CHAPTER 2

SUMMARY

CHAPTER 2 SUMMARY

This chapter provides the summary of the feasibility study.

2-1 Steel demand forecast

Demand forecast studies include macro-analysis and micro-analysis, both of which are based on the data submitted by the Philippine Government and on the data of NEDA, etc.

Apparent steel consumption is obtained by adopting the GNP's correlative equation, which is most suitable for the estimation of future steel consumption, after studying the correlative analysis of GNP, GDCF and other factors.

Table 2-1-1 shows the forecast of apparent steel consumption.

Table 2-1-1 Forecast of apparent steel consumption (Unit: 1,000 t/y)

	1978	1985	1990
A.S.C.	1,540	2,460	3,560
ASC growth rate	1962 ~ 1978 7.5% 1968 ~ 1978 4.2%	6.9%	7.7%

2-2 Outlines of new steelworks

(1) Steelworks scale and product mix

The steelworks scale and the product mix must be estimated on the basis of the estimated domestic production ratio by product mix, apparent steel consumption and steel production capacity in the Philippines.

The present steel making capacity in the Philippines is 500,000t per year according to the data provided by the counterparts. The domestic production ratio by product mix was specified taking into account the actual results of the steel industry in the Philippines and the degree of manufacturing difficulty of each kind of product.

Table 2-2-1 shows the results of steelworks scale and product mix.

Table 2-2-1 Steelworks scale and product mix (Unit: 1,000 t/y)

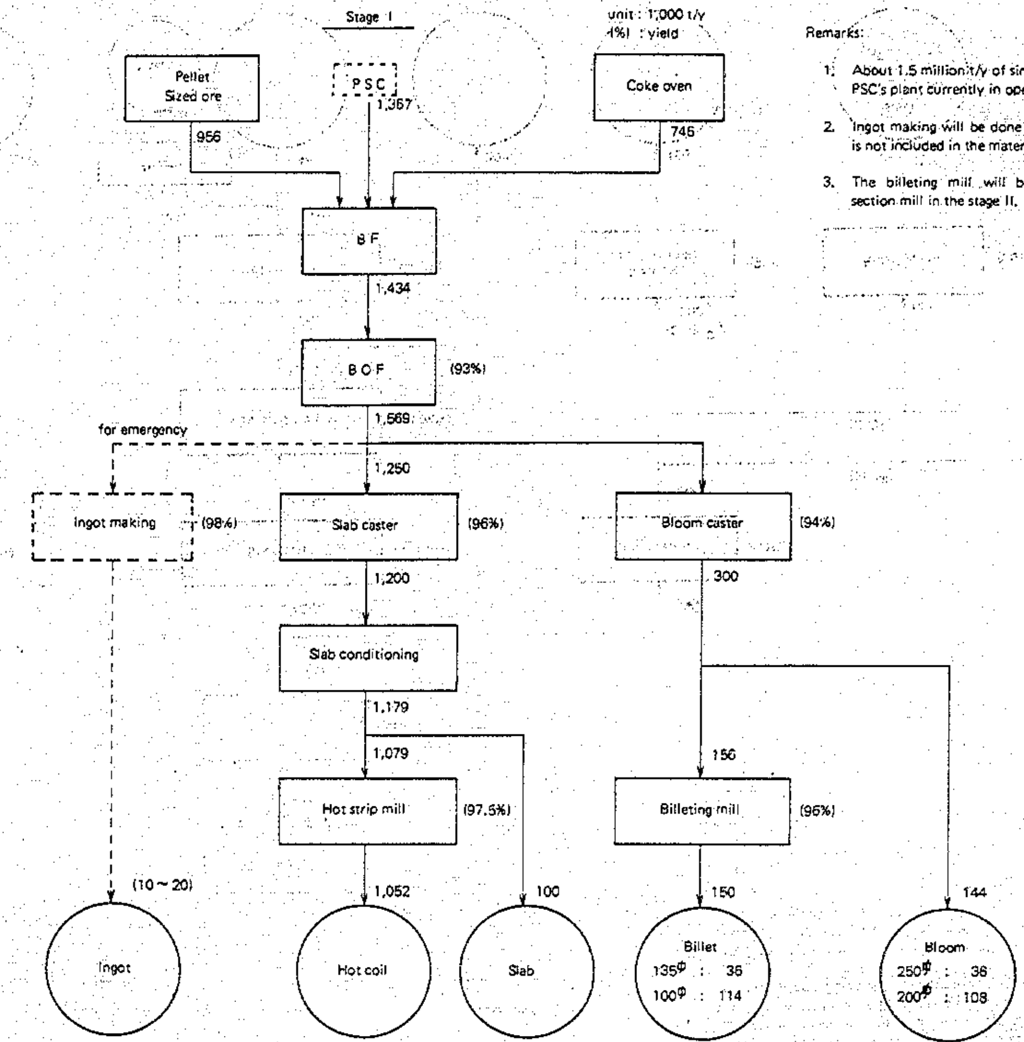
Product	Stage I (1985 ~ 1989)	Stage II (1990 ~ 1995)
Slabs for hot coil	1,110	1,800
Slabs for plate	100	200
Slab production	1,200	2,000
Blooms	144	144
Billets	156	656
Blooms for shapes & sections	0	200
Bloom production	300	1,000
Steelworks scale	1,500	3,000

(2) Production process

The following items are specified to determine the production processes.

1) The main production process shall use the blast furnace to BOF process method.
2) The molten steel that is produced in the BOF all goes through continuous casting process.
3) As the hot coil producing process, an economical hot strip mill well matching the production scale in adopted. No downstream process is planned in this study, since the coils are to be sold to the existing cold rolling mills, pipe and tube makers etc.
4) The section mill shall be a process to roll the blooms into billets, for the purpose of complying with the receiving conditions (dimensions and weight) of the existing section makers. Since the demand for shapes is anticipated in the stage II, the shape mill, which does not exist in the Philippines todya, will be installed then.

