,224
		Local	9,880	11,350	17,960	30,880	43,840	49,430	51,566
		Total	10,072	11,510	21,650	39,760	58,160	66,300	69,790
	Fuel & Power		986	1,030	1,804	2,324	2,721	2,850	2,863
	Salary	Direct	1,974	2,285	2,977	4,104	5,759	7,409	9,456
		Indirect	3,065	3,334	3,879	4,835	5,816	6,722	8,579
		Total	5,039	5,619	6,856	8,939	11,575	14,131	18,035
	Subcontracting		0	80	745	1,366	2,051	2,586	3,046
	Maintenance		690	721	1,263	1,627	1,905	1,995	2,004
	Other		1,679	1,896	3,232	5,402	7,641	8,786	9,574
	Total Cost		18,466	20,856	35,549	59,417	84,052	96,648	105,312
Gross Profit			-4,406	-4,706	-3,879	-107	2,938	2,702	-572
Profit After Tax			-4,406	-4,706	-3,879	-107	1,616	1,486	-572

Source : Study Team

Table 7-5-6 Cash Flow Statement for Steel Work (Expansion Project)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production		(1000 ton)	0	0	160	500	870	970	1,090
Sales			0	-50	14,180	40,410	68,090	80,450	85,840
Operation Expenses	Material	Import	0	0	3,306	8,400	13,840	16,390	17,744
		Local	0	0	5,448	17,354	30,314	35,904	38,040
		Total	0	0	8,754	25,754	44,154	52,294	55,784
	Fuel & Power		0	57	831	1,351	1,748	1,877	1,890
	Salary	Direct	0	0	578	1,188	2,037	2,658	3,392
		Indirect	0	-180	442	971	1,288	1,203	1,535
		Total	0	-180	1,020	2,159	3,324	3,861	4,928
	Subcontracting		0	80	745	1,366	2,051	2,586	3,046
	Maintenance		0	40	582	946	1,224	1,314	1,323
	Other		0	-0	1,193	3,158	5,250	6,193	6,697
	Total Cost		0	-3	13,124	34,733	57,751	68,125	73,668
Gross Profit			0	-47	1,056	5,677	10,339	12,325	12,172
Profit After Tax			0	-47	1,056	5,677	9,017	11,109	12,172

Source : Study Team

Table 7-5-7 Income Statement for CDD (Without Project)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Sales	Dry Dock Repair Seagoing	22,148	34,726	37,997	50,778	63,938	70,064	70,064
	Dry Dock Repair Coastal	18,723	9,902	7,629	0	0	0	0
	Dry Dock Repair Total	40,871	44,628	45,626	50,778	63,938	70,064	70,064
	Afloat Repair	4,087	4,463	4,563	5,078	6,394	7,006	7,006
	Allied Product	17,575	20,250	21,863	23,625	23,625	23,625	23,625
	Total Sales	62,533	69,341	72,051	79,481	93,957	100,695	100,695
Operating Expenses	Material Import	3,510	3,770	4,130	4,662	5,715	6,205	6,205
	Material Local	18,665	21,083	22,689	24,753	26,786	27,733	27,733
	Material Total	22,175	24,853	26,819	29,415	32,501	33,938	33,938
	Fuel & Power	4,277	4,803	4,906	5,382	6,048	6,379	6,379
	Salary & Wage	17,726	20,588	22,182	28,272	37,416	49,084	62,645
	Subcontracting	0	0	0	0	0	0	0
	Maintenance	2,994	3,362	3,434	3,767	4,234	4,465	4,465
	Depreciation	37,943	37,943	37,943	37,943	37,943	16,033	16,033
	Interest Payment	30,519	22,668	20,896	13,316	7,286	0	0
	Other	4,717	5,360	5,734	6,684	8,020	9,387	10,743
	Total Cost	120,352	119,576	121,915	124,778	133,447	119,285	134,202
Gross Profit		-57,819	-50,236	-49,864	-45,297	-39,490	-18,590	-33,507
Profit After Tax		-57,819	-50,236	-49,864	-45,297	-39,490	-18,590	-33,507
Operating Ratio		1.92	1.72	1.69	1.57	1.42	1.18	1.33

Source : Study Team

Table 7-5-8 Income Statement for CDD (Optimum Plan)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Sales	Dry Dock Repair Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536
	Dry Dock Repair Coastal	18,730	9,902	29,856	63,846	96,645	118,478	118,478
	Dry Dock Repair Total	40,887	44,756	68,095	125,067	197,712	240,014	240,014
	Afloat Repair	4,087	4,463	4,563	5,078	6,394	7,006	7,006
	Allied Product	17,575	20,188	39,588	74,138	108,738	124,188	130,925
	Total Sales	62,549	69,406	112,245	204,282	312,843	371,208	377,945
Operating Expenses	Material Import	3,511	3,780	10,061	21,105	33,717	40,289	41,981
	Material Local	18,667	21,103	32,971	57,923	85,347	98,870	101,540
	Material Total	22,178	24,883	43,032	79,028	119,064	139,158	143,521
	Fuel & Power	4,277	5,419	7,505	9,734	12,857	14,443	14,460
	Salary & Wage	17,726	20,991	23,811	30,929	43,192	57,933	73,939
	Subcontracting	0	80	1,268	2,855	5,685	7,466	8,704
	Maintenance	2,994	3,350	4,604	5,973	7,922	8,919	8,928
	Depreciation	37,943	37,943	44,037	46,602	46,602	24,692	17,531
	Interest Payment	30,519	22,668	32,898	24,741	12,776	2,901	2,009
	Other	4,718	5,472	8,022	12,852	18,872	22,792	24,955
	Total Cost	120,355	120,807	165,177	212,713	266,968	278,304	294,047
Gross Profit		-57,806	-51,401	-52,932	-8,430	45,875	92,904	83,899
Profit After Tax		-57,806	-51,401	-52,932	-8,430	25,231	51,097	46,144
Operating Ratio		1.92	1.74	1.47	1.04	0.85	0.75	0.78

