CHAPTER 7

RAW MATERIALS

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Quantities of the main raw materials required annually for iron-and-steel making by direct reduction (DR) process to be adopted by this project are as shown in Table 7.1. The present status of the raw materials and the strategy of their procurement will be studied in this chapter.

Table 7.1 Main Raw Materials Required for the Project

(unit: t/y)

Raw materials		1st stage	2nd stage	Remarks
	Iron oxides (Iron ore lump/ pellets)	1,765,000	2,789,000	Based at 67% Fe, in iron oxides
	Scrap	282,900	445,800	Ratio of scrap to DRI at 20:80. The figures include return scrap
Ferroalloys	Ferro-manganese	7,250	11,400	
Ferroalloys	Ferro-silicon	900	1,400	
	Burnt lime	90,700	143,100	
	Fluorite	3,200	5,100	
	Aluminium	2,600	4,100	
	Carburizing material	4,700	7,400	

7.1 Iron Oxide

(1) Properties of Iron Oxide for DR Process

Raw materials used for DR process considered for the study are normal iron oxide, namely iron ore lump and/or iron ore pellets (hereinafter collectively called iron ores). The quality requirements of iron ores suitable for DR process may vary with the types of process applied, but the required levels are in general as follows:

i. Chemical composition

Since the gangues can not be separated from the iron ores in DR process, it is obvious that a particularly strong demand must be placed upon the chemical composition of iron ores. This is based on the fact that in most cases direct reduced iron (DRI) is supposed to substitute steel scrap in electric arc furnaces (EAF). The principal requirements concerning chemical composition of iron ores are:

T.Fe (iron):	66% or more (preferably)
P (phosphorus):	0.05% or less
S (sulphur):	0.02% or less
$\frac{SiO_2 + Al_2O_3}{Fe} \times 100$:	5% or less

When raw materials containing high proportion of gangues are fed into EAF, a large volume of slag will be produced, thus leading to an adverse influence on steelmaking efficiency and to an increase in unit consumption of electric power. To avoid these inconveniences iron ores with less gangues must be used.

Most recent operational experiences with DR/EAF route indicate that slag to iron ratio ($\frac{SiO_2 + Al_2O_3}{Fe} \times 100$) up to 5% are considered to be permissible.

A higher energy consumption in EAF, as described above, must be properly taken into consideration. Depending upon the nature of slag, for an increase in slag of each 1%, the energy consumption of EAF increases in the range of 25 – 40 kWh per tonne of molten steel. It is well known that P and S are harmful for the quality of steel, thus contents of such elements in raw materials are restricted within certain limitations.

ii. Physical properties

General requirements concerning physical properties are the followings:

a. Particle size:

Pellets: +9mm –16mm, as mainsize fraction

Lump: +10mm –50mm, as mainsize fraction

b. Cold crushing strength: 200 kg/pellet

iii. Reduction properties

The important reduction properties are the following three:

a. High reducibility

Reducibility concerns attainment of a certain value of quantity of oxygen removed from iron ores (iron oxides) in a fixed time, and has a great influence on the productivity and quality of DRI.

b. Low degradation

The intense degradation leads to increase in pressure and dust loss in the DR plant.

c. No cluster formation during reduction

Clustering phenomenon means that raw materials adhere to each other in high temperature zone of the reduction furnace. If the degree of clustering is great, the smooth descending of the load will be restricted in shaft furnace process, leading to difficulty in discharging in the retort process.

From the viewpoint of cost, as well as from technical viewpoints, it has become important to use both chemically and physically more homogeneous iron ores. Before actually using iron ores, they must be thoroughly tested to assure their suitability in the DR process.

Table 7.1.1 shows the quality requirements on raw materials for the HyL and Midrex processes.

Table 7.1.1 Summary of Ore Quality Requirements by Major Commercial DR Processes

Ore quality requirements \ Process	HyL	Midrex
Stable, optimum ore types	Lump, preferably pellets	Pellets and/or lump (max. share of lump depends on properties)
Size range	Pellets: usual size Lump: ∿ 12–50 mm	Pellets: 95% 9–16 mm Lump: >90% 10–30 mm
Contents on fines	Screening of –6.3 mm fraction sufficient	< 5% –6.3 mm max. 20% 2.8–6.3 mm by metered addition
Crushing strength before and after reduction	> 200 kg *	> 200 kg 80 kg average
Tumble index	*	Pellets: > 95% + 6.7 mm < 4% – 0.6 mm Lump: > 85% + 6.7 mm < 10% – 0.6 mm
Chemical restrictions	< 0.15% S	< 0.02% S
Reducibility	Comparable to Alzada pellets	Usually > 92% met. in Midrex Linder Test
Decrepitation	*	∿ < 10% –2.8 mm
High temp. properties	High fusion point	Clustering temp. > 900°C
Swelling	*	*

* No special requirements or not evaluated.

(2) Supply Source

i. Occurrence of iron ore resources in Thailand

The occurrence of iron ores in Thailand has been reported by the Royal Thai Governmental Agencies and some foreign consultants. The iron ores in Thailand are roughly divided into three types with respect to genesis.

a. Pre-Cambrian formations

b. Igneous deposits formed during the Cretaceous

c. Lateritic materials

The ores of category a. are known as taconite. As shown in Figure 7.1.1, they exist in the Nong Born/Plang Yao and other places. According to laboratory test result, when the ore is crushed and ground to 0.10 mm and magnetically separated, concentrates with an approx. 70% Fe and approx. 0.03% S are obtained. As the weathered ore zone reaches approx. 30m below the surface, consideration must be given in planning the development work. So far, only the reconnaissance survey has been done, but no detailed study has been made.

The ores of category b., presumably formed during the Cretaceous, are emplaced at contact metasomatic deposits formed by the intrusion of igneous rocks into limestones. Deposits of this type are mainly concentrated in the middle and northern parts of Thailand, but they generally exist in small and irregular bodies. The primary iron minerals are mostly magnetites with a small amount of hematite as secondary origin. The ore often exhibits chalcopyrite and arsenopyrite. The untreated ore, therefore, generally contains much copper (Cu) and arsenic (As) to be harmful for steelmaking. Some ores belonging to this category are of hydrothermal origin, existing in western Thailand and the Malay peninsula. These ores contain nonferrous metals such as tin (Sn) and zinc (Zn), elimination of which has not been made by economical means. The principal primary iron minerals are iron sulphides which occasionally contain

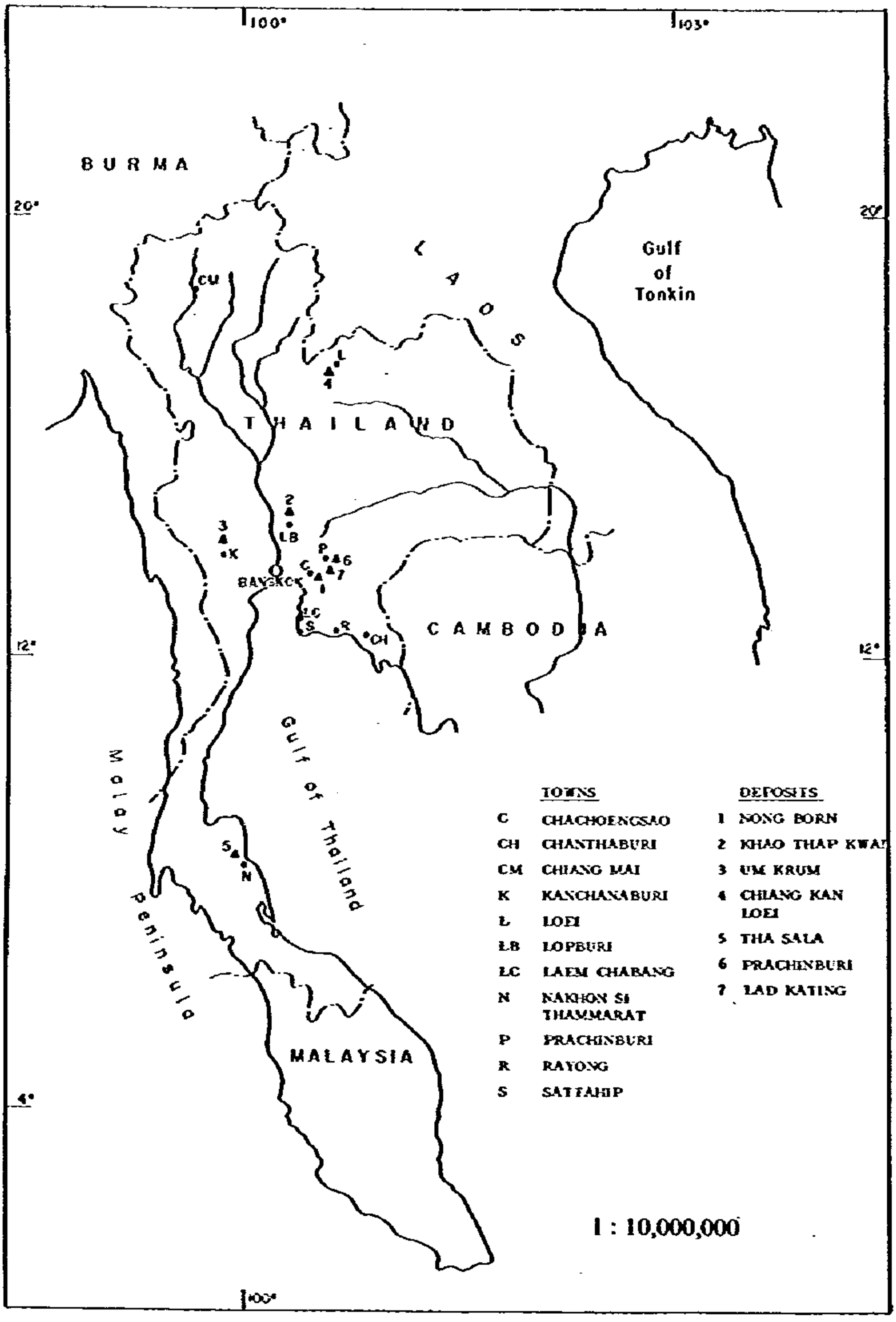

Fig. 7.1.1 Selected Iron Ore Deposits in Thailand

hematite.

The lateritic ores of category c. only contain approx. 30% Fe. The development is hampered by difficulties to extract or upgrade the iron by economical means.

Although iron ore deposits in Thailand have been investigated by the Royal Thai Governmental Agencies and some foreign consultants since 1957, iron ores have not been proved in sufficient quantity and quality to sustain large scale iron-and-steel making operations over a reasonable period of time.

Presently, SISCO's Khao Thap Kwai hematite mine is the largest iron mine in Thailand which produces on a regular basis. The ore is molten down in small blast furnaces for foundry work at Tha Luang.

Intermittently, iron ores are being mined for various industrial purposes on a small scale in other parts of Thailand.

Table 7.1.2 shows selected iron ore deposits and Table 7.1.3 production and consumption of iron ore in Thailand.

ii. Foreign iron ore sources

High grade iron ores (66% Fe or more) of major existing mines of the world, which are being fed into DR plant and tested at a laboratory scale, are listed in Table 7.1.4. They have been evaluated the suitability for DR and free market availability to DR plant. The actual FOB prices of iron ores have been investigated during April to June 1979, and adopted in the study.

(3) Selection of Supply Sources

It is difficult to have a realistic outlook for the use of domestic iron ores as supply sources for this study. Accordingly, the study is based on the assumption that iron ores will be imported. Five sources of pellets (Brazilian, Swedish,

Table 7.1.2 Selected Iron Ore Deposits in Thailand

Deposit	Nearest town	Type of ore	Type of deposit	Reserves (mill. tonnes)	Chemical analysis (%)						
					Fe	SiO_2	Al_2O_3	S	P	As	Cu
Nong Bom	Chachoengsao	Taconite	Banded iron formation	6.20	57.90	8.40	4.20	3.66	0.11		tr
Khao Thap Khwai	Lopburi	Oxidized detrital ore	Contact-metasomatic	6.95	43.33	17.49	8.93	0.02	0.07		0.23
Um Krum	Kanchanaburi	Oxidized gossan ore	Hydro-thermal	4.87	40.50	20.90	4.80	0.01	0.06	0.025	
Chiang Khan	Loei	Magnetite	Contact-metasomatic	5.00	56.70	17.40	tr	3.20	0.03	nil	0.10
Tha Sala (Khao Lok)	Nakhon	Hematite	Contact-metasomatic	1.00	60.00	12.00		0.025	0.015		
Prachinburi	Prachinburi	Laterite	Intrusive	21.60	30.00	31.20	18.20	0.03	0.07	0.002	
Lad Kating	Chachoengsao	Laterite	Metamorphic	2.80	27.40	36.50	12.70	0.01	0.06	0.02	0.05
Mae Chaem	Chaing Mai	Magnetite Hematite	Contact-metasomatic	1.00	69.85						
Phanat Nikhom	Chonburi	Unknown	Unknown	0.60	64.00						
Khao Thap Klang	Rayong	Hematite	Sedimentary origin	Unknown	46.67						
Nong Phai	Phetchabun	Unknown	Unknown	1.00							

Source: Royal Thai Government Information

Table 7.1.3 Production and Consumption of Iron Ore in Thailand

(unit: tonnes)

	1973	1974	1975	1976	1977
Production					
Northern region					
Central region	X	X	X	X	45
Nakhon Sawan	648	1,977	5,594	146	110
Phetchabun	X	X	X	6,000	5,390
Central region					
Chonburi	–	10,961	1,900	900	2,518
Lopburi	35,661	23,365	24,982	17,594	55,407
Rayong	X	X	X	360	–
Total production	36,309	36,303	32,476	25,000	63,470
Value (million bahts)	5.8	5.8	5.2	4.0	10.2
Domestic consumption	46,441	27,819	28,903	51,548	42,080
Value (million bahts)	7.4	4.5	4.6	8.2	6.7

Source: Dept. of Mineral Resources, 1977.

Australian and Indian origins) and a source of lump (Australian origin) have been selected from the sources world-wide listed in Table 7.1.4, taking into account of both technical and economical view points.

The use of a single source of high quality pellets may be preferable from the technical standpoint, but the diversification of supply sources has been proposed, considering the precaution against such risks as the limitations on capacities of the suppliers and the stoppage of supply due to strikes, etc.

As compared with the price of pellets, the price of lump being cheaper, it is planned to jointly use lump ore at the rate of approx. 20% of the burden in order to reduce the cost. Table 7.1.5 shows the parameters of selected iron ore sources for the project.

Table 7.1.4 Evaluation of High Grade Iron Ores of Major Existing Mines

Ore/Continent		% Fe	% SiO_2	% Al_2O_3	% TiO_2	% CaO+MgO	% S	% Fe	% Acid gangue / Fe	Suitability for DR: Shaft furnace I.E.	Shaft furnace L.T.	Rotary kiln I.E.	Rotary kiln L.T.	Static bed I.E.	Static bed L.T.	Product capacity Present (mill tonnes/y) Prod.	Product capacity Present (mill tonnes/y) Fe	Free market availability Present (mill tonnes/y) Prod.	Free market availability Present (mill tonnes/y) Fe
Europe																			
Solmino	P	66.5	2.0	0.3	–	1.3	0.02	0.015	3.45	+++/++		0	+	0	–	0.7	0.5	–	
Strässa	P	66.1	3.5	0.5	0.08	0.7	0.005	0.008	6.17	0	+	0	+	0	0	0.6	0.4	–	
Malmberget	P	67.8	1.4	0.4	0.3	0.5	0.004	0.014	2.65	+++/++		0	+	0	+	4.0	2.7	2.0	1.4
Sydvaranger	P	67.5	2.5	0.3	0.04	0.7	0.005	0.015	4.21		+	0	+	0	0	2.6	1.7	0.6	0.4
North America																			
Fire Lake	P	68.0	2.0	0.4	0.05	0.5	0.005	0.01	3.60	0	+	0	0	0	0	2.0	1.4	0.4	0.3
Griffith	P	66.8	3.6	0.4	–	0.8	0.005	0.03	5.99	0	0	+++		0	0	1.5	1.0	–	
INCO	P	66.5	2.7	0.7	–	0.8	0.005	0.006	5.11	++	0	0	+	0	0	0.8	0.5	–	
Peu Ridge	P	67.5	2.0	0.3	–	0.5	0.01	0.14	3.41	+++		0	+	0	0	2.0	1.4	–	
Latin america																			
Alzada	P	67.1	1.6	0.6	–	2.5	0.01	0.095	3.28	0	0	0	0	+++		1.5	1.0	–	
Pena Colorado	P	66.1	2.6	0.1	–	1.7	0.07	0.08	4.08	0	0	0	0	+++		1.5	1.0	–	
CVRD-DR	P	67.6	1.85	0.7	0.05	0.8	0.005	0.030	3.77	++		+++		++		5.0	3.3	1.5	1.0
CVRD	L	67.5	1.7	0.9	0.06	0.1	0.01	0.06	3.85	++/+		+		+					
Mutuca	L	68.0	0.8	1.2	–	–	0.01	0.09	2.94	+/+++		0	+	0	0	0.4	0.3	0.1	0.1
Jangada	L	67.5	1.2	1.3	–	–	0.03	0.12	3.70	++		0	0	0	0	0.9	0.6	–	
Pico	L	68.5	0.6	0.8	–	–	0.007	0.07	2.04	+		0	0	0	0	0.8	0.5	–	
Aguas Claras	L	68.0	0.6	1.3	0.06	–	0.01	0.07	2.79	++		0	+	0	0	3.6	2.4	1.1	0.7
Morro Agudo	L	67.7	1.0	0.9	–	–	0.004	0.10	2.81	0	0	0	+	0	0	1.0	0.7	1.0	0.7

Table 7.1.4 (cont'd)

Ore/Continent		% Fe	% SiO_2	% Al_2O_3	% TiO_2	% CaO+MgO	% S	% Fe	% Acid gangue Fe	Suitability for DR: Shaft furnace I.E.	Shaft furnace L.T.	Rotary kiln I.E.	Rotary kiln L.T.	Static bed I.E.	Static bed L.T.	Product capacity Present (mill tonnes/y) Prod.	Product capacity Fe	Free market availability Present (mill tonnes/y) Prod.	Free market availability Fe
Fabrica	P	66.4	2.1	1.2	–	1.6	–	0.08	4.82	0	+	0	0	0	0	2.5	1.7	–	
Feijao	L	68.2	1.2	1.3	–	0.2	–	0.07	3.67	++		0	+	0	0	1.0	0.7	–	
Tamandua	L	67.4	0.9	1.6	0.08	1.6	0.002	0.08	3.71	0	+	0	0	0	0	0.6	0.4	0.3	0.2
Samarco	P	66.5	3.0	0.5	0.05	2.5	0.01	0.04	5.26	0	+	0	0	0	+				
Minpeco	P	67.5	1.5	0.6	0.06	1.3	0.018	0.02	3.11	++		0	+	0	+	4.0	2.7	1.5	1.0
El Pao	L	67.0	1.0	1.0	–	–	–	0.06	2.98	0	–	0	0	0	0	0.6	0.4	0.6	0.4
Algarrobo	P	66.1	1.8	0.4	0.14	2.9	0.008	0.062	3.33	0	+	0	0	0	0	3.5	2.3	–	
Africa																			
Sishen	L	67.5	2.1	1.0	0.05	0.07	0.01	0.07	4.67	++		+++		0	+	11.0	7.2	2.0	1.3
Postmasburg	L	66.5	3.2	0.8	0.04	0.3	–	0.05	6.08	0	+	++		0	0	0.3	0.2	0.3	0.2
Beeshoek	L	66.0	2.5	1.5	–	–	0.1	0.08	6.06	0	+	0	0	0	0	0.8	0.5	0.8	0.5
Asia																			
Chowgule	P	66.0	2.10	1.75	0.08	1.0	0.004	0.06	5.83	0	+	0	+	0	0	0.5	0.3	0.1	0.1
Australia																			
Mt. Newman	L	67.0	2.0	1.0	0.06	0.1	0.007	0.04	4.48	++		0	+	0	+	2.2	1.5	2.2	1.5
Hamersley	L	66.0	2.5	1.4	0.08	0.11	0.015	0.050	5.96	+		0	+	0	0	2.5	1.6	2.5	1.6
Cockatoo	L	67.0	2.3	1.1	0.2	0.2	0.01	0.03	5.37	0	–	0	0	0	0	2.0	1.4	0.5	0.3
Koolan	L	69.0	0.6	0.4	0.2	0.2	0.01	0.015	1.74	0	–	++		0	0	2.5	1.8	–	
Savage River	P	67.0	1.9	0.5	0.4	–	0.007	0.015	3.58	0	+	0	+	0	+	2.5	1.7	0.2	0.14

I.E. .... Industrial Experience (+++ excellent, ++ good, + fair, – unsuitable, 0 no experience)
L.T. .... Laboratory, Basket or Pilot Test (+ probably suitable, – unsuitable, 0 no experience)

P .... Pellets
L .... Lump

Table 7.1.5 Parameters of Selected Imported Iron Ore Sources

Name of Supplier	LKAB (Swedish)	CVRD (Brazilian)	Chowgule (Indian)	Samarco (Brazilian)	Savage River (Australian)	Hamersley (Australian)
Kind	Pellets	Pellets	Pellets	Pellets	Pellets	Lump
Chemical analysis						
Fe	67.85 %	67.60 %	66.00 %	67.0 %	67 %	66 %
SiO_2	1.40	1.85	2.10 max.	1.5 – 2.0	1.9	2.5
Al_2O_3	0.40	0.70	1.75 max.	0.5 – 0.7	0.5	1.4
S	0.004	0.005	0.04	tr – 0.02	0.007	0.015
P	0.014	0.030	0.04 max.	0.01 – 0.06	0.015	0.050
Cold crushing strength	270 kg/pellet	350 kg/pellet	220 kg/pellet	200–225 kg/pellet	200 kg/pellet	
Size	–5 mm 3 % 5–9 mm 6 % 9–16 mm 85 % +16 mm 6 %	8–18 mm 90 % min. –5 mm 4 % max.	9–12 mm 90 % min. –5 mm 3 % max.	–6 mm 3–5 %	9–16 mm 90 % –5 mm 4 %	6–30 mm 97.5 % min.
Loading port	Narvic	Tubarao	Mormugao	Point Ubu	Port Latta	Port Dampia
Nautical miles	13,580	9,600	3,045	9,500	4,700	2,700
Max. size of vessel (DWT)	160,000	260,000	60,000	150,000	90,000	160,000
FOB (DMT) (Fe base)	US$ 29.48 (67%)	US$ 29.48 (67%)	US$ 24.42 (66%)	US$ 29.26 (66.5%)	US$ 25.46 (67%)	US$ 17.16 (66%)
FOB (Unit)	US¢ 44	US¢ 44	US¢ 37	US¢ 44	US¢ 38	US¢ 26
Frt (DMT)	US$ 8.50	US$ 9.08	US$ 8.75	US$ 9.00	US$ 8.28	US$ 5.43
C & F (DMT)	US$ 37.98	US$ 38.56	US$ 33.17	US$ 38.26	US$ 33.74	US$ 22.59
Capacity of pellet plant (t/y)	Malmberget: 3,000 × 10^3	No. 1: 2,000 × 10^3 No. 2: 3,000 × 10^3	No. 1: 550 × 10^3	No. 1: 5,000 × 10^3	No. 1 – No. 5 (500 × 10^3) × 5 = 2,500 × 10^3	
(Shipped to DR plant, 1978)	(1,400 × 10^3)	(1,500 × 10^3)		(500 × 10^3)		
Proposed purchasing quantity for the project (t/y, 1st stage)	350,000	350,000	200,000	300,000	200,000	365,000
Comments	Highly evaluated in industrial experiences	Highly evaluated in industrial experiences	Laboratory tests show probably suitable	Supplied to existing DR plants	Reduction tests show good results	Geographically nearer, industrial experience shows fair results.

Note: LKAB — Luossavaara-Kiirunavaara A.B.
CVRD — Cia. Vale do Rio Doce

(As of June 1979)

The idea of pelletizing with import pellet feed has been excluded from the 1st stage of the project (annual requirement of iron ores of 1.77 million tonnes), because the minimum optimum capacity of a pellet plant would be 3 million tonnes per year. At some future day (2nd stage) when the requirement of iron ore increases and the development of domestic iron ores becomes practicable, the manufacture of pellets would be considered.

(4) Transportation

i. Basic concept for reduction of ocean freight

There are two main factors affecting the transportation cost (freight rates) for receivers of bulk cargos like iron ores. One is whether the receiver is equipped with a large scale discharging port for bulk cargo. The other is the location of the receiver's discharging port. Freight rates vary depending upon whether the loading port of following or return cargo is located near or distant from the discharging port of iron ores, and whether or not the chances to find succeeding or return cargos are frequent .

ii. Optimum vessel size and freight rates

a. Cargo combination will be employed source-wise.

Vessels of 50,000 to 100,000 DWT have been selected for Australian and Indian iron ores among the selected sources, considering the annual purchase (0.75 million tonnes) and voyage days (approx. 10 days between Australia and Thailand).

It is, however, desirable to employ ore-oil carriers (O/O) for Brazilian and Swedish sources. Namely, cargo combinations are as follows:

CVRD: Tubarao (loading pellets) → Thailand (unloading pellets) → Persian Gulf (charging oil) → UK & Continental (discharging oil) → Tubarao

LKAB: Narvic (do) → Thailand (do) → Persian Gulf (do) → UK & Continental (do) → Narvic

b. Freight rates for the study are calculated on the basis of the concepts as explained as above. Since freight rates fluctuate from time to time depending upon then prevailing freight market, in order to obtain long-term freight rates, the calculation for the study has been made on the basis of the cost of 80,000 DWT ore vessel and 150,000 DWTO/Obuilt in 1978.

Actual freight rates will reflect the then prevailing market situation, but in the long run it is expected that the average rate of such fluctuation is close to the freight rates based on the cost.

7.2 Scrap

(1) Supply Sources

At present, domestic scrap does not meet the demand from domestic EAF steelmakers (melting capacity: approx. 550,000 t/y). Although no reliable statistics are available, approx. 400,000 tonnes of scrap are consumed by present steelmakers, and the balance is covered by imports.

Accordingly, both imported and return scraps have been taken into consideration for the project. The major source of imported scrap is firstly the United States who is exporting scrap to various countries. Australia, who is exporting scrap to Southeastern Asia, can also be a supply source.

Heavy melting scrap Nos. 1 and 2 of U.S. scrap standard are considered from the viewpoint of safety in EAF operation and stable supply and quality of scrap.

The price of scrap fluctuates drastically depending upon the general economic situation. In the study, C & F Thailand price of No. 1 heavy melting scrap is taken as US$150 per tonne on the basis of market price during April to June 1979. The study is made on the premise of general bulk carrier of 25,000 DWT and the discharging rate of 2,500 tonnes per day.

(2) Transportation

Table 7.2.1 shows sizes of vessels employed for each scrap source. Efficiency of discharging produces significant influence on freight rates and eventually on the cost of imported scrap. Specialized scrap carriers equipped with cranes and magnets, and generator have high efficiency in discharging and can carry out self-discharging. However, as specialized scrap carriers are very few in numbers, it is rather difficult to secure a sufficient number of the carrier in a stable manner. The port of this project, therefore, should be provided with shore cranes, magnets, hydraulic grabs and chutes for discharging scrap from general bulk carrier.

Table 7.2.1 Size of Vessel for Each Scrap Source

Sources	Type of vessel	Size of vessel (DWT)
U.S.A.	General bulk carrier	15,000 ∿ 30,000
	Specialized scrap carrier	20,000 ∿ 25,000
Australia	Specialized scrap carrier	18,000 ∿ 23,000

7.3 Ferroalloys

As ferroalloys are mostly produced by the process of electric arc furnaces, they are characteristically produced in countries where electric power costs are low, even where steelmaking is not a major industry. The ore producing countries or those which can purchase ores cheaply have competitiveness in cost and are main supply sources in the world.