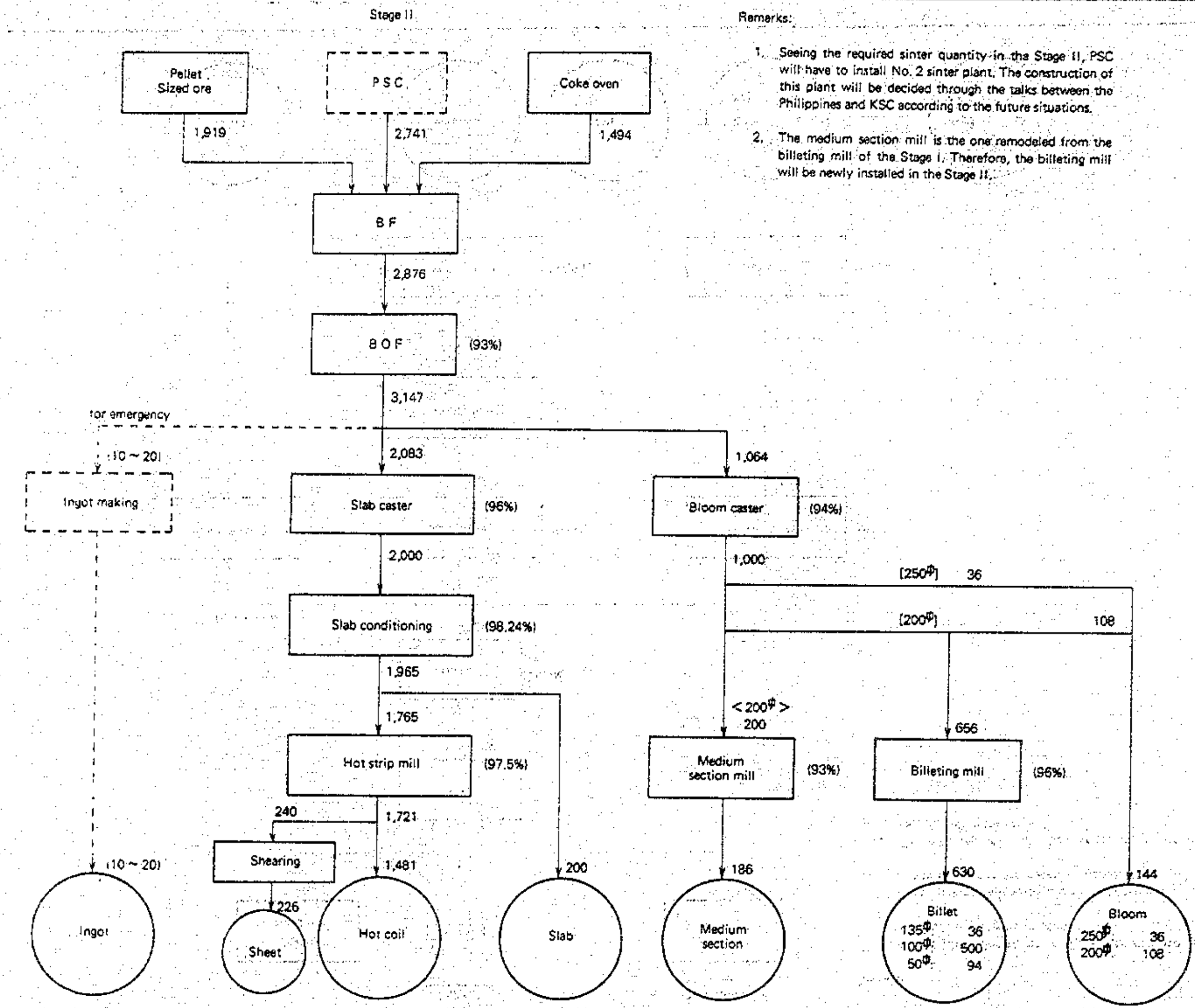
Figure 2-2-1 and *2-2-2* shows process flow (material balance).



Remarks:

1. About 1.5 million t/y of sinter are to be supplied by PSC's plant currently in operation.
2. Ingot making will be done only for emergency, so that it is not included in the material balance.
3. The billeting mill will be remodeled to the medium section mill in the stage II.

Fig. 2-2-1 Process flow and material balance at stage I



Remarks:

1. Seeing the required sinter quantity in the Stage II, PSC will have to install No. 2 sinter plant. The construction of this plant will be decided through the talks between the Philippines and KSC according to the future situations.

2. The medium section mill is the one remodeled from the billeting mill of the Stage I. Therefore, the billeting mill will be newly installed in the Stage II.

Fig. 2-2-2 Process flow and material balance at stage II

(3) Facility outline

Since this steelworks is to be the first integrated steelworks in the Republic of the Philippines, facilities that make stable operation and maintenance possible should be selected. Furthermore, energy conservation and the protection of environment were taken into consideration in selecting facilities.

1) The blast furnace, the inner volume of which is specified at 2,600$^{m^3}$, shall use the sintered ore provided by the PSC and the iron ore and pellet obtained by the steelworks, so as to produce 14,000,000 tons of pig iron annually.
   All the cokes necessary for the steelworks shall be produced in the steelworks.
2) Two basic oxygen furnace, the capacity of which is 160^t heat each, shall be installed. Through the process of continuous casting, molten steel is all made into either of blooms or slabs. For the time of BOF starting up and emergency, of course, a equipment that is capable of processing ingot shall be provided.
3) The hot strip mill as the equipment to be installed in the stage I shall consist of two reheating furnaces, a roughing mill, six stands finishing mills and two coilers, in order to produce approximately 1,000,000^t of hot coil annually.
   Under consideration of facility expansion in stage II, the layout is designed so that reheating furnace, a stand roughing mill and other equipment can be easily added to the established facilities.
4) The billet mill shall be a 3 high rolling mill.
   Among 300,000^t of annual bloom production, approximately 150,000^t of bloom shall be processed in the billet mill plant and another 150,000^t of bloom shall be sold as it is.
   In stage II, this billet mill shall be rebuilt into a medium section mill according to its production capacity.
5) Gases that are generated in the blast farnace and coke oven furnaces shall be used in the mill plant mainly. The gas generated in the BOF shall be used in the domestic power station.
6) As for other facilities, there are oxygen generating facility, power and piping systems, water supply facilities, water recirculation facilities, intraworks transportation facilities, maintenance facilities and testing and analysis facilities.
   The central maintenance station of the maintenance facilities shall be constructed adjacent to the steelworks site, because an industrial park is planned to be constructed near the steelworks site.
   This layout intends to provide convenience for cooperation with other related factories and to reserve the land in the site for Stage II expansion.