Source : Study Team

7-5-3 Analysis of Fund Flow Statement

Assumptions imposed on the analysis of the fund flow statement for CDD are as follows:

(1,000 taka)

	1992/93	1993/94	Total
Foreign	130,410	47,910	178,320
Local	69,580	29,330	98,910
Total	199,990	77,240	277,230

The total investment amounts 277,230,000 taka excluding contingencies of which the foreign currency portion 178,320,000 taka will be financed by soft loan from the Bangladesh Government (30 year repayment with 2% p.a. interest with grace period of 10 years). The local currency portion is to be financed with Commercial Bank, that is, about 40% of the total investment or 98,910,000 taka will be raised. The terms imposed on a domestic loan is a 15% p.a. interest without grace period. These borrowing conditions were presented by CDD during survey in Bangladesh. The repayment method for both loans is to repay in equal amounts during the remaining period after the grace period of principal repayment. Table 7-5-9 and 10 shows the fund flow statement of CDD "Without" and CDD "With" respectively prepared on the basis of the above assumptions.

Repayment of loans reaches its peak in 2002/03 and amounts three times larger than the investment cost, it is difficult to repay loans without liquidating internal reserves (retained earnings). The debt service ratio (net income + depreciation/principal repayment) ranges between -0.17 and 7.14 during 1992/93 to 2012/13 period and will exceed 1.3 only from the year 2007/08 as shown on Table 7-5-10. But, repayment of all loans will not be completed by the year 2012/13. Thus, this plan provides a sound investment opportunity though the larger amount of loans may weaken its repayment capability.

It is noted that the fund flow statement in Table 7-5-10 has not solved the problem of deficit amount every year. CDD should procure a short-term loan for the deficit amount every year generating throughout the planned period.

Table 7-5-9 Fund Flow Statement for CDD (Without Project)

(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Source of Funds							
Profit After Tax	-57,819	-50,236	-49,864	-45,297	-39,490	-18,590	-33,507
Depreciation	37,943	37,943	37,943	37,943	37,943	16,033	16,033
Subtotal	-19,876	-12,293	-11,921	-7,354	-1,547	-2,557	-17,474
Long-term Debts, Foreign	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0
Short-term Debts	0	0	0	0	0	0	0
Total	-19,876	-12,293	-11,921	-7,354	-1,547	-2,557	-17,474
Application of Funds							
Investment	0	0	0	0	0	0	0
Decrease in Long-term Debts	77,677	77,677	77,677	77,677	77,677	0	0
in Short-term Debts	0	0	0	0	0	0	0
Total	77,677	77,677	77,677	77,677	77,677	0	0
Net Surplus/Loss	-97,553	-89,970	-89,598	-85,031	-79,224	-2,557	-17,474
Ending of Balance	-97,553	-374,807	-464,405	-811,242	-1,136,849	-1,352,508	-1,406,547
Debt Sevice Ratio	-0.26	-0.16	-0.15	-0.09	-0.02		

Source : Study Team

Table 7-5-10 Fund Flow Statement for CDD (Optimum Plan)

(1000 taka)

	1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Source of Funds							
Profit After Tax	-57,806	-51,401	-52,932	-8,430	25,231	51,097	46,144
Depreciation	37,943	37,943	44,037	46,602	46,602	24,692	17,531
Subtotal	-19,863	-13,458	-8,895	38,171	71,833	75,789	63,675
Long-term Debts, Foreign		130,410	47,910				
Local		69,580	29,330				
Short-term Debts	0	0	0	0	0	0	0
Total	-19,863	186,532	68,345	38,171	71,833	75,789	63,675
Application of Funds							
Investment		199,990	77,240				
Decrease in Long-term Debts	77,677	77,677	84,635	94,526	104,417	8,916	8,916
in Short-term Debts	0	0	0	0	0	0	0
Total	77,677	277,667	161,875	94,526	104,417	8,916	8,916
Net Surplus/Loss	-97,540	-91,135	-93,530	-49,397	-15,735	66,873	54,759
Ending of Balance	-97,540	-188,674	-470,712	-710,916	-824,349	-717,780	-451,239
Debt Service Ratio	-0.26	-0.17	-0.11	0.40	0.69	8.50	7.14

Source : Study Team

8 ECONOMIC EVALUATION

8 ECONOMIC EVALUATION

8-1 OBJECTIVE

The purpose of the economic evaluation is to grasp how effective projects lead to the Bangladesh economy. In other words, irrespective of the composition of investors of input goods (expenses) for projects or the composition of beneficiaries of outputs (benefit), it estimates how the utilization of various resources through projects will contribute to the national economy. In other words, how to maximize the contribution of capital to the national income. Therefore, the degree of its contribution is calculated in terms of the prices for the national economy, or in terms of the economic prices.

Since the price of the ship repair services is the controlled price based on the supply constraints condition, the price cannot be claimed as the one established on the basis of the true supply and demand relationship. What constitutes the basis then, is the consumers' willingness to pay for the services, and the economic benefit in projects therefore will be estimated in terms of willingness to pay. In regard to economic cost, in recognition of the market for each input good is distored for various reasons (import substitution, policies, government intervention into the pricing system, etc.), the effects of these should be eliminated from the market prices for economic evaluation of the projects.