(1) Ferrosilicon

Ferrosilicon (Fe-Si) is being produced in Thailand at around 2,800 tonnes per year. However, the quantity is not sufficient to meet the demand from existing EAF steelmakers, and no part of it can be expected to be supplied to this project. Therefore, it is assumed that Fe-Si is purchased from overseas. Although Fe-Si manufacture is planned in Thailand, it will be taken into consideration after it has started production. The major supply sources are shown in Table 7.3.1.

Since Fe-Si manufacture, as above-mentioned, consumes a large amount of electric power, the rate of power cost in total production cost is relatively high. Norway, where the cost of electric power is inexpensive, is therefore selected as a major supplier of Fe-Si in the study.

Historically, the price of Fe-Si has widely fluctuated sharply reflecting supply and demand position in the world market. In the study the evaluation of a price has been made on the basis of market prices during April to June 1979.

Table 7.3.1 Supply Sources of Ferrosilicon

Sources	Estimated production capacity (tonnes/year)	Estimated exportable quantity (tonnes/year)	Comments
Norway	350,000	340,000	Mainly exported. Competitive prices, based on low power cost.
France	250,000	80,000	High quality. Stable delivery, but high production cost.
Spain	60,000	20,000	
Yugoslavia	100,000	50,000	Slightly inferior stability of quality and delivery.
India	75,000	40,000	Geographically nearer. Sharply influenced by market. Unstable delivery.

(2) Ferromanganese

At present around 3,000 tonnes of ferromanganese (Fe-Mn) are produced yearly in Thailand. However, this quantity is not sufficient to meet the demand from existing EAF steelmakers, and no part of it can be expected to be supplied to the project. Therefore, all of the required quantity are to be imported as presumed in the study. As some occurrences of manganese ore deposits in Thailand have been reported and new plans for Fe-Mn manufacture are under consideration, the use of locally manufactured products will be discussed after the local production has started. Comparing to Fe-Si, the rate of electric power cost of Fe-Mn is not relatively high but instead the rate of ore cost is high. Therefore, the ore producing countries and those which can purchase ores cheaply have competitiveness in cost and are main sources in the world. The principal Fe-Mn supply sources are shown in Table 7.3.2. The Indian source is selected for cost calculation. A price of Fe-Mn tends to follow the U.S. market trends, and it has been set on the basis of market prices during April to June 1979.

(3) Strategy of Procurement

There are such problems related to the procurement as supply instability during high-price period and difficulties of securing vessels in a good timing. To secure stable supply and price, it is recommended to diversify the supply sources of ferroalloys and at the same time to conclude a long term contract for part of the quantity required. In selecting supply sources, due consideration should be given to general situation of supplying countries and reliability of suppliers.

Table 7.3.2 Supply Sources of Ferromanganese

Sources	Estimated production capacity (tonnes/year)	Estimated exportable quantity (tonnes/year)	Comments
Norway	380,000	350,000	Stable delivery
France	370,000	170,000	Stable delivery Advantage in ore procurement
Spain and Portugal	230,000	110,000	Stable delivery
India	170,000	100,000	Produces ore as well Unstable delivery
Brazil	120,000	50,000	Produces ore as well

7.4 Burnt Lime

As shown in Figure 7.4.1, limestone deposits are found throughout most of Thailand. For the project, two deposits, one some 80 km and the other 150 km to the east of the proposed site at Laem Chabang, are selected as supply sources. In the former deposit, limestones extend 30 km from east to west and 50 km from north to south, in the latter, they extend 10 km east to west and 20 km north to south respectively. Although these deposits have not been surveyed in detail, the quality of limestones has been reported to be favourable in a reconnaissance survey by Dept. of Mineral Resources. Table 7.4.1 shows chemical analysis of some limestones sampled.

Table 7.4.1 Chemical Analysis of Limestones Sampled at South-east Thailand

(%)

Locality	CaO	Al_2O_3	SiO_2	Fe_2O_3	MgO	P_2O_5	SO_3	L.O.I.
Rayong	53.42	tr	1.19	0.17	1.60	0.07	0.01	43.38
B. Muang	55.77	tr	0.21	0.01	0.35	0.02	tr	43.42

L.O.I.: Loss on Ignition

In consideration of the distance between the limestone deposits and the proposed site of the project, it is assumed that a calcination plant will be installed at a place near the limestone deposits above-mentioned, and burnt lime will be transported to the site by State Railway of Thailand and supplied the project at a contract basis. Because almost twice as much limestones are required to obtain a lot of burnt lime.

According to the mineral statistics of Dept. of Mineral Resources, 706,309 tonnes of limestones were produced domestically in 1977, and of this total, 347,585 tonnes were consumed for cement manufacture.

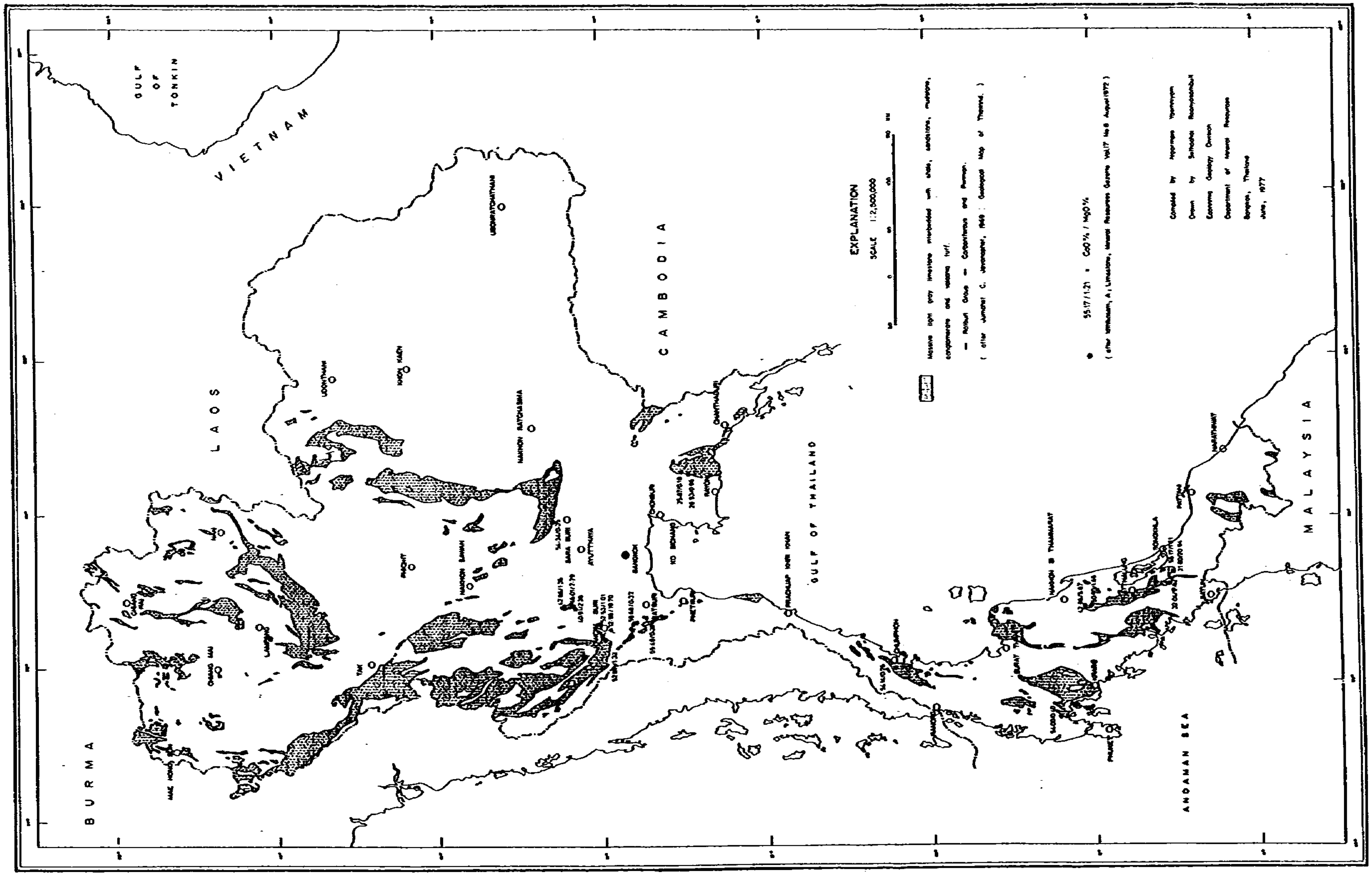

Fig. 7.4.1 Limestone Deposits in Thailand

7.5 Fluorite

Required quantity of fluorite for steelmaking (metallurgical grade) can be covered by domestic production. As a very few industries consume fluorites, most Thai fluorites are being exported (Ref. to Table 7.5.1). As shown in Figure 7.5.1, fluorites exist mainly in three regions in Thailand, namely the northern, central, and southern regions. Metallurgical grade of fluorite is mainly supplied from the northern region, and it is assumed that fluorite from the northern region will be the supply source for the project.

Table 7.5.1 Production and Export of Fluorite in Thailand

Year	Item		Tonnes
1975	Production	Ore	286,149
		Acid grade	52,501
	Domestic consumption		385
	Export	Metallurgical grade	174,160
		Acid grade	36,336
1976	Production	Ore	200,364
		Acid grade	53,322
	Domestic consumption		76
	Export	Metallurgical grade	187,776
		Acid grade	104,432
1977	Production	Ore	239,805
		Acid grade	54,826
	Domestic consumption		26
	Export	Metallurgical grade	184,792
		Acid grade	56,908

Source: Department of Mineral Resources, Bangkok, 1977.

7.6 Miscellaneous

As for miscellaneous materials, aluminium as deoxidizer, and carburizing material for adjusting a carbon content of steel will be listed. Scrap aluminium from aluminium processors, who import aluminium ingots, is used as deoxidizer, and fragments of electrode and coke breeze are considered as carburizing materials. However, there are no aluminium smelters and electrode manufacturers in Thailand. For the study, it is assumed that the former will be imported from Australia, and the latter from Australia and Japan.

7.7 Quantity of Purchase, Consumption and Inventory

The yearly quantities of purchase, consumption and inventory calculated on the basis of the production scheme are shown in Table 6.6.5.

Inventory is based at three months' supply of imported materials, and one month's supply of domestic ones. However, burnt lime only is set at two days' stock for the prevention of deterioration.

Stockyards and a warehouse have been designed to be enough for the said materials (Refer to Section 15.1).

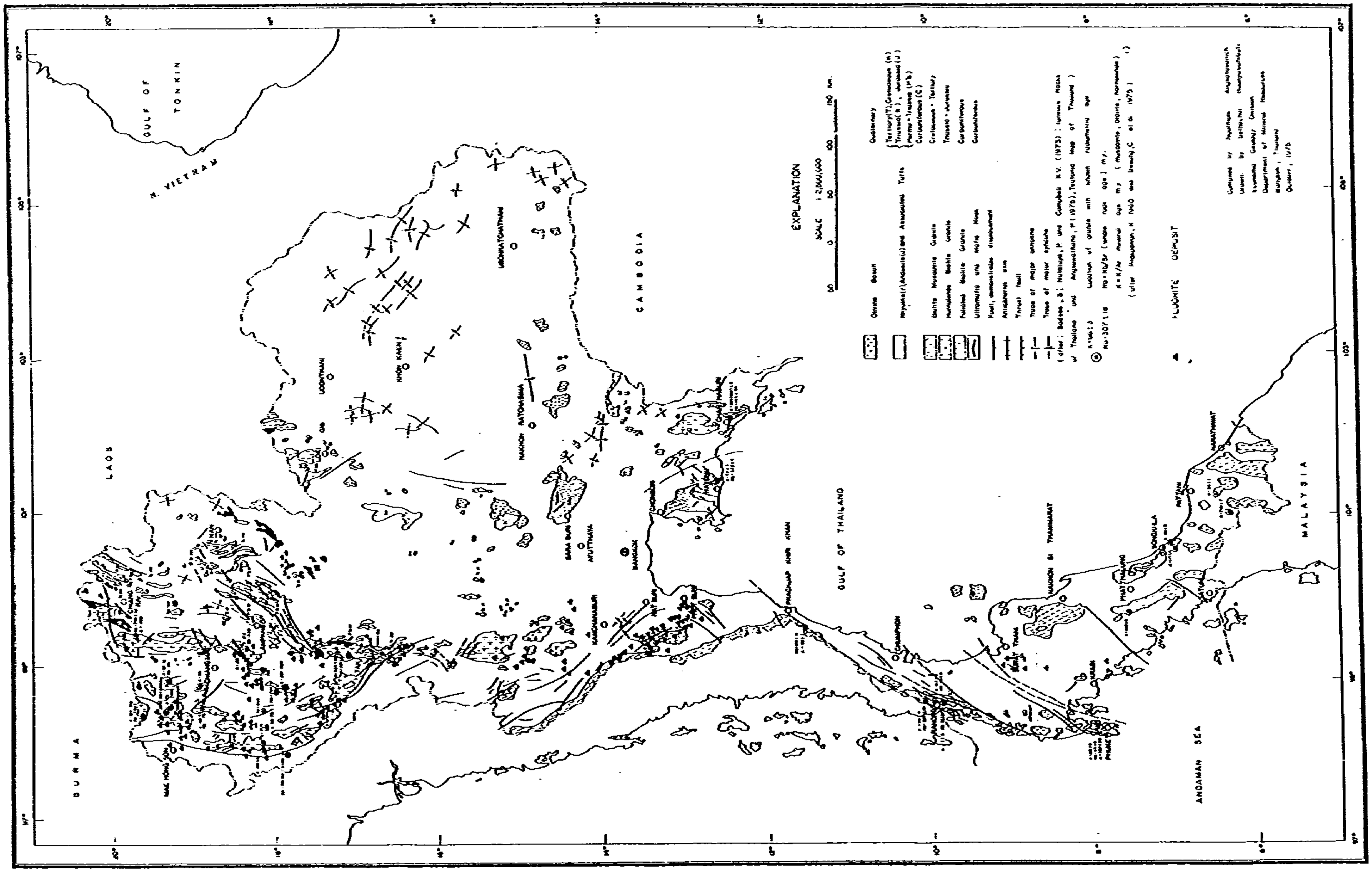

Fig. 7.5.1 Fluorite Deposits in Thailand

CHAPTER 8

NATURAL GAS, ELECTRICITY AND WATER

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8.1 Natural Gas

(1) Development Plan

Since the Royal Thai Government established a programme to explore the natural gas and oil in the Gulf of Thailand in 1971, presence of two gas fields of a commercial size has been identified. They are Union field and Texas Pacific field, and the total estimated gas reserve of the two fields is expected to be 5 trillion cubic feet, this amount being 500 MMSCFD (million standard cubic feet per day) or equivalent to the consumption for about 25 years.

For the purpose of exploiting the natural gas, the Natural Gas Organization of Thailand (NGOT) was founded in March, 1977. The NGOT's development plan outlines that the Natural Gas Project will have complete production facilities, transmission pipelines and compressor facilities so as to permit the supply of natural gas to commence in the mid-1981.

As shown in Fig. 8.1.1, a total of the outputs will, according to the natural gas production plan, reach 500 MMSCFD in 1984; initially the Union field will have an output of 150 MMSCFD, and subsequently including an output from the Texas Pacific field.

As shown in Fig. 8.1.2, gas transmission pipelines are to run from the landing point near Sattahip up to the power station in South Bangkok. In order to transmit gas up to the projected site on which the steel plant is to be built, installation of some lateral pipelines to Laem Chabang or Sattahip is necessary.

The natural gas utilization plan includes the multiutilization that gas will replace the heavy oil currently used at the South Bangkok power station run by the Electricity Generating Authority of Thailand (EGAT), gas will be chiefly used as a fuel for thermal power generation at such as the Bang Pakong new power station, gas will be used as the fuels or feedstocks at the steel plant currently under the study or by other large-sized industries to be newly developed in future, or as the source of LPG to supply it to the domestic households and other places.

(2) Utilization of Gas in the Steel Plant

In the steel plant, natural gas is used as a reductant in DR process, as a fuel for slab reheating furnaces, coil annealing furnaces and steam boilers, and as an energy in the surface scarfing or cutting of slabs. With the steel plant, gas consumption in the 1st stage will be 54 MMSCFD, and 86 MMSCFD in the 2nd stage, or 49 SCF (standard cubic foot) per tonne of product (or 480 Nm^3/t, and 17,000,000 BTU/t or 4.3 Gcal/t in heat consumption). Fig. 8.1.3 shows these consumptions and their breakdown.

It is generally recognized that natural gas composition depends on each production well and also production condition. As long as the natural gas is of ordinary kind (approx. 1,000 BTU/cu ft in heat value), it is good enough for use at the steel plant. The sulphur in natural gas unfavourably shortens the life of the catalyzer in the gas reformer in the DR process. With the present study, the natural gas composition is assumed as shown on Table 8.1.1. The sulphur in the natural gas is assumed to be 60 grains/100 SCF (1.5 g/Nm^3) in terms of H_2S, and the DR plant is to be equipped with a desulphurization system for the gas used as reductant gas.

Table 8.1.1 Characteristics of Natural Gas

Chemical composition	
Nitrogen	0.6% in vol.
Methane	71.6
Carbondioxide	16.3
Ethane	8.1
Propane	2.2
Butanes	0.9
Pentanes	0.2
Hexans	0.1
Heat value	
Gross	965.7 BTU/SCF or 9,064 kcal/Nm^3
Net	877.2 BTU/SCF or 8,233 kcal/Nm^3

(3) **Price of Natural Gas**

The base price of the gas that the NGOT buys from Union is $1.04/ 1,000,000 BTU (1976), but that from Texas Pacific is still pending. Although charge system for the gas that the NGOT will sell to consumers has not yet been established, it is presumed that a sales price will be set somewhere between the NGOT's purchase price plus its cost (for transmission and treatment of gas) and existing fuel price by heavy oil. In 1978 the EGAT, the biggest natural gas consumer to be in Thailand, bought the fuel oil at 1.5885 bahts/ℓ for its South Bangkok power station. With a view to the character of the Thailand Natural Gas Project that imported oil be promotively switched to home-produced gas to cut the payment of foreign currencies, it is likely that the Thai gas will be sold at a price lower than that of the fuel oil referred to above. The less expensive price also comes from the fact that the steel plant site is shorter in distance from the gas landing point than to the South Bangkok power station, indicating that gas transmission cost is somewhat lower.

With the above factors taken into consideration, the present study assumes the gas price to be $1.70/million BTU, based on which financial analysis will be made hereafter. The price is 15% lower than the price of above referred fuel oil. Table 8.1.2 shows the gas prices in terms of various units.

The above gas price results that the gas purchase price per tonne of steel products is about 30 dollars on the average of various products.

Table 8.1.2 Gas Price in Various Units

US dollar per million BTU (gross)	1.70
US dollar per thousand Nm^3	61.2
US dollar per million kilocalories	6.75

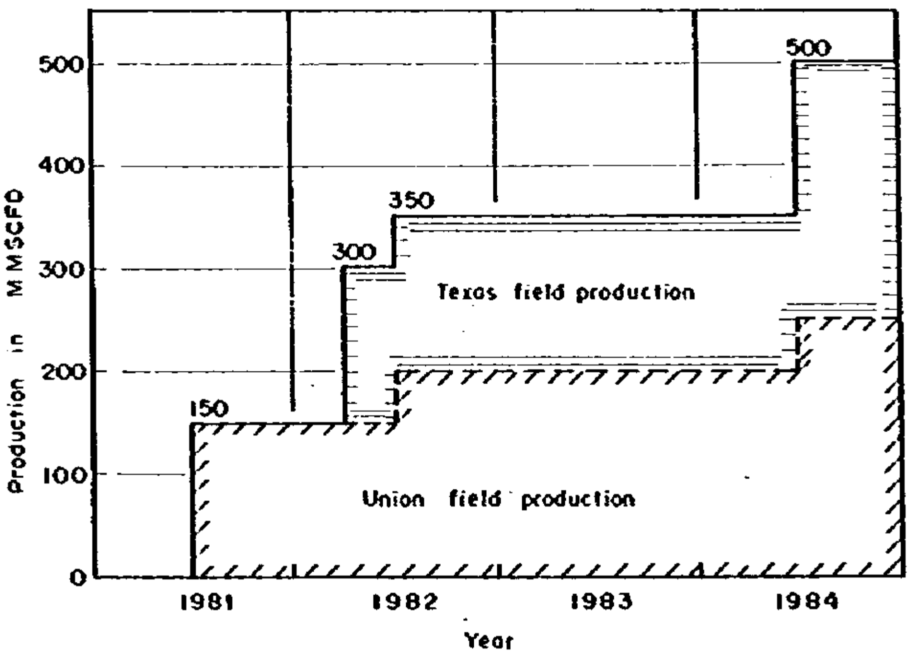

Fig. 8.1.1 Natural Gas Production Plan (Source: NGOT)

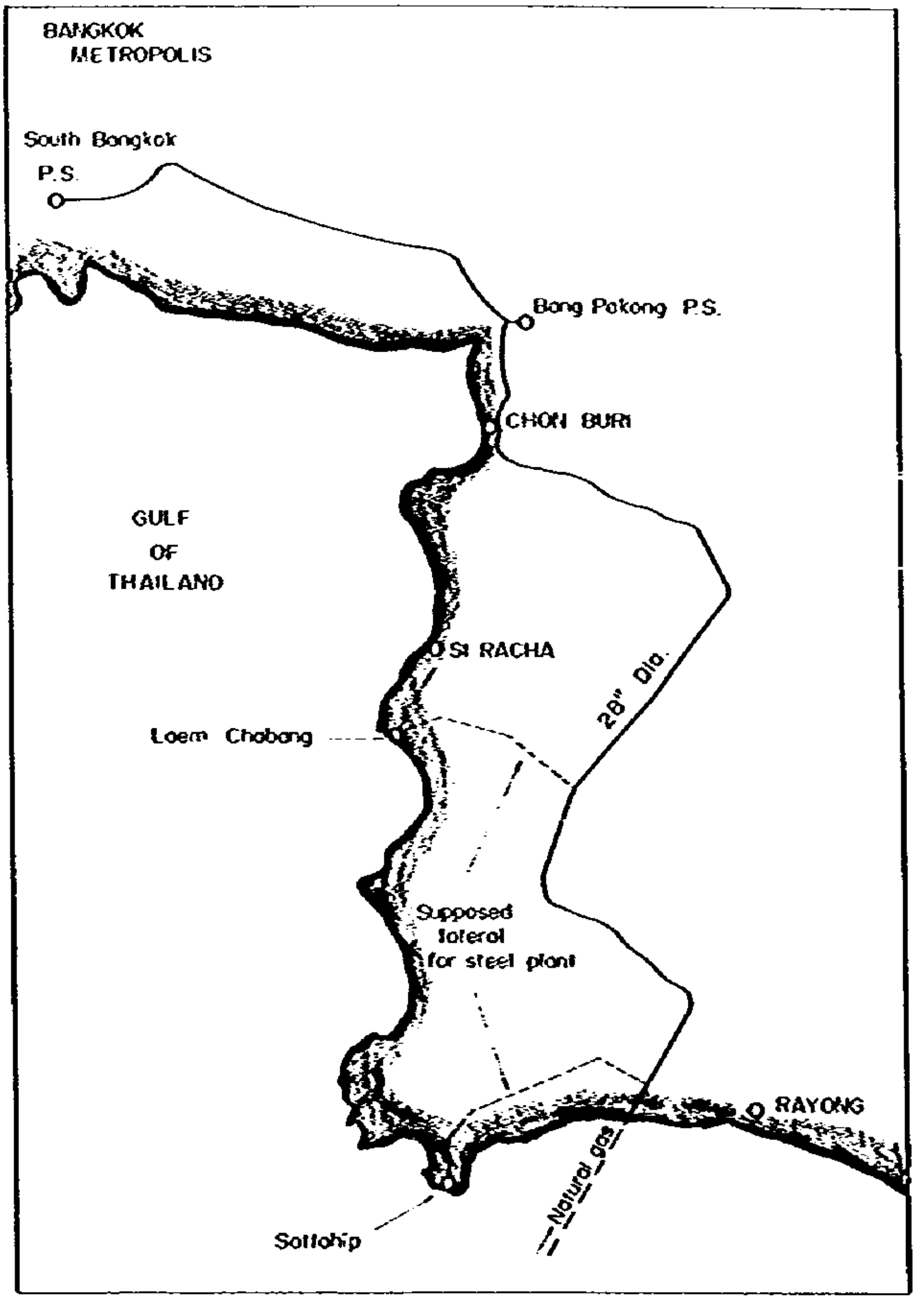

Fig. 8.1.2 On-shore Pipeline Route of Natural Gas (Source: NGOT)

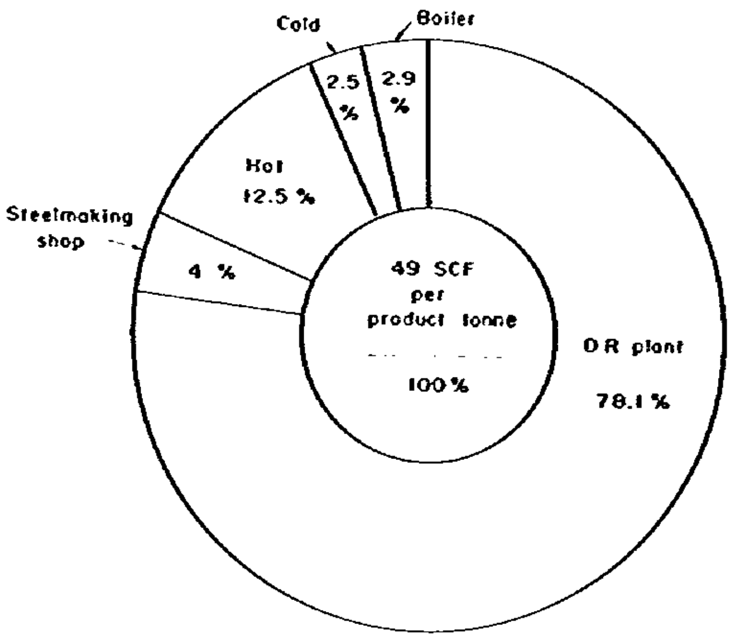

Fig. 8.1.3 Natural Gas Consumption in the New Steel Plant

8.2 Electricity

(1) Development Plan

In Thailand the demand for electricity has been increasingly accelerated every year due to more electrification and industrialization, and the annual growth in power generation between 1970 and 1977 reached as high as 15%. In terms of kWh/capita, an increase of 11% was observed during the same period. The EGAT's demand for electricity in 1977 registered 1,900 MW. In 1977, 30% of the electricity was supplied by hydropower and 67% by thermal power. Future major power resources developments involve a hydropower station in the central and western Thailand, a thermal power station (using lignite) in Mae Moh, and another thermal power station in Bang Pakong. And the total generating capacity in 1984 is estimated to reach 4,300 MW. Fig. 8.2.1 shows a power development plan by EGAT.

It is assumed that the steel plant demand power in the 1st stage will be 240 MW in 1984 and 360 MW in the 2nd stage in 1989, equivalent in both stages to 7% of the peak generation planned by the EGAT. Upon decision on the provision of the integrated steel plant project,the EGAT will be required to work out a power resources development plan and a strengthened power distribution network plan in which the steel plant demand for electricity is incorporated.

