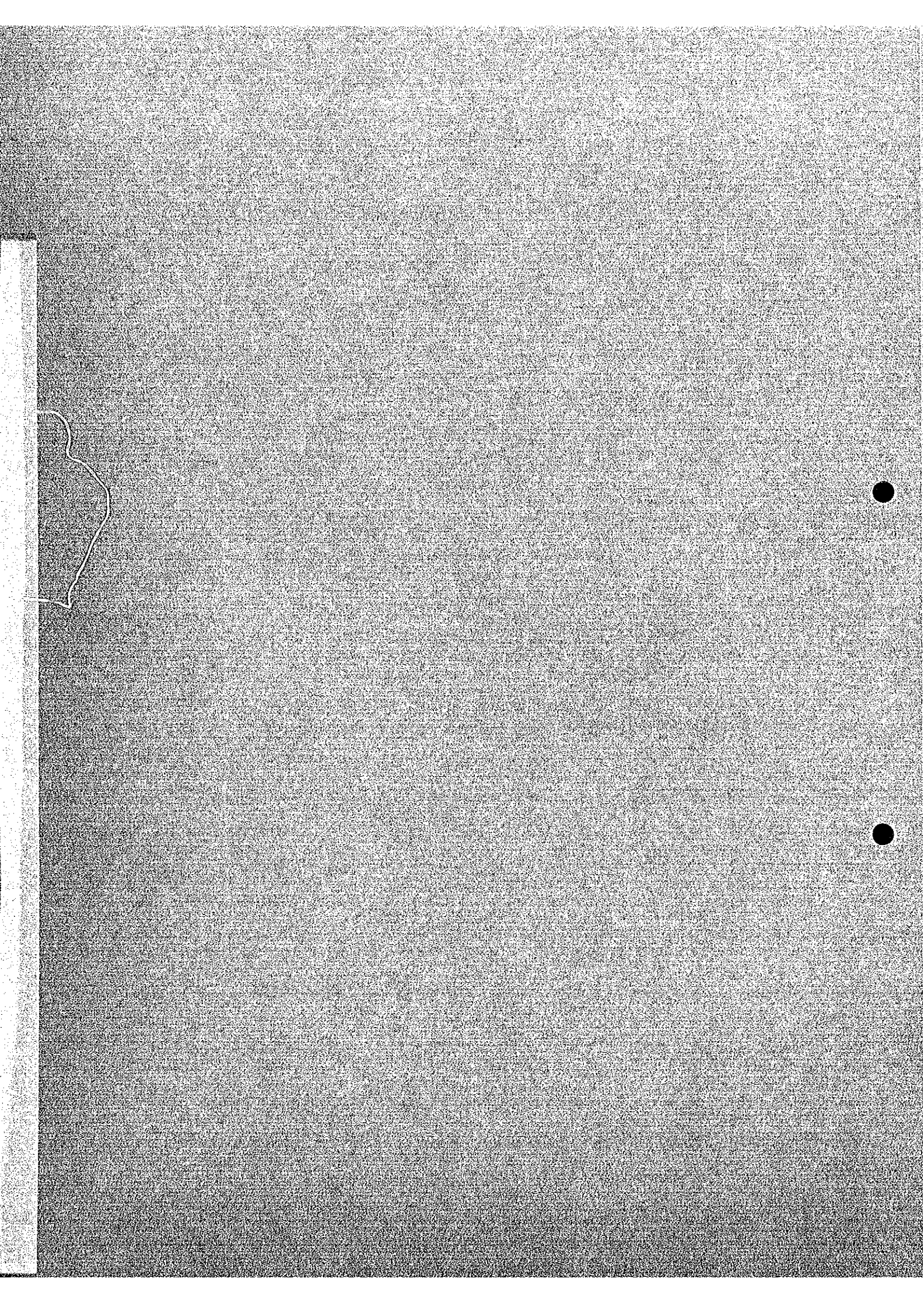
CHAPTER 7

EXECUTION PLAN



CHAPTER 7 EXECUTION PLAN

7-1 Construction schedule

The term of construction works here means a period from the start of basic planning to the start-up of operation. The term of each equipment construction works is determined by its equipment content, configuration, etc. Within this term of construction works, the period from the start of basic planning to the contract of manufacturer is planned to cover 20 months, which is broken down into:

Basic planning	6 months	
Preparation of purchase specification	4 months	Total 20 months
Biding	4 months	
Bidding evaluation and contract	6 months	

Generally, when an integrated steelworks is constructed, the production system of all equipment is arranged centering on the blowing-in of its blast furnace.

To balance the start-up production of each plant, the hot strip mill construction precedes others for slab consumption, during which period, operation is started-up using slabs brought in from other steelworks. For this new steelworks project, however, from the standpoint of an integrated system using the blast furnace method, it is preferable to mark the blowing-in of the blast furnace as the start point of production.

To supply the necessary coke for blast furnace operation, the coke oven operation is usually started one month before blowing-in of the blast furnace. This in turn requires the commencement of coal acceptance and storage two months prior to the commissioning of the coke oven into use. Therefore, material unloading and processing equipment must be completed by then.

On the other hand, simultaneous start of the B.O.F and blast furnace operation is required to process the hot metal produced by the blast furnace. The continuous casting machine and billet mill operation for the subsequent stages must also be started simultaneously.

As stipulated above, the hot strip mill operation is planned to start two months before the continuous casting operation, and to match its production level with that of the slab casting.

The lime calcining plant and oxygen plant necessary for B.O.F operation must be prepared during the B.O.F testing so that their operation can be started one month before B.O.F operation starts.