2-3 Raw materials

(1) Iron ore

After studying the documents and materials which have been submitted by the Philippine Government, we concluded that availability of the iron ore produced in the Philippines, except sand iron, is not certain at present and, therefore, iron ore shall be imported. Unloading of iron ore and manufacturing of sintered ore shall be contracted to PSC (Philippine Sinter Corporation).

(2) Coal

The present study reports the same results as in the pre-feasibility study.
Consequently, all coals shall be imported.

(3) Manganese ore

Manganese ore is reserved throughout the Philippines. In the data submitted by the Bureau of Investiment (BOI) and the Bureau of Mines (BOM), it is reported that five of twenty mines are in operation to mine manganese ore and that a large scale manganese ore deposit was found recently.
Under these circumstances, it is recommended to use domestic manganese ore.

(4) Other steelmaking raw materials

1) Ferroalloy and carbide

As for ferroalloy manufacturers, there are not only Maria Christina Chemical Industries Inc. (MCCI) but also Electro alloys Corp., which went into operation recently. Since they have capacities enough to satisfy the ferroalloys demand of the new steelworks, ferroalloys to be used shall be all domestic ones.
Also, domestic carbide shall be used for the desulfuration of molten iron.

2) Fluorite

Since fluorite is not produced in the Philippines, it shall be imported from Thailand.

3) Scrap

In general, domestic scrap shall be used. However, imported scrap may be used if the amount of the domestic scrap does not satisfy the demand.

2-4 General layout

Adjacent to the new steelworks site, there is the Philippine Sinter Corporation being in operation and the sea berth for accepting raw materials.
Since the coast line of the steelworks site is rather straight, we cannot expect the layout which offers variable possibilities.
Generally speaking, the present layout is almost the same as the layout of the pre-feasibility study. However, the layout of each facility is given the following considerations.

The raw material yard shall be constructed adjacent to the PSC yard, so as to smoothen the processes from raw material acceptance to finished product shipment. The production facilities shall be constructed close to one another at the center of the steelworks site to shorten the transportation distance. The BOF and hot strip mill were laid out adjacent to each other in consideration of future probable direct transportation and rolling of hot slabs.
For these production facilities, the energy supply facilities shall be placed at the center of the steelworks site for the purposes of the most effective operation and maintenance.
Also, the layout is designed so that the plants of raw materials, coke oven, blast furnace, steel making, hot strip mill and billet mill can be constructed in compact size to provide the most effective operations.

Fig. 2-4-1 shows general layout.