(2) Steel Plant Terms for Incoming Electricity

The steel plant is to use electric arc furnaces for steelmaking, and will consume about 1,400 kWh of electricity per tonne of product, the value being equivalent to the consumption of 2 to 2.5 times that by the BF/BOF route. Fig. 8.2.2 shows the breakdown of power consumption. As shown, 63% of the electricity will be used at the steelmaking shop. The electricity for utilities is classified into 8% for pump driving, and 1.5% for air separating unit in which oxygen is produced, and 1.2% for compressed air supply to each mill.

The total annual power consumption in the 1st stage will be 1,600,000,000 kWh, and 2,500,000,000 kWh in the 2nd stage. The hourly peak demand in the 1st stage will be 240 MW, and 360 MW in the 2nd stage. The required incoming installed capacity to meet the power demand in the 2nd stage is presumably about 450 MVA. Although the voltage of the transmission system currently use by the EGAT is 230 kV and 115 kV, it is necessary to have incoming electricity at 230 kV to meet said incoming capacity, 450 MVA electricity has to be supplied at 230 kV by the EGAT up to the receiving end of the steel plant. Table 8.2.1 shows the terms for incoming electricity.

(3) System Short-circuit Capacity and Flicker Compensation

Of the power load of the steel plant, the load on electric arc furnaces and rolling mills always largely fluctuate during operation. These load fluctuations particularly a reactive power fluctuation cases a voltage fluctuation in the electric transmission system, possible resulting in a flicker trouble. In order to avoid this, a system short-circuit capacity must be large enough. With the steel plant project, there will be no flicker trouble caused as long as the short-circuit capacity at the 230kV supply point is 8,500 MVA in the 1st stage. Should short-circuit capacity be less than the above figure, it is necessary to provide a static VAR compensator or a rotary condenser. Since there is a limitation in solving the flicker trouble only through the static VAR (Reactive power) compensator, the use of rotary condenser will also be required where short-circuit capacity is less than certain levels (3,000 MVA in the 1st state). Even in such a case, when short-circuit capacity is extremely small, a detailed study will be necessary, because there is a limit within which rotary condenser can be operated stably. With the present study, the short-circuit capacity of the incoming system at the start-up of the steel plant is assumed to be 2,000 MVA for permitting an equipment plan to be proceeded.

In implementing the steel plant project, it is of importance to make sufficient study, through a joint effort with the EGAT, as to the system short-circuit capacity.

(4) Electricity for Construction

Although the requirement of electricity for construction differes depending on the ground condition of the site, the method of ground improvement, and construction schedule, assuming that a general construction method will be employed, the required power will be about 13 million kWh, and incoming installed capacity of 4,000 kVA.

(5) Price of Electricity

The price of electricity used for the financial analysis by the study is the special rate of the current charge system (applied since August, 1977) applied to the electric smelting industry. Table 8.2.2 shows the derivation of the price. As shown, the electricity charge consists of demand charge and energy charge, but for the purpose of financial analysis, a combined unit price of 0.62 bahts/kWh will be employed. With this unit price, the average electricity purchase cost per tonne of steel products will be about 890 bahts/tonne (or $43.50/tonne).

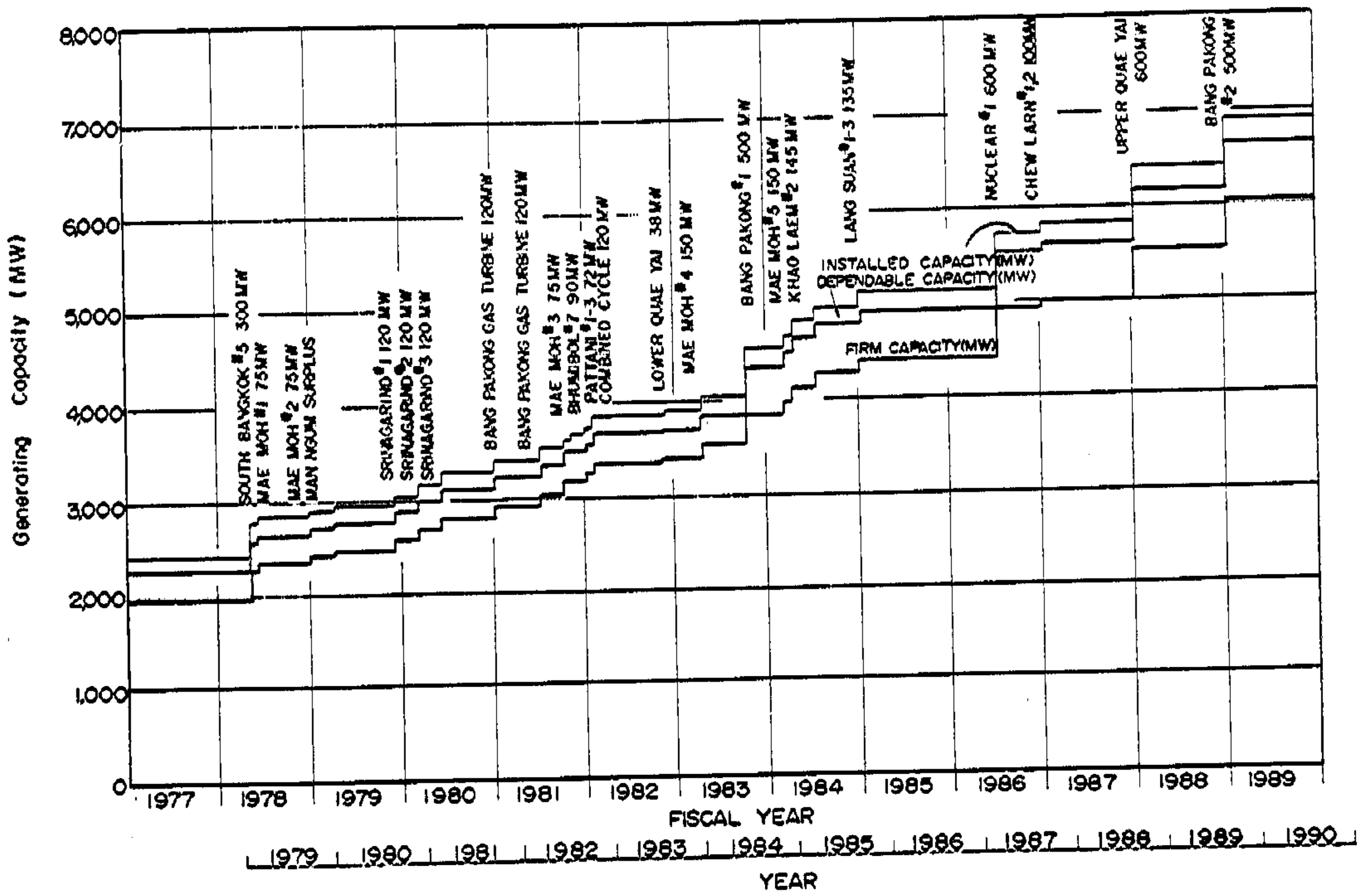

Fig. 8.2.1 Power Development Plan of EGAT (Source: EGAT)

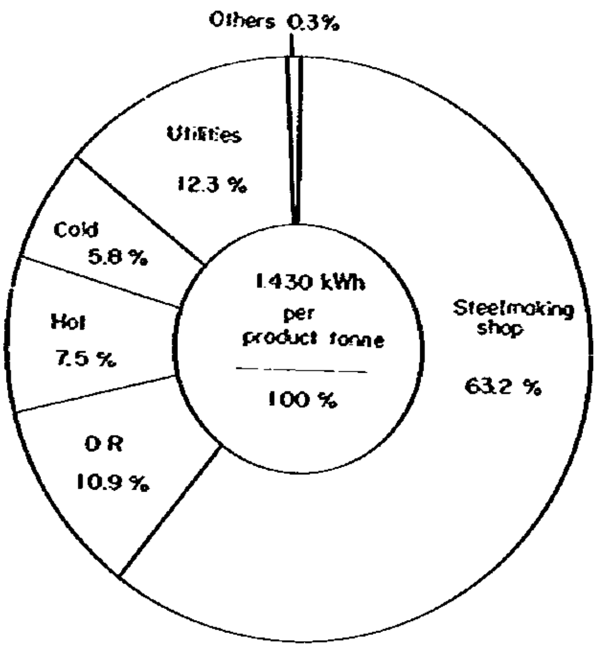

Fig. 8.2.2 Electric Power Consumption in the New Steel Plant

Table 8.2.1 Electric Power Receiving Conditions

Voltage	230 kV
	Directly grounded at neutral point
Frequency	50 Hz
No. of phase	3 phase (3 wire)
No. of circuit	Double circuits
Capacity of circuit	450 MVA per circuit
Max. power demand	
1st stage (1984)	240 MWh/h
2nd stage (1989)	360 MWh/h

Table 8.2.2 Price of Electricity

Assumption in the 1st stage:
Demand power 240,000 kW
Monthly consumption 131,400,000 kWh

Kind	Rate	Calculation
Demand charge	18,000 kW or less 58 Bahts/kW	58 x 18,000 = 1,044 x 10^3 Bahts
	Over 18,000 kW 56 Bahts/kW	56 x (240,000 – 18,000) = 12,432 x 10^3 Bahts
Energy charge	0.52 Bahts/kWh	0.52 x 131,400 x 10^3 = 68,328 x 10^3 Bahts
Total		81,804 x 10^3 Bahts
Overall unit price	81,804 x 10^3/131,400 x 10^3 = 0.62 Bahts/kWh	

8.3 Water

(1) Water Use and Source

The required amount of industrial water for the steel plant in the 1st stage will be about 50,000 m^3/day, and about 70,000 m^3/day in the 2nd stage. The industrial water will, as shown on Table 8.3.1, be used to make-up the circulated cooling water, treat products in the cold rolling process, and by the boilers. The designed rate of make-up water against the amount of circulated cooling water is 4.5%, indicating a high utilization rate of water.

It is mandatory that industrial water be kept supplied stably by the public service up to the steel plant. As there is no water rich river available near the proposed steel plant site as a water supply source, the steel plant has to have dependence on a reservoir. When the steel plant is to be located in Laem Chabang, the existing Ban-Phra reservoir will be subject to a study as a water supply source, and if located in Sattahip, the existing Dok-Krai reservoir will be picked up for study. In analysis of water supply source, annual rainfall, the catchment area of a reservoir, rainwater runoff, and evaporation of the water from a reservoir are considered to determine an amount of water that can be utilized. Further, where a reservoir is used to meet multiple purposes such as for irrigation, drinking, flood control and industry, it is necessary to clarify mutual definite rights and provide the utilization control rules. If any existing reservoir has insufficient capacity to supply water to the steel plant, a synthetic water resources development plan including other water utilization purposes (for irrigation, city water and power generation) has to be designed.

(2) Potable Water and Water for Construction

In addition to the industrial water, the steel plant will need potable water. Further, the water will be also required at the construction stage for the

Table 8.3.1 Water Requirement of the New Steel Plant

(Unit: m^3/day)

	1st stage	2nd stage
Make-up for circulated cooling water	40,600	57,900
Product treating water in cold mill process	5,300	9,800
Steam generating boilers	700	1,200
Total	46,600	68,900

concrete plant. The volume of water to be required is estimated from the number of employees and the amount of concrete to be used as shown in Table 8.3.2. These amounts of water must also be supplied by the public service.

Table 8.3.2 Potable Water Requirement

Year	Potable water (m^3/day)
1st year of construction	60
2nd year of construction	500
3rd year of construction	1,800
4th year of construction	2,200
5th year of construction	2,200
1st stage normal operation	2,200
2nd stage normal operation	3,200

(3) Price of Water

Assuming that the industrial water to be supplied to the steel plant is maintained at a reasonable price as a public service, here 1.5 bahts/m^3 is set for financial analysis by the study, the unit price being marginally lower than the current rural area price of 2.0 bahts/m^3 of potable water. The price of 1.5 bahts/m^3 is nearly compatible with the power cost required by pumping on the basis that the steel plant is located in Sattahip and water from the Dok-Krai reservoir is transferred to the steel plant over a distance of about 50 km via water pipeline. The cost of the construction of the water pipeline and reservoir will, however, have to be separately shared by the Government.

CHAPTER 9

LABOUR AND ORGANIZATION

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9.1 Organization and Personnel

The new integrated flat steel plant will be of a far higher standard both technically and in size when compared to existing steel mills in Thailand. Therefore, in order to carry out the construction and the operations of the new steel plant smoothly, what is the most important is the securing of a large number of qualified managers, engineers and skilled workers.

A study will be made on the organization and personnel for the various stages to promote the construction of the new steel plant.

Moreover, regarding the form of the new steel plant, it is assumed that a new company in the form of a limited liability company will be set up for the convenience of this study, with the actual form to be decided later.

(1) Preparation Stage

Once this project is decided, a new company should be first of all set up and the drawing up of the construction plan for the new steel plant should be initiated. It is presumed that the new company is to be set up 57 months prior to the start of operations. The main activities of the new company are:

a. Selection of an engineering company

b. Securing of the construction personnel

c. Deciding the basic plans for the new steel plant as well as the necessary resources to be used.

d. Obtaining basic agreement concerning the amount and the fund raising of the capital necessary.

e. Obtaining basic agreement concerning the procurement of raw materials and energy.

f. Obtaining basic agreement on the consolidation of the infrastructure, etc.

The organization and personnel for carrying this out are as shown in Fig. 9.1.1 and Table 9.1.1.

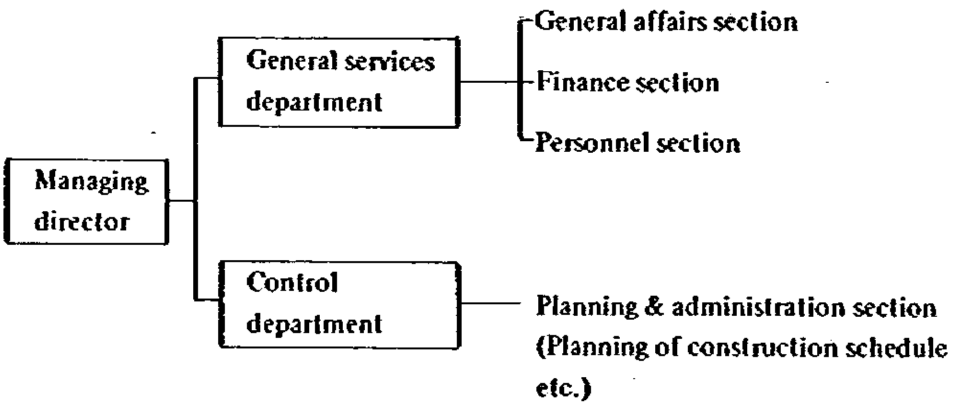


Fig. 9.1.1 Organization at the Preparation Stage

Table 9.1.1 Number of Personnel at the Preparation Stage

	Number of personnel
Managing director	1
General manager	2
Manager	4
Assist.-manager & engineer	12
Total	19

General affairs section	4
Finance section	3
Personnel section	2
Planning & administration section	3

(2) Construction Sage

The construction of the new steel plant begins 3 months after the setting up of the new company (or 54 months prior to the start of operations). The organization and personnel for the new company is expanded as shown in Fig. 9.1.2 and Table 9.1.2.

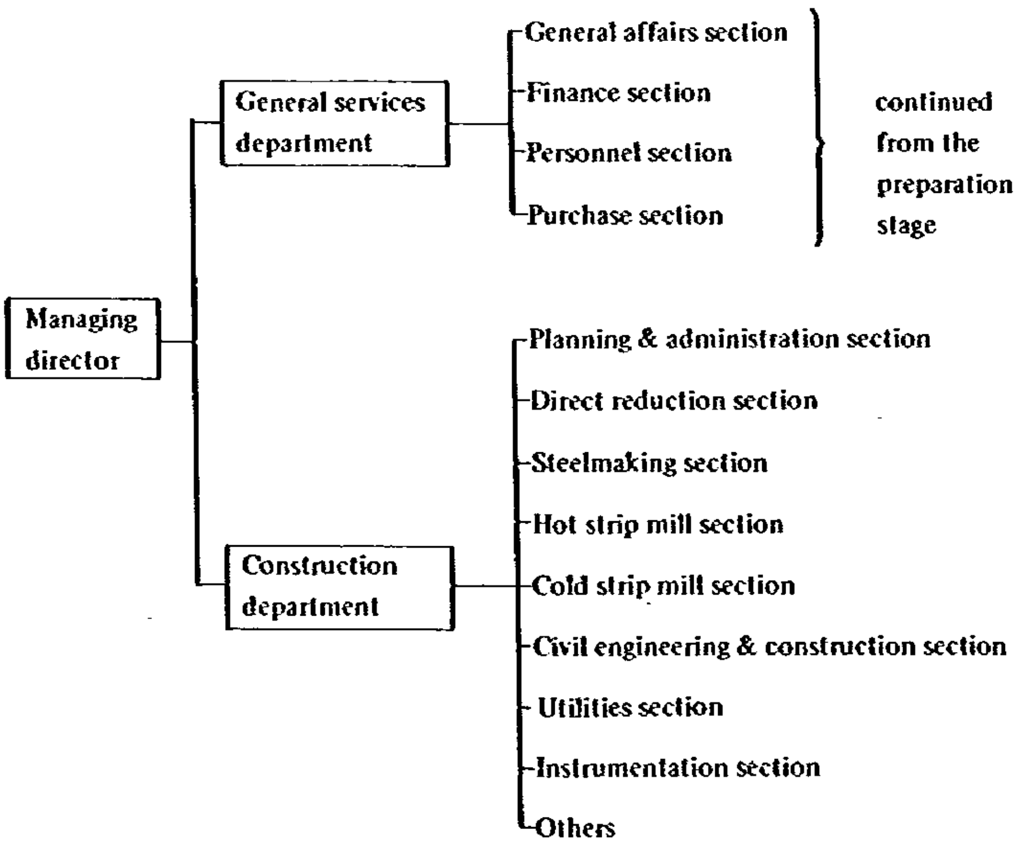


Fig. 9.1.2 Organization at the Construction Stage

Table 9.1.2 Number of Personnel at the Construction Stage

	Number of personnel
Managing director	1
General manager	2
Manger	13
Assist.-manager or engineer	
General affairs	4
Finance	4
Personnel	2
Purchase	3
Planning & administration	4
Direct reduction	1
Steelmaking	2
Hot strip mill	2
Cold strip mill	2
Civil engineering & construction	2
Utilities	2
Instrumentation	2
Others	2
(Sub-total)	(32)
Total	48

Under the initiative of the new company, the engineering company draws up the basic designs, procures the various supplies and equipments and carries out construction work.

Therefore, the main activities of the new company at this stage are:

a. Supervising and coordinating the construction (supervision of the engineering company, etc.)

b. Procuring the capital

c. Coordinating with outside companies or government, etc., and drawing up the contracts.

(3) **Operation Stage (1st stage)**

Various preparations for operations are carried out during the 2nd half of the construction stage. The organization and personnel are to be completely procured 3 months prior to the operations so that the operations will be started up smoothly.

First of all, the organization and personnel at the 1st stage are as shown in Fig. 9.1.3 and Table 9.1.3.

The organization has been drawn based on the actual examples of leading steel mills in Japan and in Thailand. There will be seven departments, i.e. production, maintenance, control, materials and transportation, general services, sales, and purchase. Each of these departments is intended to be further divided into sections to carry out their activities efficiently. When considering the large scale of the personnel and the plant, it is necessary to clarify the authority and responsibilities of each department and section so that the operations will be carried out smoothly.

Moreover, from the fact that the site is located at a distance from Bangkok, it is advisable that the sales, purchase, and finance departments are

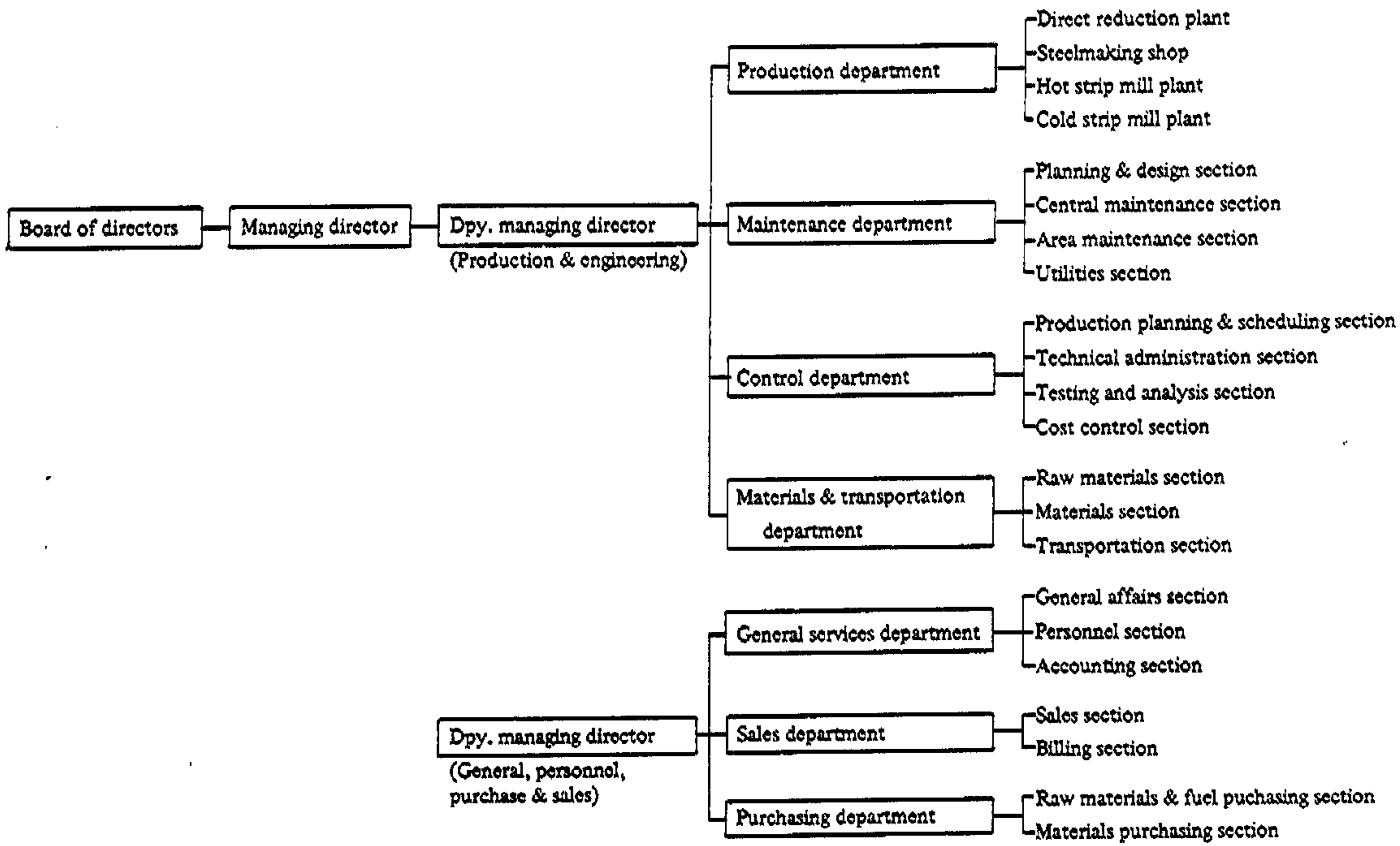


Fig. 9.1.3 Organization at the Operation Stage

Table 9.1.3 Personnel at the 1st Stage

	Staff (including managers)	Foreman & skilled worker	Other worker	Total
Production & maintenance				
Direct reduction	11	10	53	74
Steelmaking	17	89	206	312
Hot strip mill	30	98	280	408
Cold strip mill	33	112	295	440
Utilities	20	52	70	142
Maintenance	141	396	900	1,437
(Sub-total)	(252)	(757)	(1,804)	(2,813)
Control	112	102	125	339
Materials & transportation	32	149	210	391
General services	64	15	59	138
Sales	21			21
Purchase	31			31
Management	10			10
Total	522	1,023	2,198	3,743

Note: Management consists of a managing director, deputy managing directors and general managers.

located in Bangkok while the other departments are located at the site.

Calculation of the personnel has also been based on the examples of leading steel mills in Japan and Thailand. As the most modern facilities are introduced, the labour productivity is of a considerably high level than that of present Thai mills. (322 slab tonnes per capita annually.)

Moreover, concerning the working system which forms the premises for computing the required personnel, this has been set up as shown in Table 9.1.4.

Table 9.1.4 Working System

Item	Contents
Annual leave	66 days (Sundays – 52 days and holidays – 14 days)
Working hours	8 hours with 1 hour recess
Shift	3-crew/3-shift system, continuous operation, in principle, for main plants
Attendance rate	95%
Non-working coefficiency	28.5%, in principle

And, all of the work within the new steel plant are assumed to be done by the plant's employees without any sub-contracting.

Also, it is significant that out of the total workers approximately 30% should be skilled workers (including foremen) and so it is believed that an extremely important task lies in the securing of such skilled workers.

As mentioned earlier, it is necessary that these personnel be secured, in pre-established orders, prior to the start of operations, and that operation manuals be timely prepared, as well as that training of these personnel be carried out likewise. The number of personnel is as shown in Table 9.1.5.

Concerning the workers, employment of a part of the foremen and skilled workers should start 15 months prior to the start of operations and all of the necessary personnel should be completely secured about 3 months before the start of operations.

(4) Operation Stage (2nd Stage)

The required personnel for the 2nd stage is as shown in Table 9.1.6. The total is 4,538 or an increase of approximately 800 persons over the 1st stage, which is an increase of 21.2% and this rate itself is much smaller than the increase in production (57.8% increase on the slab base). This is because of the fact that in an integrated steel mill, the number of fixed personnel such as maintenance personnel is large and these personnel are not directly linked to the scale of production.

The labour productivity (slab base) is raised to a comparatively high level of 419 tonnes per capita annually at the 2nd stage compared with the 322 tonnes at the 1st stage.

9.2 Labour Cost

As the principal composition factors for labour costs there are the basic salary, bonuses, retirement fund, and welfare expenses. The labour costs have been set up as shown in Table 9.2.1 based on the actual situation prevailing in the leading steel companies of Thailand.

The basic salary and the bonus are an average of $133 per month per employee and with the retirement fund and welfare expenses added, the total will be $165 per month.

(1) Basic Salary and Bonus

The basic salary and the bonus are set up by job classification according to

Table 9.1.5 Personnel at Various Stages

	Preparation stage	Construction stage (54 months)								Operation start
	months −57	−54		−18	−15	−12	−9	−6	−3	0
Management	3	3		10	→	→	→	→	→	→
Superintendent or manager	4	13		15	16	18	23	→	→	→
Assist.-superintendent or engineer	12	32		63	102	203	228	244	→	→
Clerk					55	75	84	184	245	→
Foreman					69	162	177	189	→	→
Skilled worker					33	465	710	826	834	→
Semi-skilled worker						6	515	882	975	→
Un-skilled worker						6	6	178	1223	→
Total	19	48		88	285	945	1753	2536	3743	→

Table 9.2.2. Moreover, a bonus corresponding to 3 months of basic salary is paid per year.

Table 9.1.6 Personnel at the 2nd Stage

	Staff including managers	Foreman & skilled worker	Other worker	Total
Production & maintenance				
Direct reduction	11	13	79	103
Steelmaking	19	111	263	393
Hot strip mill	35	121	379	535
Cold strip mill	39	189	452	680
Utilities	20	52	70	142
Maintenance	161	404	919	1,484
(Sub-total)	(285)	(890)	(2,162)	(3,337)
Control	115	134	185	434
Material & transportation	37	207	323	567
General services	64	15	59	138
Sales	21			21
Purchase	31			31
Management	10			10
Total	563	1,246	2,729	4,538

Table 9.2.1 Average Unit Labour Cost

($/capita monthly)

	Unit labour cost
Basic salary	106
Bonus	27
Retirement fund	11
Welfare expenses	21
Total	165

Notes: 1. Payment on bonus per annum is equivalent to three months of basic salary.