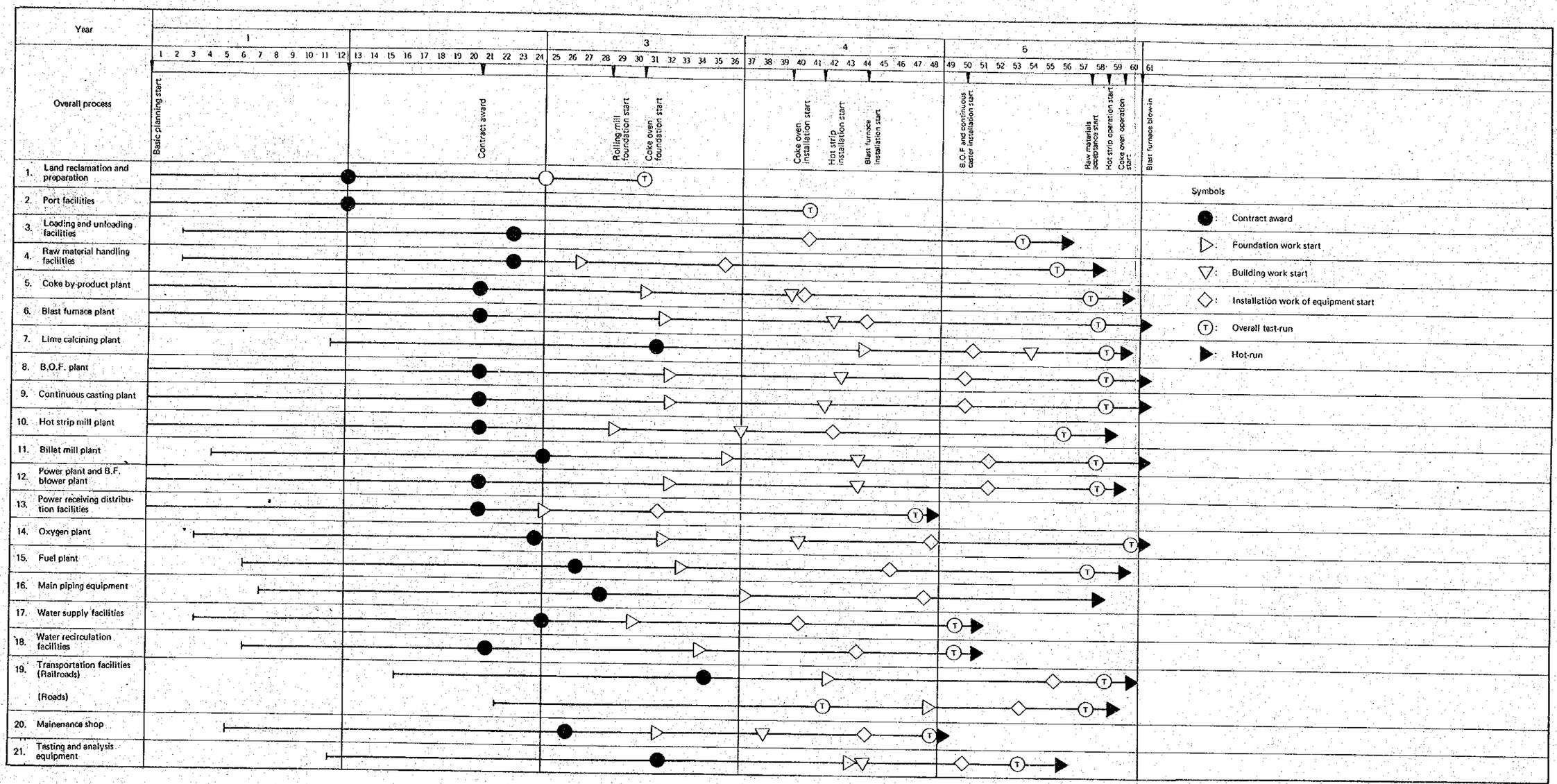
The start time of the auxiliary facilities for operation is determined corresponding to that of the above-mentioned principal equipment.

Table 7-1-1 outlines the construction schedule prepared under the conditions so far described.

The integrated production system of the new steelworks shall be established 60 months after the basic planning starts.

The land reclamation and preparation shall be completed early enough, independent of the above conditions.

Table 7-1-1 Construction schedule



7-2 Personnel plan

7-2-1 Personnel estimation

The personnel in the new steelworks shall be estimated to satisfy the following conditions:

(1) *Fig. 7-2-1* shows the organization of the new steelworks. The head office shall be located in Manila for management, planning, purchasing, sales, and have close-contact with the central authorities.
Therefore, the roles of the steelworks on site shall be the production itself, and management of production and equipment.

(2) All equipment shall be operated by employees under direct contract.

(3) For the shops requiring continuous operation, an extra 20% of workers and assistant foremen shall always be on standby.

(4) The operation and maintenance sectors shall be divided as follows:
The preventive maintenance system well-established in Japan shall be introduced for enhanced equipment operation rate, and the maintenance sector shall be set up independent of the operation sector.
The operation sector shall be responsible for routine inspection, oiling and greasing, and minor repairs made by the operators.

7-2-2 Personnel plan

Table 7-2-1 lists the head office personnel, and *Table 7-2-2* lists the steelworks personnel
The total number of personnel shall be 4,065.
The total number of the steelworks personnel shall be 3,901, and the labor-productivity shall be approximately 380$^{t/man.year}$.
For the labor-productivity, the figure alone should not be discussed, which varies according to the scale of the steelworks, equipment, and the division of direct-management and contract works.
The labor-productivity of a steelworks in developing countries is considered to be 250—350$^{t/man.year}$.
The labor-productivity of this steelworks is slightly higher; however, the figure is judged as appropriate from the viewpont of the equipment level.

