Appendix 3A-2 INFORMATION OF CONSTRUCTION COMPANIES

Appendix 3A-2

INFORMATION ON CONSTRUCTION COMPANIES

1. The Arab Contractors Osman Ahmed Osman & Co.
2. Misr Raymond Foundations
3. El Nasr Building & Construction Co.(EGYCO)
4. Arab Organization for Industrialization (AIO)
5. Alexandria Shipyard
6. Ferrometalco (FMC)
7. The Egyptian Co. for Refractories
8. National Organization for Portable Water and Sanitary Drainage (NOPWSD)
9. General Authority for Investment and Free Zones (GAFI)
10. Alexandria Governorate
11. Holding Companies for Metallurgical Industries

PLACE OF VISIT	The Arab Contractors Osman Ahmed Osman & Co.		
DATE	Aug.27.1997	TIME	10:00-12:30
GOFI MEMBERS	Mrs. Samira Ghobrial	JICA MEMBERS	Otani, Kawakami, Okamoto, Suenaga
ATTENDANTS	Mr. Shehab Eldin Ibrahim(G.Manager,Deputy Director) Mr. Farouk M Allam(G.Manager,Central Workshops) Mr. Ahmed Hemeid(Engineer)		
CONTENTS	1.Handover of questionnaire and request of the answers on; a.Estimates of construction unit price(work and material)for civil & structural work b.Installation cost(per/unit) of mechanical & electrical equipment and refractory 2.Clarification of the scope of supply and estimation Basis 3.Further study & completion of the answers by the company by Aug.31'97. 4.Installation cost estimation of; Mechanical; Approx. 460 $/t Electrical; Approx. 730 $/t Refractory; Approx. 170 $/t 5.Unit price of N_2 & O_2 (Additional question)		
RECEIVED DOCUMENTS	Company's Annual Report(1995/1996)		
ITEMS TO BE FOLLOWED	Meeting on Aug.31st(at 12:00)		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	The Arab Contractors Osman Ahmed Osman & Co.		
DATE	Aug.31.1997	TIME	12:00-13:00
GOFI MEMBERS	Mrs. Samira Ghobrial	JICA MEMBERS	Mr. Yoneyama Mr. Suenaga
ATTENDANTS	Mr. Shehab Eldin Ibrahim(G.Manager,Deputy Director) Mr. Ahmed Hemeid(Engineer)		
CONTENTS	An information and data requested by the questionnaire are provided and discussed. (Refer to the paper)		
RECEIVED DOCUMENTS	The paper of unit cost estimation "THE FEASIBILITY STUDY FOR THE PROJECT OF STEEL SHEETS with THE COORERATION OF JICA"		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	Misr Raymond Foundations		
DATE	Aug.28,1997	TIME	AM 10:00-11:30
GOFI MEMBERS	Mrs Samira Ghobrial	JICA MEMBERS	Suenaga
ATTENDANTS	Mr. Adel Gamal Soliman(Technical Office Manager, Civil) Mr. Magdy M Ghourab(Civil Engineer)		
CONTENTS	1.Handover of questionnaire and request of the answers on "Estimates of construction unit price (work and material) for civil & structural work". 2.Clarification of the scope of supply and estimation basis 3.The company ,belonging to Osman Gr.,is specialized for the piling work under the licensed by Raymond International, USA(since 15-16 years) and also can participate in soil investigation service in their activity. 4.Bore hole type pile (cast in situ pile); Normal, Size:D=60-150cm,L=18-25m,Ra=100-125t Efficiency:5-6Hrs/pcs/machine (drilling/concreting) 5.The company own a permanent fabrication shop of precast concrete pile. (standard size:450x450mm,max.L=18m,Ra=60-70t) 6.Prestressed concrete pile: Not familiar and not common in the country. 7.Steel pipe pile & sheet pile: Material shall be imported. 8.No rental system for sheet pile material is available in Egypt.		
RECEIVED DOCUMENTS	1.Unit price list(Items related to piling work only) 2.Company's prequalification data		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	El Nasr Building & Construction Co.(EGYCO)		
DATE	Aug.30,1997	TIME	12:00-13:00
GOFI MEMBERS	Mrs. Samira Ghobrial	JICA MEMBERS	Mr. Yoneyama Mr. Suenaga
ATTENDANTS	Mr. Yehya Shoukry (Technical & Executive Managig Director) Mr. Samir Ikladious		
CONTENTS	1.Handover of questionnaire and request of the answers on "Estimates of construction unit price (work and material) for civil & structural work" 2.After understanding the situation and condition of the study, the questionnaire was not satisfactorily answered.		
RECEIVED DOCUMENTS	Company's brochure & prequalification data		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	A.O.I. (Arab Organization for Industrialization) Aircraft Factory		
DATE	27 AUG. 1997	TIME	AM 10:00-13:00
GOFI MEMBERS	ENG. YOUSSEF YOUSSEF (Engineering Dep.)	JICA MEMBERS	Mr. H.KANEMOTO, Mr. Y. ISE, Mr. M.YAMAMURA, Mr. T.INOUE, Mr. K.INOUE
ATTENDANTS	Eng. HASSAN ELSHAHE : Project Manager Eng. MOHMED ABU BAKR : Marketing Research		
CONTENTS	1.A.O.I. consists of the following nine factories 1)AIRCRFT, 2)Engine Factory, 3)SARK Factory (Rocket), 4)Electronic Factory, 5)ARAB AMERICAN VEHICLE (AAV),6)ARAB BRITISH DYNAMIC (ABD : small rockets),7)ARAB BRITISH ENGINE COMPANY (Helicopter engine),8)KADR FACTORY (Military tank),9)HELWAN FOR DEVELOPMENT INDUSTRY (Plastics) 2.Factory 1)employee : approx. 4,000 persons 2)Established about 40 years ago 3)One of the main factory of A.O.I 4)Principal activity Production of aircraft, Manufacturing trailers for general users, Production of sheet metal and mechanical parts ,All types of work such as equipping of cars and manufacturing components of: Sewage treatment plant, Water treatment unit, Trailer, Silos, Annual drier, Parabolic dish antenna, Single W.C, Accommodation caravan, Sea water purification plants, Galvanizing units, 3.Factory tour 1)Machining center : Lathe, Slotting, Milling, Grinding, Honing, Thread cutting, Drilling, etc. 2)CNC tube bending machine 3)Welding, 4)Surface treatment & painting 4.Number of designers 30 persons 5.Delivery 6-9 months after contract 6.Capability of equipment manufacturing Small equipment can be manufactured by this factory.		
RECEIVED DOCUMENTS	1)Aircraft factory technological capabilities 2)Catalog of products		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	ALEXANDRIA SHIPYARD Gat No.36, Kabbary, Alexandria 21553, Egypt		
DATE	August 28, 1997	TIME	11:00am - 1:30pm
GOFI MEMBERS	Mr. Nabil El Saggeeir	JICA MEMBERS	Mr. N. Otani Mr. H. Kanemoto Mr. I. Kawakami Mr. Y. Ise Me. K. Okamoto
ATTENDANTS	Eng. Sousry M. Hashem, Marketing director		
CONTENTS	1. The following equipment and work items can be supplied for the Flat Steel Plant: (1) Carbon steel works (2) Mechanical parts (3) Piping (4) Painting and insulation (5) Factory maintenance 2. Information of the steel and casting works (1) Indicative price of steel works: EL4,000/ton (2) Production capability - Steel : 1,500tons/month - Casting : 45tons/day (3) Maximum casting capacity : 1ton/peace 3. General information (1) Total employee : 5,200 persons (2) Engineers & workers : 4,000 persons (3) Having maintenance contract with ANSDK		
RECEIVED DOCUMENTS	Company brochure		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	FERROMETALCO(FMC)		
DATE	Aug.30,1997	TIME	AM 10:20-12:30
GOFI MEMBERS	Eng.Youssef youssef Morsy	JICA MEMBERS	Mr.Otani, Mr.Ise, Mr.Okamoto, Mr.Kawakami, Mr.Kanemoto
ATTENDANTS	Hesham W. Galal(Project Engineer) Rainer Kersting(Production Manager)		
CONTENTS	1. Objectives 1) Investigation on supply equipment 2) Cost investigation on equipment and installation 2. Outline of the company 1)Foundation year: 1979, 2) Employees: 1,054 3) Parent: FERROSTAAL AG(Germany),100 % share holder 4) Cap.: 1,400 tons/M(structural steel & pipe works) 3. Products and Business Vessels to international standards, Tanks, Building structures, Silos, Ducts, Bins, Heat exchangers, Boiler parts and Erection work. 4. Representative Facilities NC Sawing/drilling machine(1,000D x 400H x 25,000L) Horizontal boring mill(230Dia x 7,500L x 3,900H x 2,000D & 200Dia x 6,500L x 2,100H x 1,450D etc.) Vertical lathe(8,000Dia x 3,945H x Weight 150t) Center lathe(2,000/4,500Dia x 10,000L etc.) continued/		

CONTENTS	5. Reference price 1) Fabrication---LE4,900/t(Steel structure), LE9,000/t(Furnace shell), LE15,000/t(Piping), LE11,000/t(Scrap bucket), LE8,000/t(Dedusting system) 2) Installation---LE600/t(Steel structure), LE1,500/t(Furnace shell), LE2,800/t(Piping works) 6. Delivery period 2~4 months(in case of 500 tons of structures) Special materials take 10~12 weeks to deliver. 7. Capability to produce equipment for new flat steel mill FMC has a potential to manufacture many equipment for DRI, Steel making equipment. But for hot rolling mill and cold rolling mill, their scope of supply may be limited because it is not good at handling small machined equipment. In addition, since it has very limited design engineers, it's necessary to handover all drawings prior to fabrication.
RECEIVED DOCUMENTS	Brochure on the company(including supply list, facility list and quality assurance program)
ITEMS TO BE FOLLOWED	None
ITEMS TO BE DISCUSSED WITH MEMBERS	None

PLACE OF VISIT	The Egyptian Co. for Refractories – Head Office and Helwan Factory –		
DATE	Aug. 31, 1997	TIME	11:00–14:30
GOFI MEMBERS	Yousef El Hassan Ahmed	JICA MEMBERS	Mr. I. Kawakami Mr. M. Yamamura
ATTENDANTS	At Head Office: Mohamed Eid (Chairman), Ali El Binnawy (G.M. of Marketing) At Factory: Ali Lofti (Director of Plant Sector), Mageli Gomma (G. M. of Basic Plant), Ali El Binnawy (G.M. 0f Marketing)		
CONTENTS	1. At head office, with Mohamed Eid (Chairman) 1) Answer to the questionnaire will be received by GOFI on 1st of September. 2) User: 70 % for iron and steel industry including export for Libya, Syria, Saudi Arabia, etc. 15 % for cement industry. 15 % for others. 3) Main user in steel industry in Egypt: EISCO, 25,000 t/y for all kinds. ANSDK, 6–7,000 t/y last year (3–4,000 t/y this year for un-shaped refractory, because ANSDK converted high alumina brick for ladle to Mg–C brick. Mg–C is not produced in the Company). 4) Special refractories like sub-merged nozzle is not available. 2. At Helwan plant with Mageli Gomma (G. M. of Plant) 1) Products: Basic refractories (shaped and un-shaped) and alumina silicate brick 2) Production: 26,000 t/y 3) Shaped basic refractories: Brick of magnesia, magnesia chromium, chromium magnesia 4) Un-shaped basic refractories: Min. 12,000 t/y of fettling, ramming, gunning, filling materials and mortar. 5) Factory observation tour		
RECEIVED DOCUMENTS	1) Answers to questionnaire 2) Brochure on the company		
ITEMS TO BE FOLLOWED	To receive the company's answers for questionnaire from GOFI		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	NOPWASD(National Organization for Potable Water and Sanitary Drainage)		
DATE	Aug.30,1997	TIME	AM 11:30~13:30
GOFI MEMBERS	Mr.Galal El Ghourab GM. Construction Project	JICA MEMBERS	T.INOUE / K.INOUE
ATTENDANTS	Eng. Abdul Hamid El Shayeb Mgr. Chemical Research		
CONTENTS	1. Activated sludge system and Oxidation ditch system are same principle. 2. Activated sludge system is the most suitable for Flat steel project. 3. Sewage treatment system shall be supplied from local market and 3 major constructors exist in Egypt. 4. Construction price of 500m3 per day of activated sludge system is 0.9 million EL in Egypt Including : 1) Equipment and materials for mechanical, electrical and civil work 2) Civil work and installation work and Commissioning. 5. Installation area of above system is required about 20mx20m and 10m x 10m.		
RECEIVED DOCUMENTS	None		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	General Authority for Investment and Free Zones (GAFI)		
DATE	Aug. 27 & 31	TIME	9:30AM
GOFI MEMBERS	Mr. Hussein Osman	JICA MEMBERS	Mr. Hosokawa Mr. Fujinaga
ATTENDANTS	GAFI: Mr.Ali Tahaa,Under secretary JICA member: Mr.Shunji HOSOKAWA MR.Yasuo FUJINAGA		
CONTENTS	The Study Team discussed with Mr. Ali Tahaa regarding the following items for the project. 1.taxes and duties In addition to taxes and duties systems Mr.Ali Tahaa advised of the disbursement of sales tax of the imports for the plant. 2.Labor cost The Study Team are advised that we should use the data issued by Middle East Advisry Group of World Bank for the labor cost of the study. 3.Dividend payment In accordance with Egyptian taxation dividend payments should be divided to the share holders after the corporate tax is levied on taxable income.		
RECEIVED DOCUMENTS	None		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	Alexandria Governorate		
DATE	Aug.28, 1997	TIME	12:00 – 13:00
GOFI MEMBERS	Mr. Abdel Aziz Abdel Zahier	JICA MEMBERS	M. Yamamura
ATTENDANTS	Dr. Fatma Abou Shouk Senior member of the environment department		
CONTENTS	1. Hearing about monitoring data of COD at El Dekhiela and Alexandria area COD = 300 mg/l at El Dekhiela port 500 mg/l at Alexandria eastern harbor 2. Unit of monitoring data SOx, T.S.P = micro gm/m^3 Dust = ton/$mile^2$/month 3. Monitoring point Wadi El Kamer: in El Dekhiela, behind Cement Co. El Mamel : near Alex. eastern harbor Eshaf : behind Alex. Governorate Smoha : near Alex. air port 4. Data of NOx and Noise will be faxed to GOFI later. 5. Dr. Fatma stressed the necessity of project agreement and Environmental Impact Assessment before start of the project.		
RECEIVED DOCUMENTS	None		
ITEMS TO BE FOLLOWED	1. COD data at El Dekhiela port and Alex. eastern harbor 2. NOx and Noise data at El Dekhiela area		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

PLACE OF VISIT	Holding Company for Metallurgical Industries		
DATE	Sept. 1, 1997	TIME	13:00-13:40
GOFI MEMBERS	Mr. Y. El Hussan Ahmed	JICA MEMBERS	Mr. Hosokawa
ATTENDANTS	Mr. Adel A. Danaf (Chairman)		
CONTENTS	General information of iron & steel industry in Egypt 1) The present production of steel products is mainly that of rebars. That of flat products is 400,000 ton per year by EISCO. Many steel companies are suffering with import of cheap prices from Russia and neighboring countries such as Saudi Arabia, Libya and Qatar. 2) Two projects of flat steel plant are planned in the future in Egypt. These are by ANSDK and EL-EZZ Steel. Both are based on DRI. In Egypt there is little generated scrap. So, the iron ore near Aswan should be developed. The BF based iron & steel plant should be studied by this iron ore in the future. 3) Such public steel companies as EISCO, Delta Steel, etc. are under reconstructing study. Now EISCO is on the second stage, will be divided at least into three companies. For the details there is EGITALIC's study report.		
RECEIVED DOCUMENTS	General Information's of Metallurgical Industries Co.		
ITEMS TO BE FOLLOWED	None		
ITEMS TO BE DISCUSSED WITH MEMBERS	None		

Appendix 3A-3 REFERENCE UNIT PRICE FOR CIVIL AND BUILDING WORKS

Appendix 3A-3 REFERNCE UNIT PRICE FOR CIBIL AND BUILDING WORK

The unit price level of the following major items of construction work of civil and building, and material will be referred and considered for the budgetary estimation in the feasibility study.