The implementation of projects would make it possible to save the foreign currency which seems the most urgent matter for the Bangladesh Economy. The degree of impact on foreign currency balance should be considered for evaluation.

8-2 ECONOMIC INTERNAL RATE OF RETURN

8-2-1 Consumer Surplus

Because of its intrinsic form of market, the project is unable to use the market price (controlled price) as a numeral to estimate its economic benefit. Therefore, it is required to seized the benefit based on the consumers' willingness to pay. Here, we would like to briefly explain about the consumers' surplus which is a representation of the aggregate consumers' willingness to pay.

Since shipowner should bear two kinds of payment for ship repairing. One is ship repair payment made by shipowner to CDD and the other is fleet operation cost expected to incur during dock repairing period. If docking period become shorten, the less flect operating cost will incurred. Both seagoing and trawler owners claimed CDD for its inefficiency of dock operation which caused excess time and exorbitant charges due to an absence of proper planning.

Total days taken for ship repair by company are summarized as follows derived from Table 8-2-1.

	Total Days Spent	Normal Days Spent	Difference	Possible Reduction with Slipway	Total Possible Reduction Days
BSC	106	64	42		42
Private	59	41	8		8
Trawler Coastal	469	220	49	144	193
Total	634	325	99	144	243

Table 8-2-1 Docking Results in 1988/89 (1/2)

No.	Name of vessel	Date of docking	Date of undocking	Total days	Normal days	Dif-fer-ence	With Slipway Project	Total Dif-fer-ence	Reasons for Delay
1	M.V. Loyal Bird(P) *1	23.06.88	06.07.88	14	10	4	-	4	Rain and Other delays
2	F.T. Imam No.-1	09.07.88	18.07.88	10	6		4	4	6/7 days waiting
3	F.T. Imam No.-2	09.07.88	18.07.88	10	6	-	4	4	4 vessels at a time takes 1/2
4	F.V. Friendship-1	09.07.88	18.09.88	10	6		4	4	days more
5	F.V. Friendship-2	09.07.88	18.07.88	10	6		4	4	
6	M.V. Queen of Diamond(P)	20.07.88	07.08.88	19	10	4	5	9	Distress vessel makes delay to
7	M.V. Jin Hand Jun-106	20.07.88	22.08.88	03	3				24/7/89 and Decision of owner delayed
8	M.T. Shyama	08.08.88	30.08.88	23	10	8	5	13	Defect list increased (3/4 days
9	F.V. Moin	08.08.88	30.08.88	23	10	8	5	13	delay) and limited welder and plater
10	M.V. Momin	08.08.88	30.08.88	23	12	11		11	Plate works delayed due to
11	M.T. Shankhachil	08.08.88	30.08.88	23	10	8	5	13	very old and caused No. 191, 192 and 194
12	M.V. Banglar Kakoli(BSC)	31.08.88	15.08.88	16	10	6		6	4 vessel in Dock and undergoing plate work
13	M.V. Banglar Progoti(DSC)	16.09.88	20.09.88	15	10	5		5	Delay due to plate renewal
14	M.V. Banglar Mamata (BSC)	02.10.88	10.10.88	9	7	2		2	Worker Problems
15	F.T. AHM-2	11.10.88	16.10.88	6	5	1		1	"
16	M.T. Shourabh	16.10.88	25.10.38	10	7	3		3	1 day for workers and 2 days for surveyor's extension
17	M.T. Naureen	26.10.88 26.11.88	03.11.38 30.11.38	13					Work extensive docked
18	F.V. Mita	26.10.88	03.11.88	8	6		2	2	
19	F.V. Joutha Jatra	26.10.88	03.11.38	8	6		2	2	
20	F.V. Joutha Udyam	26.10.88	03.11.38	8	6		2	2	
21	F.V. AL-Swamruz (P)	04.11.88	09.11.38	6	6				Ready for docking 2/3 days earlier
22	F.V. Corina	10.11.88	26.11.38	17	12				Importing problem and accident in
23	F.V. Saleem	30.11.88	17.12.38	18	10				Intermediate shaft Detect list and drawings were not available (5 days) and waiting for 3 days

Table 8-2-1 Docking Results in 1988/89 (2/2)

No.	Name of vessel	Date of docking	Date of undocking	Total days	Normal days	Difference	With Slipway Project	Total Difference	Reasons for Delay
24	M.V. AL-Tabith (P)	30.12.88	11.01.89	13	8				Accident on from 31/12 to 4/1
25	F.V. MITA	11.01.89	14.01.89	4	4				
26	M.V. Banglar Mita (BSC)	27.01.89	09.02.89	14	9	5		5	Strike and worker problem
27	M.V. Banglar Urmit (BSC)	12.02.89	03.03.89	20	12	8		8	Propeller replacement and Bedding of propeller work (New Type)
28	F.V. Joutha Udyam	03.03.89	04.03.89	2					
29	M.V. Banglar Baani (BSC)	04.03.89	21.03.89	18	7	11		11	DB tank and plate works delayed
30	M.V. Al-Sana (P)	24.03.89	30.03.89	7	7				
31	M.V. Sea Progress	31.03.89	12.04.89	13	10				Ports delay 2 days strike and one day cancelled
32	F.V. Bandhan	13.04.89	23.04.89	11	7		3	3	
33	F.V. Udyam	13.04.89	23.04.89	11	7		3	3	
		13.04.89	30.05.89						
34	B.L.V. Ali	22.06.89	02.07.89	50	10		40	40	
35	M.T. Kandari-7	13.04.89	11.05.89	31	10		21	21	Extensive and Modification Work
36	M.T. Kandari-9	13.04.89	11.05.89						
		21.05.89	30.05.89	41	10		31	31	
37	F.T. Meenhar-2	23.04.89	11.05.89	20	12				Owner Decision delayed for extensive repair
38	F.V. Moitri-S	11.05.89	21.05.89	11	8	3		3	Waited for docking
39	F.V. Moitri-T	11.05.89	21.05.89	11	8	3		3	Worker problem
40	F.V. Imam No.-3	21.05.89	30.05.89	10	8	2		2	Waited for docking
41	M.V. Banglar Maya (BSC)	31.05.89	09.06.89	10	8	2		2	Worker problem
42	M.V. Banglar Moni (BSC)	09.06.89	21.06.89	13	8	5		5	Strike one day, Holiday one day and undocking postponed one day
43	M.T. Doel	22.06.89	02.07.89	11	9		2	2	No.217 shaft works finished on
44	F.T. Meenhar-1	22.06.89	02.07.89	11	9		2	2	1/7 and undocked all 3 vessels
	Total			634	325	99	144	243	