7-2-3 Training program

Since the operation and management of an integrated steelworks require a high level of technology and experience, extensive education, and training are indispensable; therefore workers must have sufficient education and ability to successfully undergo the required education and training. Stable operation is based on the operation started by the well-trained managers and workers and on the enhancement of managerial and operational skills through experiences gained during actual operation.

Table 7-2-3 outlines an example of a training program plan, which was prepared according to the personnel list (*Table 7-2-2*) and specifications of each equipment.

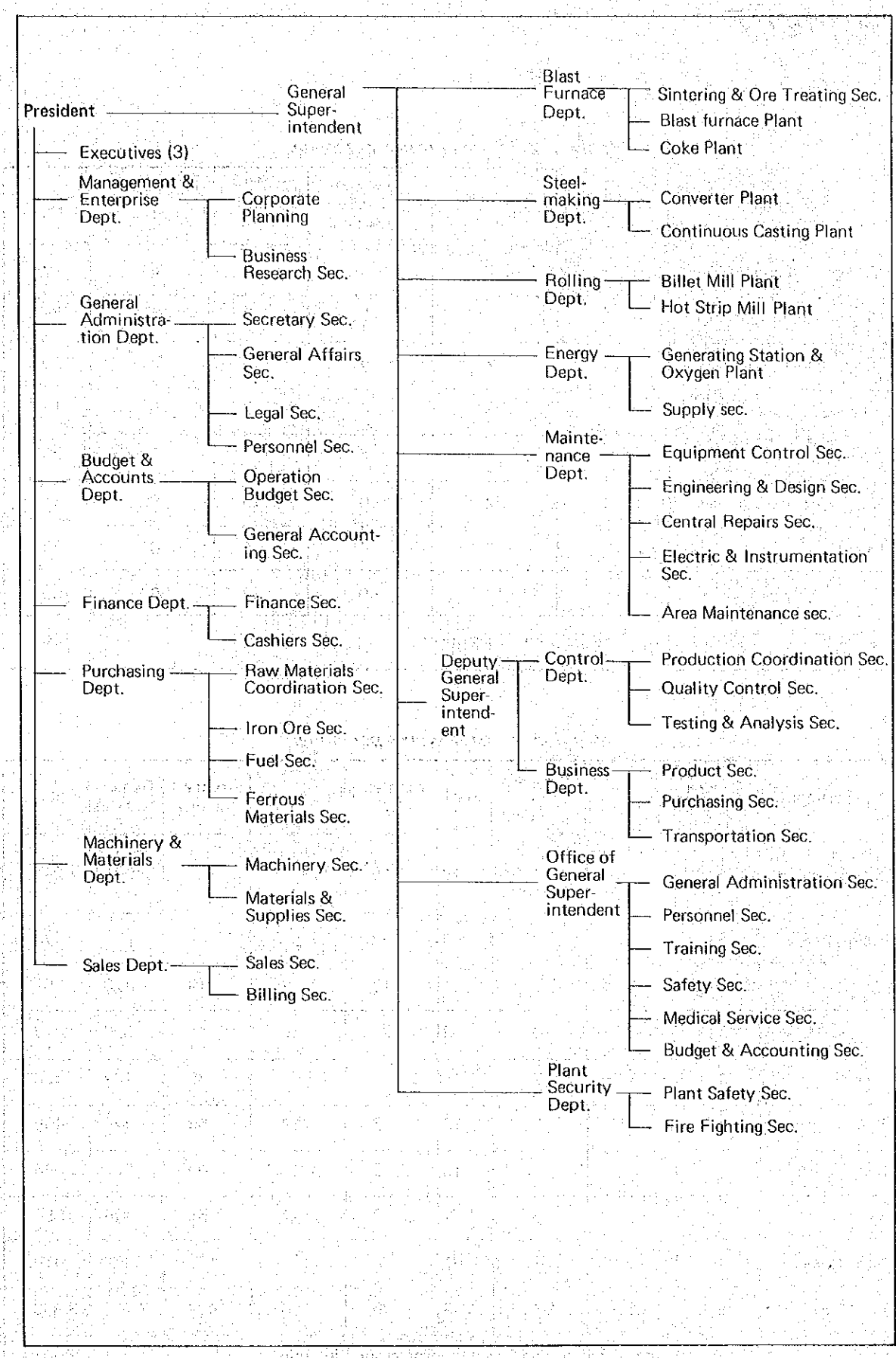


Fig. 7-2-1 Organization chart

Table 7-2-1 Head office personnel

Department	General manager	Super-intendent	Assistant super-intendent	Staff	Assistant clerk	Total
Management and planning	1	2	4	6	6	19
General administration	1	4	8	7	14	34
Budget and accounts	1	2	4	3	6	16
Finance	1	2	3	2	5	13
Purchasing	1	4	7	7	9	28
Machinery and materials	1	2	10	10	8	31
Sales	1	2	4	4	8	19
Total	7	18	40	39	56	160
	1 President and 3 Executives					164

Table 7-2-2 Steelworks personnel

Department	General manager	Super-intendent	Assistant Super-intendent	Staff	Assistant clerk	Foreman	Assistant foreman	General workers	Total
General superintendent office	1	6	14	78	45			100	244
Plant safety	1	2	7	60	3				73
Control	1	3	7	34	13	7	19	123	207
Business	1	3	10	33	20	16	44	320	447
Energy	1	2	7	15	3	8	30	102	168
Blast furnace	1	3	7	18	3	19	68	376	495
Steel making	1	2	7	18	3	19	99	547	696
Rolling	1	2	7	12	3	24	55	446	550
Maintenance	1	5	24	81	5	33	172	698	1,019
Total	9	28	90	349	98	126	487	2,712	3,899
	1 General superintendent and 1 Deputy general superintendent								3,901