1. Construction Work

(1)	Excavation work				
	1) Sandy and clayey soil	6	-	24	LE/m^3
	2) Rock (including slag)	50	-	70	LE/m^3
(2)	Filling work (with imported material)	18	-	26	LE/m^3
(3)	Sheeting work (driving & extracting)	440	-	600	LE/m^2
(4)	Piling work				
	1) Cast-in-situ pile (D=600-1000mm)	400	-	800	LE/m
	2) Pre-cast pile (D=350-600mm)	600	-	650	LE/m
(5)	Concrete work (Mix.210-280 kg/cm2)	220	-	370	LE/m^3
(6)	Form work (Plywood)	100	-	120	LE/m^2
(7)	Reinforcement (re-bar) work	2,200	-	2,300	LE/ton
(8)	Metal work (embedded steel etc.)	5,300	-	9,000	LE/ton
(9)	Structural steel work	6,000	-	9,000	LE/ton
(10)	Roofing and siding work	200	-	300	LE/m^2
(11)	Road work (asphalt t=50mm)	30	-	60	LE/m^2
(12)	Drainage work (RC pipe D=700-900mm)	700	-	900	LE/m

Note: The work includes material supply, fabrication, and construction and/or installation.

2. Construction material

(1)	Sand	10	-	20	LE/m^3
(2)	Gravel and sand mix	28	-	30	LE/m^3
(3)	Ready mixed concrete	170	-	220	LE/m^3
(4)	Reinforcement steel	1,400	-	1,900	LE/ton
(5)	Form (plywood)	100	-	250	LE/m^2
(6)	Masonry (hollow cement block)	1	-	2	LE/no
(7)	Flooring (Ceramic t=8mm)	50	-	110	LE/m^2
(8)	Roof and side cladding material (t=0.8mm)	40	-	50	LE/m^2
(9)	RC pipe (D=500-900mm)	300	-	500	LE/m

Appendix 4A-1 Meteorological Conditions

4A-1-1 Meteorological conditions (Suez)

4A-1-2 Meteorological conditions (Alexandria)

4A-1-1 Meteorological Conditions (Suez) -1/2-

A Location

	Area	State
Name	ATAQA Industrial Estate	SUEZ
Latitude	N 29° 56′	
Longitude	E 32° 33′	

B Meteorological condition (1931-1960)

1) Temperature (degrees centigrade)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
Mean of Day	14.5	15.5	17.9	21.2	25.4	27.8	29.4	29.5	27.2	24.8	20.6	16.2	22.5
Maximum	20.3	21.7	24.4	28.2	32.6	35.0	36.5	36.4	33.6	31.1	26.5	22.0	29.0
Minimum	8.7	9.3	11.4	14.3	18.1	20.5	22.3	22.6	20.6	18.5	14.7	10.3	16.0
Absolute Record Max.	28.0	32.9	35.6	41.5	43.8	45.6	44.4	42.9	41.8	42.6	41.1	32.2	-
Absolute Record Min.	0.0	0.9	2.5	6.9	10.7	13.9	17.8	18.8	13.9	11.4	5.4	3.2	-

2) Relative humidity (%)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
Average	70	68	64	61	58	62	67	70	70	71	73	72	67

3) Rainfall (mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Total	2.5	4.8	2.0	0.9	1.5	-	-	0.0	0.1	2.8	4.1	4.9	23.6
Max. in one day	7.0	21.0	11.4	9.0	12.3	-	-	0.0	2.7	30.0	32.3	24.2	-

4) No. of days with rain

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
≧0.1 mm	1.4	1.5	0.8	0.3	0.5	0.0	0.0	0.0	0.0	0.7	0.7	1.3	7.2
≧1.0 mm	1.0	1.0	0.5	0.2	0.4	0.0	0.0	0.0	0.0	0.5	0.6	0.9	5.1

5) Wind

Frequency of Surface Wind Blowing from the Following Direction (%)

Direction	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
N	29.1	29.5	37.8	48.2	54.2	70.9	70.6	74.4	73.8	58.3	47.6	34.9	52.4
NE	7.0	6.4	6.1	6.0	4.8	5.1	7.1	7.0	5.9	6.0	7.1	7.0	6.3
E	2.3	2.6	1.2	1.2	1.2	0.0	0.0	0.0	0.0	0.0	1.2	2.3	1.0
SE	4.7	3.8	3.7	2.4	1.2	1.3	0.0	0.0	0.0	1.2	1.2	2.3	1.8
S	14.0	15.4	12.2	9.7	7.2	2.5	2.4	1.2	1.2	3.6	4.8	10.5	7.1
SW	4.6	6.4	3.7	2.4	1.2	0.0	0.0	0.0	0.0	1.2	2.4	3.5	2.1
W	4.6	5.1	2.4	1.2	1.2	0.0	0.0	0.0	0.0	1.2	2.4	3.5	1.8
NW	15.0	15.4	19.5	19.3	18.1	12.6	12.9	10.4	14.3	19.0	17.8	15.1	15.8
Calm	18.6	15.4	13.4	9.6	10.9	7.6	7.0	7.0	4.8	9.5	15.5	20.9	11.7
Mean scalar wind speed (knots)	3.4	4.0	4.4	4.8	4.9	5.2	5.2	5.8	5.7	5.0	3.8	3.5	4.6

6) Seismicity

According to the report "THE GEOLOGY OF EGYPT" edited by RUSHDI SAID, the site will not belong the "Northera Red Sea-Gulf of Suez-Cairo-Alexandria Clysmic-Trend" zone.

Source:GOFI

4A-1-2 Meteorological Conditions (Alexandria) -1/2-

A Location

	Area	State
Name	EL DEKHIELA	Alexandria
Latitude	N 31° 10′	
Longitude	E 29° 51′	

B Meteorological condition(1942-1960)

1) Temperature (degrees centigrade)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
Mean of Day	13.4	14.3	16.0	17.8	20.9	23.6	25.4	26.3	25.1	22.8	19.9	16.2	20.1
Maximum	17.8	18.2	20.7	23.0	25.0	27.0	28.7	29.5	28.6	27.0	24.2	21.1	24.2
Minimum	9.1	10.1	11.4	14.1	17.0	20.5	22.4	23.5	21.7	18.7	15.7	11.6	16.3
Absolute Record Max.	22.8	35.6	39.7	39.8	40.6	40.6	37.1	34.6	39.8	35.4	37.3	27.3	-
Absolute Record Min.	4.0	5.6	6.6	8.0	11.7	15.3	17.4	17.0	15.4	11.1	10.6	4.2	-

2) Relative humidity (%)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
Average	67	66	64	65	71	73	72	72	67	67	66	66	68

3) Rainfall (mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Total	59.1	36.9	14.7	2.4	0.2	0.0	0.0	0.0	0.0	4.9	19.4	30.4	168.0
Max. in one day	40.2	41.4	14.7	2.5	0.5	0.0	0.0	0.0	0.0	4.2	19.0	18.3	-

4A-1-2 Meteorological Conditions (Alexandria) -2/2-

4) No. of days with rain

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
≧0.1 mm	11.2	6.2	5.8	1.8	0.8	0.0	0.0	0.0	0.0	2.8	5.5	4.8	38.9
≧1.0 mm	7.2	4.2	3.2	1.5	0.0	0.0	0.0	0.0	0.0	1.5	2.0	3.8	23.4

5) Wind

Frequency of Surface Wind blowing from the following direction (%)

Direction	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Mean
N	5.8	14.7	13.0	15.1	22.2	33.5	28.8	32.0	38.5	21.2	12.5	9.2	20.5
NE	4.8	18.4	13.7	24.8	31.8	18.4	8.1	7.0	21.4	38.5	31.3	19.5	19.3
E	2.5	7.7	5.9	9.5	4.6	1.2	0.5	0.0	0.6	6.6	11.7	10.9	5.1
SE	9.3	11.2	15.3	15.6	8.0	2.6	0.8	0.0	2.0	11.3	8.3	13.8	8.2
S	4.6	4.2	4.7	3.2	1.6	0.7	0.1	0.0	1.9	3.0	3.8	7.2	2.9
SW	38.9	8.6	7.9	2.7	1.6	1.4	0.9	1.1	1.9	5.8	8.2	22.9	7.6
W	11.5	4.6	5.5	2.5	2.3	1.0	2.5	1.0	0.7	1.7	3.2	5.8	3.5
NW	30.6	29.0	31.5	25.2	26.1	38.9	56.8	58.6	31.4	15.8	17.7	8.7	30.8
Calm	2.0	1.7	2.5	1.4	1.8	2.2	1.5	0.3	1.6	1.1	3.3	2.7	1.9
Mean scalar wind speed (knots)	10.2	9.1	10.5	9.8	9.0	9.8	9.4	10.2	9.0	8.0	8.0	8.2	9.3

6) Seismicity

According to the report "THE GEOLOGY OF EGYPT" edited by RUSHDI SAID, the site will belong to the"Northera Red Sea-Gulf of Suez-Cairo-Alexandria Clysmic-Trend" zone.

Source:GOFI

Appendix 4A-2 Availability of Typical Construction Materials

4A-2-1 Availability of material at site

1.Aggregate & Gravel	Several sources of the material for concrete aggregate have been developed, in consideration of quality & quantity. (for example) - El Kataba area, between Cairo & Alexandria, Desert Road; for normal use - Western part of Suez prefecture (Waddi Hagal) ; for a big amount and good quality material - West of Alexandria (about 40-50 km from Agami) - Quena(about 200 km from Safaga) ; for crushed lime stone - Cairo-Suez Road; ; for a good quality sand ; for crushed stone for rail way (Basalt)
2.Rock	A small quantity and not hard rock are available at any area. More than one m^3 size rock (Granite) shall be obtained from Aswan or Sinai area. In case of small size rock (soft lime stone), it is available in Alexandria area.
3.Granular soil for road construction and embankment fill	Since a road construction is progressing in every region in the country, it is rather easier to obtain the material at any area from a local contractor.
4.Ready mixed concrete	There is little firm specialized in a supply of a large amount of ready mixed concrete in the country. In Cairo & Alexandria, in case a small quantity and/or a normal quality of ready mixed concrete are required, it is available to obtain from a contractor. In Suez and Safaga, it is not available to obtain from a contractor but necessary to establish a supply system by himself as required.

Source:KAJIMA

4A-2-2 Availability of local material within the site

1.Cement	There are factories of Alexandria cement and Ameria cement in Alexandria area,and Suez cement in Suez area. In Safaga area, all bags of cement shall be purchased and transported from those factories in Suez or Cairo.
2.Sulfate resistant cement	A production of Alexandria Cement, Ameria Cement, Helwan Cement & Tora Cement are available.
3.Timber	100% of the timbers are imported and various sizes are available at the stock yard at designated bond area.
4.Plywood	Any thickness of normal plywood is available from the stock of import, however ,in case of a large amount., or waterproofed plywood are required, it shall be imported by himself or procured through an importing agent.
5.Brick	All kinds of bricks (sand brick, cement brick, clay brick & perforated clay brick) are available and can be obtained at/from Cairo & Alexandria.
6.Concrete products	
a. Concrete hollow block	Available sizes are 10x20x40 cm, 12x20x40 cm, & 15x20x40 cm. And a main suppliers are located in the 6th October City.
b. Concrete pipe	A production of Segwa Company at Helwan is available. The sizes are 150, 250, 300, 400, 500, 600, 700, 900 and max. 1,500 mm in diameter, and 3 m each in length.
c. Curb stone	A production of Cementa Company at 6th October City is available. The sizes are 50x30x12/15 cm, and 50x30x8 cm.
d. Interlocking paving blocks	Several kinds and sizes are available among a production of Cementa Company.
7.Asphalt material	A bituminous asphalt paving material are available at a local contractor's plant at any place in the country.
8.Reinfoecing bars	A production of ANSDK at Alexandria and El Ezz Company at Sadat City are main and an imported material are also available.
9.PC bars	P.C. bars and cables are not available in the country and shall be imported.
10.Asbestos	A flat and corrugated sheets are available.