2. Retirement fund and welfare expenses are estimated, respectively, 10% and 20% of basic salary.

Table 9.2.2 Basic Salary and Bonus

($/capita monthly)

		Basic salary	Bonus	Retirement fund	Welfare expenses	Total
Production labour	Foreman	171	43	17	34	265
	Skilled worker	112	28	11	22	173
	Semi-skilled worker	88	22	9	18	137
	Un-skilled worker	68	17	7	14	106
Administration	Manager & above (average)	391	98	39	78	606
	Assistant managers & engineers	244	61	24	49	378
	Clerk (average)	112	28	11	22	173
Average		106	27	11	21	165

(2) Retirement Fund

The provident fund system employed at the leading steel companies in Thailand is used. 10% of the basic salary of each employee is put up by the company while 5% is put up by each employee and put into a reserve. This reserve is paid to each employee in a lump sum at the time of his retirement.

(3) Welfare Expenses

For the sake of improving the morale of the employees and to secure the labour force it is necessary to provide welfare facilities such as company housing, dispensary, canteen, co-op, etc. Also, as provided by leading steel plants in Thailand, medical expenses, lunch money, work uniforms, transportation expenses and other assistance, as well as workmen's compensation insurance should be provided with.

The above welfare expenses are set at 20% of the basic salary when considering the actual practice in the leading steel companies in Thailand.

9.3 Training

A large number of qualified managers, engineers, and workers are required for the new steel plant. Therefore, it is necessary not only to expend a great deal of effort in the securing of these highly skilled workers but in order to attain a sophisticated and high level of work it is also necessary to carry out in-company trainings.

Especially, as the new integrated flat steel plant is the first of its kind in Thailand it is most important that the sufficient training be carried out before and after the start of operations.

Therefore, it is assumed that training of the key personnel at the steel mills in the developed countries is carried out before the start of operations while supervisors are invited from steel mills of developed countries at the time of operation to give a necessary guidance for the actual operation.

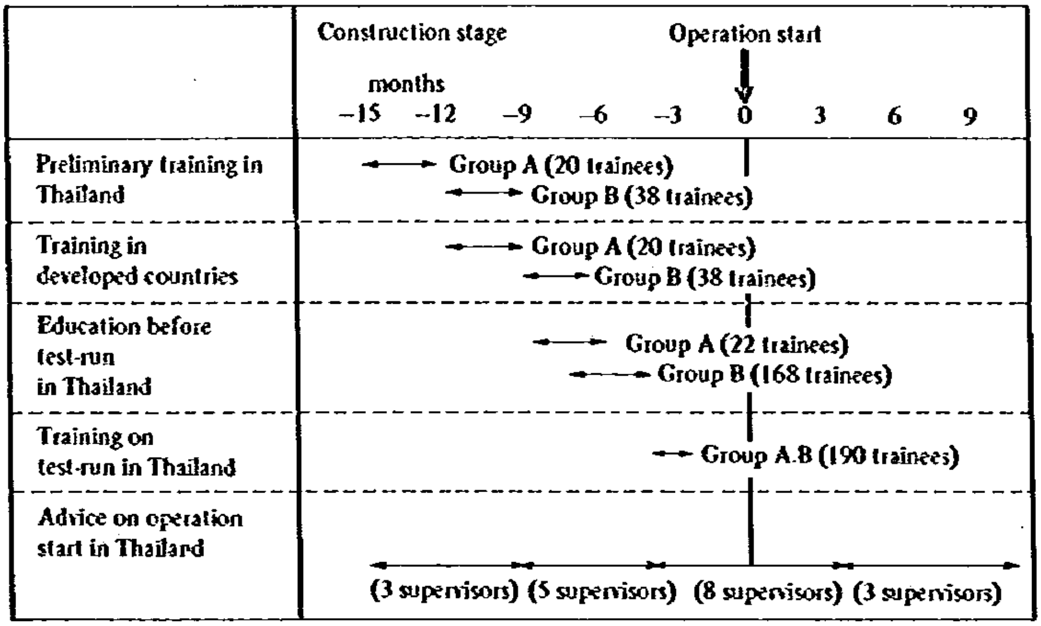
(1) Training before the Start of Operation

Before the start of operations, the key personnel (managers, engineers, foremen, etc.) are sent to developed countries for 2 or 3 months for "on-the-job training" at suitable steel mills.

The number of personnel to be sent to developed countries for training is as shown in Table 9.3.1. The number should be reviewed as the personnel increases. For example, the schedule shown in Fig. 9.3.1 can be applied to the steelmaking shop.

Table 9.3.1 Number of Trainees to be Trained in Developed Countries

	Number of trainees (A)	Training period (B)	Man-months [(A) times (B)]
		months	
Direct reduction plant	19	3	57
Steelmaking shop	58	1.5–3	117
Hot strip mill	29	3	87
Cold strip mill	31	3	93
Utilities	20	3	60
Maintenance	64	3	192
Transportation	6	3	18
Others	13	2–3	29
Total	240		653



Notes: 1. Group A: Auperintendent, assist.-superintendent, engineer & foreman.
Group B: Assist.-superintendent, foreman, skilled & semi-skilled worker.

2. Besides above, advice tours by experts from developed countries are needed, 1.5 & 2 years after operation start.

Fig. 9.3.1 Training Schedule at the Operation Stage (the case of steelmaking shop)

(2) Introduction of Techniques at the Time of Start-up Operation

Although the operations are carried out by the key personnel who have received actual training in developed countries, for the initial stage of the operation, experienced engineers are invited from developed countries (refer to Table

Table 9.3.2 Training Schedule at the Operation Stage (the case of steelmaking shop)

	Number of supervisors (A)	Training period (B)	Man-months [(A) times (B)]
		months	
Direct reduction plant	10	5	50
Steelmaking shop	14	6–12	117
Hot strip mill	11	6–10	90
Cold strip mill	19	6–10	162
Utilities	6	3–6	27
Maintenance	35	3–8	210
Transportation	2	6	12
Others	29	0.5–6	20
Total	126		688

9.3.2 for the necessary number) to give technical guidance for a smooth start-up.

The main subjects which must be carried out during the training before and after the start of operations are as follows:

i. DR plant

a. Raw materials receiving, stocking & supplying
b. Technical control of raw materials preparation
c. Operation of main equipments, and its technical standards
d. Safety & health control

ii. Steelmaking shop

a. DRI receiving & supplying
b. Technical control of steelmaking auxiliary raw materials, scrap, etc.

c. Operation of steelmaking & continuous casting, and its technical standards

d. Safety & health control

iii. Hot strip mill, Cold strip mill

a. Slabs & coils, receiving & supplying

b. Operation of main equipments such as rolling mill, etc., and its technical standards

c. Control of auxiliary equipments such as cranes

d. Safety & health control

iv. Utilities

a. Mechanism of supply of power, water, gas, oxygen, compressed air, etc.

b. Operation of main equipments, and its technical standards

c. Safety & health control

v. Maintenance

a. Organization & control system

b. Standards of repair works

c. Control of parts & components

d. Safety & health control

e. Operation of main equipments

vi. Others

a. Planning of management policy

b. Organization of an integrated steel plant

c. Budget control system

d. Control of production planning system

e. Accounting system

f. Personnel management & labor relations such as salary, welfare system, etc.

g. Transportation system

h. Market survey, price system, etc.

(3) Training during Normal Operation

The following training programme and organization should be set up under the personnel section after the operations are proceeding smoothly.

i. Training for new employees

Among the leading steel mills in Thailand, visited by the survey team, there were many where training was given to new employees according to a set curriculum.

It is necessary to give regular training to new employees based on the plant's own curriculum for a period of 6 months after the employment, under the supervision of the personnel section.

A curriculum should be set up by job classification, such as managers, technicians, clerical staffs, and workers, etc. The curriculum should also include working rules, safety rules, labour management relations, organization, and management, etc.

ii. "On-the-job training"

The new employees who have completed the entrance training course are also given instructions on the job by their supervisors where they are assigned. A training system for the "on-the-job training" must be well organized for effective result but what is important in this case is to carry out the training based on operation manuals. Also, at the beginning, the experts from developed countries, as well as the superintendents will take an initiative in carrying out the training so that the system should be prevailed in the working place.

iii. Other training

Regular training courses for the managerial class should be conducted for managers, potential clerical staffs to be managers, and foremen, etc. The objectives of these courses are to implant among those that they are the key men of the company, as well as to build up their will to participate in management, thus heightening their loyalty and having the operations of the mill carried out smoothly.

For example, some effective ways would be to select several able employees to receive training in developed countries, or at the training facilities in Thailand. Another way would be to invite specialists to provide with courses on certain specific fields.

iv. Setting-up of a company training centre

It is assumed that a training center is set up since training in a well-equipped training center is the most effective way to train the workers.

9.4 Necessary Factors for Smooth Operations

(1) Setting-up of Rationalized Wage System and Promotion System

The introduction of an efficiency pay system as well as the setting up of a retirement fund system, and a rational promotion system are also considered important from the context of heightening the morale of the employees (including the managers).

(2) Preparation of Operation Manuals

Before the start of operations, it is important to prepare a manual for each operation. This is an important job that should be done at the training stage before the start of operations. Also, even after the start of operations, it is necessary to obtain the assistance of experts from developed countries for the necessary preparations.

(3) Promotion of Voluntary Control Activities

In Japan, the foreman and the group leader, etc. form a central body to carry out voluntary control activities. An objective is set up in each group so that all the members of the group cooperate each other to attain it.

Some of the objectives are to lower costs, to increase productivity and to reduce accidents.

This type of the voluntary control activities should result in heightening the morale of the workers.

(4) Others

Athletic meets, travelling, and other recreation, etc.

CHAPTER 10

ESTIMATION OF CONSTRUCTION COST

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10.1 Assumptions and Basic Concepts for Estimation

(1) Imports and Local Procurement

After a careful on-site study of the various requirements for building the new steelworks, it has been concluded that the sources of supply of the required equipment and services should be determined according to the following criteria.

a. Equipment to be purchased. . . . . .Imported.

b. Civil works, erection & building . . . . .Procured locally.

c. Construction materials . . . . .Procured locally wherever possible.

(2) Basis for Estimation

The date of estimation and applicable currencies used in the assumptions for the estimates are as follows.

a. Date of estimation

Imports. . . . . .International market prices as of April 1979.

Local procurement . . . .Domestic market prices in Thailand as of April 1979.

b. Applicable currencies

Imports . . . . .U.S. dollars

Local procurement . . . .Bahts . . . . . as converted into U.S. dollars.

c. Exchange rate . . . . .1 U.S. dollar = 20.465 bahts (as of April 1979).

(3) **Effects of Price Changes**

It should be noted that projections in this study were estimated at the prices as of April, 1979, not at the prices prevailing at the time of construction.

The purpose of various computations was to evaluate the profitability of the project, so that uncertainties associated with price escalations were eliminated wherever possible.

It is necessary, therefore, to reexamine the actual price — current value — at the time the project is executed.

This is a matter worthy of particular attention since a sharp increase in commodity prices is expected in the future.

Note that an annual increase of 10% in prices would bring the construction cost to a level as high as 1.61 times the present estimate in five years. Even an annual 5% increase would boost the price up to 1.28 times the April 1979 level.

(4) **Taxation on the Construction Cost**

As an incentive granted by the Investment Promotion Act, a BOI-promoted industry can enjoy exemptions from custom duties and business taxes imposed on imported construction machinery and materials.

In this study, these duties and taxes were not included in calculating the costs of imported machinery, materials and services for construction on the assumption that the new steelworks, as a BOI-promoted industry, would be eligible for the incentive prescribed in the Act.

Similarly, the costs of locally available construction materials and services were calculated on the assumption that the works would be exempted from paying business taxes on them as well.

10.2 Construction Cost Required for 1st Stage

(1) Direct Construction Cost

The direct construction cost is the sum of expenditures on the machinery, equipment, structures, civil engineering work, etc. required for the construction of the steel plant.

As given in Table 10.2.1, the estimated direct construction cost amounts to a total of approx. 1,145 million dollars.

Table 10.2.1 Direct Construction Cost for the 1st Stage

(Unit: Mill. dollars)

	Import	Domestic	Total	Remarks
*Civil engineering	5.1	44.8	49.9	*Land reclamation is included
Port facilities	10.3	20.4	30.7	
Raw materials receiving and handling facilities	20.2	3.5	23.7	
Sub-materials receiving and handling facilities	7.3	5.3	12.6	
Direct reduction plant	101.8	15.7	117.5	
Electric arc furnances	67.5	19.3	86.8	
Continuous casting machines	71.8	20.0	91.8	
Hot strip mill	250.6	52.7	303.3	
Cold strip mill	192.2	52.3	244.5	
Shipping facilities	12.2	4.4	16.6	
Utility facilities	88.6	34.9	123.5	
Maintenance & inspection facilities	12.3	2.6	14.9	
*General structures	5.4	23.6	29.0	*Living quarters for workers is included
Total	845.3	299.5	1,144.8	

The construction cost per tonne, obtained by dividing this total by the annual production on slab basis (1.2 million tonnes) in the 1st stage, amounts to 954 $/t. This is a fairly reasonable level for the 1st stage investment for an integrated steel plant in a developing country.

(2) Other Investments

Expenditures required for construction other than the direct construction cost are given in Table 10.2.2, the details of which are described below.

Table 10.2.2 Fund Requirements for the 1st Stage

(Unit: Mill. dollars)

	Foreign	Domestic	Total	($/t)
1. Direct construction cost	845.3	299.5	1,144.8	(954.0)
2. Engineering fee	42.8	–	42.8	
3. Training cost and operation guidance fee	12.4	–	12.4	
4. Organization expenses	0.4	5.4	5.8	
Total construction cost	900.9	304.9	1,205.8	(1,004.8)
5. Interest during construction	160.2	–	160.2	
Total investment	1,061.1	304.9	1,366.0	(1,138.3)
6. Preparation spare parts	41.3	–	41.3	
Total fund requirement	1,102.4	304.9	1,407.3	

i. Engineering fee

Although it varies depending on how the work is divided between the steelworks and the engineering firm, the engineering fee was estimated in this study based on generally accepted standards.

ii. Education and training cost and operation guidance fee

The fees for preparatory training of the steel plant personnel, and operation guidance from overseas were estimated taking into consideration the time required for the technology transfer.

iii. Organization expenses

These expenses mainly cosist of costs required for company incorporation, recruitment, construction management, establishment of an operating system and other clerical costs prior to the commissioning of the steel plant.

iv. Preparation spare parts

They are the costs to be earmarked, prior to commissioning, for spare parts, replacement parts, etc. of machinery and equipment required for the operation of the new steel plant.

Depending on specific costs items, they were calculated to cover approximately one year's supply.

v. Interest during construction (IDC)

The required fund for payment of construction costs is financed by capital stock and borrowings. The interest on the borrowed money for which no resources are available in the construction period has to be financed by additional borrowing.

This is also counted for an independent item of investment.

(3) Total Fund Requirements

The aggregated total of the above items constitutes the fund requirements for the construction of the new steel plant.

As given in Table 10.2.2, the total construction costs amount to 1,205.8

million dollars (1,004.8 $/t), about 25% of which is raised locally, while the balance is financed abroad. Including IDC and preparation spare parts, total 1,407.3 million dollars is the amount of funds required for the 1st stage.

10.3 Direct Construction Cost Required for the 2nd Stage

(1) Accumulated Total of Direct Construction Cost

This study is based on the assumption that the 1st stage construction (1.2 million tonnes on slab basis/year) is completed in 54 months, and 21 months after the start-up, the 2nd stage construction (1.9 million tonnes on slab basis/year) is to be started.

Major items required for additional investment are as follows:

Equipment	1st stage (Unit)	To be added in 2nd stage (Unit)	Accumulated total (Unit)	
Direct reduction plant	2	1	3	
Electric arc furnaces	4	2	6	
Continuous casting machines (inc. scarfer)	2	1	3	
Heating furnaces	2	1	3	Hot strip mill
Roughing mill	1	1	2	
Reversing mill	0	1	1	Cold strip mill
Continuous annealing line	0	1	1	

The total investment for the 2nd stage construction, including additional investments other than the above items amounts to 345.7 million dollars, as given in Table 10.3.1.

Table 10.3.1 Direct Construction Cost through the 2nd Stage

(Unit: Mill. dollars)

	1st stage	2nd stage	Total
Civil engineering	49.9	7.7	57.6
Port facilities	30.7	15.5	46.2
Raw material receiving and handling facilities	23.7	14.2	37.9
Sub-material receiving and handling facilities	12.6	0.1	12.7
Direct reduction plant	117.5	58.4	175.9
Electric arc furnaces	86.8	44.1	130.9
Continuous casting machines	91.8	36.1	127.9
Hot strip mill	303.3	37.0	340.3
Cold strip mill	244.5	93.8	338.3
Shipping facilities	16.6	8.9	25.5
Utility facilities	123.5	26.5	150.0
Maintenance & inspection facilities	14.9	2.8	17.7
General structures	29.0	0.6	29.6
Total	1,144.8	345.7	1,490.5

(2) Advance Investment in the Accumulated Total

Table 10.3.1 shows the accumulated total of investment to be made during the period from the 1st stage to the 2nd stage. The table indicates that 345.7 million dollars for the 2nd stage added to the 1st stage investment of 1,144.8 million dollars brings aggregated investment for the two stages to 1,490.5 million dollars.

The 2nd stage investment represents an additional investment of approx.

30% over the 1st stage investment while production is expected to increase by approx. 58% from 1.2 million tonnes in the 1st stage to 1.9 million tonnes in the 2nd stage. This means that following completion of the 2nd stage, the accumulated investment per tonne will substantially decrease to 784 dollars.

It can be said, therefore, that an advance investment is included in the 1st stage investment. That is, when comparing the per-tonne investment of 784 dollars, which represents an equally distributed per-tonne investment over the period, the 1st stage per-tonne investment of 954 dollars includes an advance investment of approx. 22%.

10.4 Classification of Construction Cost into Fixed Assets

The fixed asset components of construction cost, excluding land, etc., are regarded as depreciable assets in cost accounting, which will be described in Chapter 11.

These depreciable assets, therefore, were estimated by the following asset classification in accordance with the service life of equipment

Fixed asset classification	(Mill. dollars)
Machinery and equipment	916.7
Buildings and other structures	188.0
Vehicles, furniture and fixtures	4.0
Other fixed assets	61.0
Total	1,169.7

The classified total of the acquisition values of these assets were computed by each cost centre, as given in Table 11.1.1, and then their depreciation costs were computed by each asset classification in each cost centre. The details of these calculations will be described in Chapter 11.

CHAPTER II

ESTIMATION OF PRODUCTION COST

CHAPTER 11 ESTIMATION OF PRODUCTION COST

CHAPTER 11 ESTIMATION OF PRODUCTION COST

11.1 Basic Concepts in Cost Accounting

(1) Calculating Conditions

a. Base period .... April, 1979

b. Currency .... U.S. dollar

c. Exchange rate .... 1 U.S. dollar = 20,465 bahts

d. Unit used .... Metric system

(2) Cost Accounting in Normal Operation

Costs in the normal operation were calculated based on the production facilities and production flow described earlier.

The normal operation is defined as the state where the operating rate projected in the equipment plan has been perfectly achieved and production has reached a well-balanced state in the years following the start-up period, or the stage of full capacity operation.

In calculating production costs, it was assumed that imported raw materials and other materials are subject to taxation under normal tax procedures.

(3) Methodology of Cost Accounting

The continuous process cost accounting system was employed in calculating production costs.

In this system, total costs incurred in each cost centre are estimated, and they are regarded as the production cost of the respective cost centres. The production cost of a preceding process (cost centre) is added to the production cost of the following process as its raw material cost. Similar calculations are repeated for the succeeding processes until the production cost of the final product can be obtained.

The costs of auxiliary divisions were calculated by the reciprocal distribution method. For the details of the cost centres described above, refer to Table 11.1.1.

(4) Classification of Cost Elements

i. Material cost

The cost of iron ore and pellets was calculated by the source of supply, and that of sub-materials by individual cost element. In the EDP cost table, however, the details of cost elements are summarized into proper unit.
The cost of auxiliary materials was also divided into rolls, refractories, packing materials, etc.

ii. Labour cost

Labour cost was calculated taking into consideration the number of personnel and wage rates by job classification as well as various fringe benefits.

iii. Overhead cost

Overhead cost was calculated in accordance with the details of each expense.

For further details, refer to the description of assumptions, the details of production cost sheet, etc.

Table 11.1.1 Cost Centre

	Direct cost centre	Product
Production division	Direct reduction	DRI
	Electric arc furnace	Molten steel
	Continuous casting	Slab
	Hot rolling	H R semi-product
	Hot finishing	H R product
	Cold rolling	C R semi-product
	Cold finishing	C R product
Auxiliary division	Water	Utilities & services
	Clean water	
	Compressed air	
	Natural gas	
	$N_2 \cdot O_2$ gas	
	Electric power	
	Steam distribution	
	Material handling	
	Product handling	
	Intra-works transportation	
	Maintenance	
	Laboratory & inspection	
	Administration	

(5) Classification of Variable Cost and Fixed Cost

Each cost is divided into variable costs and fixed costs.

Classification of costs into the variable costs, which vary with operating rate, and the period fixed costs is helpful in the following analyses.

i. Break-even point analysis

An analysis of the required operation rate level at which the period fixed costs can be recovered from the profits on the variable costs.

ii. Understanding the annual costs of shipped products

In calculating the annual costs of shipped products in financial projections, which will be described later, the annual shipment volume is multiplied by the variable costs, and the period fixed costs are added to the result.

In establishing this classification, continuous operation was assumed, taking into account the characteristics of an integrated steel plant.

That is, all labour costs including direct labour costs, repair costs, depreciation costs and other expenses which may accrue from a continued operation, regardless of changes in production volume, at a predetermined operation rate (a 1.2 million tonnes production in the integrated steel plant) were all included in fixed costs.

11.2 Assumptions of Cost Accounting

The estimating method of unit prices and costs and as the assumptions of cost accounting is based on the following considerations, taking into account the results of the on-site study and experiences of the staff of the study mission.

(1) Unit Prices of Raw Materials, and Other Materials

i. Basic considerations concerning the sources of supply

Projection was based on the assumption that locally produced products will be used in this project wherever possible as long as they are adequately available in Thailand in terms of both quality and quantity.

ii. Estimation of unit prices

The unit prices of raw materials and other materials are indicated in Table 11.2.1.

Table 11.2.1 Purchase Price of Raw Materials and Utilities

	Sources	C&F prices ($/t)	Landed prices ($/t)	Remarks
Oxide pellets				
Australia (Savage)	Import	33.74	36.16	
Brazil (CVRD)	Import	38.56	41.33	
Brazil (Samarco)	Import	38.26	40.92	
India (Chowgule)	Import	33.17	35.55	
Sweden (LKAB)	Import	37.98	40.70	
Iron ore (Australia)	Import	22.59	24.21	
Dolomite clinker	Import	250.00	267.90	
Burnt lime	Domestic	50.00	50.75	
Fluorite	Domestic	50.00	50.75	
Steel scrap	Import	150.00	156.24	
Fe-Mn	Import	400.00	435.51	
Fe-Si	Import	700.00	750.15	
Carburizing material	Import	80.00	85.73	
Natural gas	Domestic	*0.061	$/Nm^3	* Purchased price
Electric power	Domestic	*0.030	$/kWh	
Industrial water	Domestic	*0.073	$/m^3	
Clean water	Domestic	*0.098	$/m^3	

The unit prices of imported goods were determined by adding custom duties, business taxes and other charges to their C & F prices. As for domestic products, too, the prices including business taxes and other charges were used. Although the sources of raw materials and prices used in this study are considered most reasonable at present, a careful examination of possible changes in the future is needed in the execution stage of the project.

(2) Labour Costs

For the number of personnel and unit labour costs by job classification, refer to Chapter 9.

In cost accounting, the classified total of labour costs were calculated by cost centre and included in the production costs of the respective cost centres.

(3) By-products

In estimating costs, it was assumed that, among the by-products generated from each plant, scrap can be recycled as a charge into the electric arc furnace and undersized ore after screening is resalable, and their costs were subtracted from manufacturing costs.

As the standard for estimation, a value equivalent to purchased price was used for scrap and an estimated resale price was used for under-sized ore.

Other rejects, such as mill scale and slag, were assumed to be discarded since suitable recycling usage cannot be expected.

(4) Maintenance Material Costs

The costs of direct materials for maintenance were individually estimated for each plant and included in the respective department costs.

(5) Taxes and Duties

The taxes included in costs consist of custom duties and business taxes. In cost accounting, it was assumed that these taxes and duties are imposed under normal taxation procedures based on the normal operating condition of the steel plant.

The details of expected annual tax incentives will be described in Chapter 12.

(6) Depreciation Cost

Depreciation costs were calculated according to the following standards from the acquisition values of fixed assets obtained by cost centre and asset classification.

Asset	Depreciation method	Service life	Residual value
Buildings and structures	Straight-line	20 yrs.	0
Machinery and equipment	Straight-line	15 yrs.	0
Vehicles, furniture and fixtures	Straight-line	5 yrs.	0
Other assets	Straight-line	10 yrs.	0

(7) Other Expenses

Consumable material costs and other expenses were estimated taking into account the experience of the study mission and generally accepted operating results in the steel industry.

(8) Auxiliary Division Cost

The expenses of utilities and services required for manufacturing were estimated for each cost centre as given in Table 11.1.1, and were distributed among each cost centre in accordance with their consumption and utilization of utilities and services.

These expenses are eventually transferred to the production division under the reciprocal distribution method to form product costs.

The details of each auxiliary division's costs are as follows.

i. Electric power cost

The price of electric power is shown in Table 11.2.1. The unit cost obtained by adding equipment costs, labour costs required for distributing electric power to each plant to the purchased electric power price was distributed among each plant according to their power consumption.

ii. Industrial water and clean water

a. The auxiliary division cost for industrial water was estimated by adding the expenses for water distribution to the purchase price of industrial water. Since industrial water is recirculated for reuse, the cost was distributed among the plant after conversion into a unit cost per consumption.
b. The auxiliary division cost for clean water was estimated by adding distributing costs to the purchased price and distributed among each plant in accordance with consumption.

iii. Natural gas

As for natural gas, the price obtained by adding distribution costs to the purchase price was distributed among each plant.

iv. Other utilities

Other utilities include compressed air, N_2, O_2 gas, steam, etc. For them, too, the cost accrued in each department was distributed among consuming departments in accordance with their consumption.

v. Maintenance costs

Although routine inspection is carried out by each plant, other maintenances (such as periodic maintenance, etc.) will be mainly performed by the maintenance department.

The new steel plant has an independent maintenance department specially organized for that purpose, equipped with repair personnel and equipment for serving each department (for example, the fabricating plant, the machine repair shop, the foundry, etc.)

Consequently, those expenses, excluding direct material costs for maintenance, are calculated by the maintenance department, and then distributed among each production division.

vi. Plant administration costs

The expenses accruing in administrative departments such as those in charge of security, labour relations, production, quality control, etc. are included in this cost item. In addition, depreciation costs of welfare facilities such as company housing and amortization of training cost and operation guidance fee are also included in this cost item.

vii. Other services

The details of other services required for production are as follows.

Product handling; The expenses required for transporting finished products to the warehouse and delivering them in accordance with the shipping schedule.

Materials handling;	The expenses required for receiving raw materials and sub-materials in the stockyard and delivering them to each consuming department.
Intra-works transportation;	The expenses required for transporting scrap, scale, slag and other rejects generated in each plant or general materials within the premise.
Testing and analysis;	The expenses required for conducting, among others, chemical analysis of raw materials and molten steel and mechanical tests of products.