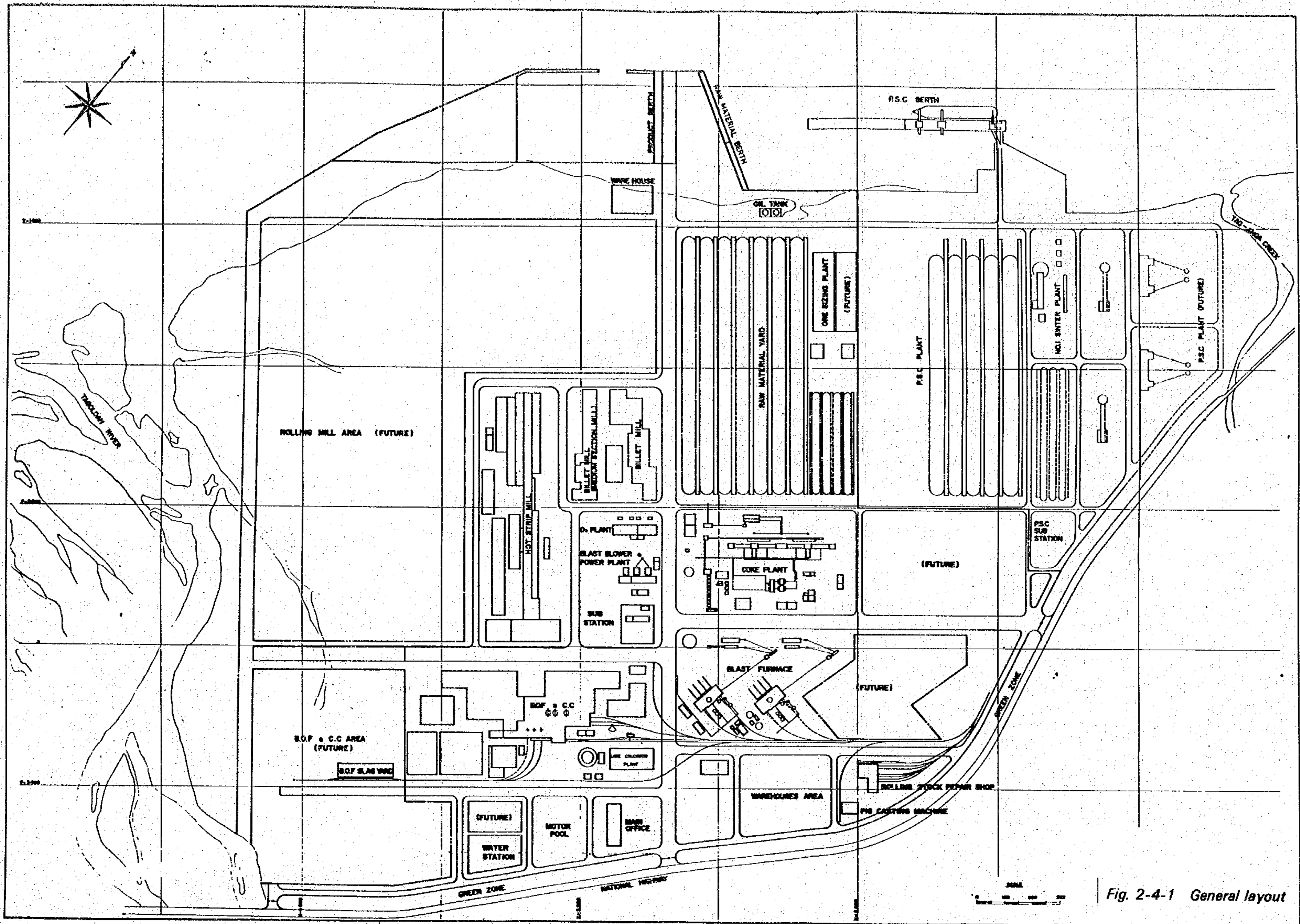


Fig. 2-4-1 General layout

2-5 Construction plan

The construction period means the period from the start of basic plan preparation to the start of steelworks operation. It is estimated that twenty months will be necessaryf for basic plan preparation, specification preparation, bidding and contracting.

In addition to the estimated twenty months, the construction schedule is calculated for each facility in the way that each facility construction shall be completed prior to the start of blast furnace operation.

The blast furnace has the longest construction period (sixty months) among these facilities.

It is desirable that the preparation of the steelworks site would be undertaken and finished as soon as possible. As for the organization of steelworks, a head office shall be established in Manila for taking the parts of financing, purchasing and sales and the steelworks shall take care of operation, maintenance and management.

The total number of the steelworks project employees is 4,065; 164 for the head office and 3,901 for the steelworks. For this first integrated steelworks in the Philippines, at ast $952^{\text{Man-Month}}$ training (engineers and workers) shall be needed if it is taken into consideration that a number of workers and engineers have to be trained abroad according to overseas technical training schedule.

2-6 Financial analysis

2-6-1 Construction costs

It is expected that the total construction cost which is required for the first stage of the new steelworks will amount to US$1.44 billion including indirect costs. The construction cost per ton of crude cast steel is US$960 (full capacity $1.5^{\text{mil.t/y}}$ base).

The total estimated amount of the preceding investment for the stage II which is contained in the direct construction cost of the stage I is US$210 million. This is equivalent to 22% of the construction cost of the stage I.

Table 2-6-1 Total required funds (Total amount and cost per ton of crude cast steel) — Stage I

	Amount	Cost per ton of crude cast steel	Ratio
	mil. $	$/t	%
Direct construction cost	1,155.6	770	80.2
Engineering fee	43.0	29	3.0
Expenses for education, training and operational guidance	35.0	23	2.4
Initial organization cost	10.0	7	0.7
Interest during construction	160.5	107	11.2
Total of construction cost	1,404.1	936	97.5
Expenses for materials to be prepared for operation and spare parts	36.0	24	2.5
Total required funds	1,440.1	960	100.0

(Preconditions of estimation)

1) Time reference and currency

For imports: March, 1979 ... International market price (US$)

For domestic procurements: March, 1979 ... Philippine domestic market price (Pesos)

2) Exchange rate: 1US$≒7.39 Pesos (March, 1979)

3) Price fluctuation: excluded from the estimate

4) Duty on imported machinaries and equipment: exemption

2-6-2 Production cost

The production costs of major products under the normal operation conditions are shown in *Table 2-6-2*. As shown in *Table 2-6-3*, Cost structure diagram, the fixed cost accounts for 37.5% of the total production cost. The ratio of the fixed cost becomes inevitably high, as the heavy industry will. *Table 2-6-4*, Sensitivity analysis, shows an estimation of how the cost per ton is effected by a 10% fluctuation of major cost elements in relation to the cost structure. The 10% reduction of the production level increases the production cost per ton of hot coil by US$12.40. Therefore, a high production level should be maintained.

Table 2-6-2 Production costs of major products

(Unit: $/t)

Products	Full cost	Variable cost
Sinter	41.9	38.4
Coke	127.2	98.5
Pig iron	157.0	114.5
Liquid steel	208.0	153.8
Slab	235.7	164.9
Bloom	240.0	159.3
Billet	286.9	172.0
Hot coil	292.5	181.0

(Preconditions of calculation)

1) Price level: March, 1979
2) Raw materials fuels, machinery and materials: Those which are not domestically available will be imported.
3) Price of iron ore and coal: Prices of C&F Philippines are estimated based on international market prices.
4) Depreciation: Straight line method (Service life: 25 years for buildings and structures, 15 years for Machinery and equipment)
5) Taxes: Tax incentive is not considered.

Table 2-6-3 Cost structure diagram

(Unit: %)

By-Products Δ21.7	By-products gas	12.4
	Return scrap etc.	6.6
Variable cost 62.5	Purchased scrap	6.5
	Iron ore	13.6
	Import coal	22.6
	Refractory	6.4
	Other materials & supplies	9.4
	PSC sintering cost etc.	6.7
Fixed cost 37.5	Mat. & supplies	6.3
	Expenses	4.3
	Labor fee	1.8
	Real prop. tax	3.6
	Depreciation etc.	21.5

Table 2-6-4 Sensitivity analysis

(Unit: $/t)

	Condition		Effects	
	Items	Variation	Billet	Hot coil
Normal case	Operating cost	–	286.9	292.5
Cost changes	Capital expenditure cost*	± 10%	± 8.5	± 8.4
	Iron ore price	± 10%	± 3.9	± 3.9
	Import coal price	± 10%	± 6.5	± 6.4
	Scrap price	± 10%	± 1.9	± 1.9
	Refractory price	± 10%	± 1.8	± 1.8
	Operation rate	– 10%	±12.8	±12.4
	"	+ 10%	–10.4	–10.1

* Capital expenditure cost includes depreciation, real property tax and maintenance & repair supplies.