Source:KAJIMA

4A-2-3 Other construction material available in Egypt

1.Steel material (Grade 37-2)		Width (mm)	Length (mm)
a.Plates	t=1,2,3,4,5,& 6 mm	1,000	6,000
	t=8,10 mm	1,500	9,000
	t=12,15,16,18,20,& 25 mm	1,500	6,000
	t=30 up to 100 mm	1,000	12,000
b.Angles	L-50x5,60x6,70x7,80x8,90x9 100x10,120x12,150x14	-	12,000
c.U-Channel	UPN-80,100,120,140,160,200,260	-	12,000
d.C-Channel	C-140x65x4,160x65x4 mm	-	6,000
e.I-Shapes	IPE-140,160,200,270,300,360,400	-	12,000
f.H-Shapes	HEA/HEB-200	-	12,000
g.Checkered plates	t=5/6,6/7	-	3,000
h.Welded pipes	D=(21.3,26.9,33.7)x 2.5 mm D=(42.4,48.3,60.3)x(3.0,2.5) mm D=88.9x(3.5,3.0),114.3x3.5 mm 139.7x3.4 mm D=168.3x(3,4,5,6) mm D=(219.1,273.0,323.9)x(4,5,6)mm	-	6,000
2.Pile			
a.Timber pile	It is not common in the country.		
b.RC pile	It is not common in the country.		
c.PC pile	It is not common in the country.		
d.Steel pipe pile	It is not common in the country.		
e.Cast-in-situ pile	Such piling work as Impact pile(Fibro), Schtraus pile(Raymond), Bored pile(Bauer) are popular in the country.		
f.Steel sheet pile	Material shall be imported and a piling work(driving & extracting) is normally done by vibro hammer.		
g.Diaphragm wall	Protection wall of this kind is rather popular in the country. (up to 1.1 m in thickness)		
3.Welding rods	Welding rods for normal steel are available, and special ones shall be imported.		
4.Bolts & Nuts	Bolts & Nuts of normal steel are available, and those of high tensile steel shall be imported.		

Source:KAJIMA

Appendix 4A-3 MAN POWER (WAGE/SALARY OF STAFF & LABOR - EXAMPLE)

Appendix 4A-3 Man Power

(Wage/Salary of Staff & Labor -Example-)

Classification	Unit	Wage/Salary	Remarks
		(LE)	
a.Staff			
Civil Engineer	Month	2,780.0	32~35 years old
Mechanical Engineer	Month	2,240.0	32~35 years old
Electrical Engineer	Month	2,240.0	32~35 years old
Administrator	Month	2,120.0	Over 30 years old
Accountant	Month	1,700.0	Over 30 years old
Secretary	Month	1,210.0	
Interpreter	Month	970.0	
Quantity Surveyor	Month	1,130.0	
b.Labor			
Foreman	Day	34.0	
Surveyor	Day	30.0	
Common Labor	Day	17.0	
Unskilled Worker	Day	12.0	
Welder	Day	24.0	
Mason	Day	30.0	
Carpenter	Day	27.0	
Re-bar Bender	Day	22.0	
Re-bar Cutter	Day	21.0	
Re-bar Fixer	Day	18.0	
Concrete Worker	Day	17.0	
Crane Operator	Day	31.0	
Heavy Equip. Operator	Day	29.0	

Note:exclude a fringe benefit and over time charges etc.

(Conditions)	
1.Labor Law & Regulation	
(1) Working Hours	Basic;8hours/day & 48 hours/week Holiday;every friday & national holiday
(2) Over Charges	125% for over 8 hours and until 6:00 P.M. 150% for over 8 hours and after 6:00 P.M. until 6:00 A.M. of the next day 200% on friday and national holiday
(3) Social Insurance Premium	For a contractor; a certain % of contract amount For a company & an employee;11-26 % of basic salary
2.Legal Control	
(1) Employ for foreigner	Necessary to get work permit
(2) Nos. of foreigners	To be less than 10 % of the total employees

Source:KAJIMA

Appendix 4A-4 AVAILABILITY OF TYPICAL CONSTRUCTIONE EQUIPMENT

Appendix 4A-4 Availability of Typical Construction Equipment (1/2)

(Note; A price are rounded and those in Alexandria and/or Suez region, as of Jan. '97.)

No	Construction Equipment	Capacity	Unit	Referential Price (LE)	
				(Rental in local market)	Remarks
1	Concrete batching Plant	60m3/H	Day	N/A	to be constructed
2	Crawler Crane	40ton	Day	770.0	
3	Crawler Crane	100ton	Day	1760.0	
4	Truck mounted Crane	40ton	Day	550.0	
5	Diesel Pile Driver	Kobe-KSH5	Day	1500.0	
6	Diesel Pile Driver	Hitachi-KH100	Day	1500.0	
7	Vibro Hammer	40kw	Ton	440.0	
8	Vibro Hammer	60kw	Ton	660.0	
9	Agitator Truck	6m3	Day	990.0	
10	Agitator Truck	8m3	Day	1230.0	
11	Back Hoe	0.4m3	Day	440.0	
12	Back Hoe	0.6m3	Day	660.0	
13	Clamshell	0.3m3	Day	770.0	
14	Clamshell	0.6m3	Day	880.0	
15	Bulldozer	D5(11ton)	Day	720.0	
16	Bulldozer	D7(21ton)	Day	1210.0	
17	Bulldozer	D9(44ton)	Day	1430.0	
18	Dump Truck	4ton	Day	170.0	

Appendix 4A-4 Availability of Typical Construction Equipment (2/2)

(Note; A price are rounded and those in Alexandria and/or Suez region, as of Jan. '97.)

No	Construction Equipment	Capacity	Unit	Referential Price (LE)	
				(Rental in local market)	Remarks
19	Dump Truck	10ton	Day	240.0	
20	Concrete Pump Car	45-50m3/H	Day	1,100.0	
21	Concrete Pump Car	55-60m3/H	Day	1,320.0	
22	Concrete Pump Car	65-85m3/H	Day	1,650.0	
23	Flat Bed Truck	5ton	Day	170.0	
24	Flat Bed Truck	10ton	Day	280.0	
25	Engine Generator	100kva	Day	220.0	
26	Engine Generator	150kva	Day	280.0	
27	Steel Road Roller	8ton	Day	660.0	
28	Tire Roller	8ton	Day	N/A	
29	Dewatering Pump	D-100mm	No	11,000.0	if,purchased new one
30	Dewatering Pump	D-150mm	No	15,000.0	if,purchased new one
31	Giant Breaker	0.7m3	Day	1,320.0	

(Remarks)

Such marine construction equipment as dredgers, burges, pontoons and tug boats are available at and belonging to Suez Canal Authority and his subsidiary companies.

Source:KAJIMA

Appendix 4A-5 CONTRACTORS

Appendix 4A-5 Contractors

(Note; Listed a representative contractor of the construction field in the country, and those figures are rounded off.)

1.General contractor

Name of Company	Capital	Annual B.Value	No of Employee
	($x10^3$LE)	($x10^6$LE)	
Arab Contractor	200,000	2,620	14,000
Nasr General Contractor	30,000	498	3,430
Egyptian Contractors Company	25,000	485	5,130
The Misr Concrete Department Company	30,000	300	7,700
Egyco	15,000	333	1,010

2.Special field contractor

a.Piling and/or deep foundation work

Name of company :Baure Egypt
:Misr Raymond
:El Nassera

b.Structual steel fabrication work

Name of Company	Capacity (ton/mon.)
Ferro Metalco	1,000
Stelco	1,000
Metalco	3,000
Arab Contractor	800
National Steel	1,000

c.Marine work

Suez Canal Authority and his subsidiary companies.

Source:KAJIMA

Appendix 4A-6 COMPARISON OF PLANT SITES

[Suez/Adabiya I.F.Z and Alexandria/El Dekhicla]

SUMMARY

ACTUAL SITUATION OF PROPOSED SITES

TECHNICAL EVALUATION

ECONOMIC EVALUATION

PLANT GENERAL LAYOUT

Summary

[1] Technical Evaluation:

Both proposed sites of Suez (Adabiya F.Z.) and Alexandria (El Dekhiela) are technically acceptable as the Flat Product Plant Site.

[2] Economical Evaluation:

1) Investment of the Suez site is estimated at around 270,000,000 LE (US$ 80,000,000) higher than Alexandria site.
2) Operation cost of Suez site is estimated at around 30,000,000 LE (US$ 9,300,000) per year higher than Alexandria site.

[3] Site condition:

There are some unpredictable factors surrounding Suez site such as;

1) Future port availability
2) Land acquisition issue under the regulations of Free Zone
3) Industrial water supply and its price

[4] Recommendation:

Alexandria site (El Dekhiela) would be more appropriate for conducting further feasibility study.

Table 4A-6-1 Proposed Site Conditions

Item	Requirement	Suez F.Z.	Alexandria/El-Dekhiela
1. Land			
1) Location	In an industrial area, convenient for transportation of raw materials and final products	In the Adabiya Industrial Free Zone, 20km east of Suez City, facing Suez Bay. About 4 km from the raw material unloading port.	Adjacent to El-Dekhiela port and close to ANSDK. About 2.4 km to the mineral jetty in the El-Dekhiela port. Reclaimed land of Lake Maryut
2) Area and shape	Ideally 1.0 to 1.5million m^2 and rectangular.	Available, approx 660,000m^2	Available, approx. 600,000m^2
3) Geographic and soil conditions	Flat, level and even.	Extremely steep, 30 m elevation differences. Large scale earth works required.	Flat and even but low ground level. Filling and banking is required to raise 4 to 5m.
	Solid, stiff soil. Shallow bearing stratum for foundation	Stiff soil .	Upper layer of stratum is soft clay. Piled foundation is required. (10-15 m)
	No obstacles to be removed	Land is divided into 8 blocks surrounded by paved roads. Drainage pipe and cables are installed under the road.	Existing building and brick fence
4) Acquisition of land		30 LE/m^2	150 LE/m^2

Item	Requirement	Suez F.Z.	Alexandria/El-Dekhiela
2. Transportation facilities			
1) Roads	Paved roads, convenient for transportation between factory and market	145 km to Cairo, via 2 lanes of paved road.	210 km to Cairo, via 2 lanes of paved or agricultural roads.
2) Port and berth		No existing port. Construction of new port facility is under consider- ation.	
a. Iron ore unloading berth	Water depth; 15-20m Length ; 300-350m	Existing port facilities at Suez or Adabiya are available.	Existing port facilities at Dekhiela port are available. 20m of water depth can accommodate 125,000 DWT vessel.
b. Scrap unloading and product shipping berth	Water depth; 7.5-10m Length ; 150-200m		Existing port facilities at Alexandria or Dekhiela are available
3. Energy and utilities			
1) Electric power	200MW	Available	Available
2) Natural gas	55,000Nm^3	Not currently, available in future	Available
3) Industrial water	36,000 ton/day	Not currently, available in future. Desalination plant for raw water is required	Available Water softener is required.
4) Waste water sewer	24,000 ton/day	Available	Available

Item	Requirement	Suez F.Z.	Alexandria/El-Dekhiela
4. Regional conditions			
1) Regional development plan	Industrial area	A part of the third year development plan	Within an industrial area
2) Supporting industries		Expected	Available
3) Environmental restrictions		Law No.4/1994 C0mpliance	Law No.4/1994 Compliance

Table 4A-6-2 Technical Evaluation

Item	Importance	Suez		Alexandria	
		Comment	Rating & score	Comment	Rating & score
1. Land					
1) Dimension & area of the site	A	Rather small and not satisfactory, but general layout could be adjusted to accommodate the area accordingly.	I-6	Rather small and not satisfactory, but general layout could be adjusted to accommodate the area accordingly.	I-6
2) Geographical conditions	A	Extremely steep, 30m elevation differences. Large scale earth works required including excavation, filling and compacting.	I-6	Flat and rectangular, but ground level is low. Earth works for raising ground level is required.	I-7
3) Soil conditions	B	Good	A-9	Upper layer of soil is silty clay. Foundation pilling is necessary	I-6
4) Other conditions	C	Existing buried items for public use such as drainage pipe, power and telephone cable shall be replaced.	I-6	Demolishion work for the existing building is necessary	I-7

Item	Importance	Suez		Alexandria	
		Comment	Rating & score	Comment	Rating & score
2. Transportation					
1) Road net work	A	Available	A-10	Available	A-10
2) Railway	C	Available between Cairo & Suez	I-7	Available between Cairo & Alex.	I-7
3) Port facilities					
a. Iron ore unloading berth	A	Not currently. Construction plan for a new mineral jetty is under consideration.	I-5	Existing facilities are available.	A-10
b. Scrap & products berth	A	Available	A-9	Available	A-9
3. Utilities					
1) Electric power	A	Available	A-10	Available	A-10
2) Natural gas	A	Not currently. Gas piping will be installed upon request of users.	I-7	Available	A-10
3) Industrial water	A	Not currently. Installation of water piping is under consideration.	I-5	Available. Water softener is necessary.	A-8
4) Waste water sewer	A	Available	A-10	Available	A-10

Item	Importance	Suez		Alexandria	
		Comment	Rating & score	Comment	Rating & score
4. Regional conditions 1) Meteorological conditions	C	Acceptable	N.A.	Acceptable	N.A
2) Environment & pollution control	A	Law NO.4/1994 Compliance. Acceptable	N.A	Law NO.4/1994 Compliance. Acceptable	N.A
Total evaluation		288/350 = 65		267/350 = 76	

Note : Weight of importance A =3, B =2, C =1

4A-6-3 Economical Evaluation : Comparison of Investment

Item		Suez.					Alexandria				
		Unit price (LE/Unit)	Quantity	Unit	Cost (x 10^3 LE)	Remarks	Unit price (LE/Unit)	Quantity	Unit	Cost (x 10^3 LE)	Remarks
Land	Acquisition of land	30	662,000	m^2	19,860		150	600,000	m^2	90,000	
	Land preparation	40	1,650,000	m^3	66,000		20	2,600,000	m^3	52,000	
	Slope protection	380	46,000	m^2	17,480		380	21,000	m^2	7,980	
	Sub total				103,340					149,980	
Port	Quay				60,000					0	
	Port facilities				107,500					0	
	Sub total				167,500					0	
Facilities in plant	Conveyor	17,000	4,000	m	68,000	From port to site	17,000	2,400	M	40,800	
	Foundation (Piling)				0		2,300	15,000	Piece	34,500	
	Desalination plant (RO)				170,000	Raw water treatment				0	
	Softener				0					14,000	Raw water treatment
	Sub total				238,000					89,300	
Total					508,840					239,280	

Difference = 269,560x10^3LE
(US$ 80,000,000)

4A-19

Table 4A-6-4 Economical Evaluation : Comparison of Operation Cost

Item		Suez Free Zone		Dekhiela		Remarks
		Investment (x10^3 LE)	Cost (LE/ton)	Investment (x10^3 LE)	Cost (LE /ton)	
Land	Acquisition of land	19,860	1.5	90,000	6.8	
	Land prepalation	66,000	6.3	52,000	4.5	
	Slope protection	17,500		7,980		
Port	Quay	60,000		0		
	Port facilities	107,500	23.6	0	18.4	
	Management cost	0		0		
Facilities in plant	Iron ore conveyor	68,000	7.0	40,800	4.3	From port to plant
	Foundation (Piling)		0	34,500	3.5	
	Desalination plant (RO)	170,000	17.6	0	0	Raw water treatment
	Softener	0	0	14,000	1.4	Raw water treatment
Freight for iron ore		0	49.2	0	34.8	
Total		508,860	105.2	239,280	73.7	Difference = 31.5LE/ton of products