These expenses were distributed to each production division in accordance with the amount of the services they receive.

11.3 Results of Cost Accounting

In this section, the results of cost accounting performed based on the concepts and assumptions described above will be outlined.

(1) Flow of Production Cost

Fig. 11.3.1 shows the flow of production cost to assist understanding

In the figure, the production volume and product cost in each process are shown in accordance with the flow of production.

The costs of finished products are shown in circles by type of product.

(2) Costs of Major Products and Services

The per-tonne costs of major products are given in Table 11.3.1.

According to the table, the cost of DRI is estimated $97.2, that of molten steel at $201.6, that of HR coil at $286.3, and that of CR coil at $338.4.

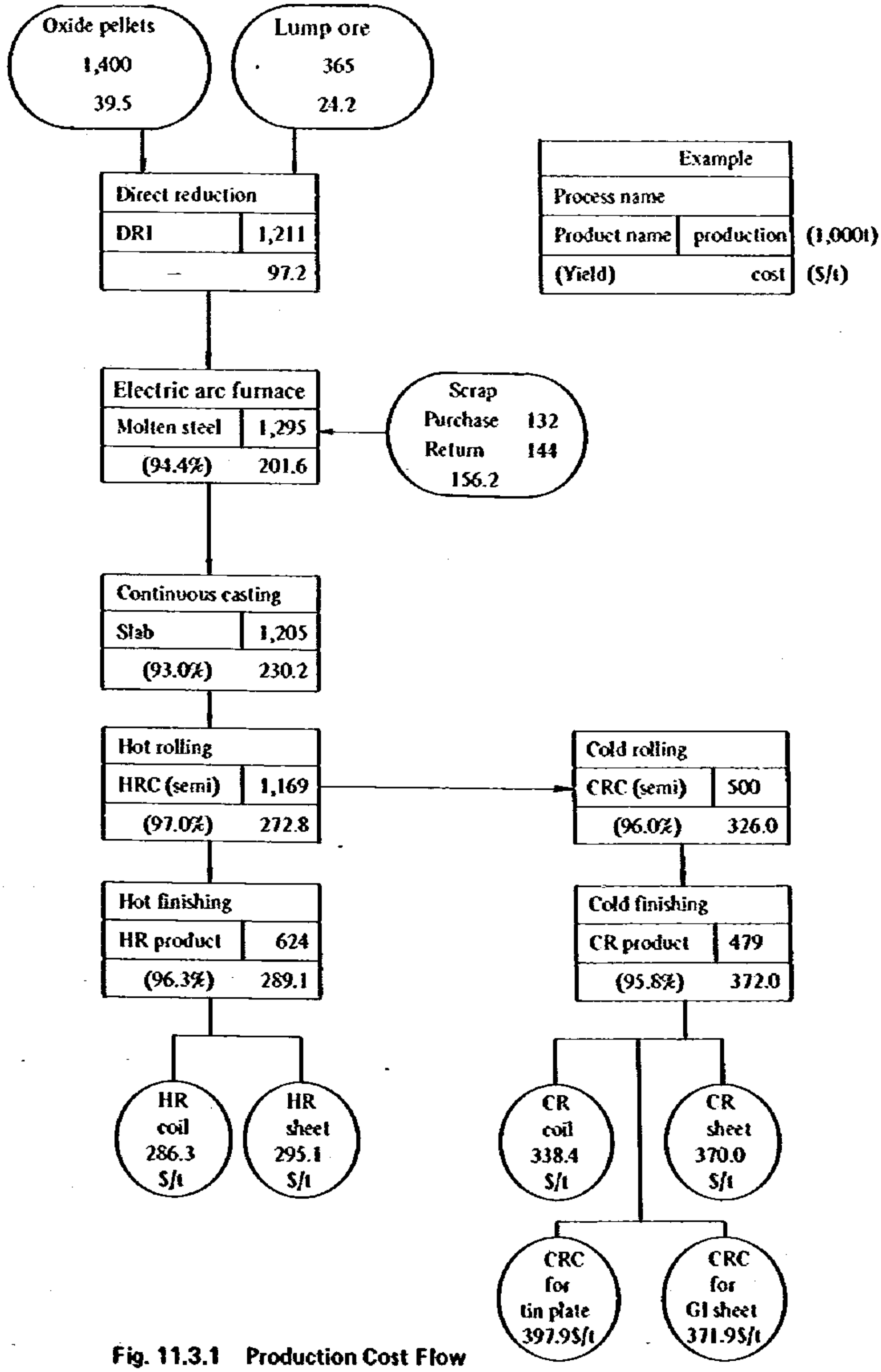

Fig. 11.3.1 Production Cost Flow

Table 11.3.1 Production Cost of Major Products

(Unit: dollars/t)

	Variable cost	Fixed cost	Total
DRI	87.8	9.4	97.2
Molten steel	195.2	6.4	201.6
Slab	222.8	7.4	230.2
HR coil	248.5	37.8	286.3
CR coil	299.6	38.8	338.4

The per-tonne variable and fixed costs of those products are also given in the table.

The unit costs of each utilities are given in Table 11.3.2.

It should be noted that these costs include the expenses required for their distribution.

Table 11.3.2 Cost of Utilities

	Cost $/unit	Remarks
Industrial water	0.035/t	Average cost of its consumption including recirculating water
Clean water	0.150/t	
Compressed air	$0.010/Nm^3$	
Natural gas	$0.062/Nm^3$	
$N_2 \cdot O_2$ gas	$0.078/Nm^3$	N_2 and O_2 are assumed to be equivalent
Electric power	0.036/kWh	
Steam	0.009/kg	

(3) **Cost Sheets by Cost Centre**

The detailed cost sheets by each cost centre are given in Table 11.3.5 through 11.3.11 in the annex of this chapter.

As described in Fig. 11.3.1, products are divided into six types; two types of hot rolled products and 4 types of cold rolled products, at the final processes.

The costs of these six products are given in Tables 11.3.12 through 11.3.17 by dividing the final cost centre into two and four product types, respectively.

The above mentioned relation can be summarized as follows.

Final process	Products
Hot finishing (Table 11.3.10)	HR coil (Table 11.3.12)
	HR sheet (Table 11.3.13)
Cold finishing (Table 11.3.11)	CR coil (Table 11.3.14)
	CR sheet (Table 11.3.15)
	CRC for tin plate (Table 11.3.16)
	CRC for GI sheet (Table 11.3.17)

(4) **Details of Total Production Cost**

The details of the item-wise total cost required when the new steelworks is operating under normal conditions are given in Table 11.3.3.

They are the classified total of each primary cost element in each department.

According to this table, the total annual purchase of raw materials, including sub-materials, amounts to $119 million, and the consumption of electric power and natural gas amount to $47 million and $32 million in value, respectively.

The total production cost amounts to $359 million, of which variable costs are $235 million, accounting for approx. 65.5%. On the other hand, fixed costs are $124 million, accounting for approx. 34.5%.

(5) Cost Analysis

Following are analyses of the above cost accounting results.

i. Cost elements and their component ratios

Fig. 11.3.2 shows the details of the above mentioned production cost expressed in component ratios by cost element.

The volume of raw materials after deducting by-products accounts for 23.1% which make variable costs including the costs of sub-materials, utilities and other materials account for 65.5%. The fact that the ratio of fixed costs is as low as 34.5% is attributable to low labour costs. This is because the per-capita labour productivity of the new steel plant is set at a high level (322 t/man-y) and the unit labour cost remains at a relatively low level.

ii. Sensitivity analysis

The results of sensitivity analysis are given in Table 11.3.4, in which the effects on total costs of 10% changes in operating rate, capital cost, and the prices of pellets, natural gas, electricity, etc. are indicated by type of product. These sensitivity results can help respond to changes in the conditions of each cost element.

Table 11.3.3 Cost Summarized Sheet

THAI INTEGRATED STEEL PLANT PROJECT

COST SUMMARIZED SHEET (GENERAL)

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D
IRON ORE (MT) 1010	365	24.211	8,837
OXIDE PELLET (MT) 1020	1,400	39.520	55,328
PURCHASE SCRAP (MT) 1030	132	156.242	20,624
RETURN SCRAP (MT) 1040	144	156.243	22,499
*	2,041	52.566	107,288
FLOURITE (KG) 1210	3,239	.051	164
RECARBURIZER (KG) 1220	4,662	.086	400
BURNT LIME (KG) 1230	91,110	.051	4,619
ALLOYS (KG) 1240	8,159	.470	3,838
ALUMINUM (KG) 1250	2,590	1.071	2,775
*	109,760	.107	11,796
RETURN SCRAP (MT) 1910	144-	156.236	22,498-
FINE ORE (MT) 1920	86-	20.826	1,791-
*	230-	105.604	24,289-
NATURAL GAS (NM3) 2010	527,400	.061	32,277
ELECTRIC POWER (KWH) 2030	1,576,600	.030	47,613
INDUS.WATER (TON) 2040	14,240	.073	1,042
CLEAN WATER (TON) 2050	660	.097	64
*			80,996
ROLL (KG) 2110			4,012
REFRACTORY (KG) 2130	23,051	.838	19,317
ELECTRODE (KG) 2140	9,065	2.149	19,481
LUB.OIL & ACID (KG) 2150			1,771
PACKING MATE,LS (KG) 2160			707
CATAL. CHEM,LS (KG) 2170			496
DOLOMITE (KG) 2180	12,950	.268	3,469
OTHER VARIABLES 2190			9,979
*			59,232
MANAGER & ABOVE 3010	24	7.208	173
ENGINEER & ASS.MNGR 3020	235	4.540	1,067
CLERK 3030	206	2.078	428
FOREMAN 3040	188	3.186	599
SKILLED WORKER 3050	835	2.087	1,743
SEMI-SKLD WORKER 3060	975	1.634	1,593
UN-SKILLED WORKER 3070	1,223	1.270	1,553
*			7,156
MAINTE. MATERIAL 3110			24,566
OTHER FIXED COST 3120			4,450
*			29,016
DEPRECIATION 3220			87,386
*			87,386
MATERIAL COST TOTAL **	111,571	.850	94,795
VARIABLE COST TOTAL **			140,228
FIXED COST TOTAL **			123,558
GRAND COST TOTAL ***			358,581

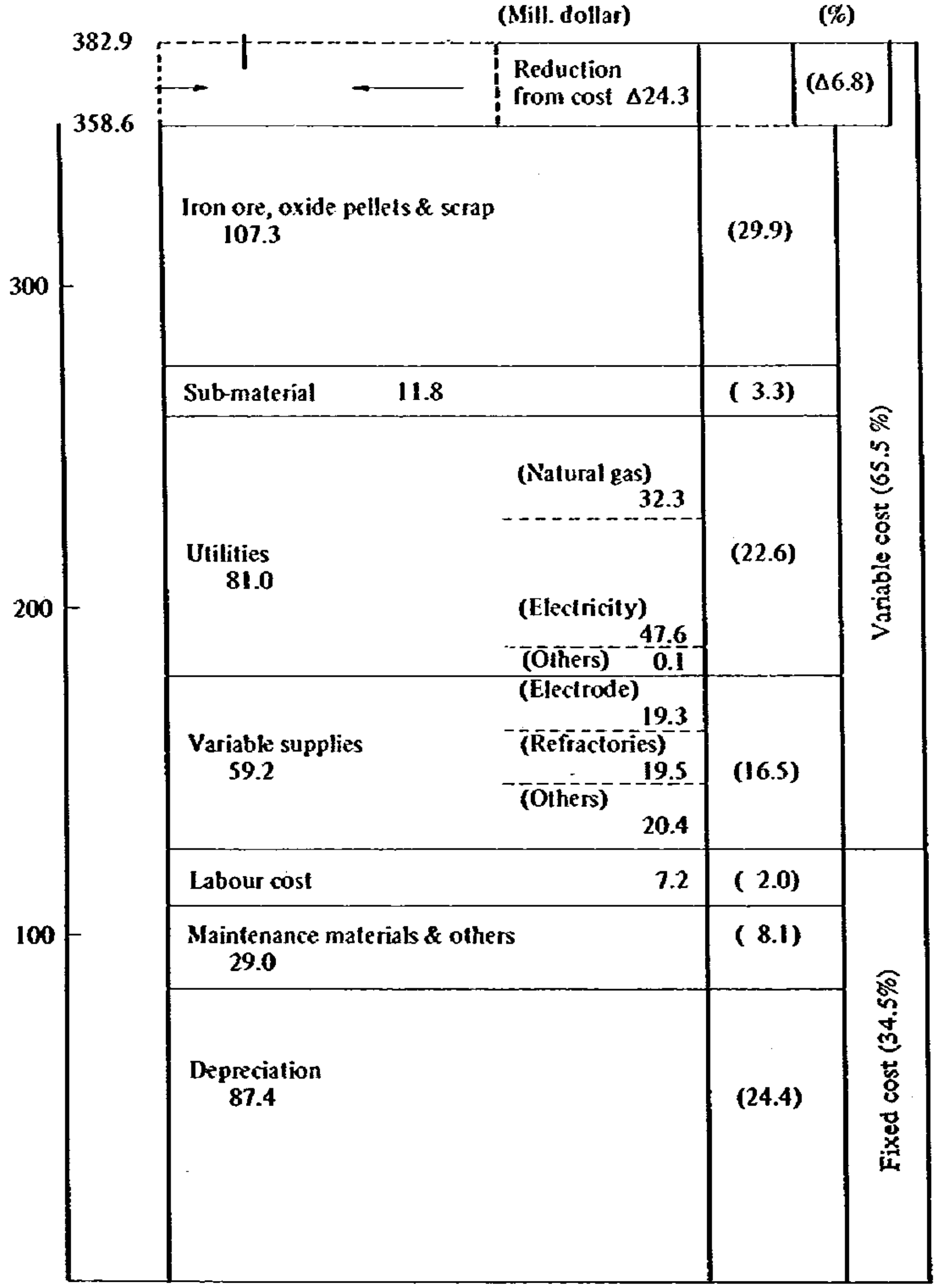

Fig. 11.3.2 Production Cost Structure Diagramme

Table 11.3.4 Sensitivity Analysis of Production Cost

(Unit: dollars/t)

	DRI	Slab	HR coil	CR coil
Normal cost	97.2	230.2	286.3	338.4
Operation rate ∓10%	± 3.5	± 8.7	±14.1	±18.8
Capital cost* ±10%	± 3.1	± 7.4	±12.0	±15.9
Pellet price ±10%	± 4.6	± 4.6	± 4.9	± 5.0
Natural gas price ±10%	± 2.1	± 2.2	± 2.7	± 3.1
Electricity price ±10%	± 0.5	± 3.3	± 3.9	± 4.4
Scrap price ±10%	–	± 3.6	± 3.8	± 3.9
Interest rate ±10%	± 1.2	± 2.9	± 4.3	± 5.3
Labour cost ±10%	± 0.1	± 0.3	± 0.5	± 0.5

* Note: Capital cost includes depreciation, maintenance material cost and interest.

Annex to Chapter 11

Cost calculation details

Table 11.3.5 ∼ Table 11.3.17	Cost sheet of production division
Table 11.3.18	Cost sheet of auxiliary divisions
Table 11.3.19	Other details

Table 11.3.5 Cost Sheet by Cost Centre: DR

THAI INTEGRATED STEEL PLANT PROJECT — C O S T   S H E E T — DATE AUG-20-1979 — PAGE 0001

(CODE) COST CENTER: (DR) DIRECT REDUCTION — (CODE) P R O D U C T: (F01) SPONGE IRON — PRODUCTION 1,211 (FOR PROCESS 1,211) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000 UNIT	UNIT PRICE US.$/UNIT	AMOUNT 1000US.$	UNIT CONSUMP (UNIT/T)	UNIT COST US.$/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P04					
H.R.C (FOR COLD) P05					
H.R COIL P11					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *					
IRON ORE (MT) 1012	355	24.211	8,537	.301	7.297
LUMP/PELLET (MT) 1020	1,410	39.520	55,628	1.156	45.688
PURCHASE SCRAP (MT) 1035					
RETURN SCRAP (MT) 1049					
*	1,765	36.354	64,165	1.457	52.985
FLUORITE (KG) 1212					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1233	459	.050	23	.385	.019
ALLOYS (KG) 1245					
ALUMINUM (KG) 1253					
*	459	.050	23	.385	.019
RETURN SCRAP (MT) 1318					
FINE ORE (MT) 1326	85-	20.226	1,721-	.071-	1.421-
*	85-	20.226	1,721-	.071-	1.421-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2045					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110					
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2153					
PACKING MATERIALS (KG) 2163					
CATAL. CHEMICALS (KG) 2173			496		.410
OCCUPITE (KG) 2183					
OTHER VARIABLES 2193			1,516		1.252
*			2,012		1.661
MANAGER & ABOVE 3015	1	7.[illegible]	7	.001	.005
ENGINEER & ASS.ENGR 3020	5	[illegible]	26	[illegible]	[illegible]
CLERK 3033	4	2.[illegible]	4	[illegible]	[illegible]
FOREMAN 3040	4	[illegible]	13	[illegible]	[illegible]
SKILLED WORKER 3050	4	2.157	13	[illegible]	[illegible]
SEMI-SKILLED WORKER 3060	22	1.535	33	[illegible]	[illegible]
UN-SKILLED WORKER 3070	51	1.259	37	.025	[illegible]
*			185		.122
MAINTE. MATERIAL 3118			2,449		2.022
OTHER FIXED COST 3125					
*			2,449		2.022
DEPRECIATION 3228			2,735		2.214
*			2,735		2.214
INDUST. WATER (TON) 4028	35,700	.035	1,377	32.763	1.137
CLEAN WATER (TON) 4035					
PRESSED AIR (NM3) 4045	10,700	.012	114	9.001	.094
NATURAL GAS (NM3) 4050	411,[illegible]	.062	25,[illegible]	349.132	21.[illegible]
N2-O2 GAS (NM3) 4060	[illegible]	.073	23	.269	.019
ELECTR. POWER (KWH) 4070	172,300	.035	6,140	142.631	5.070
STEAM (KG) 4082					
*			33,135		27.362
MATERIAL HANDLING 4158	1,765	3.387	5,978	1.457	4.935
PRODUCT HANDLING 4183					
TRANSPORTATION 4110	95,500	.022	211	77.769	.174
*			6,189		5.111
MAINTENANCE 4128	108	5.443	586		.482
LABORATORY 4135	1,765	.173	305	1.457	.252
ADMINISTRATION 4142	66	15.54[illegible]	1,662		1.372
*			2,553		1.927
MATERIAL COST TOTAL **	2,139	27.371	57,397	1.766	51.525
VARIABLE COST TOTAL **			45,959		36.308
FIXED COST TOTAL **			11,333		9.355
GRAND COST TOTAL ***			117,859		97.192

Table 11.3.6 Cost Sheet by Cost Centre: EAF

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-26-1979 — PAGE 0002

(CODE) COST CENTER: (05) ELECTRIC FURNACE — **(CODE) P R O D U C T:** (P02) LIQUID STEEL — PRODUCTION 1,295 (FOR PROCESS 1,295) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000/PLANT	UNIT PRICE US.$/QUANT	A M O U N T 1000US.$	UNIT CONSUMP QUANT/T	UNIT COST US.$/T
SPONGE IRON P01	1,211	97.192	117,697	.935	90.887
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P09					
H.R.C (FOR COLD) P10					
H.R COIL P11					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P19					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P25					
(COST CENTER) *	1,211	97.192	117,659	.935	90.887
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1035	132	156.242	20,626	.102	15.926
RETURN SCRAP (MT) 1045	143	156.243	22,453	.111	17.316
*	275	156.245	43,123	.213	33.318
FLUORITE (KG) 1210	3,239	.051	165	2.501	.127
RECARBURIZER (KG) 1220	5,652	.086	490	5.018	.379
BURNT LIME (KG) 1230	92,553	.051	4,556	78.[illegible]	3.549
ALLOYS (KG) 1240	6,159	.470	3,838	6.[illegible]	2.964
ALUMINUM (KG) 1250	2,592	1.071	2,725	2.[illegible]	2.163
*	109,[illegible]	.156	11,773	84.412	9.091
RETURN SCRAP (MT) 1910	8-	156.258	1,252-	.966-	.965-
FINE ORE (MT) 1920					
*	8-	156.259	1,252-	.966-	.965-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110					
REFRACTORY (KG) 2130	23,651	.555	12,738	17.518	9.863
ELECTRODE (KG) 2140	9,165	2.149	19,451	7.[illegible]	15.043
LUB.OIL & ACID (KG) 2150					
PACKING MATERIALS (KG) 2160					
CATAL. CHEMICALS (KG) 2170					
DOLOMITE (KG) 2180	12,550	.268	3,489	10.[illegible]	2.679
OTHER VARIABLES 2190			1,942		1.5[illegible]
*			37,698		29.1[illegible]
MANAGER & ASSOC 3010	1	7.[illegible]	7	.001	.005
ENGINEER & ASS.MGR 3020	4	4.5[illegible]	18	.003	.014
CLERK 3030	1	2.6[illegible]	2	.001	.002
FOREMAN 3040	7	3.143	22	.005	.017
SKILLED WORKER 3050	32	2.6[illegible]	87	.025	.0[illegible]2
SEMI-SKLD WORKER 3060	45	1.622	73	.035	.056
UN-SKILLED WORKER 3070	81	1.272	103	.063	.079
*			292		.225
MAINTE. MATERIAL 3110			1,826		1.410
OTHER FIXED COST 3120					
*			1,826		1.410
DEPRECIATION 3220			6,208		4.794
*			6,208		4.794
INDUST. WATER (TON) 4020	88,883	.035	3,053	67.554	2.358
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	18,412	.018	169	8.331	.864
NATURAL GAS (NM3) 4050	15,519	.062	959	11.900	.741
N2-O2 GAS (NM3) 4060	6,512	.076	528	5.019	.392
ELECTR. POWER (KWH) 4070	979,5[illegible]	.036	34,947	755.5[illegible]	26.998
STEAM (KG) 4090					
*			39,576		30.561
MATERIAL HANDLING 4090	355	3.387	1,324	.297	1.007
PRODUCT HANDLING 4100					
TRANSPORTATION 4110	455,653	.532	1,552	335.251	.819
*			2,384		1.825
MAINTENANCE 4120	74	5.663	419		.326
LABORATORY 4130	1,295	.173	224	1.000	.173
ADMINISTRATION 4140	69	15.545	1,073		.829
*			1,716		1.325
MATERIAL COST TOTAL **	110,779	1.547	171,345	85.544	132.313
VARIABLE COST TOTAL **			81,346		62.815
FIXED COST TOTAL **			8,326		6.429
GRAND COST TOTAL ***			261,017		201.558

Table 11.3.7 Cost Sheet by Cost Centre: CC

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0003

(CODE) COST CENTER	(CODE) P R O D U C T	PRODUCTION		UNIT : 1000 MT
(XC) (CONTINUOUS CASTER	(P23)SLAB	PRODUCTION	1,295	
		(FOR PROCESS	1,295)	
		(FOR SALE	0)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P22	1,295	201.558	261,017	1.075	216.612
SLAB P23					
H.R.C (FOR FINISH) P05					
H.R.C (FOR COLD) P05					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P13					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) #	1,295	201.558	261,017	1.075	216.612
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
#					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1235					
ALLOYS (KG) 1249					
ALUMINUM (KG) 1250					
#					
RETURN SCRAP (MT) 1919	50-	156.249	7,812-	.041-	6.483-
FINE ORE (MT) 1920					
#	50-	156.249	7,812-	.041-	6.483-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
#					
ROLL (KG) 2110					
REFRACTORY (KG) 2133			6,519		5.410
ELECTRODE (KG) 2149					
LUB.OIL & ACID (KG) 2150					
PACKING MATE.LS (KG) 2160					
CATAL. CHEM.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			1,807		1.500
#			8,326		6.910
MANAGER & ABOVE 3010	1	7.[illegible]	7	.001	.006
ENGINEER & ASS.MNGR 3020	5	4.6[illegible]	23	.004	.019
CLERK 3030	6	2.167	13	.005	.011
FOREMAN 3040	6	3.167	19	.005	.016
SKILLED WORKER 3050	44	2.091	92	.037	.076
SEMI-SKLD WORKER 3060	49	1.533	[illegible]	.041	[illegible]
UN-SKILLED WORKER 3070	31	1.258	[illegible]	.026	[illegible]
#			273		.227
MAINTE. MATERIAL 3110			1,930		1.602
OTHER FIXED COST 3120					
#			1,930		1.602
DEPRECIATION 3220			6,707		5.565
#			6,707		5.565
INDUST. WATER (TON) 4020	55,590	.035	2,143	45,797	1.693
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	24,110	.012	253	20,110	.210
NATURAL GAS (NM3) 4050	5,6[illegible]	.062	343	4,6[illegible]	.2[illegible]
N2-O2 GAS (NM3) 4065	25,5[illegible]	.076	1,592	21,162	1.3[illegible]
ELECTR. POWER (KWH) 4070	17,1[illegible]	.036	610	14,191	.506
STEAM (KG) 4080					
#			5,241		4.349
MATERIAL HANDLING 4250					
PRODUCT HANDLING 4160					
TRANSPORTATION 4310	55,2[illegible]	.002	122	45,473	.101
#			122		.101
MAINTENANCE 4220	79	5.663	447		.371
LABORATORY 5130					
ADMINISTRATION 6140	74	15.545	1,151		.955
#			1,598		1.326
MATERIAL COST TOTAL **	1,245	203.378	253,205	1.033	210.129
VARIABLE COST TOTAL **			15,287		12.696
FIXED COST TOTAL **			8,910		7.394
GRAND COST TOTAL ***			277,402		230.229

Table 11.3.8 Cost Sheet by Cost Centre: Hot Rolling

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET — DATE AUG-28-1979 — PAGE 0004

(CODE) COST CENTER: (030) HOT ROLLING — (CODE) PRODUCT: (P05) H.R SEMI PRODUCT — PRODUCTION 1,169 (FOR PROCESS 1,169) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT)	CODE	REQUIREMENT (000)QUANT	UNIT PRICE US.$/QUANT	AMOUNT 1000US.$	UNIT CONSUMP QUANT/T	UNIT COST US.$/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03	1,265	230.269	277,492	1.031	237.299
H.R.C (FOR FINISH)	P05					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR SI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR SI SHEET	P23					
(COST CENTER)	*	1,265	239.239	277,492	1.031	237.299
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1233					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910	20-	156.255	3,125-	.017-	2.673-
FINE ORE (MT)	1920					
	*	20-	156.255	3,125-	.017-	2.673-
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110			2,483		2.124
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2160					
CATAL. CHEM.LS (KG)	2170					
DOLOMITE (KG)	2155					
OTHER VARIABLES	2190			634		.542
	*			3,117		2.666
MANAGER & ADMIN	3010	1	7.953	7	.001	.006
ENGINEER & ASS.MNGR	3020	6	4.550	36	.007	.031
CLERK	3030	10	2.183	21	.010	.018
FOREMAN	3040	4	3.222	13	.004	.025
SKILLED WORKER	3050	60	2.083	125	.051	.107
SEMI-SKLD WORKER	3060	101	1.634	165	.159	.141
UN-SKILLED WORKER	3070	84	1.274	107	.072	.092
	*			499		.410
MAINTE. MATERIAL	3110			5,580		4.765
OTHER FIXED COST	3120			558		.478
	*			6,138		5.175
DEPRECIATION	3220			19,232		16.452
	*			19,232		16.452
INDUST. WATER (TON)	4020	72,320	.035	2,528	61.865	2.145
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4050	37,820	.010	356	32.335	.330
NATURAL GAS (NM3)	4055	65,955	.062	4,077	56.375	3.480
N2-O2 GAS (NM3)	4065					
ELECTR. POWER (KWH)	4070	114,560	.036	4,187	97.947	3.634
STEAM (KG)	4255	14,590	.009	133	12.414	.113
	*			11,262		9.583
MATERIAL HANDLING	4550					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110	35,320	.002	78	30.156	.067
	*			79		.068
MAINTENANCE	4120	224	5.651	1,268	.192	1.085
LABORATORY	4130					
ADMINISTRATION	4165	235	15.550	3,250	.179	2.782
	*			4,518		3.865
MATERIAL COST TOTAL	**	1,165	231.457	274,277	1.014	234.625
VARIABLE COST TOTAL	**			18,916		16.181
FIXED COST TOTAL	**			25,772		22.045
GRAND COST TOTAL	***			318,965		272.853