Table 7-2-3 Training program plan

Plant department	Managerial personnel (Man x Month)			Workers (Man x Month)			
	General manager and manager	Assistant manager	Staff	Foreman	Assistant foreman	General workers	Total (M–Month)
Iron making	4 x 2	5 x 3	10 x 3	13 x 3	11 x 4	7 x 4	164
Steel making	3 x 2	5 x 3	15 x 3	15 x 3	15 x 4	10 x 4	211
Rolling	3 x 2	5 x 3	5 x 3	5 x 3	10 x 4	10 x 4	131
Energy	3 x 2	3 x 3	5 x 3	4 x 3	5 x 4	5 x 4	82
Equipment	5 x 2	15 x 3	15 x 3	18 x 3	15 x 4	12 x 4	262
Business	4 x 2	1 x 2	1 x 3	1 x 3	2 x 3		22
Control	4 x 2	4 x 2	3 x 3	3 x 3	5 x 3	5 x 3	64
General administration and personnel	2 x 2	2 x 2					8
Finance and accounting	1 x 2	1 x 2					4
Safety	1 x 2	1 x 2					4
							952

CHAPTER 8

ESTIMATION OF CONSTRUCTION COST

Summary of Chapter 8:

I Estimate bases

1) Estimate period and currency

Imported = Mar. 1979 — International Market Price (US$)

Domestic = Mar. 1979 — Philippines Domestic Market Price (Pesos)

2) Exchange rate 1 US$ = 7.39 Pesos (Mar. 1979)

3) Price Fluctuations — Not included in the estimate

4) Taxes related to equipment and facilities which are imported—exemption

II Construction costs for Stage I

(1) Total required capital investment (total cost and cost per ton of crude cast steel)

	Amount	Cost per ton	Make up percentage
	($1 million)	$/t	%
Direct construction cost	1,155.6	770	80.2
Engineering fee	43.0	29	3.0
Training & Education cost and operating guidance fee	35.0	23	2.4
Initial organization expenses	10.0	7	0.7
Interest during construction	160.5	107	11.2
Construction cost total	1,404.1	936	97.5
Operational spare parts	36.0	24	2.5
Total required capital investment	1,440.1	960	100.0

(2) Acquisition cost of tangible fixed assets

(Unit: $1 million)

Classifications of tangible fixed assets	Acquisition cost
Land	35.6
Buildings & structures	445.3
Equipment & machinery	850.4
Vehicles	20.2
Fixed assets total	1,351.5

III Stage I and II Direct construction cost analysis

(1) Rate between import and domestic procurment

(Unit: $1 million)

	Import	%	Domestic	%	Total
Stage I	728.0	63.0	427.6	37.0	1,155.6
Stage II	523.2	71.2	211.8	28.8	735.0
Total	1,251.2	66.2	639.4	33.8	1,890.6

(2) Estimate of the preceeding investment for the construction of stage II

	Stage I	Stage II	Average	Preceding investment	Rate of preceding investment
	mil. $				
Direct construction costs	1,155.6	735.0	945.3	210.3	22%
	$/t				
Cost per ton of crude cast steel	770	490	630	140	22%

(3) Direct construction costs per ton of crude cast steel and make up percentage (Average of stage I, II)

Facilities	Tonnage rate	Make up percentage	Remarks
	$/t	%	
Civil · Port · Material handling facilities	79	12.5	
Iron and steel production facilities	257	40.8	(Coke oven, calcining-BF-BOF-CC)
Rolling mill facilities	146	23.2	(Finished products)
Electric power · Gas · Water facilities	113	17.9	
Other auxiliary facilities	35	5.6	
Total	630 *1	100.0	

*1 { Stage I 770 $/t
Stage II 490 $/t

CHAPTER 8 ESTIMATION OF CONSTRUCTION COST

8-1 Basic concepts for estimation of direct construction cost.

(1) Division between import and domestic procurement

The division between import and domestic procurement is subject to the following established set of standards.

1) Equipment to be purchased: Import
2) Civil works, erection & installment: Domestic
3) Construction Materials: Whatever materials are obtainable in the domestic market are classified as belonging to the area of domestic procurement. That is to say, domestic procurement is to be chosen if possible.

Besides, in order to increase the portion of domestic procurement, the results of field investigation has been enough considered.

(2) Estimate bases

1) Time of estimation

Import = March, 1979 — International market price,

Domestic Procurement = March, 1979 — Philippines domestic market price

2) Currency and Exchange Rate

(1) Currency

Import = US$

Domestic Procurement: Pesos → exchange to US$

(2) Exchange Rate: 1 US$ = 7.39 Pesos (March, 1979)

(3) Effect of commodity price fluctuation

The construction cost in this study is not an estimate that assumes a cost at the time when the construction work is actually carried out but has been calculated by the current prices at the time of March 1979. An influence of price fluctuation to selling prices of products and purchasing prices of raw materials (including the prices of energy and utilities) does not appear at the same rate over any given period of time. The profit ratio of this project is greatly effected by a relative connection in the increase ratio of prices rather than its absolute level. Therefore, in this study, in order to eliminate an uncertain or unreliable estimate, the effect of commodity price fluctuation is not included in the whole of the following study in accordance with the general rules in this kind of study.

Hereabout, it is only mentioned for reference that effects of commodity price fluctuation is usually very large. For example, the commodity price level in approximately five years time would be estimated at about 1.61 the rates at the time of the study in the case of 10% increase at the annual rate.