Note : Interest = 7.5% per year

31,500,000 LE/year
(US$ 9,320,000/year)

Figure 4A-6-1 General Plant Layout-Suez/Adabiya

[Preliminary]

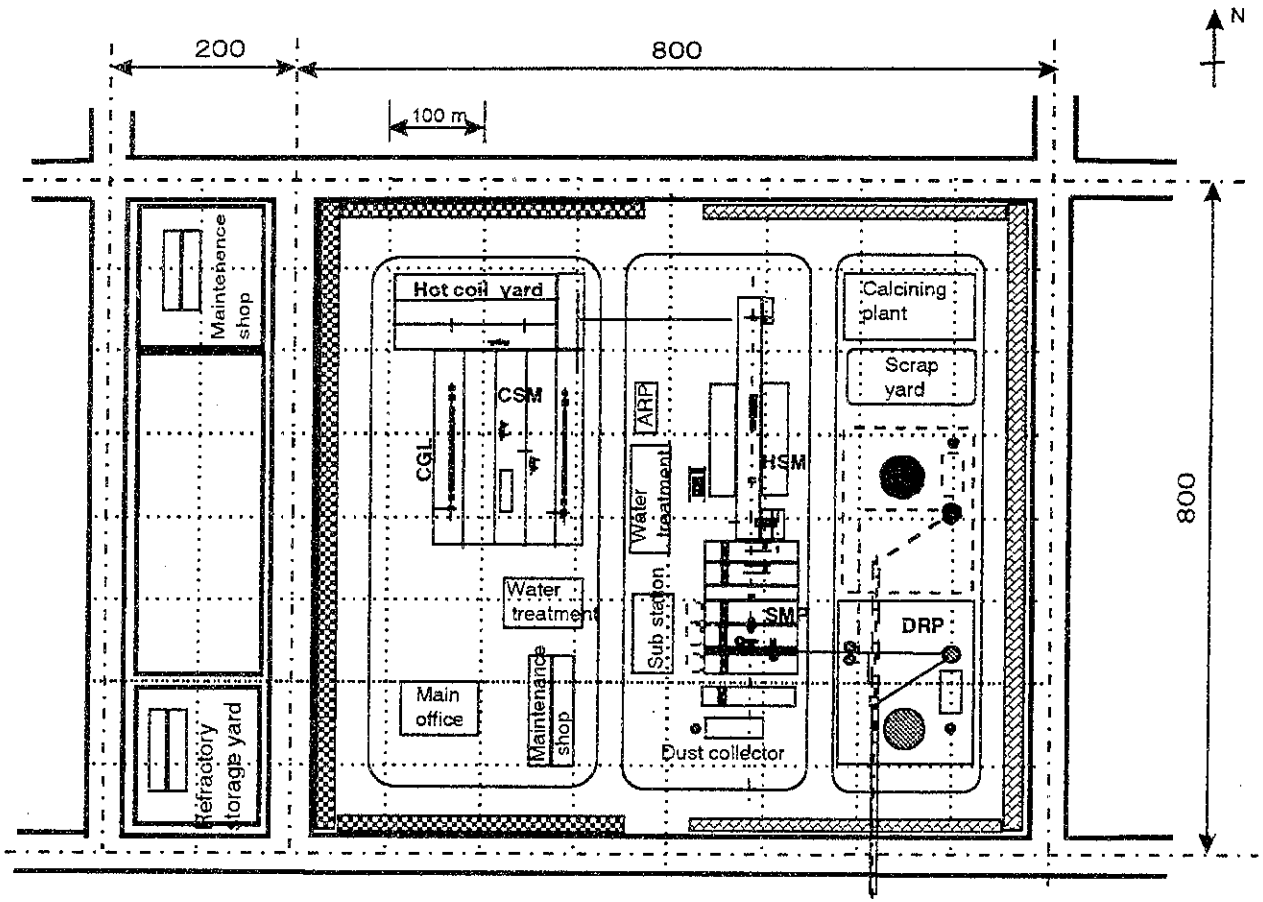


Figure 4A-6-2 Plant site Elevation-Suez/Adabiya
[East/West]

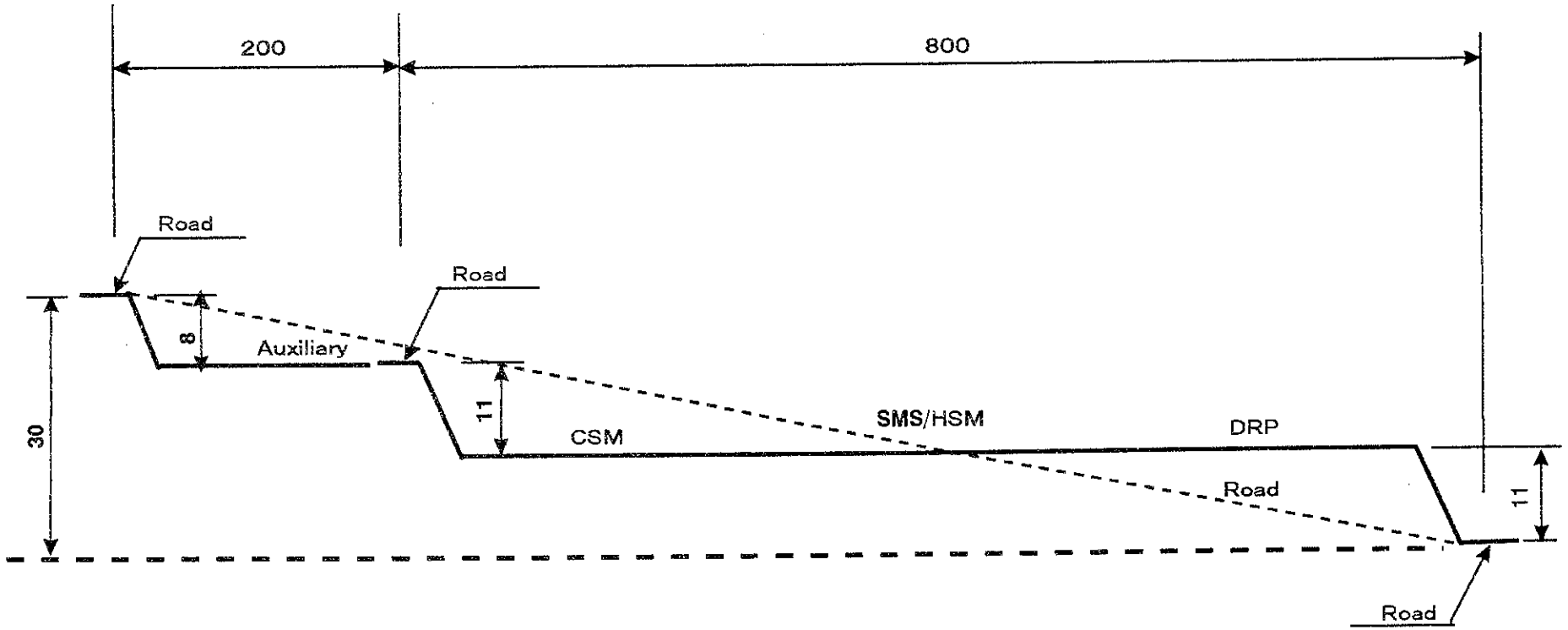
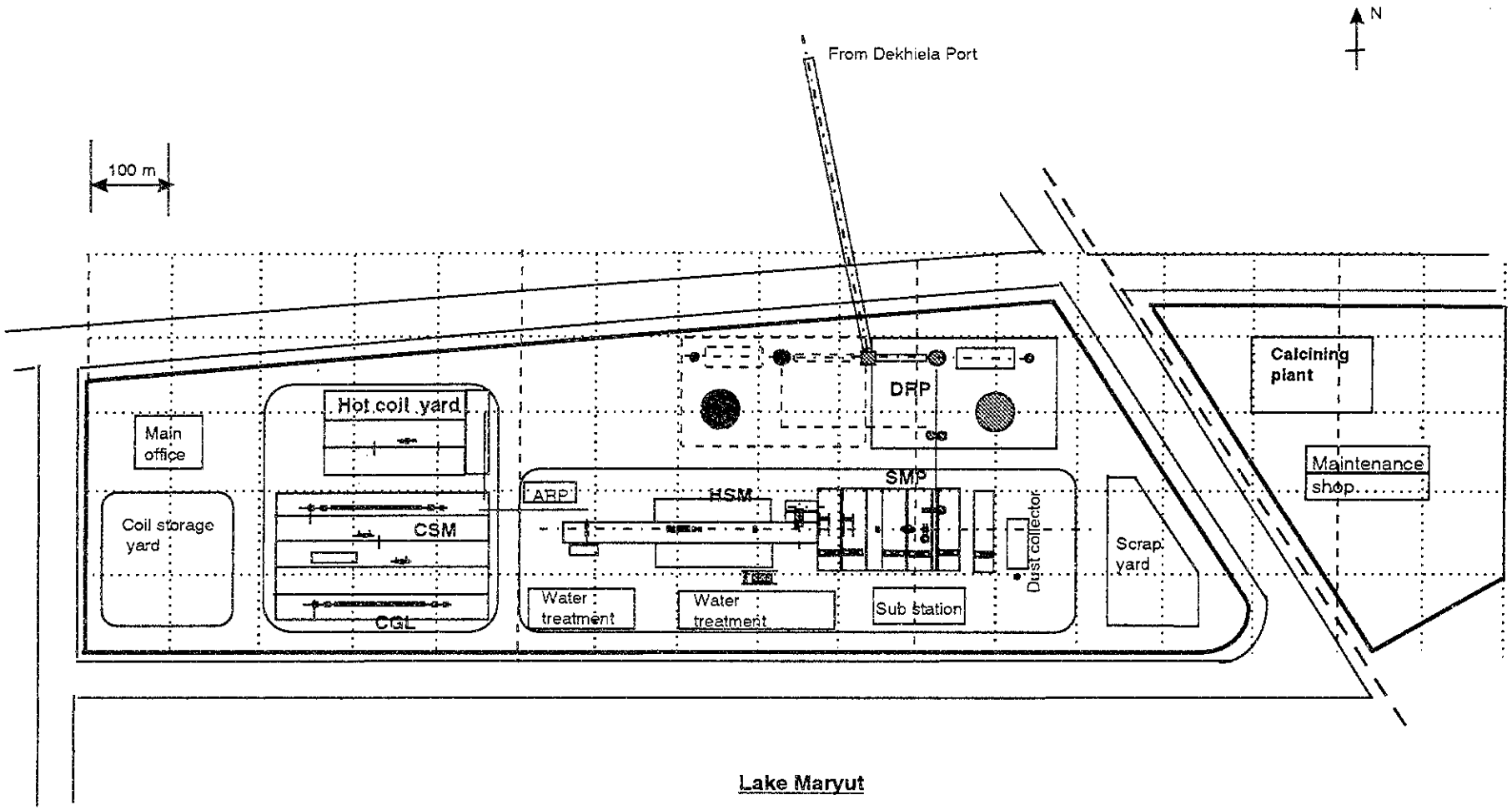


Figure 4A-6-3 General Plant layout-Alexandria/El Dekhiela
[Prelimanary]



Appendix 4A-7 INFORMATION AND DATA OF SAFAGA

Appendix 4A-7 INFORMATION AND DATA OF SAFAGA

Safaga was one of the sites proposed by GOFI at the first field survey. However, it was eliminated from the candidates site at the end of the first survey due to the fact that it is not an appropriate for construction of the flat product plant.
Information and date of Safaga which are obtained during the first field survey are as follows.

1. LAND AND UTILITIES

1-1 Site Conditions (Location and Area)

Safaga is located at the coast of the Red sea, about 610 km southeast of Cairo and some 60 km south of Hurghada City, which is the largest town on the Red Sea with population of approximately hundred thousand inhabitants. Development plan of Safaga City started 15 years ago and is still under development.

Three areas (Safaga I, II, III) ,of which locations shown in Figure 4A-3-3, are indicated by the Red Sea Governorate. Although no exact figures of the area nor coordinate of the boundary were indicated, all the areas seems to have large enough area and topographical shape required for construction of the flat product plant.
The proposed area, except Safaga III are located comparatively close to the Safaga Port. The distance from Safaga port to the Safaga I and III are approximately 7 km and 3 km respectively. The land will cost 3 to 10 EL/m^2. Land preparation work is required because of rugged and uneven level of the surface.

1-2 Social Conditions

1-2-1 Incentives, law and regulations

The Egyptian government has been constructing 12 new towns as "New Communities", away from the major cities like Cairo and Alexandria. Extremely generous incentives are available to attract investment into these new towns, including ten-year tax exemptions, cheap land and relatively little bureaucracy. Tax holidays can be extended still further through self-financed expansion or through the creation of subsidiary companies. However, Safaga and Suez are not included in New Communities.

In addition to "New Community", the Egyptian government established "Free Zone". This investment system is not so attractive as "New communities" in terms of incentives. This

system was set up in 1994 to promote manufacturing capacity, to create employment opportunities and to generate foreign exchanges earning through export.

Two type of free zones have been established by the General Authorities for Investment (GAFI). One is public free zones for a conglomerate of projects. Another is private free zones, for a single project which requires a particular location. The project for flat product plant is big enough to be located at public free zone. Five public zones are currently under operation. And three public zones are newly approved and other two are newly under study. These are shown in table 4A-3-1.

Safaga, Suez and Alexandria have public free zones respectively. These special incentives for free zones in practice have been used mainly for trading activities, while some limited incentives are available under general Company Law 159/1981.

Table 4A-7-1 Public Free Zones

Stage	Zone	Governorate
Operating	Alexandria	Alexandria
	Nasr city	Cairo
	Port Said	Port Saidd
	Suez	Suez
	Ismailia	Ismailia
Newly approved	Safaga	Red Sea
	Cairo	Cairo
	Damietta	Damietta
Newly under studying	East	Port Said
	Al Arish	North Sinai

Source: "New Communities, Aug. 1995" by American Chamber of Commerce in Egypt

1-2-2 Supporting industries

It seems that industries in Alexandria and Suez will be under expansion, but in Safaga it will take many years for the flat product projects to have enough supporting industries.

1-3 Construction Requirement

For a steel works construction, a large amount of construction material, manpower of many

categories, and many kinds of constructional equipment will be required under the well experienced management.

It is of importance that in the region of the site, a supply capability of such resources as material, manpower and equipment are to be sufficient to the extent that the project requires.

Three prospective areas are proposed and surveyed based on a "General Development Plan" in the region, in which an industrial zone is indicated.