2-6-3 Financial estimation

The financial estimation is made in accordance with the following preconditions. The basic case has been made with selling prices estimated at present (March, 1979) in consideration of tax exemption according to Investment Incentive Act. By changing the respective factors, the three simulation cases are also studied. The results are given in *Table 2-6-5.* In each case, the funds are drastically reduced in the first year and the seventh year (the first blast furnace relining). Especially, in the simulation case 1 that the exemption of I.I. Act is restricted due to Presidential Decree 1352, a shortage of the funds continues for a long term (about 10 years after the operation start) and this case has problems. When the selling prices are reduced by 5% (the operation start), this case has problems. When the selling prices are reduced by 5% (the simulation case 3), this is almost same as the case 1. The investment efficiency is slightly low in the basic case with the ROE value of about 10%.

Besides, as shown in Table 2-6-8, the added value effect of this project is 221 mil.$ in the 6th year and equivalent to 40% of added value ratio. And, as shown in *Table 2-6-9,* the international balance of payment effect is accumulated 2.2 billion$ during 20 project years. After completion of long term loan repayment, it can be expected that 265 mil.$ will be saved each year. Therefore, these national economic effects are considerably good.

(1) Results of financial estimation

Table 2-6-5 Profit and loss estimation (Simulation analysis) (Unit: Million $)

Case pre-sumptions	Basic case		Simulation case 1		Simulation case 2		Simulation case 3	
	• Basic sales price • Exemption by I.I. Act		• Basic sales price • Due to P.D No. 1352, exemption restriction and 5% tax		• Sales price 5% up • Exemption by I.I. Act		• Sales price 5% down • Exemption by I.I. Act	
Year (After operation)	Profit and loss (after tax)	Funds blance accumulated *	Profit and loss	Funds balance accumulated	Profit and loss	Funds balance accumulated	Profit and loss	Funds balance accumulated
1	–10	–34	–35	–63	7	–17	–32	–56
2	46	–12	38	–53	60	19	37	–43
3	62	26	41	–40	81	76	43	–24
4	63	64	42	–26	81	133	44	–4
5	69	109	49	–5	88	199	50	22
6	66	149	48	14	84	258	48	44
7	–40	44	–55	–108	–26	168	–54	–74
8	93	112	86	–51	106	249	80	–19
9	75	161	59	–21	93	319	56	12
10	82	217	67	17	100	397	64	50
11	79	378	66	172	96	575	61	193
12	79	539	66	327	96	753	61	336
13	74	696	63	479	92	927	57	475
14	–16	710	–24	491	–3	954	–29	476
15	74	1,080	63	863	91	1,340	57	828

* Plus indicates fund surplus and minus fund shortage.

Table 2-6-6 Analysis of investment efficiency

(Unit: %)

	Basic case	Simulation case 1	Simulation case 2	Simulation case 3
ROI	8.16%	6.86	9.45	6.81
ROE	9.96%	6.78	13.17	6.72

(Preconditions of financial estimation)

1) Project period of financial estimation = 1980—1999

(Construction period: 5 years
Operation period: 15 years)

2) Operation scale of the steelworks = production of 1.5 million tons at the first stage

3) Time reference = March, 1979 (Price fluctuation is not considered.)

4) Capital = $320 million

5) Long-term borrowing = $1,120 million (including interest of $161 million during construction period — interest rate of 9%)

6) Short-term borrowing = (Interest rate is 16%)

(2) Analysis of profit and loss structure in basic case

① *Table 2-6-7 Profit and loss analysis under product classification (Average of normal years)*

(Unit: $/t)

Product	Sales price	Production cost	Transportation cost	General admin. exp.	Interest	Total cost	Profit
Billet	375.0	276.7	6.4	15.0	42.9	341.0	34.0
Hot coil	395.0	282.1	5.6	15.8	45.1	348.6	46.4

Note: Production cost is the cost after tax adjustment.

② **Break-even point analysis**

Operation level at the break-even point: 1,116 thous. tons

Operation rate: 77.2%

(3) Analysis of national economic effects in the basic case

Table 2-6-8 Added value effects

(Unit: Million $)

	6th year	13th year
Indirect taxes	66.6	113.9
Compensation of employee	7.9	7.9
Capital consumption allowance	80.3	75.5
Operating surplus	66.0	74.4
Added value total	220.8	271.7
Added value ratio	39.4%	48.5%

Table 2-6-9 International balance of payment effects

(Unit: Billion $)

	Accumulated amount
Substitute of imported steel products	6.0
Imported raw materials	2.4
Interest of loan	0.6
Payment of construction cost	0.8
Outflow of foreign currencies	3.8
Net savings of foreign currencies	2.2

CHAPTER 3

GENERAL DEMAND FORECAST

CHAPTER 3. GENERAL DEMAND FORECAST

3-1 Results of demand forecast

This chapter provides a summary of chapter 12 which gives the details of the basic concept for demand forecasting and the analysis and conclusion reached through the various data. This demand forecast includes 6 types of macro-forecast and 2 types of micro-forecast; the data is selected from that information so as to forecast the steel demands in the Philippines. *Table 3-1-1* shows the results of these 8 types of forecasts. The macro-forecast provides the tonnage which is estimated on the basis of correlative equations of Apparent Crude-steel Consumption and Gross National Product (GNP) or Gross Domestic Capital Formation (GDCF), and of GNP and GDCF/GNP (three types of correlative analyses). For the basic data, the (1968 to 1978) data, which is supplied by the Philippine counterparts, and the (1962 to 1978) data of the previous Fact-Finding Study, which may have some inconsistencies though, are used.

After calculating the correlative equations, the value planned by the National Economic and Development Authority (NEDA) is used for the value of the forecasted year's Gross National Product and Gross Domestic Capital Formation.

The growth rate is taken as being consistent since the NEDA's plan does not provide the values for 1988 to 1990.

In micro-forecasting, the consumption patterns of the products and the demands provided by the counterparts this time are multiplied by the growth rate of each demand.