Source: CDD
Note: *1: Private Vessel

In 1988/89, CDD spent 634 days for 44 vessels which were comprised of eight BSC, five private and 31 coasters/trawlers. There are various reasons for delay but the major problems are summarized as, first, absence of slipway for trawler/coasters, second, absence of proper planning including worker problems. These problems can be solved by implementing the optimum plan. With execution of this plan, it is expected that CDD can achieve a less time for more work volume as under (refer to Table 5-1-5 and 5-1-16).

Year	Days per Docking Seagoing vessel		Days per Docking Coastal/Trawler	
	Without	With	Without	With
1987/88	15.2	15.2	10.4	10.4
1989/90	14.4	14.4	10.1	10.1
1992/93	13.2	13.2	9.2	9.2
1993/94		12.6		8.7
1997/98	11.7	9.2	8.2	6.3
2002/03	11.2	7.8	7.8	5.4
2007/08	10.8	7.4	7.4	5.1
2012/13	10.8	7.4	7.4	5.1

Therefore, consumer surplus can be realized by reducing days for ship repair at CDD for both seagoing and coastal/trawlers.

Fixed operating cost for seagoing vessels amounts to around 5,000 US dollars per day obtained from the Questionnaire survey in Table 3-4-11.

Fixed operating cost for trawlers amounts to 70,000 - 90,000 taka per day obtained from the interview survey.

Thus, economic benefit generating from time reduction can be calculated by multiplying reduced days with fixed operating cost per day.

8-2-2 Economic Cost

Since the financial analysis was carried out by the numeral of the domestic currency, the financial prices of input and output should be converted into the economic prices. Project input can be imported or purchased from a domestic source. To calculate economic prices of project cost, their world prices (FOB or CIF) are adjusted to "border prices" by allowing for "domestic transfer costs". The economic "border-equivalent" prices can be obtained by deriving from conversion factors.

Conversion factors are usually smaller than one. Average conversion factors aggregate across groups of goods. The most aggregative conversion factor is the Standard Conversion Factor (SCF), which directed to apply 0.82 for calculation by the Bangladesh Government (Project proforma).

The SCF is meant to be an average ratio of border and domestic market prices. In its simplest form, it is a ratio of two versions of a country's foreign trade amount, one exclusive of and the other inclusive of import taxes and export taxes or subsidies.

The SCF is in effect the ratio between an official exchange rate (OER) and a shadow exchange rate (SER). The SCF can be used to adjust domestic market prices downward to their border-priced equivalents. It is also possible to adjust border price upward to domestic market equivalents.

When the Taka's exchange rate is estimated by the principle of shadow exchange rate (SER), the exchange rate as of 1989 (field survey time) turns out to be 4.35 Yen per taka so that SER becomes 5.3 Yen per taka by adjusting the foreign currency portion upward to taka. The result is obtained as follows:

SER = OER/SCF = 4.35 yen per taka/0.82 =
5.30 yen per taka

Shown below are total financial and economic costs for the projects. The foreign currency portion required for project implementation holds a big weight. Nevertheless, as market prices reflect effective rates, no substantial difference exists between the two cost estimates.

Slipway Project	:	Financial Cost	210,680 x 10^3 taka
		Economic Cost	214,885 x 10^3 taka
Steel Expansion Project:		Financial Cost	66,550 x 10^3 taka
		Economic Cost	71,858 x 10^3 taka

Although the ratio of the cost of unskilled labor to the total investment of projects are quite small, modification by the opportunity cost of unskilled labor shall apply 0.73 for calculation which is directed by Bangladesh Government.

Economic cost excludes "transfer payments" such as duties and taxes from both capital investment cost and operating expenses. There is one more conversion factors for electricity directed to use for calculation, that is, 1.11 for industry.

8-2-3 Results

In consideration of the foregoing reviews, the economic internal rate of return (EIRR) for the Slipway Project and the Steel Expansion Project are calculated as 31% and 13% respectively, shown in Table 8-2-2 to 7 and thereby, total EIRR is 27%.

In general, it is believed that a cut off rate should be either the opportunity cost or the marginal cost of capital. However, it is difficult to calculate such opportunity cost, an exhaustive list of the total amount of available capital and all projects that can be implemented in Bangladesh is required. Even if this data is made available, we cannot escape from the uncertainties involved in preparation of this data. The International Bank for Reconstruction and Development (IBRD) assumes that the opportunity cost of capital in each developing country lies between 8 to 15%. Accordingly, the project is evaluated in the light of the upper limit of 15%.

The economic internal rate of return for the plan greatly exceeds these interest rate and proves that the said plan will greatly contribute to the Bangladesh economy.