Except the construction work of so-called Phosphate Jetty which is under construction with completion target by the end of 1997, a construction activity are not observed in particular. Such resources as material, manpower, and equipment are to be brought in and mobilized from Cairo or outside the region.

2. TRANSPORTATION AND PORT FACILITIES

2-1 Port Facility

Safaga port lies on the western coast of Red Sea and is naturally protected by the Main Land and Safaga Island. The port is characterized by enough depth suitable for constructing deep quays.

- The port used for grains, general cargo and Passengers is 14 m depth, 290 m length with 3 berths.
- The port used for aluminum and coal is 8-10 m depth, 336 m length with 2 berths.
- The port exclusively used for phosphate is under construction, and will be 15 m depth and 400 m length.

According to the both port authorities of Safaga and Suez ,the new mineral jetty could be constructed subject to prior consent with relevant authority adjacent to above mentioned port for phosphate, and construction cost shall be born by the steel plant.

2-2 Road and Railway

The land transportation has a great impact on operation cost of the flat product plant in terms of the transportation of raw materials and delivery of the final products to its market. A reliable transportation system ensures the steel plant the shortest possible delivery of raw materials at economical cost. Also it is indispensable that the finished products should be delivered safely to their final destination as quickly and economically as possible.

The land transportation in Egypt are summarized as follows.

2-2-1 Road transport

Egypt has 45,000 km of roads, of which 17,000 km are inter-city roads in relatively fair and good condition. Roads connect Cairo with Alexandria, Suez, Ismailia, Port Said and other delta towns, and Aswan as far as the High Dam and they are in reasonable condition. Paved inter-city roads increased from 8,365 km in 1981 to 18,770 km in 1995. Table 4A-3-2 shows length of paved roads.

Table 4A-7-2 Length of Paved Roads by Main Governorate

Unit: km

Governorate	Width of Road (m)			Total
	<7.5	7.5-12	>12 or double	
1) Cairo	-	338	233	571
2) Alexandria	97	-	132	229
3) Suez	60	309	378	747
4) Port Said	-	19	78	97
5) Red Sea	736	888	16	164
Total	6,692	9,885	2,193	18,770

Source: CAPMAS

Note: 1995

Regarding to the road conditions, Suez is generally in good conditions. Roads along the Red Sea is not well arranged.

Newly proposed roads are as follows;

- Armant - El Kharga
- Ewainat Shark - Abu Simbel
- Assuit - Hurghada
- Daurout - El Frafra
- Aswan - Shalateen

2-2-2 Railway transport

Safaga has single track railway connected to western El Kharga.

3. WATER SUPPLY, SEWAGE AND WASTE WATER TREATMENT

3-1 Water Supply

3-1-1 Water resource

The existing water supply line (diameter of pipe line is 200 mm) from Qena to Hurghada has a capacity of 1,250 m^3/hr (30,000 m^3/d) and is connected to the reservoir (capacity : 40,000 m^3). Another one line from Kuraimat to Hurghada (capacity : 56,000 m^3/d) is under construction and is expected to complete by the end of this year (1997). This supply line does not pass through Safaga, and the distance from Hurghada to Safaga is about 60 km.
These two lines are supply of potable water used for citizen life and will be supplied to the steel plant.

Raw water is not available in Safaga.

In case that the site is selected at Safaga, it will be necessary for the steel plant to develop under ground water by drilling well or to install desalination plant.

Supply facilities of potable and raw water in the three proposed sites are briefly summarized as follows respectively:

Table 4A-7-3 Potable Water

(Requirement for Flat Project: 1,000 m^3/d)

Proposed sites	Area	Pipe line (mm)	Capacity m^3/d (future)	Result
Safaga	Safaga I	200	30,000	Available
	Safaga II	-		
	Safaga III	200	30,000	Available
Suez	Suez I	1,000	11,000 (30,000)	Available
	Suez II	1,000	11,000 (30,000)	Available
	Suez III	1,000	11,000 (30,000)	Available
Alexandria	Mannshia	1,000	30,000	Available
	Merghen	1,000	30,000	Available

Table 4A-7-4 Raw Water (Requirement for Flat Project)

Proposed site	Area	Pipe line	Distance from the nearest water sources
Safaga	Safaga I, II, III	Not available	None *1
Suez	Suez I,II, III	Available	1) 10-12 km from Suez Canal 2) Further study for using the treated sewage water is required.
Alexandria	Mannshia Merghen	Available Available	5 km from Mahmodia canal 15 km from Nobaria canal

*1: The development of under ground water for drilling well or installation of desalination plant are required.

3-1-2 Sewage and industrial waste water

The facilities of sewage and waste water in area Safaga I,II and III are not available.

3-2 Natural Resources and Energy

3-2-1 Electric power

Power of 220kV and capacity of 150 MW (2 x 75 MW) will be supplied from Elasagoreb by the end of 1997.
However, this capacity is not sufficient for operation of the flat product plant.

3-2-2 Natural gas

Supply lines exist in Alexandria and Suez, but do not exist in Safaga.
Future plan about natural gas pipe line does not exist also in Safaga.
Natural gas pipe line is available from Ras Gareb, of which distance from Safaga is about 150 km.

Supply pipe line in the each proposed sites is summarized as Table 4A-3-5

Table 4A-7-5 Natural Gas Supply Pipe Line to Sites

Proposed sites	Pipe line	Future plan	Distance from nearest line
Safaga	Not exist	Not exist	150 km (Ras Gareb)
Suez	Exist	?	
Alexandria	Exist	Exist	

4. NATURAL CONDITIOND

4-1 Meteorological Condition at Safaga (Hurghada) in 1943-1960

- Temperature(°C)
  - Annual mean : max.27.0, min.17.7
  - Absolute records : max. 43.0, min. 3.4
- Rainfall(mm)
  - Annual mean : N/A (total 4)
- R humidity (%)
  - Annual mean : 52
- Wind rose : omitted (Prevailing; NNW, WNW)
- Seismicity *1 : 1st belt "R.Sea-Delta-Med.Sea" & 3rd belt "El Akaba bay-Dead Sea"

4-2 Topographical Condition

The designated three areas, each of which located along the coast, present a hilly natural desert of which elevation are higher enough above the sea water level, and land seem to have a little steep gradient and so much undurated in consideration of the land development.

It should be remarked furthermore that according to the topographical maps, big wadis which cross both the designated southern area, Safaga II and northern area, Safaga III are clearly shown on them.

4-3 Soil Condition

The features of land surface is desert, weathered and eroded. And it seems a surface soil consists of crushed or fragment of rock, coarse sand and gravel.

The details of the composition of subsurface soil such as layer, thickness of strata, inclination, etc. are not obtained and uncertain.

In addition, no underground water is observed and the expected bearing capacity of subsurface soil might be approximately 1 kg/cm^2.

4-4 Sea Condition

A prospective port location are to be considered at the southern part of Safaga bay, which is located at the south of Safaga island and naturally protected by it.

According to the chart, location adjacent to the existing oil jetty seems suitable, however, the details on the exact location are not designated, and those on the sea condition are not available and uncertain at all.

5. Environmental

At present, there is no remarkable environmental problem in Safaga.

And also, there are no big heavy industries, and the geographical conditions seem to be free from environmental pollution.

Therefore, there will be no serious environmental problem in construction of steel plant, if the plant is equipped with well designed pollution control system.

Appendix 6A-1 DIRECT REDUCTION PLANT

Appendix 6A-1-1 DIRECT REDUCTION PLANT EQUIPMENT LIST

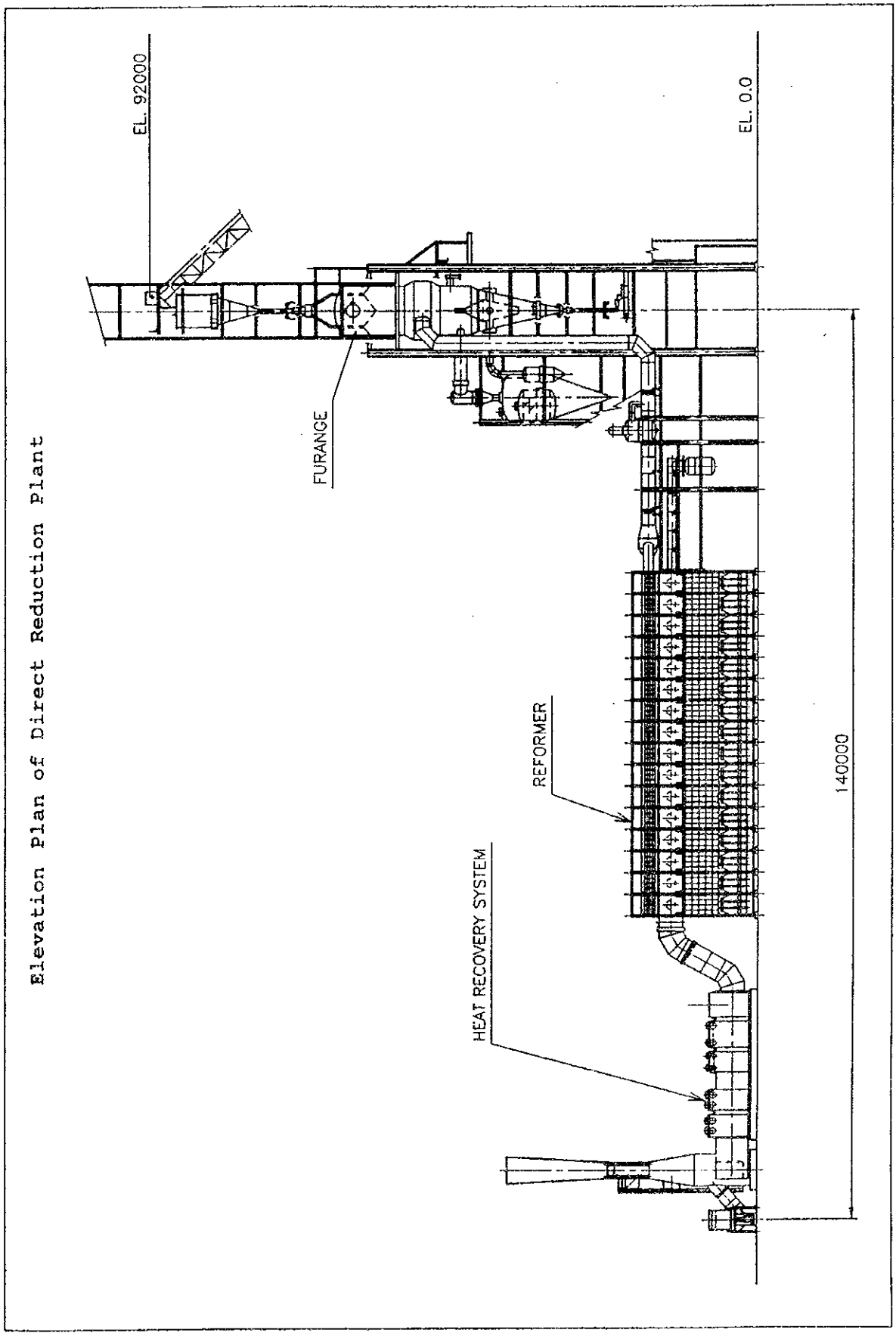
Appendix 6A-1-2 DIRECT REDUCTION PLANT DRAWINGS

Appendix 6A-1-1 Direct Reduction Plant Equipment List

No.	Equipment	Q'ty	Specification
DR01	Process Gas System		
0101	Reduction furnace	1	134 t/h, 6.5 mID
0102	Furnace feed leg	1	
0103	Cooling gas distributor	1	
0104	Cooling gas off-take	1	
0105	Burden feeder water tank	1	
0106	Reformer tube	450	250 mmID
0107	Reformer	1	15 bay, 6 rows
0108	Catalyst	1 lot	
0109	Reformed gas cooler	1	
0110	Top gas scrubber	1	
0111	1st stage process gas compressor	2	Rotary lobe type
0112	Pulsation dumper for 1st process gas compressor	2	
0113	2nd stage process gas compressor	2	Rotary lobe type
0114	Pulsation dumper for 2nd process gas compressor	2	
0115	Process gas mixer	1	
0116	Process gas mist eliminator	1	
0117	Process gas aftercooler	1	
0118	Cooling gas scrubber	1	
0119	Cooling gas compressor	2	Rotary lobe type
0120	Pulsation dumper for cooling gas compressor	2	
0121	Cooling gas mist eliminator	1	
DR02	Combustion System		
0201	Main air blower	1	Centrifugal type
0202	Recuperator	2	
0203	Fuel gas mixer	1	
0204	Main burner (A)	150	Diffusion type
0205	Main burner (B)	60	Diffusion type
0206	Auxiliary air blower	1	Centrifugal type
0207	Auxiliary burner	60	Premix type
DR03	Flue Gas System		
0301	Dilution air blower	1	Centrifugal type
0302	Ejector stack	1	
0303	Ejector stack fan	1	Centrifugal type
DR04	Seal Gas System		
0401	Seal gas cooler	1	
0402	Seal gas compressor	1	Positive displacement type
0403	Seal gas aftercooler	1	
0404	Seal gas refrigerant dryer	1	
0405	Purge gas compressor	2	Positive displacement type
0406	Purge gas adsorption dryer	1	
0407	Purge gas tank	3	

No.	Equipment	Q'ty	Specification
0408	Inert gas generation unit	1	
0409	Upper slide gate	1	
0410	Lower slide gate	1	
DR05	Process Water System		
0501	Scrubber venturi booster pump	2	
0502	Top gas scrubber recycle pump	1	
0503	Clarifier	1	
0504	Clarifier underflow pump	2	
0505	Chemical dosing unit	1	pH control/flocculant
0506	Cold process water pump	3	
0507	Cooling tower	1	
0508	Hot process water pump	2	
DR06	Oxide Handling System		
0601	Day bin discharge feeder	3	
0602	Day bin discharge conveyor	3	
0603	Day bin transfer conveyor	1	
0604	Furnace feed conveyor	1	300 t/h, 900 mm width
0605	Oxide day bin	3	
0606	Remet feeding unit	1	
0607	Furnace charge hopper	1	
DR07	Product Handling System		
0701	Upper burden feeder	1	
0702	Middle burden feeder	1	
0703	Lower burden feeder	1	
0704	Furnace discharge feeder	1	Vibrating type
0705	Product storage bin	3	7000 ton each
0706	Grating feeder	1	
0707	Product storage bin discharge feeder	3	Vibrating type
0708	Furnace discharge conveyor	1	
0709	Product elevating conveyor	1	
0710	Product bin feed conveyor		With tripper
0710	Cold DRI briquetting unit	1	
DR08	Machinery Cooling Water System		
0801	Burden feeder cooling water pump	2	
0802	Machinery cooling water pump	2	
0803	Machinery cooling water heat exchanger	1	Plate type
DR09	Non-process Services		
0901	Instrument air unit	1	
0902	Plant air unit	1	
DR99	Spare Parts and Consumable		
9901	Spare Parts	1 set	
9902	Consumables	1 set	