(4) Tax that will be levied on equipment to be imported

In this study, the estimate is done with the assumption that the Investment Incentive Act (hereafter the I.I. Act) is applied and equipment to be imported are exempted from all taxes (customs duty and compensating tax). Meanwhile, according to the Presidential Decree No. 1352 and 1395 (April 21, 1978 and May 31, 1978) it was newly regulated that the tax exemption portion due to the I.I. Act are levied by 5% taxation. However, in this study, since this project is characterized by a national level project, the construction cost is estimated in assumption that "Tax Incentive recover clause (Sec. 5)" regulated in the same P.D. 1395 would be applied and exemption from taxation due to I.I. Act would be applied. Besides, an estimate based on 5% taxation of P.D. 1352 and 1395 is calculated as the Simulation case 1. Please refer to chapter 10, financial analysis for details.

8-2 Required construction costs

8-2-1 Direct construction costs

(1) Total cost of direct construction at stage I and II

Estimates of the direct construction cost are done with stage I (*Table 8-2-1*) and stage II (*Table 8-2-2*) by the classification of the blast furnace construction stage. First of all, it shall be stated that at stage II only the direct construction cost is roughly estimated. The reason why the direct construction cost at stage II has been a rough estimate is that investment at stage II is comparatively included into that of stage I and therein unless the total cost of direct construction is seen through both stages, a well balanced observation is impossible.

(Unit: Mil. $)

	Import	Domestic	Total	Costs of crude cast steel
		Mil. $	Mil. $	$/t
Stage I	728.0	427.6	1,155.6	770
Stage II	523.2	211.8	735.0	490
Total	1,251.2	639.4	1,890.6	630

Meanwhile, at stage II

① Expansion of PSC (to increase sintering production)

② Expansion of PSC-berth (to increase material handling capabilities)

The investment for the above catagories is necessary. But they are beyond the limits of this project and excluded. Being shown as reference, investment relative to expansion of the PSC-berth is supposed to be around $46 million.

Table 8-2-1 Direct construction cost (Stage I)

(Unit: $1 million)

Classifications of facilities		Imported	Domestic	Total	Remarks
1-1	Land reclamation	—	21.6	21.6	Stage II included, and acquisition cost of land for future expansion included too
1-2	Civil engineering work	0.5	27.7	28.2	Stage II included, road and waste water facilities
2	Port facilities	12.7	22.8	35.5	
3	Products and materials handling facility	10.4	1.7	12.1	
4	Materials preparation facility	54.9	21.4	76.3	
5	Coke oven plant and by-products plant	75.1	27.5	102.6	
6	Blast furnace plant	60.9	32.2	92.1	Cold pig iron casting machine included
7	Burnt lime calcining plant	9.0	3.6	12.6	
8-1	B.O.F plant	59.0	33.3	92.3	
8-2	Ingot-making equipment	4.4	0.2	4.6	
9-1	Slab continuous casting equipment	57.4	24.6	82.0	
9-2	Bloom continuous casting equipment	29.8	12.2	42.0	
10	Billet mill	15.9	7.7	23.6	
11	Hot strip mill	140.4	91.8	232.2	
12	Medium section equipment	—	—	—	
13	Power receiving and distributing station	11.5	4.0	15.5	Road lighting and main cable of communication line are included
14	Power generating · Blast furnace blower	53.0	11.0	64.0	
15	Oxygen plant	22.7	8.8	31.5	
16	Gas and heavy oil facilities	12.9	5.6	18.5	
17	Power piping work facilities	5.3	7.2	12.5	
18	Water supply facilities	19.7	13.7	33.4	
19	Water recirculating facility	26.0	12.5	38.5	
20	Transport facility intra-works	16.3	6.6	22.9	
21	Maintenance and repair shops	25.3	22.7	48.0	Common materials & supplies warehouse included
22	Testing and analysis facility	5.7	1.7	7.4	
23	Plant administrative office	0.2	5.5	5.7	
	Total	728.0	427.6	1,155.6	

Table 8-2-2 Direct construction cost (Stage II)

(Unit: $1 million)

Classifications of facilities		Imported	Domestic	Total	Remarks
1-1	Land reclamation	–	–	–	
1-2	Civil engineering work	–	–	–	
2	Port facilities	(10.6) 1.9	(13.2) 2.6	(23.8) 4.5	Upper level = sea berth
3	Products and materials handling facility	(20.2) 11.2	(2.3) 5.9	(22.5) 17.1	Upper level = 1,800 ton unloader x 2
4	Materials preparation facility	33.0	8.9	41.9	
5	Coke oven plant and by-products plant	65.6	20.2	85.8	
6	Blast furnace plant	57.1	30.0	87.1	
7	Burnt lime calcining plant	8.1	3.8	11.9	
8-1	B.O.F. plant	23.9	6.9	30.8	
8-2	Ingot making equipment	–	–	–	
9-1	Slab continuous casting equipment	60.5	24.9	85.4	
9-2	Bloom continuous casting equipment	31.2	12.4	43.6	
10	New billet mill	42.6	22.0	64.6	
11	Hot strip mill	53.3	21.4	74.7	
12	Medium section equipment	31.6	10.6	42.2	
13	Power receiving and distribution station	3.9	0.9	4.8	
14	Power generating · Blast furnace blower	32.0	6.0	38.0	
15	Oxygen plant	19.1	7.3	26.4	
16	Gas and heavy oil facilities	3.1	2.2	5.3	
17	Power piping work facilities	0.4	0.6	1.0	
18	Water supply facilities	9.9	7.2	17.1	
19	Water recirculating facility	20.4	10.1	30.5	
20	Transport facility intra works	12.2	1.4	13.6	
21	Maintenance and repair shops	0.9	3.1	4.0	
22	Testing and analysis facility	1.1	0.6	1.7	
23	Plant administrative office	0.2	2.8	3.0	
	Total	(30.8) 523.2	(15.5) 211.8	(46.3) 735.0	Upper ( ), which are facilities respected to sea-berth, are not included to total

(2) Estimate of direct construction cost equivalent to the preceding investment at stage I for the construction of stage II.