It has been made clear that the said plan presents strong financial/economic benefits earning capacity through the projection and analyses in the previous sections. The financial rate of return of 12.4%, and the economic rate of return of 27% strongly recommend the implementation of the said plan.

The necessity of CDD's expansion in the perspective of the regional development is obvious not only from the point of view of economic aspects but also from social aspects. Further it is expected that the role of CDD in the development scheme will increase its importance. In these instances it is felt beneficial to state briefly on the feature of development in the said project area.

Table 8-2-2 Cost Benefit Flow Statement for Ship Repair (Without Project)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	Vessels	Seagoing	13	19	20	25	27	28	28
		Coastal	24	12	9	0	0	0	0
	Days/ Vessel	Seagoing	14.4	13.2	13.2	11.7	11.2	10.8	10.8
		Coastal	10.1	9.2	9.2	8.2	7.8	7.4	7.4
Sales		Seagoing	22,148	34,726	37,997	50,778	63,938	70,064	70,064
		Coastal	18,723	9,902	7,629	0	0	0	0
Benefit		Seagoing	0	3,745	3,942	11,087	14,191	16,556	16,556
		Coastal	0	864	648	0	0	0	0
		Total	40,871	49,237	50,216	61,865	78,129	86,620	86,620
	Material	Import	1,994	2,177	2,226	2,477	3,119	3,418	3,418
		Local	6,315	6,895	7,049	7,845	9,878	10,825	10,825
		Total	8,309	9,072	9,275	10,322	12,997	14,243	14,243
Operating	Fuel & Power		3,653	4,251	4,366	4,894	5,833	6,001	6,001
Economic Cost	Salary	Direct	3,967	4,633	5,301	7,199	10,152	13,670	17,447
		Indirect	7,601	8,843	9,546	12,245	16,115	21,194	27,050
		Total	11,567	13,477	14,847	19,444	26,267	34,865	44,497
	Subcontracting		0	0	0	0	0	0	0
	Maintenance		2,304	2,681	2,753	3,086	3,553	3,784	3,784
	Other		1,583	1,948	2,124	2,775	3,845	4,889	5,852
	Total Cost		27,417	31,428	33,365	40,520	52,295	63,781	74,377
Net Benefit			13,454	17,809	16,851	21,345	25,834	22,839	12,244

Source: Study Team

Table 8-2-3 Cost Benefit Flow Statement for Ship Repair (Optimum Plan)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	Vessels	Seagoing	13	19	20	28	36	38	38
		Coastal	24	12	35	61	69	73	73
	Days/ Vessel	Seagoing	14.4	13.2	12.6	9.2	7.8	7.4	7.4
		Coastal	10.1	9.2	8.7	6.3	5.4	5.1	5.1
Sales		Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536
		Coastal	18,730	9,902	29,856	63,846	96,645	118,478	118,478
Benefit		Seagoing	0	3,745	5,913	23,915	39,026	43,691	43,691
		Coastal	0	864	3,920	18,544	25,944	29,200	29,200
		Total	40,887	49,365	77,928	167,526	262,682	312,905	312,905
	Material	Import	1,995	2,183	3,322	6,101	9,645	11,708	7,139
		Local	6,317	6,915	10,521	19,323	30,547	37,082	37,082
		Total	8,312	9,098	13,843	25,424	40,192	48,790	48,790
Operating	Fuel & Power		3,653	4,169	5,298	6,891	9,541	10,980	10,980
Economic Cost	Salary	Direct	3,967	4,965	5,879	8,046	12,334	17,772	22,682
		Indirect	7,601	9,012	9,423	11,711	15,825	20,976	26,771
		Total	11,567	13,978	15,302	19,758	28,158	38,748	49,453
	Subcontracting		0	0	382	1,087	2,653	3,562	4,130
	Maintenance		2,304	2,629	3,341	4,346	6,017	6,924	6,924
	Other		1,584	1,987	2,817	4,751	7,656	9,900	11,028
	Total Cost		27,420	31,862	40,984	62,256	94,217	118,904	131,304
Net Benefit			13,467	17,503	36,944	105,270	168,465	194,000	181,601

Source: Study Team

Table 8-2-4 Cost Benefit Flow Statement for Slipway Project

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	Vessels Seagoing	0	0	0	3	9	10	10
	Coastal	0	0	26	61	69	73	73
	Days/ Seagoing	0.0	0.0	-0.6	-2.5	-3.4	-3.4	-3.4
	Vessel Coastal	0.0	0.0	-0.5	-1.9	-2.4	-2.3	-2.3
Sales	Seagoing	9	128	242	10,443	37,129	51,472	51,472
	Coastal	7	0	22,227	63,846	96,645	118,478	118,478
Benefit	Seagoing	0	0	1,971	12,828	24,835	27,134	27,134
	Coastal	0	0	3,272	18,544	25,944	29,200	29,200
	Total	16	128	27,712	105,661	184,553	226,284	226,284
Material	Import	1	6	1,096	3,624	6,526	8,290	3,721
	Local	2	20	3,472	11,478	20,669	26,257	26,257
	Total	3	26	4,568	15,102	27,195	34,547	29,978
Operating Fuel & Power		0	-82	932	1,998	3,908	4,979	4,979
Economic Salary	Direct	0	332	578	848	2,181	4,101	5,234
Cost	Indirect	0	169	-123	-534	-290	-218	-279
	Total	0	501	455	314	1,891	3,883	4,956
Subcontracting		0	0	382	1,087	2,653	3,562	4,130
Maintenance		0	-51	588	1,260	2,464	3,140	3,140
Other		0	39	693	1,976	3,811	5,011	5,175
Total Cost		3	434	7,619	21,736	41,922	55,123	56,927
Net Benefit		13	-306	20,093	83,925	142,631	171,161	169,357