The growth rate of the product demands is estimated by calculating the future activity levles of demand sectors and by obtained elasticity cofficients for steel demands with respect to some of the demand sectors.

For the 1978 consumption patterns of each product by demand sectors, we estimated future steel demand in the same way. In this estimation, the forecast for Apparent Crude Steel Consumption is made by the macro-forecast, and the demand forecast for each product by the micro-forecast. Micro-forecast could have been used for the estimation of Apparent Crude Steel Consumption, but the macro-forecast is used for this because sufficient basic data were not avilable for the pourpose of micro-focasting. The micro-forecast is necessary to support the macro-forecast which does not provide sufficient data for grasping the demand for each product, an essential for facility planning.

In macro-forecasts, the models D, E and F which are calculated based on the 1968 to 1978 data are affected by the lower demand for iron/steel, and therefore the growth rate is low and the correlative equation value is low also.

Model C shows the highest correlative equation value. Iron/steel demands in the Philippines seem to have a stronger growth potential than indicated by model C.

We take model A as the conclusion drawn from demand forecasting. With respect to micro-analysis, model G is the best because the basic data is accurate. However, model H seems to be better, because it uses more up-to-date data. Compared with projected consumption for product type in 1977 to 1978, the greatest change seems to occur, so we take model H, adjusting the estimation of each product. Model A uses macro values.

Table 3-1-2 shows the final estimated figures obtained by breaking down the products, according to model H.

With respect to iron/steel demands in the Philippines, the demand for bar-steel is increasing, because of big-scale construction investment. Formerly, the bulk of demand for flat products consisted of tin plates, and galvanized iron sheets. In the future, the demand for flat products is estimated to increase centered on CRS/C, HRS/C and plates which are needed for such modern industries as vehicle manufacturing, electrical industries, and the ship-building industry, etc.

Table 3-1-1 Comparison of demand forecast values

(Unit: 1,000 t)

Classification	Base Data	Correlative Equation	Independent Variables		Apparent Crude Steel Consumption			Mean Growth Rate		Remarks
					Actual	Forecast				
			x_1	x_2	1978	1985	1990	'85/'78 (%)	'90/'85 (%)	
Macro-Forecast	1962 ~ 1978	$y = 0.0168x_1 + 102.95$ $(r = 0.9247)$	GNP		1,542	2,456	3,560	6.9	7.7	Model A
		$y = 0.0506x_1 + 372.00$ $(r = 0.9264)$	GDCF		1,542	2,332	3,319	6.1	7.3	Model B
		$y = 0.0117x_1 + 3{,}166.37x_2 - 337.51$ $(r = 0.9409)$	GNP	GDCF/GNP	1,542	2,178	2,966	5.1	6.4	Model C
	1968 ~ 1978	$y = 0.0130x_1 + 355.00$ $(r = 0.8850)$	GNP		1,542	2,176	3,030	5.0	6.8	Model D
		$y = 0.0374x_1 + 596.57$ $(r = 0.9198)$	GDCF		1,542	2,045	2,775	4.1	6.3	Model E
		$y = 0.0098x_1 + 2{,}057.74x_2 + 63.49$ $(r = 0.9008)$	GNP	GDCF/GNP	1,542	2,006	2,662	3.8	5.8	Model F
Micro-Forecast	1977	Forecast by products and sectors			1,542	2,415	3,525	6.6	7.9	Model G
	1978	Ditto			1,542	2,578	3,783	7.6	8.0	Model H