Appendix 6A-1-2 Elevation Plant of Direct Reduction Plant



Appendix 6A-2 STEELMAKING PLANT

Appendix 6A-2-1 STEELMAKING PLANT EQUIPMENT LIST

Appendix 6A-2-2 STEELMAKING PLANT DRAWINGS

Appendix 6A-2-1 Steelmaking Plant Equipment List

No.	Equipment	Q'ty	Specification
SM01	Handling Facilities		
SM011	Scrap Handling Facilities		
01110	Scrap bucket	2 sets	1) 60 t scrap charge, clam shell type
SM012	DRI and Additives Handling Facilities		
01210	DRI/lime storage system	1 lot	1) Junction houses (J/H): 2 sets 2) DRI/lime conveyor: 250 t/hr x 2 sets 3) Tripper: 250 t/hr x 1 set for No.2 DRI/lime conveyor, 4) DRI storage hopper: 200 m^3 x 2 sets 5) Lime storage hopper: 200 m^3 x 1 set
01220	DRI/lime charging system into EAF	1 lot	1) DRI weighing feeder: 230 t/hr x 2 sets 2) Lime weighing feeder: 30 t/hr x 1 set 3) No.3 DRI/lime conveyor: 260 t/hr x 1 set 4) Charge hopper: 1 set 5) Swing chute: 1 set
01230	Additives storage system	1 lot	1) Dumping hopper: 1 set 2) No.1 additive conveyor: 1 set 3) No.2 additive conveyor: 1 set 4) Tripper for No.2 additive conveyor: 1 set 5) Storage hopper: 10 sets, with feeder
01240	Additives charging system into EAF	1 lot	1) Lorry car: 1 set, with weigher 2) EAF charge hopper: 1 set

No.	Equipment	Q'ty	Specification
01250	Additives charging system into ladle	1 lot	1) Chute to ladle charge hopper : 1 set 2) Ladle charge hopper: 1 set 3) Chute to ladle: 1 set
01260	Additives charging system into LF	1 lot	1) Chute to LF charge hopper: 1 set 2) LF charge hopper: 1 set 3) Chute to LF: 1 set
01280	Dedusting equipment for DRI and additives handling facilities	1 lot	1) Dedusting equipment for J/H: 2 sets 2) Dedusting equipment for tripper: 1 set 3) Dedusting equipment for CDRI/lime weighing feeder: 1 set
SM013	Ladle handling facilities		
01310	Ladle	7 sets	1) For 160 t molten steel with ladle valve and bubbling plug fixtures
01320	Ladle transfer car for EAF	1 set	1) With weigher
01330	Ladle transfer car for LF	2 sets	
01340	Ladle dryer	2 sets	1) Natural gas combustion type
01350	Ladle preheater	1 set	1) Natural gas combustion type
01360	Ladle valve maintenance station	1 lot	1) Deck:2 sets 2) Ladle stand: 2 sets 3) Hydraulic unit: 2 sets for station and CCM casting floor
01370	Ladle relining station	1 lot	1) Deck for 2 ladles: 1 set 2) Moval deck and ladder: 2 sets
01380	Ladle dismantling station	1 set	1) Ladle stand
SM014	Slag handling facilities		
01410	Slag pot	6 sets	
SM02	Electric arc furnace facilities		

No.	Equipment	Q'ty	Specification
SM021	Electric arc furnace	1 set	1) DC furnace with EBT system, water cooled shell and roof 2) Heat capacity: 160 t excluding 20 t hot heel 3) Transformer capacity: 133 MVA 4) Electrode: 30 inches dia. 5) Furnace tilting, roof swing, electrode hoisting, slag door hoisting: By hydraulic cylinder
SM022	Utility system and piping	1 lot	1) Cooling water piping 2) Pneumatic piping 3) Hydraulic system 4) Furnace bottom cooling air piping 5) Lubrication system
SM023	Auxiliary equipment		
02310	Tapping hole maintenance Deck	1 set	
02320	Bottom electrode push up Device	1 set	
02330	Oxygen and carbon injection manipulator	1 set	
02340	Carbon injection system	1 set	
02350	Gunning system	1 set	
02360	Electrode nippling device for EAF	1 set	
02370	Electrode stand for EAF	1 set	
SM03	Fume extraction system		1) Bag filter type combined of EAF direct suction, LF direct suction and building suction 2) Total gas volume will be controlled by varying fan revolution with torque converters. Gas volume of each suction will be controlled by dampers
SM031	EAF direct suction system	1 lot	
SM032	EAF tapping side local suction System	1 lot	
SM033	LF Direct suction system	1 lot	
SM034	Building suction system	1 lot	

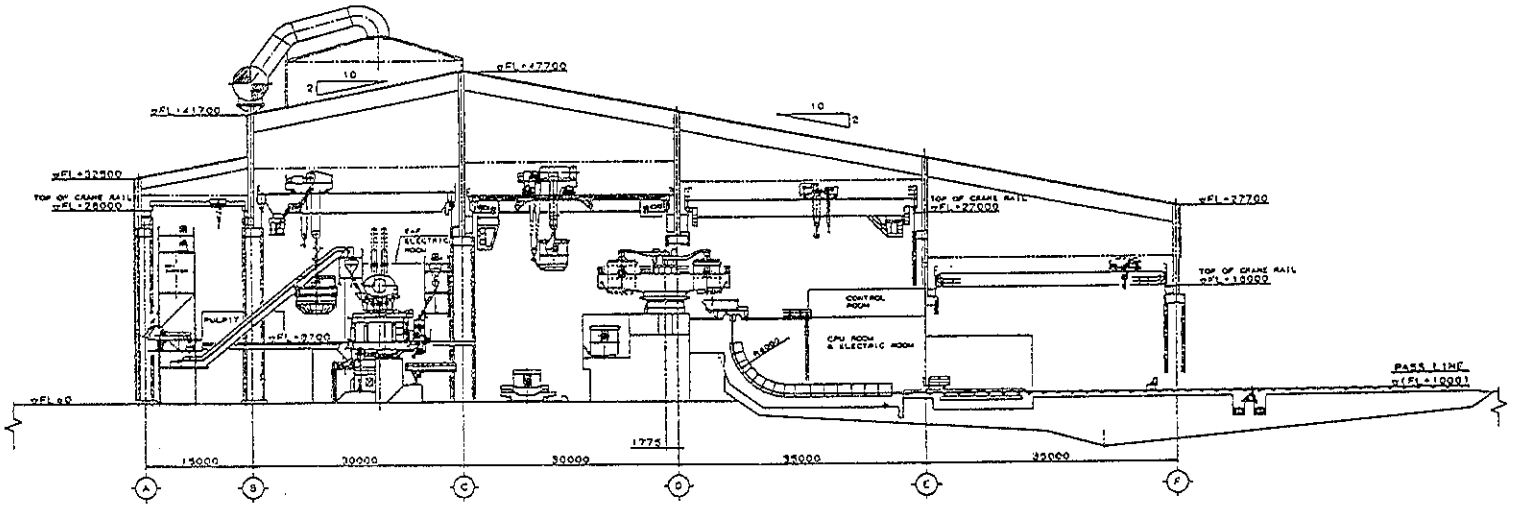
No.	Equipment	Q'ty	Specification
SM035	Bag house and dust handling Facilities	1 lot	
SM04	Ladle furnace facilities		
SM041	Furnace	1 set	1) Ladle capacity: 160 t 2) Transformer capacity: 23 MVA 3) Electrode: 16 inches dia. 4) Electrode hoisting, electrode clamping, roof lifting: By hydraulic cylinder
SM042	Ladle stirring equipment	1 lot	
04210	Ladle bottom stirring device	2 sets	
04220	Emergency stirring lance	1 set	
SM043	Auxiliary Equipment		
04310	Temperature, oxygen content and sampling device	1 set	
04320	Electrode stand for LF	1 set	
SM05	Cranes and jib cranes facilities		
SM051	Cranes		
05110	110/30 t scrap charging crane	1 set	1) At EAF aisle
05120	280/70 t ladle crane	1 set	1) At ladle aisle
SM052	Jib cranes and hoist	1 lot	
SM053	Hoists	1 lot	
SM06	Electrical equipment, instrumentation and computer system		
SM061	Electric power supply and distribution		
06110	Flicker compensation equipment And higher harmonics filter	1 lot	1) Thyristor controller reactor: 1 set 2) Thyristor power controller: 1 set 3) Higher harmonics filter: 1 set

No.	Equipment	Q'ty	Specification
06120	33/6.6 kV local substation	1 lot	1) 33 kV switchgear: 1 set 2) 33/6.6 kV step down transformer: 1 set 3) 6.6 kV switchgear: 1 set 4) 6.6 kV static capacitor: 1 set 5) 6.6 kV/400 V step down transformer: 3 sets 6) 6.6 kV/3.3 kV step down transformer for HV crane power source: 1 set
SM062	DRI and additive handling system	1 lot	
SM063	Melt Shop		
06310	DC electric arc furnace	1 lot	1) 33 kV switch gear: 2 sets 2) Transformer–rectifier assembly: 2sets x 66.5 MVA 3) DC reactor: 2 sets
06320	EAF auxiliary equipment	1 lot	
SM064	Dedusting system	1 lot	1) 6.6 kV switchgear: 1 set 2) 6.6 kV/400 V step down transformer: 1 set
SM065	Ladle furnace		
06510	Ladle furnace	1 lot	1) 33 kV switchgear: 1 set 2) Ladle furnace transformer: 23 MVA x 1 set
06520	LF auxiliary equipment	1 lot	
SM066	Information system		
06610	Automatic control system	1 lot	1) Computer control system: 1 set for EAF and LF
06620	Intercommunication system	1 lot	
06630	Television system	1 lot	
SM067	Common electrical		
06710	Cranes and jib crane	1 lot	
06720	Lighting	1 lot	
06730	Outlet for small power	1 lot	
06740	Power supply to EOT cranes	1 lot	
06750	Fire protection system	1 lot	

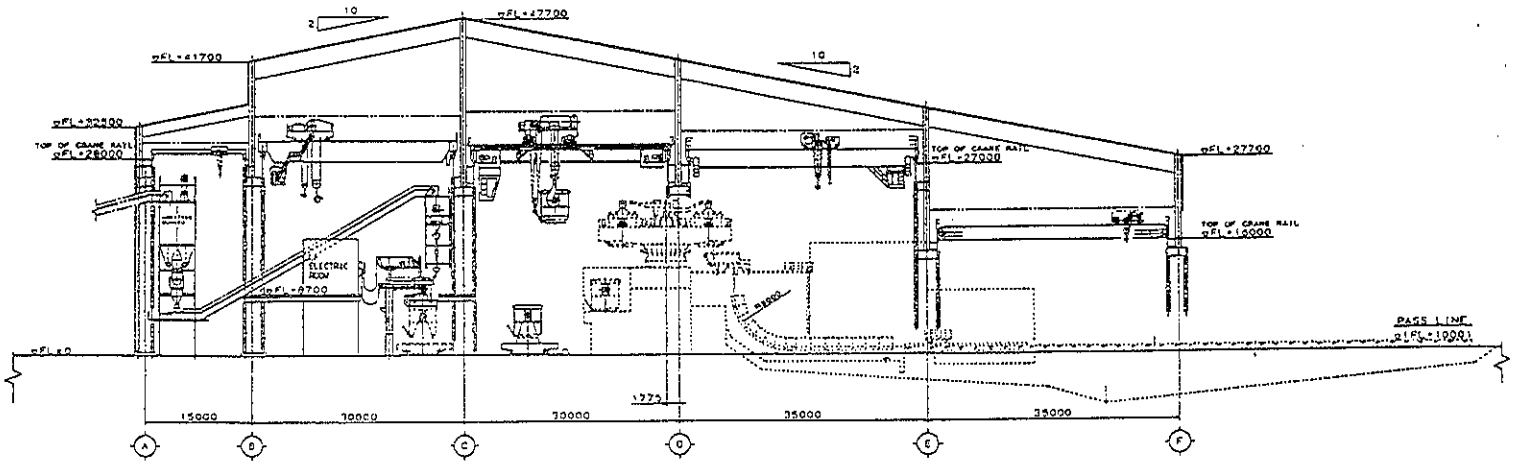
No.	Equipment	Q'ty	Specification
06760	Ventilation and air conditioning system	1 lot	
SM07	Continuous casting machine facilities		
SM071	Slab caster	1 set	1) Type: Vertical bending type 2) Strand: 1 str. 3) Slab size: 210 mm thickness x 800 – 1,600 mm width x 5 – 10.9 m length 4) Slab weight: 28.0 t max. 5) Casting speed: 2.0 m/min. max.
7110	Ladle handling equipment	1 lot	1) Ladle turret 2) Emergency trough
07120	Tundish facilities	1 lot	1) Tundish: 2 sets, approximately 30 t capacity 2) Tundish car: 2 sets 3) Tundish preheater: 2 sets 4) Tundish nozzle preheater: 2 sets
07130	Supporting structure and cooling chamber	1 lot	1) Steel structure, cooling chamber and ladle operating deck 2) Steam exhaust equipment
07140	Mold and oscillating facilities	1 lot	1) Mold assembly 2) Mold oscillation equipment
07150	Strand guide and withdrawal unit	1 lot	1) Strand guide segments 2) Segment removal system 3) Support frame 4) Roll drive unit 5) Dummy bar head disconnecting device
07160	Dummy bar and cutting facilities	1 lot	1) Dummy bar 2) Cutting equipmentTorch cut-off type
07170	Discharge equipment	1 lot	1) Discharge tables 2) Dummy bar storage 3) Deburring equipment 4) Marking equipment
SM072	Maintenance equipment (Mechanical equipment)		