Source: Study Team

Table 8-2-5 Cost Benefit Flow Statement for Steel Work (Without Project)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000ton)		320	370	400	430	430	430	430
Sales		14,060	16,200	17,490	18,900	18,900	18,900	18,900
Operation Economic Cost	Material Import	117	98	234	293	293	293	293
	Local	9,880	11,350	12,512	13,526	13,526	13,526	13,526
	Total	9,997	11,448	12,746	13,819	13,819	13,819	13,819
	Fuel & Power	1,094	1,080	1,080	1,080	1,080	1,080	1,080
	Salary Direct	1,630	1,887	1,981	2,408	3,074	3,923	5,007
	Indirect	2,972	3,406	3,332	3,746	4,387	5,350	6,828
	Total	4,602	5,293	5,313	6,154	7,461	9,273	11,835
	Subcontracting	0	0	0	0	0	0	0
	Maintenance	690	681	681	681	681	681	681
	Other	1,638	1,850	1,982	2,173	2,304	2,485	2,741
	Total Cost	18,022	20,352	21,802	23,907	25,345	27,338	30,156
Net Benefit		-3,962	-4,152	-4,312	-5,007	-6,445	-8,438	-11,256

Source: Study Team

Table 8-2-6 Cost Benefit Flow Statement for Steel Work (Optimum Plan)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000ton)		320	370	560	930	1,300	1,400	1,520
Sales		14,060	16,150	31,670	59,310	86,990	99,350	104,740
Operation Economic Cost	Material Import	117	98	2,563	6,115	9,854	11,615	12,561
	Local	9,880	11,350	17,960	30,880	43,840	49,430	51,566
	Total	9,997	11,448	20,523	36,995	53,694	61,045	64,127
	Fuel & Power	1,094	1,143	2,002	2,580	3,020	3,164	3,178
	Salary Direct	1,630	1,887	2,439	3,362	4,711	6,056	7,729
	Indirect	2,972	3,232	3,758	4,684	5,633	6,507	8,305
	Total	4,602	5,119	6,197	8,046	10,344	12,563	16,034
	Subcontracting	0	59	544	997	1,497	1,888	2,224
	Maintenance	690	721	1,263	1,627	1,905	1,995	2,004
	Other	1,638	1,849	3,053	5,024	7,046	8,065	8,757
	Total Cost	18,022	20,338	33,582	55,268	77,505	88,719	96,323
Net Benefit		-3,962	-4,188	-1,912	4,042	9,485	10,631	8,417

Source: Study Team

Table 8-2-7 Cost Benefit Flow Statement for Steel Expansion Project

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000ton)		0	0	160	500	870	970	1,090
Sales		0	-50	14,180	40,410	68,090	80,450	85,840
Operation Economic Cost	Material Import	0	0	2,329	5,822	9,561	11,322	12,268
	Local	0	0	5,448	17,354	30,314	35,904	38,040
	Total	0	0	7,777	23,176	39,875	47,226	50,308
	Fuel & Power	0	63	922	1,500	1,940	2,083	2,098
	Salary Direct	0	0	457	953	1,637	2,133	2,722
	Indirect	0	-174	426	939	1,245	1,157	1,477
	Total	0	-174	884	1,892	2,883	3,290	4,199
	Subcontracting	0	59	544	997	1,497	1,888	2,224
	Maintenance	0	40	582	946	1,224	1,314	1,323
	Other	0	-1	1,071	2,851	4,742	5,580	6,015
	Total Cost	0	-14	11,780	31,361	52,160	61,381	66,167
Net Benefit		0	-36	2,400	9,049	15,930	19,069	19,673

Source: Study Team

8-3 IMPACTS ON FOREIGN CURRENCY BALANCE

8-3-1 Method

The implementation of projects would make it possible to save the foreign currency since it would prevent the capital outflow which would have occurred in such a way that domestic vessels would have to be repaired in foreign shipyards, if the plan should not be realized. Likewise, the capability of manufacturing the steelwork at CDD would basically perform the function of saving the foreign currency. In the meantime, the revenue earned by repairing foreign vessels would help Bangladesh acquire the foreign currency. It is considered, therefore, that the balance between the gross earning and the payment of imported materials and equipment goods is the amount of the foreign currency saved and acquired, which will derive from projects. It is additionally considered that the stay of foreign vessel crews will promote the import level of foreign currency. Saving and acquisition of foreign currency, thus, are expected to improve the balance of payments in Bangladesh.

Most of steel products are importing at present. With the execution of the steel expansion project, imported products can be substituted for domestic products, which contribute to foreign currency saving. In developing countries, the theme concerning how to utilize scarce resources of foreign currency to achieve maximum returns became common topics. The Bangladesh Government may be quite sensitive to foreign exchange earnings so that the projects should be analysed as to whether they can contribute to national foreign currency balance or not.

The degree of impact on foreign currency balance can be estimated first by preparing cash flow of foreign portion for each project and compare their FIRR and original FIRR. Cash flow of foreign portion is prepared in such a way that foreign currency revenue (foreign currency saving) and expenses including capital investment cost are deducted from original cash flow statement and compare net foreign currency balance every year. The foreign currency revenue of the slipway project is assumed to be seagoing revenue because the ship repairing facility for seagoing is not available except CDD in Bangladesh. The foreign currency revenue items of the steel expansion project are assumed to be electricity towers, portable bridges, chemical plants and half of others because these products are import substitute items at present (Refer to Table 7-3-4).