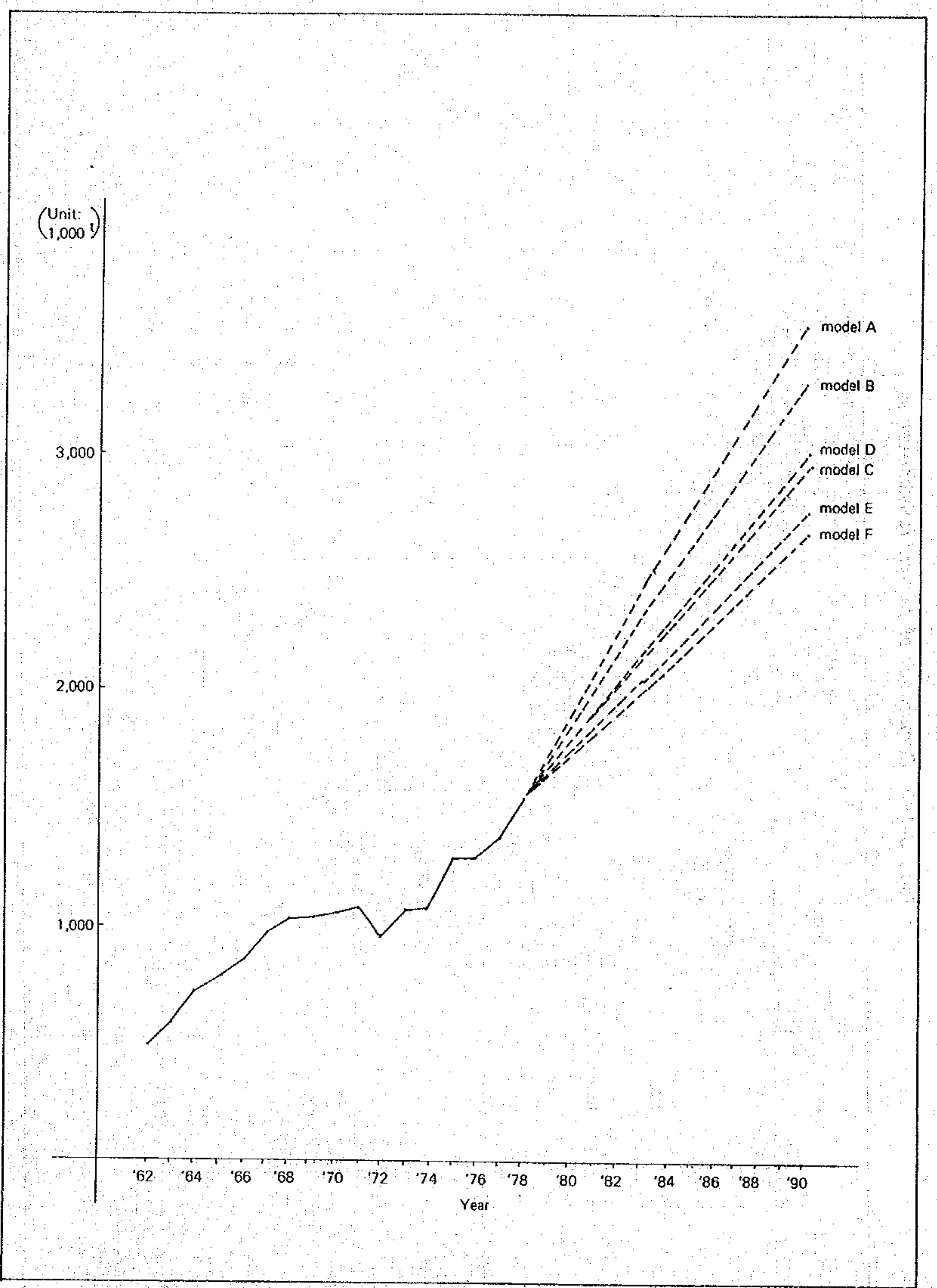


Fig. 3-1-1 Trends in apparent crude steel consumption, actual and forecast

Table 3-1-2 Demand forecast for 1978 through 1990 by products

(Unit: t)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Mean Increase Rate, %	
														1985/1978	1990/1985
Galvanized Iron Sheets	126,448	133,787	141,552	149,768	158,461	167,658	177,389	187,688	200,137	213,412	227,568	242,663	258,754	5.804	6.633
Tin Plates	162,759	170,316	178,224	186,499	195,158	204,219	213,701	223,623	234,089	245,044	256,512	268,517	281,081	4.643	4.680
CRS/C	87,206	95,785	105,208	115,558	126,927	139,414	153,130	168,199	186,983	207,865	231,079	256,886	285,573	9.838	11.168
HRS/C	95,389	106,460	118,816	132,606	147,996	165,172	184,342	205,733	228,769	254,384	282,867	314,540	349,761	11.606	11.197
Pipe & Tubes	71,975	76,755	81,852	87,288	93,085	99,267	105,859	112,891	121,149	130,011	139,521	149,727	160,582	6.641	7.315
Plates	117,737	127,204	137,432	148,483	160,423	173,323	187,260	202,318	219,926	239,066	259,872	282,489	307,080	8.041	8.703
Bars	431,355	454,553	478,999	504,760	531,906	560,512	590,656	622,434	662,307	704,734	749,879	797,916	849,030	5.378	6.406
Wire Rods & Wire	91,263	96,481	101,998	107,830	113,996	120,514	127,405	134,694	143,254	152,358	162,040	172,338	183,288	5.718	6.355
Shapes & Sections	18,969	22,258	26,118	30,647	35,961	42,197	49,514	58,100	64,965	72,641	81,224	90,821	101,551	17.340	11.815
TOTAL	1,203,101	1,283,599	1,370,199	1,463,439	1,563,913	1,672,276	1,789,266	1,915,680	2,061,579	2,219,515	2,390,562	2,575,897	2,776,800	6.871	7.707
Crude Steel Equivalent	1,542,437	1,645,640	1,756,665	1,876,204	2,005,017	2,143,944	2,293,931	2,456,000	2,643,050	2,845,532	3,064,823	3,302,432	3,560,000	6.871	7.707

3-2 Product mix and steelworks capacities

3-2-1 Product mix

Table 3-2-1 was obtained by breaking down according to product type for projected consumption of 1985 based on the domestic production rate of 1978. The domestic production rate in 1978 was highest for bars and galvanized sheet, and lowest for HRS/C and plates. Domestic production rates for the low-percentage items in 1978 will progressively rise as the industrialization of the Philippines advances, especially after the new integrated steel works has been constructed.

Table 3-2-1 Production estimated for 1985 by product based upon the domestic product mix (percentage) of 1978 (in t.)

Product	Domestic production		Imports		Total	
	Quantity	Percent	Quantity	Percent	Quantity	Percent
		(%)		(%)		(%)
G.I. Sheets	155,593	82.9	32,095	17.1	187,688	100.0
Tin plates	96,158	43.0	127,465	57.0	223,623	100.0
CRS/C	88,136	52.4	80,063	47.6	168,199	100.0
HRS/C	46,084	22.4	159,649	77.6	205,733	100.0
Pipes & Tubes	74,169	65.7	38,722	34.3	112,891	100.0
Plates	46,331	22.9	155,987	77.1	202,318	100.0
Bars	564,548	90,7	57,886	9.3	622,434	100.0
Wire Rods-Wire	101,021	75.0	33,673	25.0	134,694	100.0
Shapes & Sections		–	58,100	100.0	58,100	100.0
	(460,140)	(52.2)	(437,994)	(47.8)	(898,134)	(100.0)
Total	1,172,040	61.2	743,640	38.8	1,915,680	100.0

* Figures in parentheses are totals of five products related to hot strip.

Table 3-2-2 is an estimate of the growth in the domestic production rates of the five hot-strip-related products in the Philippines.

Table 3-2-2 Demand for hot coil in 1985 (in t.)

Product	Estimate for 1985				
	Apparent consumption	Domestic production rate	Domestic production	Product-material ratio	Hot coil demanded
		(%)			
G.I. Sheets	187,688	100	187,688	1.031	193,506
Tin plates	223,623	60	134,174	1.309	175,634
CRS/C	168,199	90	151,379	1.064	161,067
HRS/C	205,733	95	195,446	1.053	205,805
Pipes & Tubes	112,891	95	107,246	1.092	117,113
Total	898,134	86.4	775,933		853,125

This estimate was based on the assumption that cold-rolled sheets and colils for home-produced galvanized sheets and tin plates would be wholly supplied domestically.