In this study, production scale of crude produced steel increases two times; $1.5^{mil.t/y}$ at stage I (BF X1) and $3.0^{mil.t/y}$ at stage II (BF X2). However, the direct construction cost at stage I includes the preceding investment for the construction of stage II, therefore the total construction cost does not meet the requirements of two times of it at stage I. For example, at stage I, the two converters are constructed and only one of them is operated due to repairing rotation, and at stage II, only additional one converter furnace is established, holding three converters, two of them are operated which means that two thirds of all ocnstruction cost is spent at stage I.

Therefore, the construction cost at stage I includes the cost of preceding investment for stage II and is regarded as rather expensive against the scale. Then direct construction cost of which investment for stage II shall precede is estimated in *Table 8-2-3*.

Basis of thinking for estimation of preceding investment costs.

It is assumed to be the difference from average construction cost

① Preceding investment cost = Stage I construction costs — I, II average construction costs

② Preceding investment rate = preceding investment cost/average construction cost

Sammerized table of the preceding investment

	Stage I	Stage II	Average	Preceding investment	Rate of preceding investment
Direct construction cost	mi. $ 1,155.6	735.0	945.3	210.3	22%
Cost per ton of crude cast steel	$/t 770	490	630	140	22%

The main facilities of large preceding investment

Classification of facilities	Preceding investment
Hot stripping mill	78.7 mil. $
B.O.F. plant	30.8
Maintenance & repair shops	22.0
Material preparation facility	17.2
Power generating · Blast furnace blower	13.0
Port facilities	15.5
Civil engineering work	14.1
Coke oven plant / by-products plant	8.4

The main facilities of large preceding investment rate

Classification of facilities	Percentage
Land reclamation	100%
Civil engineering work	100
Power piping work facilities	84
Maintenance & repair shops	85
Port facilities	78
Testing & analysis facilities	64
Power receiving and distribution facility	52
Gas and heavy oil facilities	55
Hot stripping mill	51
B.O.F. plant	50

In stage I period, the overall cost of preceding investment is $210 million. The stage I hot stripping mill cost is close to that amount. After the stage I, II periods, in order to hold down the overall construction costs to a minimum, all efforts to invest precedingly must be made. That is, the projects' efficiency may have to be improved in stage II.

Table 8-2-3 Estimate of direct construction cost equivalent to the preceding investment at stage I for the construction of stage II

(Unit: mil. $)

		Stage I	Stage II	Average	Preceding investment	Rate of preceding investment	Remarks
		mil. $	mil. $	mil. $	mil. $		
1-1	Land reclamation	21.6	–	10.8	10.8	100%	
1-2	Civil engineering work	28.2	–	14.1	14.1	100	
2	Port facilities	35.5	4.5	20.0	15.5	78	
3	Products and material handling facilities	12.1	17.1	14.6	–2.5	–17	Product warehouse build in Stage II
4	Materials preparation facilities	76.3	41.9	59.1	17.2	29	
5	Coke oven plant and by-products plant	102.6	85.8	94.2	8.4	9	
6	Blast furnace plant	92.1	87.1	89.6	2.5	3	
7	Burnt lime calcining plant	12.6	11.9	12.3	0.3	2	
8-1	B.O.F. plant	92.3	30.8	61.5	30.8	50	
8-2	Ingot-making equipment	4.6	–	2.3	2.3	100	
9-1	Slab continuous casting equipment	82.0	85.4	83.7	–1.7	2	
9-2	Bloom continuous casting equipment	42.0	43.6	42.8	–0.8	2	
10	Billet mill	23.6	64.6	44.1	–20.5	–46	
11	Hot strip mill	232.2	74.7	153.5	78.7	51	
12	Medium section equipment	–	42.2	21.1	–21.1	–100	
13	Power receiving and distribution station	15.5	4.8	10.2	5.3	52	
14	Power generating Blast furnace blower	64.0	38.0	51.0	13.0	25	
15	Oxygen plant	31.5	26.4	28.9	2.6	9	
16	Gas and heavy oil facilities	18.5	5.3	11.9	6.6	55	
17	Power piping work facilities	12.5	1.0	6.8	5.7	84	
18	Water supply facilities	33.4	17.1	25.2	8.2	33	
19	Water recirculating facilities	38.5	30.5	34.5	4.0	12	
20	Transport facility intra-works	22.9	13.6	18.2	4.7	26	
21	Maintenance and repair shops	48.0	4.0	26.0	22.0	85	
22	Testing & analysis facilities	7.4	1.7	4.5	2.9	64	
23	Plant administrative office	5.7	3.0	4.4	1.3	30	
	Total	1,155.6	735.0	945.3	210.3	22	
Cost per ton of crude cast steel		$/t 770	$/t 490	$/t 630	$/t 140	22	

(3) The direct construction cost per ton of crude cast steel and structural divisions of facilities;

The direct construction cost per ton of crude cast steel and the rate of the division structurally of facilities is shown in *Table 8-2-4*. Under these assumptions, the figures below will be valid.

Direct construction costs per ton of crude cast steel and make up percentage (Average of Stage I, II is used)

Facilities	Tonnage rate	Percentage	Remarks
	$/t	%	
Civil · Port · Material handling facilities	79	12.5	
Iron and steel production facilities	257	40.8	(Coke oven, calcining-B.F.-B.O.F.-CC)
Rolling mill facilities	146	23.2	(Product)
Electric power · Gas · Water facilities	113	17.9	
Other auxiliary facilities	35	5.6	
Total	630 *1	100.0	

*1 { Stage I 770 $/t; Stage II 490 $/t }

As the rolling facilities vary depending on projects, the direct construction costs up to the process of semi-fimished product will be 484 dollars per ton, if the rolling facilities were precluded. By using PSC facilities, the best possible efficiency will be able to be realized.