No.	Equipment	Q'ty	Specification
07210	Tundish repairing equipment	1 lot	1) Stands 2) Lifting beam
07220	Mold and segment maintenance Equipment	1 lot	1) Stands 2) Lifting beams 3) Mold and segment transfer car
SM073	Information system		
07310	Production and process control System	1 lot	
07320	General instrumentation	1 lot	1) Tundish weigher 2) Mold level control
07330	Basic automation	1 lot	1) PLC system
07340	Communication system	1 lot	
SM074	Utilities Distribution		
07410	Water circuit and cooling system	1 lot	1) Mold cooling water system 2) Secondary spray cooling water system 3) Machine cooling water system (closed circuit) 4) Machine cooling water system (open circuit)
07420	Gas and compressed air	1 lot	1) Argon gas 2) Oxygen gas 3) Compressed air
07430	Hydraulic and lubrication system	1 lot	
SM075	Electrical power supply and distribution		
07510	High voltage facilities	1 lot	1) 6.6 kV switchgear: 1 set 2) 6.6 kV/400 V step down transformer: 1 set
07520	Low voltage facilities	1 lot	
07530	Electrical equipment and motor	1 lot	
07540	Emergency power supply		
SM076	Cranes and hoists		
07610	80/20 t TD handling crane	1 set	1) Cutter yard
07620	70/10 t maintenance crane	2 set	1) Delivery yard and discharging yard
07630	3 t service crane	1 set	1) At scale pit

No.	Equipment	Q'ty	Specification
07640	Hoists and jib crane	1 lot	
SM99	Spareparts and consumables	1 lot	



SECTION A-A



SECTION B-B

Appendix 6A-3 HOT STRIP MILL PLANT

Appendix 6A-3-1 HOT STRIP MILL PLANT EQUIPMENT LIST

Appendix 6A-3-2 HOT STRIP MILL DRAWING

Appendix 6A-3-1 Hot Strip Mill Equipment List

No.	Equipment	Q'ty	Specification
HS01	Hot strip mill		
	- Capacity		one (1) million ton/year
	- Type		Semi-Continuous HSM
HS011	Slab yard		
0111	Slab conditioning area	1	Manual scarfing
0112	Slab conveyor	1	Walking beam type
0113	Slab transfer crane	1	
HS012	Slab reheating furnace		
0121	Slab charger	1	
	- Type		Rack & pinion drive type
	- Stroke		Approx. 6,000 mm
0122	Slab reheating furnace	1	
	- Type		Walking beam & Re-gene type burner
	- Capacity		180 t/H (average 150 t/H)
	- Effective length		Approx. 30 m
0123	Slab extractor	1	Double unit rack and pinion type
0124	Slab charging table	1	Individual drive
0125	Slab discharging table	1	Individual drive
HS013	Roughing mill		
0131	Hydraulic scale breaker (HSB)	1	Hydraulic spray (pressure 150 kg/cm^2)
0132	Roughing mill		
	- Type	1	4-Hi reverse attached edger type
	- Roll dimension		
	- Back-up roll		950/850 mm x 1730 mm
	- Work roll		1420/1250 mm x 1730 mm
	- Main drive motor		4000 kw x 2
	- Attached edger		700 kw x 2
	- Descaling device		Hydraulic spray (Pressure 150 kg/cm^2)

No.	Equipment	Q'ty	Specification
0133	Roll changing equipment	1	
	- Back-up roll		Single retractable type
	- Work roll		Sled type (Hydraulic)
0134	Mill side guide	2	
	- Entry side guide		Rack and pinion type motor driven
	- Delivery side guide		Rack and pinion type motor driven
0135	Roller table	1	
	- Type		Line shaft & Indivual drive
HS014	Coil box and crop shear	1	
0141	Side guide	2	
	- Coil box entry side guide		Rack and pinion type
	- Crop shear entry side guide		Rack and pinion type
0142	Coil box	1	
	- type		3-Roll in-line type
	- Bar thickness (Max/Min)		18-35 mm
0143	Crop shear	1	
	- Type		Rotary drum (Double knife)
	- Capacity		40mm max.
0144	Finishing scale breaker	1	
	- Type		Pinch roll type with measuring system
HS015	Finishing mill		
0151	Finishing mill	5	
	- Type		4Hi 5-stand with work roll shift
	- Roll dimension		
	- Back-up roll		
	Diameter		1420/1250 mm
	Barrel length		1730 mm
	- Work roll		
	Diameter		730/650 mm
	Barrel length		2030 mm (work roll shift 300mm)

No.	Equipment	Q'ty	Specification
	(Finishing mill)		
	- Main drive motor		6000 kw AC
	- Hydraulic AGC		F1 to F5
	- Work roll shifting		F1 to F5
0152	Side guide	5	Rack and pinion type
0153	Looper	4	Motor drive
0154	Roll changing equipment	5	
	- Back-up roll		Sled type (hydraulic)
	- Work roll		Push puller and side shift type
0155	Instruments		
	-Width meter	1	
	-Thickness meter	1	x-ray
	-Thickness profile meter	1	x-ray
HS016	Run-out table		
0161	Run-out table	1	Individually motor driven
0162	Run-out cooling system	1	
	- Type		
	- Top		Laminar flow nozzle type
	- Bottom		Spray nozzle type
	- Cooling capacity		From 900℃ to 550℃
	- Control method		Computer control
HS017	Down coiler		
0171	Coiler entry side guide	1	Screw-nut motor drive with quick opening device
0172	Pinch Roll	1	Housing type
0173	Down coiler	1	
	- Type		Stationary hydraulic type
	- Mandrel		Double expansion wedge type mandrel
	- wrapper roll		Three wrapper rolls
0174	Coil stripping equipment	1	Coil car type
0175	Coil inspection line	1	
	- Capacity		Thickness = 1.6-6.0mm
HS018	Coil conveyor		

No.	Equipment	Q'ty	Specification
0181	Coil banding machine	1	Automatic (Single row strap)
0182	Coil marking device	1	Automatic operation
0183	Coil weighing device	1	Automatic operation
0184	Coil conveyor	1	
	- Type		Chain type
HS019	Roll shop		
0191	Work roll grinder	1	Wheel traverse type
0192	Back up roll grinder	1	Wheel traverse type
0193	Lathe	1	Wheel traverse type
0194	Roll bearing washer	1	Nozzle washing
HS020	Information system for rolling mill		
0201	Process computer system	1	Process automation & data control
0202	Communication system	1	Telephone & paging
HS021	Utility for rolling mill		
0211	Water circuit and cooling system	3	- Furnace cooling system
			- Roll cooling system
0212	Gases and compressed air	1	- Run-out cooling system
0213	Hydraulic system	4	- In works piping
			- Auxiliary Hydraulic system (A)
			- Auxiliary Hydraulic system (B)
			- AGC Hydraulic system
0214	Lubrication system	4	- Down Coiler Hydraulic system
			- Oil lubrication system
			- Rougher and finisher lubrication system
			- Coiler lubrication system
			- Morgoil lubrication system
0215	Centralized grease system	1	
0216	Descaling system	1	- HSB, RM-descaling & FSB
0217	Scale pit	1	- Mill pit
0218	Run out water pit	1	- Run out pit
HS022	Fume exhaust system	1	
HS023	Electrical power supply	1	

No.	Equipment	Q'ty	Specification
	and distribution		
0231	High voltage facilities	1	
0232	Low voltage facilities	1	
0233	Electrical equipment for rolling mill	1	- Motor and accessories - Variable speed drive system - Motor control centers and local starters
0234	Wiring for rolling mill	1	

No.	Equipment	Q'ty	Specification
HS03	Hot coil & Plate finishing line		
HS031	Skinpass line(SKL)	1	Strip : Thickness 1.6-6.0 mm
			Width 600-1,600 mm
			Capacity: 500,000 t/y (full operation)
0311	Entry coil saddle	1	Three position
0312	Entry coil car	1	Coil buggy type
0313	Pay off reel	1	Mandrel type
0314	Crop shear	1	Hydraulic up cut shear
0315	Mill	1	
	- Type		4-Hi hydraulic
	- Roll dimension		
	- Work roll		630 x 1730
	- Back up roll		1200 x 1660
	- Rolling Speed		300 mpm max.
	- Bender		Max. 80 ton / two cylinder
0316	Dividing shear	1	Hydraulic up cut shear
0317	Tension reel	1	Mandrel type
0318	Delivery conveyor	1	Walking beam type
0319	Thickness gauge	1	1.6-6.0 mm γ-ray
0320	Coil weighing device	1	Automatic operation
HS032	Plate finishing line	1	Capacity 200,000 t/y
0321	Dividing shear	1	Gas cutting
0322	Cooling bed	1	30 m width x 30 m length
0323	Heavy leveler	1	capacity max. 24 mm
0324	Plate cutting area	2	Semi-automatic gas cutting
0325	Plate stock yard	1	
HS033	Information system	1	Communication system
HS034	Utility for hot finishing line		
0341	Water circuit system	1	
0342	Compressed air	1	
0343	Hydraulic system	1	
0344	Lubrication system	1	

No.	Equipment	Q'ty	Specification
HS035	Electrical equipment for hot finishing line		
0351	Electric equipment	1	- Motor and accessories - Variable speed drive system - Motor control centers and local starters
0352	Wiring	1	
HS040	Crane		
	Over head crane		
	- Slab yard	4	75t/10t x 27.5m span Over head
	- Mill yard	2	75t/40t x 25.5m span Over head
	- Roll shop	1	60t/30t x 27.5m span over head
	- Motor room	1	20t/ 10t x 22.5m span Over head
	- Furnace yard	1	10t x 10 m span Over head
	- Mill scale pit	1	5t x 24 m gantry crane
	- Coil cooling yard	2	35t/ 5t x 27.5m span Over head
	- Skinpass yard	2	35t/ 5t x 27.5m span Over head
	- Plate yard	3	10t/ 5t x 27.5m span Over head
HS041	Handling equipment		
0411	Slab lifter	4	65 ton max.
0412	Slab magnet lifter	1	28 ton max.
0413	Roll lifter	1	30 ton max.
0414	Coil liter	2	28 ton max.
0415	Plate magnet lifter	2	10 ton max.
0416	Roll transfer car	1	60 ton max.
HS042	Slab & coil stock Yard		
0421	Slab stock yard	1	In house
0422	Coil cooling yard	1	For skinpass line
0423	Coil stock yard	1	In house and outside
0424	Plate stock yard	1	In house
HS050	Spare parts and consumable		
0510	spare parts	1	
0520	consumable	1	

Appendix 6A-4 COLD STRIP MILL PLANT

Appendix 6A-4-1 Cold Strip Mill Equipment List

No.	Equipment	Q'ty	Specification
CS1	Pickling Line		1) Capacity: 376,000 ton/year 2) Type: Push-pull type 3) Material: Hot rolled low carbon Steel 4) Line speed: 10-90 mpm (DC variable) 5) Strip thickness: 2.0-5.0 mm 6) Strip width: 700-1,250 mm 7) Pickling agents: Hydrochloric acid 18% by weight
CS11	Entry Section		
1110	Entry coil storage conveyor	1	1) Chain conveyor (6 coil stations)
1112	Entry coil storage saddle	1	1) composed of one station for band removal
1120	Entry coil car	1	1) Pit type
1130	Pay off reel	1	1) Cantilever mandrel type with filler plates
1132	Hold down roll	1	1) Rubber lining rolls 2) motor driven
1134	Coil peeler	1	
1140	Flattener	1	1) Five roller type 2) equipped with pinch roll & side guides
1150	Thickness gauge	1	1) γ ray type
1160	Entry shear	1	1) equipped with pinch roll, scrap conveyor and scrap boxes
1170	Entry threading tables	1 set	
1180	Side guides	1 set	
CS12	Pickling Tank Section		
1210	Pickling tank	3	1) Rubber lining tank
1220	Dam rolls	4 sets	1) Rubber lining roll Motor driven
1230	Fume exhaust system	1 set	1) Blower suction fume scrubber type 2) FRP construction
CS13	Rinse Tank Section		
1310	Rinse spray tank	1	
1320	Wringer rolls	4 sets	1) Rubber lining rolls 2) Motor driven
1330	Dam rolls	2 sets	1) Rubber lining rolls 2) motor driven

No.	Equipment	Q'ty	Specification
1340	Hot air dryer	1	1) Spray nozzle header type 2) heat-exchanged by steam 3) Air temperature: 120 °C
CS14	Acid Circulation System		
1410	Re-circulation tank	3	1) Rubber lining tank
1420	Heat exchangers	3 sets	
1430	Pumps	1 set	
1440	Storage tank	1	1) Rubber lining tank
1450	Water demineralizing system	1 set	
1460	Installation and valves	1 set	
1470	Acid piping materials	1 set	
CS15	Exit Section		
1510	Exit shear	1	1) equipped with roll quadrant with side guides, pinch rolls, scrap cart and scrap boxes
1520	Steering roll	1	
1530	Side trimmer	1	1) equipped with scrap chopper, scrap conveyor and scrap boxes
1540	Inspection station	1	
1542	Exit threading tables	1 set	1) including loop table
1550	Bridle roll	1	1) Three roll plunger type
1560	Oiler	1	
1562	Deflector pinch roll	1	1) equipped with knock down roll and threading table
1570	Exit edge control	1	
1580	Tension reel	1	1) Cantilever mandrel type with hold down roll, outboard bearing and filler plates
1582	Belt wrapper	1	
1590	Exit coil car	1	1) Pit type
1592	Weigh scale	1	
1594	Coil banding machine	1	
1596	Exit coil storage saddles	1 set	1) composed of three coil stations for maximum size coil

No.	Equipment	Q'ty	Specification
CS16	Electrical Equipment		
1610	Motors and sensors	1 set	
1620	Controller	1 set	1) PLC system(Programmable logical controller)
1630	Wiring	1 set	
CS17	Auxiliary Equipment		
1710	Entry hydraulic system	1 set	1) Entry and delivery
1720	Pneumatic system	1 set	
1730	Grease lubrication system	1 set	
1740	Simple parts	1 set	
CS18	Acid Regeneration Plant		1) Hydrochloric acid
1810	Spray roaster	1	
1820	Pre-concentrator	1	1) including venturi scrubber
1830	Absorber	1	1) including separator, sump and stack
1840	Exhaust fan	1	
1850	Tanks and pumps	1 set	
1860	Oxide storage	1 set	1) Bag house 2) Oxide storage bin
1870	Ducting and piping	1 set	
1880	Acid proof brick	1 set	
CS2	Cold Rolling Mill		1) Capacity: 376,000 ton/year 2) Type: Reversing cold reduction mill 3) Material: Pickled, hot rolled low carbon steel 4) Rolling speed: 0-450/1,200 mpm 5) Roll force: Hydraulic push up 6) Strip thickness Entry: 2.0-5.0 mm Deliver: 0.4-2.5 mm 7) Strip width: 700-1,250 mm
CS21	Entry Section		
2110	Entry coil skid	1	1) composed of three coil stations
2120	Entry coil car	1	1) Pit type
2130	Pay off reel	1	1) Cantilever mandrel type
2140	Strip feeder	1	
2150	Entry tension reel	1	1) Single mandrel reel