Table 11.3.9 Cost Sheet by Cost Centre: Cold Rolling

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0010

**(CODE) COST CENTER ** (XF80)COLD ROLLING

(CODE) P R O D U C T (P130)C.R SEMI PRODUCT

PRODUCTION 500 (FOR PROCESS 500) (FOR SALE 0)

UNIT : 1000 MT

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08	521	272.560	142,129	1.042	284.258
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*	521	272.530	142,129	1.042	284.258
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910	21-	156.238	3,281-	.042-	6.562-
FINE ORE (MT)	1920					
	*	21-	156.195	3,280-	.042-	6.561-
NATURAL GAS (NM3)	2210					
ELECTRIC POWER (KWH)	2220					
INDUS.WATER (TON)	2230					
CLEAN WATER (TON)	2250					
	*					
ROLL (KG)	3110			1,167		2.334
REFRACTORY (KG)	3130					
ELECTRODE (KG)	3140					
LUB.OIL & ACID (KG)	3150					
PACKING MATE'LS (KG)	3160			1,453		2.966
CATAL. CHEM'LS (KG)	3170					
DOLOMITE (KG)	3180					
OTHER VARIABLES	3190			[illegible]		[illegible]
	*			3,653		[illegible]
MANAGER & ABOVE	3310	1	[illegible]	7	[illegible]	[illegible]
ENGINEER & ASS.MNGR	3320	8	[illegible]	35	[illegible]	[illegible]
CLERK	3330	4	[illegible]	8	[illegible]	[illegible]
FOREMAN	3340	7	[illegible]	22	[illegible]	[illegible]
SKILLED WORKER	3350	38	[illegible]	75	[illegible]	[illegible]
SEMI-SKLD WORKER	3360	53	[illegible]	55	[illegible]	[illegible]
UN-SKILLED WORKER	3370	41	1.268	53	.102	[illegible]
	*			297		.594
MAINTE. MATERIAL	3110			3,223		[illegible]
OTHER FIXED COST	3120			[illegible]		[illegible]
	*			3,522		[illegible]
DEPRECIATION	3220			10,626		21.252
	*			10,625		21.250
INDUST. WATER (TON)	4020	9,613	.035	333	19.220	.665
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040	36,520	.010	383	73.040	.766
NATURAL GAS (NM3)	4050	1,635	.062	95	3.270	.195
B2-?? GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	62,260	.036	2,213	121.??	4.426
STEAM (KG)	4080	53,929	.009	492	107.??	.985
	*			3,521		7.042
MATERIAL HANDLING	4150					
PRODUCT HANDLING	4160					
TRANSPORTATION	4110	24,100	.002	53	48.200	.106
	*			53		.106
MAINTENANCE	4120	123	5.659	696	.245	1.392
LABORATORY	4130					
ADMINISTRATION	4140	116	15.563	1,803	.232	3.6??
	*			2,499		4.9??
MATERIAL COST TOTAL	**	500	277.698	139,849	1.000	277.698
VARIABLE COST TOTAL	**			9,723		19.445
FIXED COST TOTAL	**			14,444		28.858
GRAND COST TOTAL	***			163,816		326.032

Table 11.3.10 Cost Sheet by Cost Centre: Hot Finishing

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-20-1979 — PAGE 0007

**(CODE) COST CENTER ** (KE03)HOT FINISHING | (CODE) P R O D U C T (P03)H.R PRODUCT | PRODUCTION 624 (FOR PROCESS 0) (FOR SALE 624) | UNIT : 1000 MT

COST ELEMENT (UNITS) CODE		REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06	648	272.595	176,836	1.038	283.391
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*	648	272.595	176,836	1.038	283.391
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1045					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1235					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910	24-	156.255	3,752-	.038-	6.016-
FINE ORE (MT)	1920					
	*	24-	156.255	3,752-	.038-	6.016-
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110			12		.019
REFRACTORY (KG)	2120					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATELS (KG)	2160			157		.252
CATAL. CHEMCLS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			[illegible]		[illegible]
	*			753		1.207
MANAGER & ABOVE	3010					
ENGINEER & ASSISTANT	3020	4	4.509	18	.006	.029
CLERK	3030	7	5.143	35	.011	.056
FOREMAN	3040	7	5.143	32	.011	.055
SKILLED WORKER	3050	22	2.091	46	.035	.074
SEMI-SKLD WORKER	3060	34	1.639	53	.054	.085
UN-SKILLED WORKER	3070	53	1.271	75	.085	.120
	*			234		.375
MAINTE. MATERIAL	3110			845		1.354
OTHER FIXED COST	3120			200		.321
	*			1,045		1.675
DEPRECIATION	3220			2,816		4.516
	*			2,816		4.516
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040	5,100	.015	53	8.173	.085
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	3,803	.036	136	6.093	.218
STEAM (KG)	4080					
	*			189		.303
MATERIAL HANDLING	4100					
PRODUCT HANDLING	4105	565	2.482	1,401	.905	2.245
TRANSPORTATION	4110	24,113	.002	52	38.642	.083
	*			1,453		2.329
MAINTENANCE	4120	35	5.657	198	.056	.317
LABORATORY	4130	624	.173	108	1.000	.173
ADMINISTRATION	4140	32	15.531	497	.051	.796
	*			803		1.287
MATERIAL COST TOTAL	**	624	277.381	173,086	1.000	277.381
VARIABLE COST TOTAL	**			3,238		5.189
FIXED COST TOTAL	**			4,297		6.886
GRAND COST TOTAL	***			180,621		289.456

Table 11 3.11 Cost Sheet by Cost Centre: Cold Finishing

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-20-1979 — PAGE 0015

**(CODE) COST CENTER **	(CODE) P R O D U C T	PRODUCTION 479	UNIT : 1000 MT
(K500)COLD FINISHING	(P100)C.R PRODUCT	(FOR PROCESS 0)	
		(FOR SALE 479)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14	55	354.522	16.458	.113	34.342
C.R.C (FOR SHEET) P15	135	326.559	34.258	.281	79.871
C.R.C (FOR TIN) P16	85	332.753	23.284	.175	59.148
C.R.C (FOR GI) P18	235	339.255	85.924	.493	167.665
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) #	510	326.832	163.916	1.044	340.325
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
#					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
#					
RETURN SCRAP (MT) 1910	21-	156.238	3.281-	.044-	6.851-
FINE ORE (MT) 1920					
#	21-	156.238	3.281-	.044-	6.850-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
#					
ROLL (KG) 2110			350		.731
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150			288		.601
PACKING MATERIALS (KG) 2160			553		1.154
CATAL. CHEMICALS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			951		1.992
#			2.141		4.478
MANAGER & ABOVE 3010			23		.048
ENGINEER & ASS.MNGR 3020	5	4.538	31	.010	.065
CLERK 3030	15	2.067	32	.031	.067
FOREMAN 3040	10	3.232	36	.021	.075
SKILLED WORKER 3050	57	2.035	119	.119	.245
SEMI-SKLD WORKER 3060	77	1.535	126	.161	.263
UN-SKILLED WORKER 3070	119	1.269	151	.249	.315
#			453		2.018
MAINTE. MATERIAL 3110			2.112		4.409
OTHER FIXED COST 3120			200		.418
#			2.312		4.827
DEPRECIATION 3220			7.234		15.102
#			7.234		15.102
INDUST. WATER (TON) 4020	8.933	.035	310	18.643	.647
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	8.483	.010	88	17.537	.184
NATURAL GAS (NM3) 4050	11.780	.062	724	24.626	1.511
N2-O2 GAS (NM3) 4060	4.516	.078	352	9.355	.735
ELECTR. POWER (KWH) 4070	29.838	.036	1.064	62.215	2.221
STEAM (KG) 4080	84.493	.009	778	176.218	1.618
#			3.318		6.916
MATERIAL HANDLING 4090	435	2.429	1.079	.920	2.253
PRODUCT HANDLING 4100	23.588	.002	46	43.541	.096
TRANSPORTATION 4110					
#			1.125		2.349
MAINTENANCE 4120	46	5.474	408	.101	1.010
LABORATORY 4130	479	.173	83	1.000	.173
ADMINISTRATION 4140	81	15.555	1.263	.169	2.637
#			1.533		3.820
MATERIAL COST TOTAL **	479	333.476	159.735	1.000	333.476
VARIABLE COST TOTAL **			8.414		17.545
FIXED COST TOTAL **			11.020		23.937
GRAND COST TOTAL ***			178.169		371.558

Table 11.3.12 Cost Sheet by Product: HR Coil

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-28-1979
PAGE 0035

(CODE) COST CENTER	(CODE) PRODUCT	PRODUCTION 425	UNIT : 1000 MT
(E) HOT FINISHING (C)	(P10) H.R COIL	(FOR PROCESS 0)	
		(FOR SALE 425)	

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000 QUANT	UNIT PRICE US.$/QUANT	AMOUNT 1000US.$	UNIT CONSUMP QUANT/T	UNIT COST US.$/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06	435	272.595	118,592	1.026	279.958
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*	436	272.596	118,952	1.026	279.958
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1232					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1255					
	*					
RETURN SCRAP (MT)	1910	11-	156.259	1,719-	.026-	4.045-
FINE ORE (MT)	1920					
	*	11-	155.273	1,719-	.026-	4.045-
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110			11		.026
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATERIALS (KG)	2160			107		.252
CATAL. CHEMICALS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			249		.586
	*			367		.864
MANAGER & ABOVE	3010	3	4.526	13	.007	.031
ENGINEER & ASS.ENGR	3020	5	2.145	11	.012	.026
CLERK	3030	4	3.145	13	.009	.031
FOREMAN	3040	11	2.091	23	.026	.054
SKILLED WORKER	3050	15	1.836	26	.035	.061
SEMI-SKLD WORKER	3060	37	1.271	47	.087	.111
UN-SKILLED WORKER	3070					
	*			133		.313
MAINTE. MATERIAL	3110			512		1.205
OTHER FIXED COST	3120			132		.311
	*			644		1.515
DEPRECIATION	3220			1,707		4.016
	*			1,707		4.016
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040	2,391	.010	25	5.626	.059
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	2,201	.036	79	5.179	.186
STEAM (KG)	4080					
	*			104		.245
MATERIAL HANDLING	4090	355	2.692	955		2.247
PRODUCT HANDLING	4100	15,812	.002	34	37.205	.081
TRANSPORTATION	4110					
	*			989		2.327
MAINTENANCE	4120	21	5.663	119		.280
LABORATORY	4130	411	.173	71	.967	.167
ADMINISTRATION	4140	19	15.545	295		.694
	*			455		1.141
MATERIAL COST TOTAL	**	425	275.913	117,263	1.000	275.913
VARIABLE COST TOTAL	**			1,545		4.576
FIXED COST TOTAL	**			2,424		5.645
GRAND COST TOTAL	***			121,692		286.334

Table 11.3.13 Cost Sheet by Product: HR Sheet

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-20-1979 PAGE 0609

(CODE) COST CENTER: (XE02)HOT FINISHING (S) — **(CODE) P R O D U C T:** (P12)H.R SHEET — PRODUCTION 199 (FOR PROCESS 0) (FOR SALE 199) — UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06	212	272.835	57,854	1.065	298.723
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	212	272.835	57,854	1.065	298.723
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	13-	156.255	2,031-	.065-	10.226-
FINE ORE (MT) 1920					
*	13-	156.231	2,031-	.065-	10.206-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2050					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			1		.005
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PACKING MATE'LS (KG) 2160			53		.251
CATAL. CHEM'LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			375		1.886
*			426		2.141
MANAGER & ABOVE 3310	1	6.533	4	.005	[illegible]
ENGINEER & ASS.MNGR 3320	[illegible]	2.143	4	[illegible]	[illegible]
CLERK 3330	[illegible]	[illegible]	9	[illegible]	[illegible]
FOREMAN 3340	[illegible]	2.691	[illegible]	[illegible]	[illegible]
SKILLED WORKER 3350	11	[illegible]	21	[illegible]	[illegible]
SEMI-SKLD WORKER 3360	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
UN-SKILLED WORKER 3370	22	[illegible]	[illegible]	[illegible]	[illegible]
*			101		.508
MAINTE. MATERIAL 3110			333		1.673
OTHER FIXED COST 3120			[illegible]		[illegible]
*			451		2.015
DEPRECIATION 3220			[illegible]		[illegible]
*			[illegible]		5.585
INDUST. WATER (TON) 4010					
CLEAN WATER (TON) 4020					
PRESSED AIR (NM3) 4030	2,789	.010	28	13.513	.141
NATURAL GAS (NM3) 4050					
N2-O2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	1,599	.036	57	8.035	.286
STEAM (KG) 4080					
*			85		.427
MATERIAL HANDLING 4100	102	2,[illegible]	446		2.241
PRODUCT HANDLING 4110	8,188	.002	18	41.145	[illegible]
TRANSPORTATION 4115					
*			464		2.332
MAINTENANCE 4120	14	5.653	79		.397
LABORATORY 4130	213	.173	37	1.070	.186
ADMINISTRATION 4140	13	15.565	202		1.015
*			313		1.595
MATERIAL COST TOTAL **	199	283.518	55,823	1.000	280.518
VARIABLE COST TOTAL **			1,293		6.497
FIXED COST TOTAL **			1,513		8.106
GRAND COST TOTAL ***			58,729		295.120

Table 11.3.14 Cost Sheet by Product: CR Coil

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-28-1979 — PAGE 0016

(CODE) COST CENTER	(CODE) P R O D U C T	PRODUCTION	54	UNIT $ 1000 MT
(3603)COLD FINISHING (C)	(P20)C.R COIL	(FOR PROCESS	0)	
		(FOR SALE	54)	

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08					
H.R COIL	P11					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14	54	304.629	16,453	1.000	304.629
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*	54	304.629	16,453	1.000	304.629
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910		154.238			
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2210					
ELECTRIC POWER (KWH)	2230					
INDUS.WATER (TON)	2240					
CLEAN WATER (TON)	2255					
	*					
ROLL (KG)	2110			63		1.167
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150			17		.315
PACKING MATERLS (KG)	2160			5		.093
CATAL. CHEMILS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			26		.481
	*			111		2.056
MANAGER & ABOVE	3310					
ENGINEER & ASS.MNGR	3320		4.620			
CLERK	3330		[illegible]			
FOREMAN	3340		[illegible]			
SKILLED WORKER	3350	5	[illegible]	10	.093	.185
SEMI-SKLD WORKER	3360	6	[illegible]	10	.111	.185
UN-SKILLED WORKER	3370	7	1.269	9	.130	.167
	*			29		.537
MAINTE. MATERIAL	3110			211		3.907
OTHER FIXED COST	3120			20		.370
	*			231		4.278
DEPRECIATION	3220			724		13.407
	*			724		13.407
INDUST. WATER (TON)	4020	1.512	.035	52	28.000	.963
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050	2.16[illegible]	[illegible]	138	[illegible]	2.556
B2-OF GAS (NM3)	4060	.810	[illegible]	63	15.000	1.167
ELECTR. POWER (KWH)	4070	3.5[illegible]	[illegible]	131	[illegible]	2.426
STEAM (KG)	4080	3.733	[illegible]	35	70.000	.648
	*			419		7.759
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100	69	2.000	122		2.259
TRANSPORTATION	4110	1.555	.082	4	30.667	.074
	*			126		2.333
MAINTENANCE	4120	9	5.6[illegible]	51		.944
LABORATORY	4135	35	.1[illegible]	7	.784	.130
ADMINISTRATION	4145	8	15.545	124		2.296
	*			182		3.370
MATERIAL COST TOTAL	**	54	304.629	16,452	1.000	304.629
VARIABLE COST TOTAL	**			838		15.519
FIXED COST TOTAL	**			984		18.222
GRAND COST TOTAL	***			18,272		338.370

Table 11.3.15 Cost Sheet by Product: CR Sheet

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-28-1979 PAGE 0017

(CODE) COST CENTER (XG02)COLD FINISHING (S) | (CODE) P R O D U C T (P21)C.R SHEET | PRODUCTION 121 (FOR PROCESS 0) (FOR SALE 121) | UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT (000)QUANT	UNIT PRICE US.D/QUANT	AMOUNT (000)US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15	125	326.864	38,259	1.033	316.182
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	125	326.854	38,259	1.033	316.382
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	4-	156.238	625-	.033-	5.165-
FINE ORE (MT) 1920					
*	4-	155.258	625-	.033-	5.165-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
COAL (KG) 2110			145		1.169
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
SUB.OIL & ACID (KG) 2150			72		.595
PACKING MATE.LS (KG) 2160			272		2.249
CATAL. CHEMI.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			341		2.881
*			859		7.025
MANAGER & ABOVE 3010					
ENGINEER & ASS.MNGR 3020	3	4.558	14	.025	.116
CLERK 3030	7	2.567	16	.058	.116
FOREMAN 3040	4	3.258	13	.033	.106
SKILLED WORKER 3050	21	2.185	44	.174	.356
SEMI-SKLD WORKER 3060	37	1.535	91	.313	.520
UN-SKILLED WORKER 3070	59	1.269	75	.488	.620
*			221		1.826
MAINTE. MATERIAL 3110			875		7.231
OTHER FIXED COST 3120			55		.452
*			930		7.685
DEPRECIATION 3220			2,994		24.744
*			2,994		24.744
INDUST. WATER (TON) 4020	3,549	.035	123	29.332	1.017
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	739	.918	8	6.107	.065
NATURAL GAS (NM3) 4050	6,977	.542	382	48.322	2.936
N2-O2 GAS (NM3) 4060	1,876	.078	147	15.211	1.215
ELECTR. POWER (KWH) 4070	10,773	.015	145	87.033	1.185
STEAM (KG) 4080	14,336	.019	131	118.479	1.083
*			1,896		9.458
MATERIAL HANDLING 4090	6,113	2.443	273	51.822	2.256
PRODUCT HANDLING 4100	6,147	.082	13		.107
TRANSPORTATION 4110					
*			286		2.364
MAINTENANCE 4120	36	5.643	234	1.165	1.935
LABORATORY 4130	143	.173	26		.195
ADMINISTRATION 4140	34	15.548	529		4.372
*			757		6.256
MATERIAL COST TOTAL **	121	331.816	37,633	1.000	311.016
VARIABLE COST TOTAL **			2,959		24.782
FIXED COST TOTAL **			4,145		34.256
GRAND COST TOTAL ***			44,767		369.975

Table 11.3.16 Cost Sheet by Product: CRC for Tin Plate

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979 PAGE 0018

(CODE) COST CENTER: (X503) COLD FINISHING (T)

(CODE) P R O D U C T: (P22) C.R.C FOR TIN PLATE

PRODUCTION 80 (FOR PROCESS 0) (FOR SALE 80)

UNIT : 1000 MT

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16	85	332.753	28,284	1.062	353.559
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P25					
(COST CENTER)	*	85	332.753	28,284	1.062	353.559
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910	4-	156.250	625-	.050-	7.813-
FINE ORE (MT)	1920					
	*	4-	156.250	625-	.050-	7.813-
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS. WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110			100		1.250
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB. OIL & ACID (KG)	2150			63		[illegible]
PACKING MATE.LS (KG)	2160			70		.875
CATAL. CHEM.LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			[illegible]		[illegible]
	*			[illegible]		[illegible]
MANAGER & ABOVE	3010					
ENGINEER & ASS.ENGR	3020					
CLERK	3030	2	[illegible]	4	.025	[illegible]
FOREMAN	3040	3	[illegible]	[illegible]	[illegible]	[illegible]
SKILLED WORKER	3050	12	[illegible]	[illegible]	[illegible]	[illegible]
SEMI-SKLD WORKER	3060	15	[illegible]	[illegible]	[illegible]	[illegible]
UN-SKILLED WORKER	3070	20	1.259	[illegible]	.250	[illegible]
	*			83		1.312
MAINTE. MATERIAL	3110			476		5.950
OTHER FIXED COST	3120			42		.525
	*			518		6.475
DEPRECIATION	3220			1,630		20.375
	*			1,630		20.375
INDUST. WATER (TON)	4020	2,505	.035	87	31.312	1.087
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040	2,033	[illegible]	21	25.412	.262
NATURAL GAS (NM3)	4050	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
N2-O2 GAS (NM3)	4060	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ELECTR. POWER (KWH)	4070	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STEAM (KG)	4080	21,265	[illegible]	[illegible]	265.875	[illegible]
	*			928		11.600
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100	73	2.488	181		2.262
TRANSPORTATION	4110	5,128	.002	11	64.100	.137
	*			192		2.400
MAINTENANCE	4120	15	5.663	105		1.359
LABORATORY	4130	118	.373	20	1.475	.225
ADMINISTRATION	4140	18	15.565	283		3.538
	*			410		5.122
MATERIAL COST TOTAL	**	81	341.459	27,659	1.012	345.737
VARIABLE COST TOTAL	**			1,936		24.200
FIXED COST TOTAL	**			2,235		27.937
GRAND COST TOTAL	***			31,831		397.875

Table 11.3.17 Cost Sheet by Product: CRC for GI Sheet

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-20-1979 — PAGE 0019

**(CODE) COST CENTER	**(CODE) P R O D U C T	PRODUCTION	224	UNIT : 1000 MT
(XG04)COLD FINISHING (G)	(P23)C.R.C FOR GI SHEET	(FOR PROCESS	0)	
		(FOR SALE	224)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18	236	339.865	83.824	1.054	357.259
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	236	339.865	83.824	1.054	357.259
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	13-	156.238	2.031-	.058-	9.067-
FINE ORE (MT) 1920					
*	13-	156.238	2.031-	.058-	9.067-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			42		.189
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150			131		.589
PACKING MATERLS (KG) 2160			213		.956
CATAL. CHEMILS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			332		1.472
*			772		3.445
MANAGER & ABOVE 3010					
ENGINEER & ASS.MNGR 3020	2	9.618	9	.009	.041
CLERK 3030	6	2.557	12	.027	.051
FOREMAN 3040	3	3.218	18	.013	.081
SKILLED WORKER 3050	19	2.318	45	.085	.199
SEMI-SKLD WORKER 3060	19	1.636	31	.085	.138
UN-SKILLED WORKER 3070	33	1.269	42	.147	.188
*			158		.643
MAINTE. MATERIAL 3110			552		2.455
OTHER FIXED COST 3120			83		.371
*			635		2.835
DEPRECIATION 3220			1.924		8.424
*			1.924		8.424
INDUST. WATER (TON) 4020	1.364	.035	47	6.089	.210
CLEAN WATER (TON) 4030	5.628	.010	52	25.125	.243
PRESSED AIR (NM3) 4040	1.454	.052	87	6.265	.388
NATURAL GAS (NM3) 4050	541	.078	42	2.411	.186
N2-H2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	6.192	.035	219	27.624	.976
STEAM (KG) 4080	45.975	.009	411	205.654	1.835
*			865		3.842
MATERIAL HANDLING 4092					
PRODUCT HANDLING 4100	223	2.458	503		2.245
TRANSPORTATION 4110	8.159	.002	18	36.022	.081
*			521		2.326
MAINTENANCE 4120	22	5.653	125		.558
LABORATORY 4130	182	.173	31	.812	.139
ADMINISTRATION 4140	21	15.545	327		1.459
*			483		2.156
MATERIAL COST TOTAL **	223	349.744	77.993	.996	348.183
VARIABLE COST TOTAL **			2.641		11.790
FIXED COST TOTAL **			2.665		11.897
GRAND COST TOTAL ***			83.299		371.870

Table 11.3.18 Auxiliary Divisions

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0020

**(CODE) COST CENTER **	(CODE) P R O D U C T	PRODUCTION	283,920	UNIT : 1000 MT
(Y3) INDUSTRIAL WATER		(FOR PROCESS	283,920)	
		(FOR SALE	0)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P10					
H.R COIL P11					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P19					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER)					
IRON ORE (MT) 1010					
PRICE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910					
FINE ORE (MT) 1920					
*					
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS. WATER (TON) 2050	14,269	.073	1,042	.050	.004
CLEAN WATER (TON) 2055					
*			1,042		.004
ROLL (KG) 2110					
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PICKLING MATERIALS (KG) 2160					
CATAL. CHEMICALS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			53		
*			53		
MANAGER & ABOVE 3010	1	[illegible]	7		
ENGINEER & ASS.ENGR 3020	1	[illegible]	5		
CLERK 3030	2	[illegible]	4		
FOREMAN 3040	4	[illegible]	13		
SKILLED WORKER 3050	8	2.125	[illegible]		
SEMI-SKLD WORKER 3060	8	[illegible]	[illegible]		
UN-SKILLED WORKER 3070	8	[illegible]	[illegible]		
*			69		
MAINTE. MATERIAL 3110			793		.003
OTHER FIXED COST 3120					
*			793		.003
DEPRECIATION 3220			2,023		.010
*			2,023		.010
INDUST. WATER (TON) 4020					
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040					
NATURAL GAS (NM3) 4050					
N2-O2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	122,980	.036	4,387	.433	.015
STEAM (KG) 4080					
*			4,387		.015
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110	5,550	.002	13	.021	
*			13		
MAINTENANCE 4120	32	5.663	181		.001
LABORATORY 4130					
ADMINISTRATION 4140	31	15.549	482		.002
*			663		.002
MATERIAL COST TOTAL **					
VARIABLE COST TOTAL **			[illegible]		.022
FIXED COST TOTAL **			3,555		.013
GRAND COST TOTAL ***			9,549		.035

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT	COST SHEET	DATE AUG-20-1979
		PAGE 0021
**(CODE) COST CENTER ** (YC0) CLEAN WATER	(CODE) PRODUCT	PRODUCTION 660 (FOR PROCESS 660) (FOR SALE 0) UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P05					
H.R.C (FOR COLD) P06					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P15					
C.R.C (FOR SHEET) P16					
C.R.C (FOR TIN) P17					
C.R.C (FOR SI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR SI SHEET P23					
(COST CENTER) *					
IRON ORE (MT) 1010					
PRICE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910					
FINE ORE (MT) 1920					
*					
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050	660	.097	64	1.000	.097
*			64		.097
ROLL (KG) 2110					
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PACKING MATERIALS (KG) 2160					
CATAL. CHEMILS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2199			2		.003
*			2		.003
MANAGER & ABOVE 3010					
ENGINEER & ASS.MNGR 3020					
CLERK 3030	1	2.000	2	.002	.003
FOREMAN 3040					
SKILLED WORKER 3050	1	2.000	2	.002	.003
SEMI-SKLD WORKER 3060					
UN-SKILLED WORKER 3070	1	1.032	1	.002	.002
*			5		.008
MAINTE. MATERIAL 3110			6		.009
OTHER FIXED COST 3120					
*			6		.009
DEPRECIATION 3220			22		.033
*			22		.033
INDUST. WATER (TON) 4020					
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040					
NATURAL GAS (NM3) 4050					
N2-O2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070					
STEAM (KG) 4080					
*					
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110					
*					
MAINTENANCE 4120					
LABORATORY 4130					
ADMINISTRATION 4140					
*					
MATERIAL COST TOTAL **					
VARIABLE COST TOTAL **			66		.100
FIXED COST TOTAL **			33		.050
GRAND COST TOTAL ***			99		.150