Main facilities having large make up percentage

Facilities	Percentage
Hot stripping mill	16.4%
Coke oven plant & by-product plant	9.8
Blast furnace plant	9.5
Slab continuous casting equipment	8.9
B.O.F. plant	6.5
Material preparation facility	6.5

Table 8-2-4 Direct construction costs per ton of crude cast steel and its make up percentage

(Unit: $/t)

Classification of facilities	Stage I (1.5 Mil. t)	Stage II (1.5 Mil. t)	Average (1.5 Mil. t)	Make up percentage	Remarks
	$/t	$/t	$/t	%	
1-1 Land reclamation	14	—	7	1.1	
1-2 Civil engineering work	19	—	9	1.4	
2 Port facilities	24	3	13	2.1	
3 Products and materials handling facility	8	11	9	1.4	
4 Materials preparation facility	51	28	41	6.5	
(Sub-total for civil · Port and material handling facility costs)	(116)	(42)	(79)	(12.5)	
5 Coke oven plant and by-products plant	68	57	62	9.8	
6 Blast furnace plant	61	58	60	9.5	
7 Burnt lime calcining plant	8	8	8	1.3	
8-1 B.O.F. plant	62	20	41	6.5	
8-2 Ingot-making equipment	3	—	2	0.3	
9-1 Slab continuous casting equipment	55	57	56	8.9	
9-2 Bloom continuous casting equipment	28	29	28	4.5	
(Sub-total for facilities used in producing steel)	(285)	(229)	(257)	(40.8)	
10 Billet mill	16	43	29	4.6	
11 Hot strip mill	155	50	103	16.4	
12 Medium section equipment	—	28	14	2.2	
(Sub-total for rolling mill facilities)	(171)	(121)	(146)	(23.2)	
13 Power receiving and distribution station	10	3	7	1.1	
14 Power generating · Blast furnace blower	43	25	34	5.4	
15 Oxygen plant	21	18	19	3.0	
16 Gas · Heavy oil facilities	12	4	8	1.3	
17 Power piping work facilities	8	1	5	0.8	
18 Water supply facilities	22	12	17	2.7	
19 Water recirculating facilities	26	20	23	3.6	
(Sub-total for electric power · gas · water facilities)	(142)	(83)	(113)	(17.9)	
20 Transport facility intra-works	15	9	12	1.9	
21 Maintenance and repair shops	32	3	17	2.7	
22 Testing and analysis facilities	5	1	3	0.5	
23 Plant administrative office	4	2	3	0.5	
(Sub-total for plant support facilities)	(56)	(15)	(35)	(5.6)	
Total	770	490	630	100%	

(4) Rate of imported and domestic procurement

The procurement of materials should be at the largest rate of domestic procurement as possible, in the Philippines. The *Table 8-2-5* shows the possible capability of domestic procurement and need of importation. With these results, the domestic procurement rate in stage I is 37.0% and is certainly a large amount. Of that rate 70% is related to civil work and construction.

Rate between import and domestic procurement

(Unit: million $)

	Import	%	Domestic	%	Total
Stage I	728.0	63.0	427.6	37.0	1,155.6
Stage II	523.2	71.2	211.8	28.8	735.0
Total	1,251.2	66.2	639.4	33.8	1,890.6

Make up of domestic procurement amounts in Stage I

	Domestic procurement cost	Make up percentage
Civil works and construction related costs	298.6 mil. $	69.8%
Equipment & machinery installation related costs	97.9	22.9
Land aquisition and reclamation related cost	31.1	7.3
Total	427.6	100.0

Table 8-2-5 Breakdown of division between import and domestic procurement

Items	Division		Remarks
	Import	Domestic	
1. Equipment purchase	○		Installation of equipment is domestic supply
2. Civil, erection & installation		○	
3. Steel structure works	○		
4. Materials necessary for construction			
Steel pipe pile		○	
Concrete pile		○	
Gas piping steel pipe	○		
Reinforcing material		○	
Common steel materials		○	But steel material needed for the B.O.F., blast furnace and continuous casting facility will be imported
Building finishing materials			
Crane gurders	○		
Roof		○	
Wall · Fence		○	
Monitor		○	
Assorted attached house		○	
Railroad rail	○		
Concrete		○	
Other materials needed for civil engineering work		○	Asphalt material, etc.
Red brick for buildings		○	
Fire proof bricks	○		
Electric cable	○		
Illumination equipment		○	
Steel pipe for carrying water		○	
Piping valve	○		
Fume pipe		○	

8-2-2 Other necessary investments

Indirect cost relative to the construction and other expenses necessary before starting operations are estimated and shown item by item in *Table 8-2-5*.

(1) Engineering Fee

Engineering fee varies with mutual roles between the side of new steelworks and the engineering firm. Hereabout, a rough estimate is made on the basis of a level of fee generally considered viable and adopted.

(2) Training and education cost and operation guidance fee

There are some costs necessary for training the personnel of the steelworks in operating technics before the start up of the steelworks, and for receiving operation guidance from overseas to insure safe and effecient operation. These training areas include the necessity of training in the Philippines and overseas and the period before and after the operation starts, which is necessary for technics to be transfered (for about half a year after operation has started).

(3) Initial orginization costs

This cost consists of expenditures for founding the corporation, employment of personnel, construction management and others necessary to establish a set up by which the steelworks starts up smoothly.