Second, the Modified Buruno Ratio (MBR), well known to measure the degree of impact, will be obtained by the following formula:

$$MBR = \frac{\text{Present Value of Local Currency Expenses}}{\text{Present Value of Foreign Currency Revenue}}$$

With the application of appropriate discount rate, the present values of both local currency expenses and foreign currency revenue are obtained and the ratio of these two values can measure the degree of consuming one unit local currency to earn one unit foreign currency for the project. When this ratio fall below the SER, the project is proved to contribute to the national foreign currency balance.

8-3-2 Results

The results of calculation are presented in Table 8-3-1 to 6 and summarized as under:

	Slipway	Steel Expansion	Total
FIRR (%)	13.7	7.7	12.4
FIRR for foreign portion (%)	4.7	19.5	10.0
Buruno Ratio	1.78	1.04	1.34

It is obvious that since the slipway project is aimed to provide facilities for trawlers and coastals with technical assistance for both seagoing and trawlers/coastals, a lower FIRR for foreign portion and Buruno ratio exceeds SER (1.22). On the other hand, the steel expansion project with technical assistance obtained higher FIRR for foreign portion and fall below SER and concluded to contribute to the national foreign currency balance.

8-4 OTHER BENEFITS

8-4-1 Expansion of Employment

About 780 personnel and 180 subcontracted workers are scheduled to be hired for the operation of CDD, which means that these projects will create 128 personnel and 180 subcontracted workers for job opportunities. Furthermore, taking the multiplier effect, into consideration, it is estimated that the implementation of projects will produce the employment creation effect which offers several times as many job opportunities as the above mentioned number, including the related industries sector and the services sector. In other words, the sales of CDD will provide the employees engaged in this dockyard and the related industries with the primary increment of their income. Those individuals favored by this primary incremental income, in turn, will appropriate part of these receipts for purchasing the consumption goods, capital goods and services. Consequently, such disbursement will create the secondary increment of income in the sectors of goods and services. Thus, the process of the increment of income will be repeated, except the savings and the expenditures for the import goods which will not contribute to an increase in the domestic income level, and will lead further increase in the national income and more job opportunities.

8-4-2 Development of the Related Industries

It is expected that the implementation of projects will contribute to a development and progress of the domestic related industries dealing with various materials and equipment goods required for CDD to a great extent. Taking the early mentioned multiplier effect into account, it is considered that a repercussion effect given upon the domestic industries would be extremely remarkable.

Table 8-3-1 Modified Bruno Ratio for Ship Repair (Without Project)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000ton)	Vessels	Seagoing	13	19	20	25	27	28	28
		Coastal	0	0	0	0	0	0	0
	DWT	Seagoing	142,612	210,197	223,132	274,211	302,964	311,367	311,367
		Coastal	0	0	0	0	0	0	0
Sales		Seagoing	22,148	34,726	37,997	50,778	63,938	70,064	70,064
		Coastal	0	0	0	0	0	0	0
		Total	22,148	34,726	37,997	50,778	63,938	70,064	70,064
Material		Import	0	0	0	0	0	0	0
		Local	6,315	6,895	7,049	7,845	9,878	10,825	10,825
		Total	6,315	6,895	7,049	7,845	9,878	10,825	10,825
Operating Expenses	Fuel & Power		3,291	3,830	3,933	4,409	5,075	5,406	5,406
	Salary	Direct	4,847	5,667	6,499	8,860	12,535	16,950	21,633
		Indirect	7,840	9,122	9,847	12,631	16,631	21,864	27,905
		Total	12,687	14,789	16,346	21,492	29,166	38,814	49,538
	Subcontracting		0	0	0	0	0	0	0
	Maintenance		2,304	2,681	2,753	3,086	3,553	3,784	3,784
	Other		2,460	2,819	3,008	3,683	4,767	5,883	6,955
	Total Cost		27,057	31,014	33,090	40,514	52,439	64,712	76,508
Gross Profit			-4,909	3,712	4,907	10,264	11,499	5,352	-6,444
Profit After Tax			-4,909	2,042	2,699	5,645	6,325	2,944	-6,444

Source: Study Team

Table 8-3-2 Modified Bruno Ratio for Ship Repair (Optimum Plan)

(1000 taka)

			1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production (1000ton)	Vessels	Seagoing	13	19	20	28	36	38	38
		Coastal	0	0	0	0	0	0	0
	DWT	Seagoing	142,612	210,197	223,132	296,537	369,942	385,787	385,787
		Coastal	0	0	0	0	0	0	0
Sales		Seagoing	22,157	34,854	38,239	61,221	101,067	121,536	121,536
		Coastal	0	0	0	0	0	0	0
		Total	22,157	34,854	38,239	61,221	101,067	121,536	121,536
Material		Import	0	0	0	0	0	0	0
		Local	6,317	6,915	10,521	19,323	30,547	37,082	37,082
		Total	6,317	6,915	10,521	19,323	30,547	37,082	37,082
Operating Expenses	Fuel & Power		3,291	3,756	4,773	6,208	8,596	9,892	9,892
	Salary	Direct	4,847	6,076	7,230	9,903	15,278	22,134	28,249
		Indirect	7,840	9,296	9,725	12,086	16,340	21,669	27,655
		Total	12,687	15,372	16,955	21,990	31,617	43,802	55,904
	Subcontracting		0	0	524	1,490	3,634	4,880	5,657
	Maintenance		2,304	2,629	3,341	4,346	6,017	6,924	6,924
	Other		2,460	2,867	3,611	5,336	8,041	10,258	11,546
	Total Cost		27,059	31,540	39,726	58,692	88,452	112,838	127,005
Gross Profit			-4,902	3,314	-1,487	2,529	12,615	8,698	-5,469
Profit After Tax			-2,696	1,823	-818	1,391	6,938	4,784	-3,008