By product type, 82.9% of all galvanized sheets used was domestically produced in 1978. Considering the all-time high rate of 95.9% in 1972, 100% domestic production would technically be possible if the government's industrial policy permits galvanized sheet manufacturers to expand their production equipment.

Domestic production of tin plate in 1978 was a low 43%. This inactivity is believed due to the use of imported tin plates for exported cans of fruit, the lower earning power of tin plate manufacturers resulting from the relative decline of product sale prices in comparision with raw materials costs, and the temporary damage from typhoons. Elimination of these difficulties will require strenuous efforts. For the purpose of this feasibility study, however, it was assumed that the domestic production rate would recover to the average level of the past.

It is estimated that the demand for cold-rolled and hot-rolled sheets and coils falling within the manufacturable size range of the new hot-strip mill can be met with production wholly within the nation. Domestic production of pipes and tubes is increasing steadily, and this trend will continue into the future.

For plates, a mill being contemplated, in addition to the new integrated steel works, is estimated to come on stream by 1985. Already high domestic prodution rates for bars, wire rods and wires will rise even further. Shapes and sections will be produced by the new integrated steel works in stage II. *Table 3-2-3* shows estimates of domestic production by product for 1985 and 1990 based on the above assumptions. *Table 3-2-4* shows the demand necessary by product for the new integrated steel works, derived by multiplying the domestic production in *Table 3-2-3* by the product-unit ratio. The results obtained were compared with the equipment plan, then sales amounts were determined.

Table 3-2-3 Domestic production by products

(Unit: t)

Product	1978			1985			1990			Increase of domestic production		Remarks
	Apparent consumption a	Domestic production ratio b	Domestic production c = a x b	Apparent consumption d	Domestic production ratio e	Domestic production f = d x e	Apparent consumption g	Domestic production ratio h	Domestic production i = g x h	1985/1978 j = f − c	1990/1985 k = i − f	
		(%)			(%)			(%)				
G. I. Sheets	126,446	82.9	104,770	187,688	100.0	187,688	258,754	100.0	258,754	82,918	71,066	
Tin Plates	162,759	43.0	69,942	223,623	60.0	134,174	281,081	60.0	168,649	64,232	34,475	
CRS/C	87,206	52.4	45,738	168,199	90.0	151,379	285,573	90.0	257,016	105,641	105,637	
HRS/C	95,389	22.4	21,340	205,733	95.0	195,446	349,761	95.0	332,273	174,106	136,827	
Pipes & Tubes	71,975	65.7	47,300	112,891	95.0	107,246	160,682	95.0	152,648	59,946	45,402	
Plates	117,737	22.9	26,987	202,318	90.0	182,086	307,080	90.0	276,372	155,099	94,286	The transfer of plate mill shall be completed by 1985.
Bars	431,355	90.7	391,350	622,434	95.0	591,312	849,030	95.0	806,579	199,962	215,267	
Wire Rod & Wire	91,263	75.0	68,467	134,694	90.0	121,225	183,288	90.0	164,959	52,758	43,734	
Shapes & Sections	18,969	0	0	58,100	0	0	101,551	95.0	96,473	–	96,473	The shaped-steel mill shall be newly installed for stage II.
(Sub-Total)	(543,777)	(53.2)	(289,090)	(898,134)	(86.4)	(775,933)	(1,335,851)	(87.5)	(1,169,340)	(486,843)	(393,407)	The sub-total is based on five products related to hot strip.
Total	1,203,101	64.5	775,894	1,915,680	87.2	1,670,556	2,776,800	90.5	2,513,723	894,662	843,167	

Table 3-2-4 Sales plan of new integrated steelworks

(Unit: 1,000 t)

Product		1985		1986		1987		1988		1989		1990		Remarks
		Demand	Sales	Demand	Sales	Demand	Sales	Demand	Sales	Demand	Sales	Demand	Sales	
	Hot Coil for G. I. Sheets	194	172	206	240	220	240	235	240	250	240	267	268	(Demand calculation)
	Hot Coil for Tin Plates	176	48	184	96	192	192	201	192	211	192	221	192	**[Hot coil]**
	Hot Coil for CRS/C	161	96	179	220	199	220	221	220	246	220	273	268	Domestic production of G.I. sheets x 1.01 x 1.021
	Hot Coil for HRS/C	206	144	229	259	254	256	283	256	315	256	350	354	Domestic production of tin plates x 1.282 x 1.021
	Hot Coil for Pipes & Tubes	117	77	126	144	135	144	145	144	155	144	167	163	Domestic production of CRS/C x 1.042 x 1.021
	Total of Hot Coil	854	537	924	959	1,000	1,052	1,085	1,052	1,177	1,052	1,278	1,245	Domestic production of HRS/C x 1.092
Slabs	Slabs for Plates	217	100	236	100	257	100	279	100	303	100	329	200	**[Slabs]** Domestic production of plates x 1.19
	Bloom	791	198	842	144	896	144	954	144	1,015	144	1,080	144	**[Bloom & Billet]** Domestic production of bars } x 1.11
	Billet		74		150		150		150		150		630	Domestic production of wire rods and wire } x 1.11
	Shapes & Sections	0	0	0	0	0	0	0	0	0	0	96	93	**[Shapes & Sections]**
	Total	1,862	909	2,002	1,353	2,153	1,446	2,318	1,446	2,495	1,446	2,783	2,312	Domestic production of shapes and sections

3-2-2 Steel works capacities

Table 3-2-5 shows the new integrated steelworks capacity limits based on the product mix, established in Section 3-2-1, the projected demand, and domestic prodcution rates.

Table 3-2-5 Production capacity limits of new integrated steelworks
(in 1,000^t and semifinished steel terms)

Product	Stage I 1987 ~ 1989	Stage II 1992 ~ 1995
Slabs for Hot Coils	1,100	1,800
Slabs for Plates	100	200
Sub-Total	1,200	2,000
Blooms	144	144
Billets	156	656
Blooms for Sahpes & Sections	0	200
Sub-Total	300	1,000
Total	1,500	3,000