(4) Operational spare parts

This indicates the required procurement value of the amount of spares and replacement parts for necessary machinary, equipment and other materials which shall be prepared before the start up of the steelworks. The spares and replacements for the machinary equipment are estimated for one year and supplies, such as roll, etc. which are to be prepared for operation are estimated for three months.

(5) Interest during construction

Construction payments will be made by appropriation of the company's capital and loans. For payment of the interest caused by these loans, a further loan will have to be obtained since no income source is available during construction period. The details of this problem are explained in chapter 10.

8-2-3 Total required capital investment

The total required capital investment including direct construction cost and other investment values (in stage I), and necessary cost per ton of crude cast steel are shown in *Table 8-2-6.* The total necessary investment is $1,440 million.

Table 8-2-6 Total capital investment and cost per ton of crude cost steel (Stage I)

Categories	Amount	Cost per ton	Make up percentage
	mil. $	$/t	%
Direct construction costs	1,155.6	770	80.2
Engineering fee	43.0	29	3.0
Training & education cost, operation guidance fee	35.0	23	2.4
Initial organization expenses	10.0	7	0.7
Interest during construction	160.5	107	11.2
Construction cost total	1,404.1	936	97.5
Operational spare parts	36.0	24	2.5
Total required capital investment	1,440.1	960	100.0

Total construction cost per ton of crude cast steel is $936 (excluding operational spare parts). It is an advantage that the facilities relative to the PSC — berth and sintering production equipment, that is, PSC existing equipment, can be effectively utilized. According to kinds of project, the rolling equipment largely varies with the kinds of final products and working processes, and, therefore, comparison may not be easily made but this total construction cost per ton may be at a reasonable level as an investment at stage I.

8-3 Allocation of construction cost to cost centers

Of the construction cost items, those which constitute the fixed assets acquisition cost should be allocated to cost centers for production cost calculation in chapter 9. (Description of the cost centers will be given in chapter 9). In order to enable this, an affirmation of amount to be transfered to the fixed assets should be established firstly.

8-3-1 Acquisition cost of fixed assets

Of the construction costs, the direct construction cost, engineering fee and interest during construction are regarded as constituting the acquisition cost of fixed assets. By correspondence to classification of machine life expectancy in the depreciation accounting, tangible fixed assets are divided into the land, buildings and structures, the machinery and equipment and vehicles. Meanwhile, the operational spare parts constitute the required capital investment for the construction. Nevertheless, they don't constitute fixed assets but inventories. *Table 8-3-1* shows the acquisition cost of the fixed assets with the asset classifications.

Except the land, depreciation is applied to the items previously mentioned.

Table 8-3-1 Acquisition cost of fixed assets

(Unit: mil. $)

Classification of fixed assets		Acquisition cost
	Land	35.6
	Buildings & structures	445.3
	Equipment & machinery	850.4
	Vehicles	20.2
Tangible fixed assets total		1,351.5
Training & education cost and operating guidance fee		36.8
Initial organization expenses		11.2
Total		1,399.5

8-3-2 Allocations of tangible fixed asset to cost centers

The fixed assets except the land are applied with depreciation, and, therefore, the aquisition cost should be allocated to the cost centers for calculation of depreciation by cost centers. With making the equipment classification of the direct construction cost mentioned at the section 8.2 as a standard, the equipment classification are corrected so that depreciation by cost centers can be adquately obtained. Equipment corresponding to the cost centers are explained in *Table 9-1-1*. For example, the following points are ammended.

(1) Divisions of power generation and blast furnace blower.

(2) Independance of the steam

(3) Division of sea water, industrial water, potable water of the water supply facilities

(4) Transfer of water circulation facilities to each factory

(5) Of the transportation equipment, those which are specially used for the transportation of hot metal and liquid steel are to be added to the blast furnace and basic oxigen furnace.

In this result, the allocations of tangible fixed assets to cost centers are shown in *Table 8-3-2*.

Table 8-3-2 Allocations of construction cost of fixed assets to cost centers

Cost centers	Code	Fixed assets acquisition cost			
		Buildings & structures	Equipment & machinery	Vehicles and land	Total
Sintering plant	XAO	–	–	–	–
Coke oven	XBO	19.8	100.6		120.4
Calcining plant	XCO	3.1	13.6		16.7
Blast furnace	XDO	24.5	92.5	10.5	127.5
Basic oxygen furnace	XEO	48.1	68.1	3.8	120.0
Slab casting equipment	XFO	37.5	65.9		103.4
Bloom casting equipment	XGO	18.6	33.9		52.5
Billetting mill	XHO	8.4	21.5		29.9
Hot strip mill	XIO	88.6	201.6		290.2
Oxygen plant (N_2, Ar)	YAO	4.8	32.2		37.0
Power generation	YBO	8.7	60.8		69.5
Blast furnace blower	YCO	1.7	18.5		20.2
Steam generator	YDO		0.2		0.2
Sea water	YEO	13.6	12.2		25.8
Industrial water	YFO	5.7	4.8		10.5
Potable water	YGO	1.5	1.3		2.8
Gas · Oil distribution	YHO	29.0	7.3		36.3
Material handling	YIO	36.5	63.3	1.0	100.8
Iron-ore sizing	YJO	1.5	10.2		11.7
Product handling	YKO	10.6	4.2	1.0	15.8
Intra-works transportation	YLO	7.9	0.1	3.9	11.9
Test and inspection	YMO	1.6	7.1		8.7
Maintenance shop	YNO	15.7	30.5		56.2
Plant administration	YOO	47.9			47.9
(Land)	YOO			35.6	35.6
Total		445.3	850.4	Land 35.6 Vehicles 20.2	1,351.5