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
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**(CODE) COST CENTER ** (CODE) P R O D U C T — PRODUCTION 133,200 (FOR PROCESS 133,200) (FOR SALE 0) — UNIT : 1000NM3

(Y03) PRESSED AIR

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
LARGE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2020					
INDUS. WATER (TON)	2030					
CLEAN WATER (TON)	2040					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2160					
CATAL. CHEMI.LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			4		
	*			4		
MANAGER & ABOVE	3010	1	5.000	5		
ENGINEER & ASS.MNGR	3020	1	3.000	[illegible]		
CLERK	3030	2	3.000	[illegible]		
FOREMAN	3040	4	2.000	[illegible]		
SKILLED WORKER	3050	3	2.000	[illegible]		
SEMI-SKLD WORKER	3060	[illegible]	1.667	[illegible]		
UN-SKILLED WORKER	3070	6	1.259	[illegible]		
	*			31		
MAINTE. MATERIAL	3110			110		.001
OTHER FIXED COST	3120					
	*			110		.001
DEPRECIATION	3220			381		.003
	*			381		.003
INDUST. WATER (TON)	4020	3,500	.035	122	.026	.001
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	18,600	.036	664	.140	.005
STEAM (KG)	4080					
	*			785		.006
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	4	5.863	23		
LABORATORY	4130					
ADMINISTRATION	4140	4	15.549	62		
	*			85		.001
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			874		.007
FIXED COST TOTAL	**			522		.004
GRAND COST TOTAL	***			1,396		.010

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0023

**(CODE) COST CENTER ** (VE0) NATURAL GAS

(CODE) P R O D U C T

PRODUCTION 527.490 (FOR PROCESS 527.490) (FOR SALE 0)

UNIT : 1000NM3

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P05					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010	527.493	.061	32.277	1.000	.061
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*			32.277		.061
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATERIALS (KG)	2160					
CATAL. CHEMICALS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			6		
	*			6		
MANAGER & ABOVE	3010					
ENGINEER & ASS.MNGR	3020					
CLERK	3030					
FOREMAN	3040	1	2.030	2		
SKILLED WORKER	3050	2	2.000	4		
SEMI-SKLD WORKER	3060	2	1.520	3		
UN-SKILLED WORKER	3070	2	1.520	3		
	*			12		
MAINTE. MATERIAL	3110			62		
OTHER FIXED COST	3120					
	*			62		
DEPRECIATION	3220			221		
	*			221		
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070					
STEAM (KG)	4080					
	*					
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	3	5.653	17		
LABORATORY	4130					
ADMINISTRATION	4140	2	15.545	31		
	*			48		
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			32.331		.061
FIXED COST TOTAL	**			295		.001
GRAND COST TOTAL	***			32.626		.062

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET — DATE AUG-20-1979 — PAGE 0024

(CODE) COST CENTER	**(CODE) PRODUCT**		
(MFO N2 02 GAS		PRODUCTION	35,890
		(FOR PROCESS	35,890)
		(FOR SALE	0)
		UNIT : 1000NM3	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P05					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *					
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLUORITE (KS) 1210					
RECARBURIZER (KS) 1220					
BURNT LIME (KS) 1230					
ALLOYS (KS) 1240					
ALUMINUM (KS) 1250					
*					
RETURN SCRAP (MT) 1910					
FINE ORE (MT) 1920					
*					
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KS) 2110					
REFRACTORY (KS) 2130					
ELECTRODE (KS) 2140					
LUB.OIL & ACID (KS) 2150					
PACKING MATERIALS (KS) 2160					
CATAL. CHEMICALS (KS) 2170					
DOLOMITE (KS) 2180					
OTHER VARIABLES 2190			11		
*			11		
MANAGER & ABOVE 3010	1	5.[illegible]	5		
ENGINEER & ASS.MNGR 3020	3	[illegible]	6		
CLERK 3030	4	[illegible]	13		
FOREMAN 3040	10	[illegible]	21		
SKILLED WORKER 3050	11	2.[illegible]	18		.001
SEMI-SKLD WORKER 3060	10	1.[illegible]	13		
UN-SKILLED WORKER 3070		1.[illegible]			
*			76		.002
MAINTE. MATERIAL 3110			[illegible]		[illegible]
OTHER FIXED COST 3120			[illegible]		[illegible]
*			5[illegible]		.016
DEPRECIATION 3220			1,027		.028
*			1,027		.028
INDUST. WATER (TON) 4020	2,909	.035	101	.079	.003
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040					
NATURAL GAS (NM3) 4050					
N2-O2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	22,933	.036	817	.622	.022
STEAM (KS) 4080					
*			918		.025
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110					
*					
MAINTENANCE 4120	12	5.663	68		.002
LABORATORY 4130					
ADMINISTRATION 4140	12	15.549	187		.005
*			255		.007
MATERIAL COST TOTAL **					
VARIABLE COST TOTAL **			1,184		.032
FIXED COST TOTAL **			1,691		.046
GRAND COST TOTAL ***			2,875		.078

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET — DATE AUG-20-1979 — PAGE 0025

(CODE) COST CENTER: (Y60) ELECTRIC POWER — (CODE) PRODUCT — PRODUCTION 1,576,600 (FOR PROCESS 1,576,600) (FOR SALE 0) — UNIT : 1000KWH

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *					
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910					
FINE ORE (MT) 1920					
*					
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2020	1,576,600	.030	47,613	1.000	.030
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*			47,613		.030
ROLL (KG) 2110					
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PACKING MATE.LS (KG) 2160					
CATAL. CHEM.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			14		
*			14		
MANAGER & ABOVE 3010					
ENGINEER & ASS.ENGR 3020	1	5.[illegible]	5		
CLERK 3030	[illegible]	2.[illegible]	10		
FOREMAN 3040	[illegible]	3.25[illegible]	13		
SKILLED WORKER 3050	7	2.163	15		
SEMI-SKILLED WORKER 3060	7	1.571	11		
UN-SKILLED WORKER 3070	7	1.284	9		
*			63		
MAINTE. MATERIAL 3110			1,2[illegible]		.001
OTHER FIXED COST 3120			[illegible]		
*			1,5[illegible]		.001
DEPRECIATION 3220			4,[illegible]		.0[illegible]
*			4,[illegible]		.0[illegible]
INDUST. WATER (TON) 4120					
CLEAN WATER (TON) 4130					
PRESSED AIR (NM3) 4140					
NATURAL GAS (NM3) 4150					
N2-O2 GAS (NM3) 4160					
ELECTR. POWER (KWH) 4170	27,169	.036	957	.017	.001
STEAM (KG) 4180					
*			957		.001
MATERIAL HANDLING 4190					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110					
*					
MAINTENANCE 4120	53	5.663	300		
LABORATORY 4130					
ADMINISTRATION 4140	50	15.549	777		
*			1,077		.001
MATERIAL COST TOTAL **					
VARIABLE COST TOTAL **			47,671		.032
FIXED COST TOTAL **			6,618		.004
GRAND COST TOTAL ***			54,279		.035

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-28-1979 PAGE 0026

(CODE) COST CENTER: (YHO) STEAM | **(CODE) P R O D U C T** | PRODUCTION 152,000 (FOR PROCESS 152,000) (FOR SALE 0) | UNIT : TON

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	F01					
LIQUID STEEL	F02					
SLAB	F03					
H.R.C (FOR FINISH)	P05					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P13					
C.R.C (FOR SHEET)	P14					
C.R.C (FOR TIN)	P15					
C.R.C (FOR GI)	P16					
C.R COIL	P18					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2050					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATERLS (KG)	2160					
CATAL. CHEMILS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			18		
	*			18		
MANAGER & ABOVE	3010	[illegible]	[illegible]	[illegible]		
ENGINEER & ASS.MNGR	3020	1	5.400	5		
CLERK	3030	1	[illegible]	[illegible]		
FOREMAN	3040	2	[illegible]	6		
SKILLED WORKER	3050	4	2.4[illegible]	8		
SEMI-SKLD WORKER	3060	3	2.061	5		
UN-SKILLED WORKER	3070	4	1.250	5		
	*			31		
MAINTE. MATERIAL	3110			54		
OTHER FIXED COST	3120					
	*			54		
DEPRECIATION	3220			192		.001
	*			192		.001
INDUST. WATER (TON)	4020	130	.035	6	.001	
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050	15,200	.062	945	.099	.006
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	3,100	.036	111	.020	.001
STEAM (KG)	4080					
	*			1,057		.007
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	2	5.253	11		
LABORATORY	4130					
ADMINISTRATION	4140	2	15.545	31		
	*			42		
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			1,117		.007
FIXED COST TOTAL	**			277		.002
GRAND COST TOTAL	***			1,394		.009

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET

DATE AUG-28-1979 | PAGE 0127

**(CODE) COST CENTER: (Y10) MATERIAL HANDLING ** (CODE) PRODUCT

PRODUCTION 2,150 (FOR PROCESS 2,150) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P15					
C.R.C (FOR GI)	P16					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1035					
RETURN SCRAP (MT)	1040					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1010					
FINE ORE (MT)	1020					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS. WATER (TON)	2040					
CLEAN WATER (TON)	2050					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2160					
CATAL. CHEM.LS (KG)	2170					
DOLOMITE (KG)	2185					
OTHER VARIABLES	2190			580		.270
	*			580		.270
MANAGER & ABOVE	3010	1	7.[illegible]	7		.003
ENGINEER & ASS.MNGR	3020	1	5.[illegible]	5		.002
CLERK	3030	3	2.[illegible]	6	.001	.003
FOREMAN	3040	6	3.167	19	.003	.009
SKILLED WORKER	3050	37	2.081	77	.017	.036
SEMI-SKLD WORKER	3060	13	1.515	21	.006	.010
UN-SKILLED WORKER	3070	25	1.269	33	.012	.015
	*			168		.078
MAINTE. MATERIAL	3110					
OTHER FIXED COST	3120			1,343		.625
	*			1,343		.625
DEPRECIATION	3220			4,116		1.914
	*			4,116		1.914
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4035					
PRESSED AIR (NM3)	4045					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4170	1,820	.036	64	.847	.030
STEAM (KG)	4180					
	*			64		.030
MATERIAL HANDLING	4190					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	55	5.653	311		.145
LABORATORY	4130					
ADMINISTRATION	4140	45	15.549	700		.326
	*			1,011		.470
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			1,655		.770
FIXED COST TOTAL	**			5,627		2.617
GRAND COST TOTAL	***			7,282		3.387

Table 11 3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-28-1979 — PAGE 0028

(CODE) COST CENTER: (YJ) PRODUCT HANDLING ** **(CODE) P R O D U C T** ** PRODUCTION 1,000 (FOR PROCESS 1,000) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000(UNIT)	UNIT PRICE US.D/(UNIT)	A M O U N T 1000US.D	UNIT CONSUMP (UNIT/T)	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P08					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2020					
INDUS. WATER (TON)	2030					
CLEAN WATER (TON)	2040					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB. OIL & ACID (KG)	2150					
PACKING MATE'LS (KG)	2160					
CATAL. CHEM'LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190					
	*					
MANAGER & ABOVE	3210					
ENGINEER & ASS.MGR	3220					
CLERK	3230					
FOREMAN	3240	3	3.333	10	.003	.010
SKILLED WORKER	3250	60	2.083	125	.060	.125
SEMI-SKILD WORKER	3260	40	1.625	65	.040	.065
UN-SKILLED WORKER	3270	20	1.250	25	.020	.025
	*			225		.225
MAINTE. MATERIAL	3110					
OTHER FIXED COST	3120			419		.419
	*			419		.419
DEPRECIATION	3220			1,442		1.442
	*			1,442		1.442
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	500	.035	18	.500	.018
STEAM (KG)	4080					
	*			18		.018
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	17	5.553	95		.095
LABORATORY	4130					
ADMINISTRATION	4140	18	15.545	281		.281
	*			376		.376
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			394		.394
FIXED COST TOTAL	**			2,086		2.086
GRAND COST TOTAL	***			2,480		2.480

Table 11 3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-28-1979, PAGE 0029

(CODE) COST CENTER (YK9)TRANSPORTATION ** (CODE) P R O D U C T — PRODUCTION 749,500 (FOR PROCESS 749,500) (FOR SALE 0) — UNIT : TON

COST ELEMENT (UNIT) CODE		REQUIREMENT (CCC QUANT)	UNIT PRICE US.D/QUANT	A M O U N T (CCC US.D)	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P05					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	#					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	#					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1230					
BURNT LIME (KG)	1235					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	#					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	#					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	#					
ROLL (KG)	2110					
REFRACTORY (KG)	2135					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2160					
CATAL. CHEMI.LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			509		.001
	#			509		.001
MANAGER & ABOVE	3010	2	7.520	15		
ENGINEER & ASS.MNGR	3020	18	4.556	82		
CLERK	3030	7	2.143	15		
FOREMAN	3040	16	3.187	51		
SKILLED WORKER	3050	90	2.089	188		
SEMI-SKLD WORKER	3060	36	1.639	59		
UN-SKILLED WORKER	3070	135	1.267	171		
	#			581		.001
MAINTE. MATERIAL	3110			26		
OTHER FIXED COST	3120			100		
	#			126		
DEPRECIATION	3220			269		
	#			269		
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	100	.036	4		
STEAM (KG)	4080					
	#			4		
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	#					
MAINTENANCE	4120	1	5.683	6		
LABORATORY	4130					
ADMINISTRATION	4140	9	15.548	140		
	#			146		
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			659		.001
FIXED COST TOTAL	**			976		.001
GRAND COST TOTAL	***			1,635		.002

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET

DATE AUG-20-1979
PAGE 0030

**(CODE) COST CENTER ** (CODE) P R O D U C T | PRODUCTION 1,000 | UNIT :

BLDG MAINTENANCE | (FOR PROCESS 1,000) | (FOR SALE 0)

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P21					
LIQUID STEEL	P22					
SLAB	P03					
H.R.C (FOR FINISH)	P26					
H.R.C (FOR COLD)	P15					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P23					
C.R.C FOR GI SHEET	P25					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1010					
FINE ORE (MT)	1025					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS. WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATERIALS (KG)	2160					
CATAL. CHEMICALS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190					
	*					
MANAGER & ABOVE	3010	4	7.259	29	.004	.029
ENGINEER & ASS.MNGR	3020	123	4.557	558	.123	.558
CLERK	3030	15	2.067	31	.015	.031
FOREMAN	3040	87	3.172	276	.087	.276
SKILLED WORKER	3050	359	2.407	645	.359	.645
SEMI-SKLD WORKER	3060	426	1.536	656	.426	.656
UN-SKILLED WORKER	3070	474	1.270	602	.474	.602
	*			2,837		2.837
MAINTE. MATERIAL	3110			246		.246
OTHER FIXED COST	3120			1,000		1.000
	*			1,246		1.246
DEPRECIATION	3220			892		.892
	*			892		.892
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	703	.036	25	.700	.025
STEAM (KG)	4080					
	*			25		.025
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	10	5.663	57		.057
LABORATORY	4135					
ADMINISTRATION	4140	39	15.548	606		.606
	*			663		.663
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			688		.688
FIXED COST TOTAL	**			4,975		4.975
GRAND COST TOTAL	***			5,663		5.663

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0031

(CODE) COST CENTER	**(CODE) P R O D U C T**		
4190 LABORATORY		PRODUCTION	4,163
		(FOR PROCESS	4,163)
		(FOR SALE	0)

UNIT :

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP. QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P05					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR T.M)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLOURITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS. WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATERLS (KG)	2160					
CATAL. CHEMILS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190					
	*					
MANAGER & ABOVE	3010	1	7.[illegible]	7		.002
ENGINEER & ASS.MNGR	3020	7	4.57[illegible]	32	.002	.008
CLERK	3030	6	2.167	13	[illegible]	.003
FOREMAN	3040	3	3.333	10	[illegible]	.002
SKILLED WORKER	3050	22	2.691	[illegible]	[illegible]	[illegible]
SEMI-SKLD WORKER	3060	13	1.615	21	[illegible]	.005
UN-SKILLED WORKER	3070	10	1.333	13	.002	.003
	*			142		.034
MAINTE. MATERIAL	3110			68		.016
OTHER FIXED COST	3120			[illegible]		.048
	*			268		.064
DEPRECIATION	3220			231		.055
	*			231		.055
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070					
STEAM (KG)	4080					
	*					
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	3	5.663	17		.004
LABORATORY	4130					
ADMINISTRATION	4140	4	15.548	62		.015
	*			79		.019
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			79		.019
FIXED COST TOTAL	**			641		.154
GRAND COST TOTAL	***			720		.173

Table 11.3.18 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT	COST SHEET	DATE AUG-20-1979
		PAGE 0132

(CODE) COST CENTER	**(CODE) PRODUCT**	PRODUCTION 1,000	UNIT T
(Y5) ADMINISTRATION		(FOR PROCESS 1,000)	
		(FOR SALE 0)	

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000 QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000 US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P05					
H.R.C (FOR COLD)	P06					
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	*					
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	*					
FLUORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	*					
RETURN SCRAP (MT)	1910					
FINE ORE (MT)	1920					
	*					
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	*					
ROLL (KG)	2110					
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2165					
CATAL. CHEM.LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190					
	*					
MANAGER & ABOVE	3010	10	7.3[illegible]	73	.010	.073
ENGINEER & ASS.MNGR	3020	37	4.773	177	.037	.177
CLERK	3030	115	2.105	242	.115	.242
FOREMAN	3040	8	3.125	25	.008	.025
SKILLED WORKER	3050	21	2.095	44	.021	.044
SEMI-SKLD WORKER	3060	35	1.1[illegible]	41	.035	.041
UN-SKILLED WORKER	3070	76	1.276	97	.076	.097
	*			699		.699
MAINTE. MATERIAL	3110			2,158		2.158
OTHER FIXED COST	3120			830		.830
	*			2,988		2.988
DEPRECIATION	3220			9,544		9.544
	*			9,544		9.544
INDUST. WATER (TON)	4020					
CLEAN WATER (TON)	4030	665	.149	99	.665	.099
PRESSED AIR (NM3)	4040					
NATURAL GAS (NM3)	4050					
N2-O2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	720	.035	25	.720	.025
STEAM (KG)	4080					
	*			124		.124
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110					
	*					
MAINTENANCE	4120	85	5.863	498		.498
LABORATORY	4135					
ADMINISTRATION	4145	109	15.548	1,695		1.695
	*			2,193		2.193
MATERIAL COST TOTAL	**					
VARIABLE COST TOTAL	**			2,317		2.317
FIXED COST TOTAL	**			13,231		13.231
GRAND COST TOTAL	***			15,548		15.548

Table 11.3.19 Other Divided Cost Centres

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET

DATE AUG-20-1979
PAGE 0055
UNIT : 1000 MT

**(CODE) COST CENTER ** (K03)HOT ROLLING (FIN.)

(CODE) PRODUCT: (P06) H.R.C (FOR FINISH)

PRODUCTION 668 (FOR PROCESS 665) (FOR SALE 0)

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03	668	233.237	153,783	1.031	237.315
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	665	232.218	153,783	1.031	237.315
IRON ORE (MT) 1010					
PRICE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	11-	155.250	1,719-	.017-	2.653-
FINE ORE (MT) 1920					
*	11-	156.273	1,719-	.017-	2.653-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			1,376		2.123
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PACKING MATE.LS (KG) 2160					
CATAL. CHEM.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			351		.542
*			1,727		2.665
MANAGER & ABOVE 3010	1	7.9[illegible]	7	.[illegible]	.011
ENGINEER & ASS.MNGR 3020	4	[illegible]	18	.[illegible]	.[illegible]
CLERK 3030	6	[illegible]	15	.[illegible]	.[illegible]
FOREMAN 3040	5	[illegible]	16	.[illegible]	.[illegible]
SKILLED WORKER 3050	33	[illegible]	[illegible]	.[illegible]	.[illegible]
SEMI-SKLD WORKER 3060	56	[illegible]	[illegible]	.[illegible]	.[illegible]
UN-SKILLED WORKER 3070	47	1.274	69	.073	.[illegible]
*			274		.425
MAINTE. MATERIAL 3110			3,049		4.765
OTHER FIXED COST 3120			305		.471
*			3,354		5.176
DEPRECIATION 3220			10,651		16.452
*			10,651		16.452
INDUST. WATER (TON) 4020	43,377	.035	1,393	61.047	2.145
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	20,353	.010	220	32.335	.332
NATURAL GAS (NM3) 4050	35,535	.062	2,200	55.373	3.455
92-92 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	63,473	.036	2,266	97.945	3.497
STEAM (KG) 4080	8,033	.009	73	12.424	.113
*			6,269		9.502
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100	19,555	.002	44	32.755	.068
TRANSPORTATION 4110					
*			44		.068
MAINTENANCE 4120	124	5.663	702		1.083
LABORATORY 4130					
ADMINISTRATION 4140	116	15.545	1,824		2.784
*			2,526		3.887
MATERIAL COST TOTAL **	657	231.447	152,061	1.014	234.662
VARIABLE COST TOTAL **			10,455		16.182
FIXED COST TOTAL **			14,283		22.051
GRAND COST TOTAL ***			176,936		272.835

Table 11.3.19 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT	COST SHEET	DATE AUG-20-1979
		PAGE 0006

**(CODE) COST CENTER	**(CODE) PRODUCT	PRODUCTION	521	UNIT : 1000 MT
(X0022)HOT ROLLING (C.R)	(P06)H.R.C (FOR COLD)	(FOR PROCESS	521)	
		(FOR SALE	0)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03	537	230.289	123.622	1.031	237.278
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08					
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	537	230.289	123.622	1.031	237.278
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1049					
*					
FLUORITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	9-	155.259	1.456-	.017-	2.699-
FINE ORE (MT) 1920					
*	9-	156.222	1.456-	.017-	2.699-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			1.107		2.125
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150					
PACKING MATE.LS (KG) 2160					
CATAL. CHEMI.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			263		.505
*			1.370		2.628
MANAGER & ASSOE 3310		7.825			
ENGINEER & ASS.MNGR 3320	4	4.5[illegible]	18	.008	.035
CLERK 3330	4	2.1[illegible]	8	[illegible]	.015
FOREMAN 3340	4	3.2[illegible]	13	[illegible]	.025
SKILLED WORKER 3350	27	2.[illegible]83	56	.052	.107
SEMI-SKLD WORKER 3360	45	1.634	74	.086	.142
UN-SKILLED WORKER 3370	37	1.274	47	.071	.091
*			216		.415
MAINTE. MATERIAL 3110			2.451		4.705
OTHER FIXED COST 3120			245		.470
*			2.696		5.175
DEPRECIATION 3220			8.571		16.451
*			8.571		16.451
INDUST. WATER (TON) 4020	32.223	.035	1.118	61.848	2.145
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	16.847	.016	177	32.336	.340
NATURAL GAS (NM3) 4050	29.370	.062	1.517	56.372	3.488
N2-O2 GAS (NM3) 4065					
ELECTR. POWER (KWH) 4070	51.039	.035	1.822	97.965	3.497
STEAM (KG) 4080	6.552	.009	59	12.433	.113
*			4.693		9.553
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110	16.144	.002	35	32.795	.067
*			35		.067
MAINTENANCE 4120	[illegible]	5.863	566		1.086
LABORATORY 4130					
ADMINISTRATION 4140	93	15.549	1.446		2.775
*			2.012		3.862
MATERIAL COST TOTAL **	526	231.473	122.216	1.013	234.580
VARIABLE COST TOTAL **			8.430		16.183
FIXED COST TOTAL **			11.453		22.049
GRAND COST TOTAL ***			142.129		272.813

Table 11.3.19 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T — DATE AUG-20-1979, PAGE 0011

(CODE) COST CENTER	(CODE) PRODUCT	PRODUCTION		UNIT
(AF01)COLD ROLLING (C)	(P14)C.R.C (FOR COIL)	PRODUCTION	54	UNIT : 1000 MT
		(FOR PROCESS	54)	
		(FOR SALE	0)	

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P04					
H.R.C (FOR COLD) P05	57	272.850	15,559	1.056	287.963
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P18					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	57	272.997	15,550	1.055	287.963
IRON ORE (MT) 1010					
GRADE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	2-	156.238	312-	.037-	5.778-
FINE ORE (MT) 1920					
*	2-	156.000	312-	.037-	5.778-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2020					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			126		2.333
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150			160		2.963
PICKLING MATERIALS (KG) 2160					
CATAL. CHEMICALS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			108		2.000
*			394		7.295
MANAGER & ABOVE 3010		[illegible]			
ENGINEER & ASS.MNGR 3020		[illegible]			
CLERK 3030		[illegible]			
FOREMAN 3040		[illegible]			
SKILLED WORKER 3050	2	[illegible]	4	.037	.074
SEMI-SKLD WORKER 3060	2	1.838	3	.037	.056
UN-SKILLED WORKER 3070	2	1.268	3	.037	.055
*			10		.185
MAINTE. MATERIAL 3110			120		2.222
OTHER FIXED COST 3120			20		.370
*			140		2.593
DEPRECIATION 3220			421		7.795
*			421		7.795
INDUST. WATER (TON) 4020	381	.035	13	7.056	.241
CLEAN WATER (TON) 4030					
PRESSED AIR (NM3) 4040	1,446	.010	15	26.778	.278
NATURAL GAS (NM3) 4050	63	.062	4	1.167	.074
N2-O2 GAS (NM3) 4060					
ELECTR. POWER (KWH) 4070	2,457	.036	88	45.500	1.630
STEAM (KG) 4080	2,135	.009	19	39.556	.352
*			139		2.574
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110	555	.002	2	10.278	.037
*			2		.037
MAINTENANCE 4120	5	5.663	28		.519
LABORATORY 4130					
ADMINISTRATION 4140	5	15.549	78		1.444
*			106		1.963
MATERIAL COST TOTAL **	55	277.454	15,239	1.019	282.185
VARIABLE COST TOTAL **			641		11.870
FIXED COST TOTAL **			571		10.574
GRAND COST TOTAL ***			16,451		304.629

Table 11.3.19 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — C O S T S H E E T

DATE AUG-20-1979
PAGE 0012
UNIT : 1000 MT

**(CODE) COST CENTER ** (KF02)COLD ROLLING (S)

** (CODE) P R O D U C T (P15)C.R.C (FOR SHEET)

PRODUCTION 125 (FOR PROCESS 125) (FOR SALE 0)