Source: Study Team

Table 8-3-3 Modified Bruno Ratio for Ship Repair (Slipway Project)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Vessels	Seagoing	0	0	0	3	9	10	10
Production	Coastal	0	0	0	0	0	0	0
(1000ton) DWT	Seagoing	0	0	0	22,326	66,978	74,420	74,420
	Coastal	0	0	0	0	0	0	0
Sales	Seagoing	9	128	242	10,443	37,129	51,472	51,472
	Coastal	0	0	0	0	0	0	0
	Total	9	128	242	10,443	37,129	51,472	51,472
Material	Import	0	0	0	0	0	0	0
	Local	2	20	3,472	11,478	20,669	26,257	26,257
	Total	2	20	3,472	11,478	20,669	26,257	26,257
Operating Fuel & Power		0	-74	840	1,800	3,521	4,486	4,486
Expenses Salary	Direct	0	409	731	1,043	2,743	5,184	6,616
	Indirect	0	174	-122	-545	-291	-195	-249
	Total	0	583	609	498	2,451	4,988	6,367
Subcontracting		0	0	524	1,490	3,634	4,880	5,657
Maintenance		0	-51	588	1,260	2,464	3,140	3,140
Other		0	48	603	1,653	3,274	4,375	4,591
Total Cost		2	526	6,636	18,178	36,013	48,126	50,497
Gross Profit		7	-398	-6,394	-7,735	1,116	3,346	975
Profit After Tax		2,213	-219	-3,517	-4,254	614	1,840	3,436

Source: Study Team

Table 8-3-4 Modified Bruno Ratio for Steel Work (Without Project)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	(1000ton)	100	125	145	175	175	175	175
Sales		4,540	5,775	6,715	8,125	8,125	8,125	8,125
Material	Import	0	0	0	0	0	0	0
	Local	9,880	11,350	12,512	13,526	13,526	13,526	13,526
	Total	9,880	11,350	12,512	13,526	13,526	13,526	13,526
Fuel & Power		986	973	973	973	973	973	973
Operation Expenses	Salary Direct	1,974	2,285	2,399	2,916	3,722	4,751	6,063
	Indirect	3,065	3,514	3,437	3,864	4,528	5,519	7,044
	Total	5,039	5,799	5,836	6,780	8,250	10,270	13,107
	Subcontracting	0	0	0	0	0	0	0
	Maintenance	690	681	681	681	681	681	681
	Other	1,660	1,880	2,000	2,196	2,343	2,545	2,829
	Total Cost	18,255	20,683	22,002	24,156	25,773	27,995	31,116
Gross Profit		-13,715	-14,908	-15,287	-16,031	-17,648	-19,870	-22,991
Profit After Tax		-13,715	-14,908	-15,287	-16,031	-17,648	-19,870	-22,991

Source: Study Team

Table 8-3-5 Modified Bruno Ratio for Steel Work (Optimum Plan)

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	(1000ton)	100	100	265	595	925	1,085	1,145
Sales		4,540	4,500	14,665	35,395	55,775	65,225	68,965
Material	Import	0	0	0	0	0	0	0
	Local	9,880	11,350	17,960	30,880	43,840	49,430	51,566
	Total	9,880	11,350	17,960	30,880	43,840	49,430	51,566
Fuel & Power		986	1,030	1,804	2,324	2,721	2,850	2,863
Operation Expenses	Salary Direct	1,974	2,285	2,977	4,104	5,759	7,409	9,456
	Indirect	3,065	3,334	3,879	4,835	5,816	6,722	8,579
	Total	5,039	5,619	6,856	8,939	11,575	14,131	18,035
	Subcontracting	0	80	745	1,366	2,051	2,586	3,046
	Maintenance	690	721	1,263	1,627	1,905	1,995	2,004
	Other	1,660	1,880	2,863	4,514	6,209	7,099	7,751
	Total Cost	18,255	20,680	31,490	49,649	68,300	78,091	85,266
Gross Profit		-13,715	-16,180	-16,825	-14,254	-12,525	-12,866	-16,301
Profit After Tax		-13,715	-16,180	-16,825	-14,254	-12,525	-12,866	-16,301

Source: Study Team

Table 8-3-6 Modified Bruno Ratio for Steel Expansion Project

(1000 taka)

		1989/90	1992/93	1993/94	1997/98	2002/03	2007/08	2012/13
Production	(1000ton)	0	-25	120	420	750	910	970
Sales		0	-1,275	7,950	27,270	47,650	57,100	60,840
Material	Import	0	0	0	0	0	0	0
	Local	0	0	5,448	17,354	30,314	35,904	38,040
	Total	0	0	5,448	17,354	30,314	35,904	38,040
Fuel & Power		0	57	831	1,351	1,748	1,877	1,890
Operation Expenses	Salary Direct	0	0	578	1,188	2,037	2,658	3,392
	Indirect	0	-180	442	971	1,288	1,203	1,535
	Total	0	-180	1,020	2,159	3,324	3,861	4,928
	Subcontracting	0	80	745	1,366	2,051	2,586	3,046
	Maintenance	0	40	582	946	1,224	1,314	1,323
	Other	0	-0	863	2,318	3,866	4,554	4,923
	Total Cost	0	-3	9,488	25,493	42,527	50,096	54,150
Gross Profit		0	-1,272	-1,538	1,777	5,123	7,004	6,690
Profit After Tax		0	-1,272	-1,538	1,777	5,123	7,004	6,690

Source: Study Team