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	A M O U N T 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P08	130	272.830	35,454	1.049	283.712
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR GI) P16					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR GI SHEET P23					
(COST CENTER) *	130	272.830	35,454	1.049	283.712
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	5-	156.238	781-	.049-	6.248-
FINE ORE (MT) 1920					
*	5-	156.282	781-	.042-	6.248-
NATURAL GAS (NM3) 2010					
ELECTRIC POWER (KWH) 2030					
INDUS.WATER (TON) 2040					
CLEAN WATER (TON) 2050					
*					
ROLL (KG) 2110			292		2.336
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140			371		2.968
LUB.OIL & ACID (KG) 2150					
PACKING MATERIALS (KG) 2160					
CATAL. CHEMILS (KG) 2170					
DOLOMITE (KG) 2180			253		2.018
OTHER VARIABLES 2190					
*			915		7.314
MANAGER & ASSIE 3310	[illegible]	7.555	4	[illegible]	[illegible]
ENGINEER & ASS.ENGR 3320	[illegible]	4.528	2	[illegible]	[illegible]
CLERK 3330	[illegible]	2.183	5	[illegible]	[illegible]
FOREMAN 3340	[illegible]	3.143	[illegible]	[illegible]	[illegible]
SKILLED WORKER 3350	[illegible]	2.979	15	[illegible]	[illegible]
SEMI-SKLD WORKER 3360	[illegible]	1.638	[illegible]	[illegible]	[illegible]
UN-SKILLED WORKER 3370	[illegible]	1.266	6	[illegible]	[illegible]
*			33		.264
MAINTE. MATERIAL 3110			392		3.[illegible]
OTHER FIXED COST 3120			65		[illegible]
*			457		3.656
DEPRECIATION 3220			1,379		11.032
*			1,379		11.032
INDUST. WATER (TON) 4520	1,247	.035	43	9.976	.344
CLEAN WATER (TON) 4530	4,738	.018	52	37.904	.[illegible]
PRESSED AIR (NM3) 4540	208	.062	13	1.664	.104
NATURAL GAS (NM3) 4550					
N2-H2 GAS (NM3) 4560					
ELECTR. POWER (KWH) 4570	8,247	.036	287	65.976	2.295
STEAM (KG) 4580	6,995	.015	64	55.959	.[illegible]
*			457		3.656
MATERIAL HANDLING 4100					
PRODUCT HANDLING 4110	3,128	.002	7	25.024	.[illegible]
TRANSPORTATION 4119					
*			7		.056
MAINTENANCE 4120	16	5.683	91		.728
LABORATORY 4130					
ADMINISTRATION 4140	15	15.545	233		1.[illegible]
*			324		2.592
MATERIAL COST TOTAL **	125	277.456	34,653	1.000	277.454
VARIABLE COST TOTAL **			1,781		13.658
FIXED COST TOTAL **			1,874		14.992
GRAND COST TOTAL ***			38,258		306.064

Table 11.3.19 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT	COST SHEET	DATE AUG-20-1979 PAGE 0013
(CODE) COST CENTER (XF03)COLD ROLLING (T)	**(CODE) PRODUCT** (P16)C.R.C (FOR TIN)	PRODUCTION 85 (FOR PROCESS 65) (FOR SALE 0) — UNIT : 1000 MT

COST ELEMENT (UNIT) CODE	REQUIREMENT 1000/QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP. QUANT/T	UNIT COST US.D/T
SPONGE IRON P01					
LIQUID STEEL P02					
SLAB P03					
H.R.C (FOR FINISH) P06					
H.R.C (FOR COLD) P09	66	272.533	24,956	1.035	282.423
H.R COIL P10					
H.R SHEET P12					
C.R.C (FOR COIL) P14					
C.R.C (FOR SHEET) P15					
C.R.C (FOR TIN) P16					
C.R.C (FOR SI) P13					
C.R COIL P20					
C.R SHEET P21					
C.R.C FOR TIN PLATE P22					
C.R.C FOR SI SHEET P23					
(COST CENTER) *	69	272.795	24,956	1.035	282.423
IRON ORE (MT) 1010					
OXIDE PELLET (MT) 1020					
PURCHASE SCRAP (MT) 1030					
RETURN SCRAP (MT) 1040					
*					
FLOURITE (KG) 1210					
RECARBURIZER (KG) 1220					
BURNT LIME (KG) 1230					
ALLOYS (KG) 1240					
ALUMINUM (KG) 1250					
*					
RETURN SCRAP (MT) 1910	6-	156.238	625-	.047-	7.353-
FINE ORE (MT) 1920					
*	6-	156.250	625-	.047-	7.353-
NATURAL GAS (NM3) 2210					
ELECTRIC POWER (KWH) 2230					
INDUS.WATER (TON) 2240					
CLEAN WATER (TON) 2250					
*					
ROLL (KG) 2110			193		2.329
REFRACTORY (KG) 2130					
ELECTRODE (KG) 2140					
LUB.OIL & ACID (KG) 2150			252		2.965
PICKLING MATE.LS (KG) 2160					
CATAL. CHEM.LS (KG) 2170					
DOLOMITE (KG) 2180					
OTHER VARIABLES 2190			178		2.1[illegible]
*			628		7.[illegible]
MANAGER & ADJVE 3310	2	7.939	9	.026	.[illegible]
ENGINEER & ASS.MNGR 3320	1	[illegible]	2	.012	.[illegible]
CLERK 3330	1	[illegible]	3	.012	.[illegible]
FOREMAN 3340	1	[illegible]	[illegible]	.055	.[illegible]
SKILLED WORKER 3350	8	[illegible]	17	.[illegible]	.[illegible]
SEMI-SKLD WORKER 3360	12	1.[illegible]	23	.141	.[illegible]
UN-SKILLED WORKER 3370	9	1.258	11	.106	.[illegible]
*			62		.729
MAINTE. MATERIAL 3110			631		7.424
OTHER FIXED COST 3120			104		1.22[illegible]
*			735		8.6[illegible]
DEPRECIATION 3220			2,219		26.1[illegible]
*			2,219		26.1[illegible]
INDUST. WATER (TON) 4220	2,037	.035	70	23.612	.824
CLEAN WATER (TON) 4230					
PRESSED AIR (NM3) 4240	7,626	.010	66	89.696	.941
NATURAL GAS (NM3) 4250	354	.152	21	3.929	.247
N2-H2 GAS (NM3) 4260					
ELECTR. POWER (KWH) 4270	12,952	.036	462	152.353	5.435
STEAM (KG) 4280	11,255	.0[illegible]	1[illegible]	132.4[illegible]	1.21[illegible]
*			736		8.659
MATERIAL HANDLING 4090					
PRODUCT HANDLING 4100					
TRANSPORTATION 4110	5,034	.002	11	59.224	.123
*			11		.123
MAINTENANCE 4120	26	5.663	147		1.729
LABORATORY 4130					
ADMINISTRATION 4140	24	15.548	373		4.358
*			520		6.118
MATERIAL COST TOTAL **	64	278.345	23,381	.988	275.071
VARIABLE COST TOTAL **			1,887		22.203
FIXED COST TOTAL **			3,016		35.492
GRAND COST TOTAL ***			28,284		332.753

Table 11.3.19 (cont'd)

THAI INTEGRATED STEEL PLANT PROJECT — COST SHEET

DATE AUG-28-1979 PAGE 0014

(CODE) COST CENTER	(CODE) PRODUCT	PRODUCTION 236	UNIT : 1000 MT
(XF04)COLD ROLLING (G)	(P18)C.R.C (FOR GI)	(FOR PROCESS 236)	
		(FOR SALE 0)	

COST ELEMENT (UNIT)	CODE	REQUIREMENT 1000QUANT	UNIT PRICE US.D/QUANT	AMOUNT 1000US.D	UNIT CONSUMP QUANT/T	UNIT COST US.D/T
SPONGE IRON	P01					
LIQUID STEEL	P02					
SLAB	P03					
H.R.C (FOR FINISH)	P06					
H.R.C (FOR COLD)	P05	246	272.890	67,109	1.042	284.369
H.R COIL	P10					
H.R SHEET	P12					
C.R.C (FOR COIL)	P14					
C.R.C (FOR SHEET)	P15					
C.R.C (FOR TIN)	P16					
C.R.C (FOR GI)	P18					
C.R COIL	P20					
C.R SHEET	P21					
C.R.C FOR TIN PLATE	P22					
C.R.C FOR GI SHEET	P23					
(COST CENTER)	#	246	272.891	67,109	1.042	284.369
IRON ORE (MT)	1010					
OXIDE PELLET (MT)	1020					
PURCHASE SCRAP (MT)	1030					
RETURN SCRAP (MT)	1040					
	#					
FLORITE (KG)	1210					
RECARBURIZER (KG)	1220					
BURNT LIME (KG)	1230					
ALLOYS (KG)	1240					
ALUMINUM (KG)	1250					
	#					
RETURN SCRAP (MT)	1910	10-	156.238	1,562-	.042-	6.619-
FINE ORE (MT)	1920					
	#	10-	156.265	1,562-	.042-	6.619-
NATURAL GAS (NM3)	2010					
ELECTRIC POWER (KWH)	2030					
INDUS.WATER (TON)	2040					
CLEAN WATER (TON)	2050					
	#					
ROLL (KG)	2110			551		2.335
REFRACTORY (KG)	2130					
ELECTRODE (KG)	2140					
LUB.OIL & ACID (KG)	2150					
PACKING MATE.LS (KG)	2160			700		2.966
CATAL, CHEMI.LS (KG)	2170					
DOLOMITE (KG)	2180					
OTHER VARIABLES	2190			472		2.000
	#			1,723		7.301
MANAGER & ABOVE	3010	1	7.000	7	[illegible]	.030
ENGINEER & ASS.MNGR	3020	5	4.550	22	[illegible]	[illegible]
CLERK	3030	2	2.600	5	[illegible]	[illegible]
FOREMAN	3040	4	3.1[illegible]	13	[illegible]	[illegible]
SKILLED WORKER	3050	24	2.0[illegible]	50	[illegible]	[illegible]
SEMI-SKLD WORKER	3060	36	1.6[illegible]	59	[illegible]	[illegible]
UN-SKILLED WORKER	3070	25	1.228	32	.106	[illegible]
	#			187		.792
MAINTE. MATERIAL	3110			1,879		7.962
OTHER FIXED COST	3120			311		1.318
	#			2,190		9.280
DEPRECIATION	3220			6,606		27.992
	#			6,606		27.992
INDUST. WATER (TON)	4020	5,975	.035	207	25.318	.877
CLEAN WATER (TON)	4030					
PRESSED AIR (NM3)	4040	22,692	.010	238	96.153	1.008
NATURAL GAS (NM3)	4050	995	.062	62	4.216	.263
B2-B2 GAS (NM3)	4060					
ELECTR. POWER (KWH)	4070	38,546	.036	1,376	163.331	5.831
STEAM (KG)	4080	33,510	.009	305	141.992	1.292
	#			2,189		9.275
MATERIAL HANDLING	4090					
PRODUCT HANDLING	4100					
TRANSPORTATION	4110	14,953	.002	33	63.407	.140
	#			33		.140
MAINTENANCE	4120	76	5.663	430		1.822
LABORATORY	4130					
ADMINISTRATION	4140	72	15.549	1,119		4.742
	#			1,549		6.564
MATERIAL COST TOTAL	**	236	277.741	65,547	1.000	277.741
VARIABLE COST TOTAL	**			5,496		23.281
FIXED COST TOTAL	**			8,983		38.064
GRAND COST TOTAL	***			80,026		339.085

CHAPTER 12

FINANCIAL ANALYSIS

Chapter 12

CHAPTER 12 FINANCIAL ANALYSIS

CHAPTER 12 FINANCIAL ANALYSIS

12.1 Assumptions for Financial Analysis

(1) Type of Business Organization of the New Steel Plant

The type of business organization into which the new steel plant will be organized is a matter to be decided by the owner.

For the purpose of this study, however, it was assumed that the new company would be incorporated in the form of a limited liability company.

(2) Raising of Capital and Equipment Funds

The fund requirements for the new steel plant have already been discussed in Chapter 10.

The time and method of raising the funds are based on the following preconditions.

i. Total fund requirements

Payment of the fund requirements was projected based on the construction schedule. For the details of each fund, refer to Table 12.1.1.

ii. Capital

Of the above mentioned fund requirements, the local procurement portion of the construction cost will be set aside for capital, with the remaining amount being financed with borrowed money. The amount of equity capital is $312 million, accounting for approx. 25% of the total fund requirements, excluding interest.

iii. Long-term loans

The balance after subtracting the amount of equity capital from the required fund will be financed by long-term loans.

Table 12.1.1 Payment and Raising of Funds During Construction Period

(Unit: Mill. dollars)

Payment & raising items	Amount of fund
Machinery & engineering fee	907.5
Training cost & operation guidance fee	12.4
Preparation spare parts	41.3
Civil, erection, building	280.1
Organization expenses	5.8
Total	1,247.1
Equity	312.0
Loan	935.1
Interest during construction	160.2
Balance of loans (as of year end)	1,095.3

The interest accruing from loans during the construction period will be financed by additional loans. As a results, the total sum of loans including interest during construction (IDC) amounts to $1,095.3 million.

Although various formations of the sources of financing are possible, long-term loans for the purpose of this study were estimated supposing general conditions of international financing; i.e., effective interest: 9%, repayment terms:

the principal repayable by equal installments for 10 years after commissioning with a grace period during construction.

iv. Payment of required funds

The time and ratios of payment of the required funds were estimated taking into account the date of contract, the time of shipment, the time of acceptance inspection, etc. for equipment to be purchased, and the date of contract, the construction period, the time of acceptance inspection, etc. for local construction works.

This study assumes 54 months to be necessary for construction. Any delay in construction will cause construction cost such as IDC to increase substantially, bringing undesirable effect to the production cost and total profitability of the project.

Therefore, it is necessary to make every effort to keep up the construction schedule at the implementation stage.

For instance, 40% increase is predicted in the amount of IDC, when the construction is delayed by one year behind schedule.

(3) Annual Sales Plan

Annual sales volumes are projected as shown in Table 12.1.2. All the sales of the proposed steel plant rely solely on hot rolled and cold rolled flat products with no semi-finished products sold.

Table 12.1.2 Sales Projection

(1,000 tonnes)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HR coil	259	424	425	425	425	425	425	425	425	425	425	425	425	425	425
HR sheet	121	199	199	199	199	199	199	199	199	199	199	199	199	199	199
CR coil	24	46	53	54	54	54	54	54	54	54	54	54	54	54	54
CR sheet	54	105	119	121	121	121	121	121	121	121	121	121	121	121	121
CRC for tin plate	36	69	79	80	80	80	80	80	80	80	80	80	80	80	80
CRC for GI sheet	100	194	221	224	224	224	224	224	224	224	224	224	224	224	224
Total	594	1,037	1,096	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103

(4) Sales Prices

Sales prices were estimated by assuming the following two cases.

i. Case A

In view of the fact that this project involves the construction of a new steel plant for the purpose of producing substitutes for imported flat steel produsts, the prices of substitutes of imported flat steel products at present (as of April 1979) is considered as the basis for estimating sales prices. This fundamental case is termed as Case A.

The prices of substitutes of imported flat steel products were estimated based on the prices obtained by adding the existing tariff rates, business tax rates, bank charges, etc. to CIF prices.

It should be noted that transportation costs to customers were not included in the estimated prices because the Ex-mill terms were assumed in this study for the delivery terms of flat steel products.

ii. Case B

Furthermore, we calculated sales prices for an alternative case, called Case B, which postulates ideal conditions for ensuring adequate profits.

In this case, an optimum profit level was postulated, at which the return on investment (ROI) of the new company can be maintained at 10% under the discounted cash flow (DCF) method, which will be described later.

(5) Production Cost for Sales

Estimation of production cost for sales to be indicated on the profit and loss statement is based on the following concepts.

For the actual amount of costs, refer to the profit and loss statement.

i. Variable costs

The total variable cost of shipped products is calculated by multiplying per-tonne variable costs by annual shipment volumes, as described in Chapter 11.

ii. Fixed costs

Fixed costs for each year, such as labour costs, depreciation costs, fixed material costs, etc. are added to the total variable cost. The result is the total production cost for sales in each year.

(6) General and Administrative Expenses

As general and administrative expenses, the expenses required for head office business, including head office labour costs, office rentals and other office expenses, were estimated.

(7) Working Capital Requirements, and its Financing and Interests

i. Working capital requirements

Working capital requirements for a normal operating year are given in Table 12.1.3.

Although a part of the required fund for maintaining current assets such as accounts receivable and inventories can be convered by accounts payable, etc., the balance must be financed by additional short-term loans.

In Case A, a fund of approx. 77 million dollars will be required for a normal operating year.

Table 12.1.3 Working Capital

(Unit: 1,000 dollars)

	Case A	Case B	Remarks
Assets			
Accounts receivable	54,438	61,847	Approx. 1.5 month's sales
Inventories	45,390	45,390	
Finished product	5,639	5,639	Assuming an average 0.25 month's inventory
Semi-finished product	12,407	12,407	Estimated for major semi-finished products
Raw materials	27,344	27,344	Assuming an average 2.6 month's inventory
Cash on hand & in banks	3,729	4,236	Approx. 0.1 month's sales
Total	103,557	111,473	
Liabilities			
Accounts payable for material	18,382	18,382	Assuming the purchase value of 1.3 month's raw materials
Other current liabilities	7,457	8,472	
Total	25,839	26,854	
Net working capital	77,718	84,619	

ii. Financing of working capital and fund cost

The above mentioned fund requirements will be financed by locally available short-term loan.

As for the interest rate, 12% (the present prime rate (11%) as of April, 1979 plus 1% for various charges) was used for the purpose of this study. The short-term loans were assumed to be repayable next year with one year borrowing.

(8) **Taxes, Duties and Tax Incentives**

Taxes, duties and tax incentives were estimated based on the following standards.

i. Custom duty and business tax

As described in Chapter 11, production costs were calculated on the assumption that custom duties and business taxes are imposed on raw materials and other operational materials under normal taxation procedure.

This is because the tax reduction period stipulated in the current Investment Promotion Act is as short as less than a year, which is insignificant to adopt as an effective incentive for this kind of project.

This problem will be discussed later in the chapter of "Recommendations". For the purpose of financial projections here, the assumptions in Chapter 11 remain unchanged, or based on the cost including taxes imposed under normal taxation procedure.

On the other hand, business taxes on the sales achieved by the new company were calculated on the assumption that 90% tax reduction can be enjoyed for five years through the tax incentive provided under the Investment Promotion Act and normal taxation is applied for the subsequent years.

ii. Corporate income tax

A corporate income tax of 30% is usually imposed on the profit of the company. In this study, however, a "Tax Holiday" of 8 years was assumed as an incentive under the Investment Promotion Act.

According to the Act, losses incurred during the "Tax Holiday" period may be offset by profits in the subsequent five years. This rule was applied to this study (In Case A, the losses were offset by the profits in the succeeding two years.)

Furthermore, based on the assumption that the new steel plant is located in the "Promoted Zone", a 50% tax reduction for five years after the above mentioned period, as stipulated in the Act, was taken into account in this study.

12.2 Results of Financial Projections

The results of financial projections made based on the preconditions set forth in the preceding section will be described as follows.

(1) Profit and Loss Statement

Profit and loss statements for Case A and B are given in Table 12.2.1 and 12.2.2, respectively.

i. Case A

In Case A, losses will be incurred in the first and second years after commissioning due to the start-up period, and then the business should begin turning a profit from the third year onward.

ii. Case B

In Case B, the business for the first year after commissioning will be operating in the red, and turn a profit from the second year on.

(2) Cash Flow Statement

The cash flow statement contains projected variations in the annual fund position of the new steelworks. Those for Cases A and B are given in Tables 12.2.3 and 12.2.4.

Table 12.2.1 Projected Profit and Loss (Case A)

(B) PROJECTED PROFIT & LOSS
(1000DOL.)

PAGE= 2-1
DATE= AUG/28/1979

PROJECT : THE INTEGRATED STEEL PLANT PROJECT IN THAILAND
CASE NO : (A)

CALENDAR YEAR	1	2	3	4	5	6	7	8	9	10
PROJECT YEAR	-5	-4	-3	-2	-1	1	2	3	4	5
SALES	0.	0.	0.	0.	0.	236239.	416799.	444199.	447440.	447440.
VARIABLE COST	0.	0.	0.	0.	0.	125217.	219594.	232932.	234516.	234516.
PRODUCTION FIXED COST	0.	0.	0.	0.	0.	36173.	36173.	36173.	36173.	36173.
DEPRECIATION & AMORTIZ. (#1)	0.	0.	0.	0.	0.	87358.	87358.	87358.	87358.	87358.
PRODUCTION COST FOR SALES	0.	0.	0.	0.	0.	161390.	255767.	269105.	270689.	270689.
LONG TERM LOAN INTEREST	0.	0.	0.	0.	0.	97187.	88737.	78877.	69018.	59158.
SHORT-T LOAN & DEPOSIT INTER.	0.	0.	0.	0.	0.	0.	0.	1222.	1369.	1380.
GENERAL ADMINIST. EXPENSES	0.	0.	0.	0.	0.	2280.	2280.	2280.	2280.	2280.
BUSINESS TAX FOR SALES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL COST	0.	0.	0.	0.	0.	348214.	434141.	438842.	430713.	420871.
OPRATING INCOME	0.	0.	0.	0.	0.	-111975.	-17342.	5357.	16727.	26569.
NON-OPERATING REVENUES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-OPERATING EXPENSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ORDINARY INCOME	0.	0.	0.	0.	0.	-111975.	-17342.	5357.	16727.	26569.
EXTRAORDINARY PROFITS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EXTRAORDINARY LOSSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET INCOME BEFORE TAXES	0.	0.	0.	0.	0.	-111975.	-17342.	5357.	16727.	26569.
(LOSS FORWARD)	0.	0.	0.	0.	0.	-111975.	-129317.	-129317.	-129317.	-129317.
(TAXABLE INCOME)	0.	0.	0.	0.	0.	-111975.	-129317.	-129317.	-129317.	-129317.
RESERVE FOR TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET INCOME AFTER TAXES	0.	0.	0.	0.	0.	-111975.	-17342.	5357.	16727.	26569.
PROV.OF LEG.RETAINED EARNINGS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DISPOSABLE INCOME AFTER TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

(NOTES) (#1)INCLUDES "DEPRECIATION"	0.	0.	0.	0.	0.	80475.	80475.	80475.	80475.	80475.
"AORTIZ.OF T/A & TRAIN.FEE"	0.	0.	0.	0.	0.	6235.	6235.	6235.	6235.	6235.
"AORTIZ.OF INITIAL ORG.EXP."	0.	0.	0.	0.	0.	647.	647.	647.	647.	647.

Table 12.2.1 (cont'd)

(B) PROJECTED PROFIT & LOSS
(1000DOL.)

PROJECT : THE INTEGRATED STEEL PLANT PROJECT IN THAILAND
CASE NO : (A)

PAGE= 2-2
DATE= AUG/28/1979

CALENDAR YEAR	11	12	13	14	15	16	17	18	19	20
PROJECT YEAR	6	7	8	9	10	11	12	13	14	15
SALES	447440.	447440.	447440.	447440.	447440.	447440.	447440.	447440.	447440.	447440.
VARIABLE COST	234516.	234516.	234516.	234516.	234516.	234516.	234516.	234516.	234516.	234516.
PRODUCTION FIXED COST	36173.	36173.	36173.	36173.	36173.	36173.	36173.	36173.	36173.	36173.
DEPRECIATION & AMORTIZ. (#1)	86457.	86457.	86457.	86457.	86457.	79574.	79574.	79574.	79574.	79574.
PRODUCTION COST FOR SALES	270689.	270689.	270689.	270689.	270689.	270689.	270689.	270689.	270689.	270689.
LONG TERM LOAN INTEREST	49298.	39439.	29579.	19719.	9860.	0.	0.	0.	0.	0.
SHORT-T LOAN & DEPOSIT INTER.	1385.	1385.	1385.	1385.	1385.	1377.	604.	597.	597.	597.
GENERAL ADMINIST. EXPENSES	2280.	2280.	2280.	2280.	2280.	2280.	2280.	2280.	2280.	2280.
BUSINESS TAX FOR SALES	6712.	6712.	6712.	6712.	6712.	6712.	6712.	6712.	6712.	6712.
TOTAL COST	416621.	406961.	397101.	387242.	377382.	360631.	359858.	359851.	359851.	359851.
OPRATING INCOME	30619.	40479.	50339.	60198.	70058.	86809.	87582.	87589.	87589.	87589.
NON-OPERATING REVENUES	0.	0.	0.	0.	0.	0.	0.	0.	0.	93987.
NON-OPERATING EXPENSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	93987.
ORDINARY INCOME	30619.	40479.	50339.	60198.	70058.	86809.	87582.	87589.	87589.	87589.
EXTRAORDINARY PROFITS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EXTRAORDINARY LOSSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET INCOME BEFORE TAXES	30619.	40479.	50339.	60198.	70058.	86809.	87582.	87589.	87589.	87589.
(LOSS FORWARD)	-129317.	-129317.	-129317.	-69119.	939.	0.	0.	0.	0.	0.
(TAXABLE INCOME)	-129317.	-129317.	-129317.	-69119.	939.	86809.	87582.	87589.	87589.	87589.
RESERVE FOR TAXES	0.	0.	0.	0.	141.	13021.	13137.	13138.	13138.	13138.
NET INCOME AFTER TAXES	30619.	40479.	50339.	60198.	69917.	73787.	74444.	74450.	74450.	74450.
PROV.OF LEG.RETAINED EARNINGS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DISPOSABLE INCOME AFTER TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(NOTES) (#1)INCLUDES										
"DEPRECIATION"	79574.	79574.	79574.	79574.	79574.	79574.	79574.	79574.	79574.	79574.
"AORTIZ.OF T/A & TRAIN.FCC"	6235.	6235.	6235.	6235.	6235.	0.	0.	0.	0.	0.
"AORTIZ.OF INITIAL ORG.EXP."	647.	647.	647.	647.	647.	0.	0.	0.	0.	0.

Table 12.2.2 Projected Profit and Loss (Case B)

(B) PROJECTED PROFIT & LOSS
(1000DOL.)

PROJECT : THE INTEGRATED STEEL PLANT PROJECT IN THAILAND
CASE NO : (B)

PAGE= 2-1
DATE= AUG/28/1979

CALENDAR YEAR	1	2	3	4	5	6	7	8	9	10
PROJECT YEAR	-5	-4	-3	-2	-1	1	2	3	4	5
SALES	0.	0.	0.	0.	0.	269009.	474028.	504700.	508329.	508329.
VARIABLE COST	0.	0.	0.	0.	0.	125217.	219594.	232932.	234516.	234516.
PRODUCTION FIXED COST	0.	0.	0.	0.	0.	36173.	36173.	36173.	36173.	36173.
DEPRECIATION & AMORTIZ. (#1)	0.	0.	0.	0.	0.	87358.	87358.	87358.	87358.	87358.
PRODUCTION COST FOR SALES	0.	0.	0.	0.	0.	161390.	255767.	269105.	270689.	270689.
LONG TERM LOAN INTEREST	0.	0.	0.	0.	0.	97187.	88737.	78877.	69018.	59158.
SHORT-T LOAN & DEPOSIT INTER.	0.	0.	0.	0.	0.	0.	0.	1268.	1421.	1438.
GENERAL ADMINIST. EXPENSES	0.	0.	0.	0.	0.	2280.	2280.	2280.	2280.	2280.
BUSINESS TAX FOR SALES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL COST	0.	0.	0.	0.	0.	348214.	434141.	438888.	430765.	420923.
OPRATING INCOME	0.	0.	0.	0.	0.	-79205.	39887.	65812.	77564.	87406.
NON-OPERATING REVENUES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-OPERATING EXPENSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ORDINARY INCOME	0.	0.	0.	0.	0.	-79205.	39887.	65812.	77564.	87406.
EXTRAORDINARY PROFITS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EXTRAORDINARY LOSSES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET INCOME BEFORE TAXES	0.	0.	0.	0.	0.	-79205.	39887.	65812.	77564.	87406.
(LOSS FORWARD)	0.	0.	0.	0.	0.	-79205.	-79205.	-79205.	-79205.	-79205.
(TAXABLE INCOME)	0.	0.	0.	0.	0.	-79205.	-79205.	-79205.	-79205.	-79205.
RESERVE FOR TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET INCOME AFTER TAXES	0.	0.	0.	0.	0.	-79205.	39887.	65812.	77564.	87406.
PROV.OF LEG.RETAINED EARNINGS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DISPOSABLE INCOME AFTER TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

(NOTES) (#1)INCLUDES										
"DEPRECIATION"	0.	0.	0.	0.	0.	80475.	80475.	80475.	80475.	80475.
"AORTIZ.OF T/A & TRAIN.FEE"	0.	0.	0.	0.	0.	6235.	6235.	6235.	6235.	6235.
"AORTIZ.OF INITIAL ORG.EXP."	0.	0.	0.	0.	0.	647.	647.	647.	647.	647.