No.	Equipment	Q'ty	Specification
CS22	Mill stand equipment		
2210	Mill stand	1	1) 4-Hi single stand
2220	Pinch roll & deflector roll	2 sets	1) Entry & delivery
2222	Mill guides	2 sets	1) Entry & delivery
2230	Dividing shear	1	
2240	Roll changing device	1 set	1) Automatic work roll changing System
2250	Main mill drive & spindles	1 set	1) Single drive
2260	Hydraulic roll positioning system	1 set	
2262	Roll bending system	1 set	1) Increase and decrease
2270	Rolls, bearings and chocks	1 set	
2272	Mill hood and shutter	1 set	
2274	Mill piping	1 set	
CS23	Exit Section		
2310	Delivery tension reel	1	1) Single mandrel reel
2320	Belt wrapper	1	
2330	Delivery coil car	1	1) Pit type
2340	Delivery coil skid	1 set	1) composed of three coil stations for maximum size coil
2350	Safety cage	1	
2360	Coil banding machine	1	1) Automatic machine
CS24	Auxiliary Equipment		
2410	Hydraulic system	1 set	1) Push up hydraulic system 2) Auxiliary hydraulic system 3) Valve stands
2420	Lubrication system	1 set	1) Gear lubrication system 2) Oil mist lubrication system
2430	Roll coolant system	1 set	
2440	Fume exhaust system	1 set	
2450	Cellar ventilation system	1 set	
2460	Pneumatic system	1 set	
2470	Sump drainage system	1 set	
2480	Inter connecting piping	1 set	
CS25	Electrical Equipment		
2510	Motors and sensors	1 set	

No.	Equipment	Q'ty	Specification
2520	Controller	1 set	1) PLC system
2530	Wiring	1 set	
CS26	Roll shop		
2610	Roll grinder	2	1) one for Back up rolls 2) one for Work rolls
2620	Shot blast machine	1	
2630	Bearing washer	1 set	
2640	Chock remover	2 sets	1) for Back up & Work rolls
2650	Chock tilter	1 set	
CS3	Batch Annealing Furnaces		1) Capacity: 272,000 ton/year 2) Type: 100% hydrogen single stack annealing furnace 3) Material: Cold rolled low carbon steel 4) Strip thickness: 0.5-2.5 mm 5) Strip width: 700-1,250 mm
CS31	Annealing base	21	1) High convention "O" ring design annealing base
CS32	Inner cover	21	1) Stainless steel "O" ring seal inner cover 2) Atmosphere gas: Hydrogen
CS33	Heating furnace	10	1) Single stack tangential direct fired annealing furnace 2) Movable furnace
CS34	Cooling cover	11	1) Forced cooling type by recirculation fan
CS35	Convector plate	63	1) Mild steel construction
CS36	Instrumentation		
3610	Controller	1 set	1) DCS(Digital control system)
3620	Thermocouples	1 set	
3630	Control valves and wiring	1 set	
CS37	Electrical Equipment		
3710	Motors and sensors	1 set	
3720	Wiring	1 set	
CS38	Auxiliary Equipment		
3810	Lifting ring	1 set	1) Inner covers and convectors lifting ring
3820	Coil conveyor	1 set	1) Chain conveyor with up-ender
3830	Utility piping	1 set	

No.	Equipment	Q'ty	Specification
CS4	Temper Mill		1) Capacity: 680,000 ton/year 2) Type: 4-Hi single stand combination mill 3) Material: Annealed, cold rolled low carbon steel 4) Rolling speed: 1,000 mpm 5) Strip thickness: 0.5-2.5 mm 6) Strip width: 700-1,250 mm
CS41	Entry Section		
4110	Entry conveyor	1	1) Chain conveyor 2) Five coil stations 3) Equipped with down-ender
4120	Coil preparation station	1 set	
4130	Entry coil skid	1 set	1) One coil station
4140	Entry coil car	1 set	1) Pit type
4150	Pay off reel	1 set	1) Single mandrel type
CS42	Mill Stand Equipment		
4210	Mill stand	1 set	1) 4-Hi single stand
4220	Deflector roll & pinch roll	2 sets	1) Entry and delivery
4230	Tension bridle	2	1) Entry and delivery 2) Two roll type
4240	Dividing shear	1	
4250	Roll changing device	1	1) Automatic work roll changing system
4260	Main drive and spindles	1 set	1) Single drive
4270	Rolls and bearings	1 set	
4280	Mill hood and shutter	1 set	
4280	Mill piping	1 set	
CS43	Exit Section		
4310	Delivery tension reel	1	1) Single mandrel reel
4320	Belt wrapper	1	
4330	Delivery coil car	1	1) Pit type
4340	Delivery coil skid	1 set	1) composed of three coil stations
4350	Safety cage	1 set	
4360	Coil banding machine	1	
CS44	Auxiliary equipment		

No.	Equipment	Q'ty	Specification
4410	Hydraulic system	1 set	1) Push up hydraulic system 2) Auxiliary hydraulic system 3) Valve stands
4420	Lubrication system	1 set	1) Gear lubrication system 2) Oil mist lubrication system
4430	Roll coolant system	1 set	
4440	Fume exhaust system	1 set	
4450	Cellar ventilation system	1 set	
4460	Pneumatic system	1 set	
4470	Sump drainage system	1 set	
4480	Inter connecting piping	1 set	
CS45	Electrical equipment		
4510	Motors and sensors	1 set	
4520	Controller	1 set	1) PLC system
4530	Wiring	1 set	
CS5	Hot Dip Galvanizing Line		1) Capacity: 100,000 ton/year 2) Type: Non oxygen horizontal furnace type 3) Material: Cold rolled low carbon steel 4) Line speed: Max. 90 mpm 5) Strip thickness: 0.4–1.6 mm 6) Strip width: 700–1,250 mm
CS51	Entry section		
5110	Entry coil skid	2 sets	1) Two coil stations for each pay off reel 2) V-shape top
5112	Entry coil car	2 sets	1) Scissors type 2) Floor mounted 3) V-shape top
5120	Pay-off reel	2 sets	1) Cantilever mandrel type 2) Uncoiling direction: over-winding 3) Centering adjustment: ±150 mm 4) Drive: DC motor drive
5121	Outer board bearing	2 sets	1) Bearing bottom support type
5122	Snubber roll	2 sets	1) Rubber lining
5123	Threading guides	2 sets	

No.	Equipment	Q'ty	Specification
5124	Guide tables	1 set	
5125	No.1 pinch roll	1	1) Rubber lining
5126	No.1 Double pinch roll	1	
5130	Thickness gauge	2 sets	1) γ-ray thickness gauge
5140	Double cut shear	1	1) Double rake up-cut shear 2) actuated by hydraulic cylinder 3) equipped with entry & exit feed rolls
5142	Scrap disposal device	1 set	1) Tilting table 2) Retractable scrap piling table
5144	No.1 Deflector roll	1	
5146	3-Hi pinch roll	1	
5150	Welder	1	1) Narrow lap seam welder 2) Welding time: < One minutes
5152	No.2 pinch roll	1	1) Rubber lining
5160	Degreasing tank	1	1) Horizontal tank 2) Alkali(NaOH) brush scrubber type 3) equipped with wringer and dam rolls
5162	Hot water rinse tank	1	1) Horizontal tank 2) High pressure spray nozzle type 3) equipped with wringer and dam rolls
5164	Water circulation system	1 set	1) equipped with circulation tanks, neat tank, pump, etc.
5166	No.1 Dryer unit	1	1) Hot air slit nozzle spray type 2) Hot air temperature: 120 °C 3) heat-exchanged with steam
5170	No.1 Bridle roll	1	1) Two roll type 2) DC motor drive
5180	Entry looper	1	1) Horizontal four strand looper 2) Effective stroke: 45 m 3) Effective length: 180 m(2 min.)
5182	Deflector roll	4	
5184	No.1 & 2 Steering roll	2 sets	1) one roll horizontal swing type
5186	No.3 Steering roll	1	1) Two small diameter deflector roll swing type
5188	No.4 Steering roll	1	1) Two roll vertical swing type
CS52	Center Section		

No.	Equipment	Q'ty	Specification
5210	No.2 Bridle roll	1	1) Two roll type 2) DC motor drive
5212	Tension meter roll	1	1) Three roll type 2) equipped with load cell
5214	Dancer roll	1	1) Air cylinder valance type
5220	Furnace casing	1 set	1) NOF furnace: Approx. 17.8 m 2) RTH furnace: Approx. 18 m (Atmosphere gas: HNX) 3) No.1 JC zone: Approx. 7 m (Atmosphere gas: HNX) 4) LTH zone: Approx. 15 m (Atmosphere gas: HNX) 5) No.2 JC zone: Approx. 5 m (Atmosphere gas: HNX)
5221	Furnace structure	1 set	
5222	Heating equipment	1 set	1) NOF: Nozzle mix direct fired burner RTH : U-type radiant tube burner LTH : Electrical heater
5223	Cooling equipment	2 sets	1) Gas jet nozzle spray type 2) Atmosphere gas: HNX gas
5224	Furnace roll drive system	1 set	1) Support rolls: 30 pieces 2) NOF & RTH rolls: Water cooled
5225	Furnace instrumentation	1 set	1) Control valves, sensors etc. 2) DCS(Digital control system)
5226	Refractory	1 set	
5227	Turn down roll	1	1) One roll type
5228	Snout	1	1) Equipped with stainless steel tip
5230	Zinc Pot	1	1) Ceramic pot with inductors 2) Capacity: approx. 100 ton
5231	Gas wiping equipment	1	1) Compressed air gas wiping 2) Equipped with sink roll and stabilizing rolls
5232	Air cooling device	2 sets	1) Air nozzle spray type 2) equipped with support rolls
5233	Top deflector roll	2	1) Chromium-plated water cooled roll

No.	Equipment	Q'ty	Specification
5234	Water cooling tank	1	1) Water dipping type 2) Cooling temperature: < 50 ℃
5235	No.2 Wringer roll unit	1	1) Two sets of wringer rolls
5236	No.2 Dryer unit	1	1) Hot air slit spray nozzle type 2) Hot air temperature: 90 ℃
5237	No.5 Steering roll	1	1) Two roll vertical swing type
5238	Coating weight gauge	1	1) Fluorescence X-ray gauge
5240	No.3 Bridle roll	1	1) Two roll type with snubber roll 2) DC motor drive
5242	Skin pass mill	1	1) 4-Hi singe stand 2) Hydraulic push-up system 3) Wet rolling mill
5244	No.4 Bridle roll	1	1) Four roll type with snubber roll 2) DC motor drive
5246	Tension leveler	1	1) Upper unit swing type 2) consists of elongation and C- bent correction units
5248	No.5 Bridle roll	1	1) Four roll type with snubber roll 2) DC motor drive
5250	Chromate tank	1	1) Horizontal spray nozzle type 2) equipped with two sets of wringer rolls
5252	Chromate circulation system	1 set	1) consists of circulation tank, neat tank, exhaust water pit, pumps etc.
5254	No.3 Dryer	1	1) Hot air slit nozzle spray type 2) Hot air temperature: 120 ℃
5260	No.6 Bridle roll	1	1) Two roll type with snubber roll 2) DC motor drive
CS53	Delivery Section		
5310	Delivery looper	1	1) Four strand horizontal looper 2) Effective stroke: 35 m 3) Effective length: 140 m
5312	Deflector roll	4	
5314	No.6 Steering roll	1	1) Two roll vertical swing type
5316	No.7 & 8 Steering roll	2 sets	1) One roll horizontal swing type
5320	No.7 Bridle roll	1	1) Two roll type with snubber roll 2) DC motor drive

No.	Equipment	Q'ty	Specification
5322	Deflector roll	1	
5330	Inspection table	1	1) Length: Approx. 4 m
5340	Oiling machine	1	1) Spray and roll coating type
5342	Shear pinch roll	1 set	
5344	Measuring roll	1	1) Roller follower type
5350	Exit shear	1	1) Up cut shear with double rake
5352	Sample conveyor	1	1) equipped with scrap bucket
5354	Tension reel EPC	1	
5356	Exit deflector roll	1	
5358	Threading tables	1 set	
5360	Tension reel	1	1) Cantilever mandrel type 2) Winding direction: over & under 3) Centering adjustment: ±150 mm 4) Drive: DC motor drive
62	Snubber roll	2	
5364	Outer board bearing	1	
5366	Belt wrapper	1	
5370	Delivery coil car	1	1) Scissors type 2) Floor mounted
5372	Delivery coil skid	1 set	1) Two coil stations
5374	Banding machine	1	
5376	Weigh scale	1	
CS54	Auxiliary Equipment		
5410	CPC system	8 sets	
5420	EPC system	1 set	
5430	Hydraulic system	2 sets	1) Entry and delivery
5440	Grease lubrication system	1 set	
5450	Pneumatic system	1 set	
5460	Entry and delivery structure	1 set	
5470	Piping	1 set	
5480	Safety equipment	1 set	
CS55	Electrical Equipment		
5510	Motors and sensors	1 set	
5520	Controller	1 set	1) PLC system
5530	Wiring	1 set	

No.	Equipment	Q'ty	Specification
CS6	Recoiling Line		1) Capacity: 300,000/year 2) Line speed: Max. 300 mpm 3) Material: Annealed, cold rolled low carbon steel and galvanized steel 4) Strip thickness: 0.4–2.5 mm 5) Strip width: 700–1,250 mm
CS61	Mechanical Equipment		
6110	Entry coil skid	1 set	1) Three coil stations
6111	Entry coil car	1	1) Scissors type 2) Floor mounted
6120	Pay off reel	1	1) Cantilever mandrel type 2) equipped with holddown rolls 3) Winding direction: Over & under
6121	Entry EPC device	1 set	
6122	Entry deflector pinch roll	1 set	
6130	Entry shear	1	1) Up-cut shear 2) equipped with pinch rolls and scrap bucket
6140	Side trimmer	1	
6141	Scrap handling equipment	1 set	1) Baller 2) Scrap bucket
6150	Inspection table	1	
6160	Oiling machine	1	1) Nozzle spray and roll coating
6170	Exit shear	1	1) Up-cut shear with pinch rolls and scrap bucket
6180	Exit EPC device	1 set	
6181	Exit deflector pinch roll	1	
6182	Tension reel	1	1) Cantilever mandrel type 2) equipped with snubber rolls
6190	Delivery coil car	1	1) Scissors type 2) Floor mounted
6191	Delivery coil skid	1 set	1) Three coil stations
6192	Banding machine	1	
6193	Weigh scale	1	
CS62	Auxiliary Equipment		
6210	EPC system	2 sets	1) Entry and exit
6230	Hydraulic system	1 set	

No.	Equipment	Q'ty	Specification
6240	Pneumatic system	1 set	
6250	Grease lubrication system	1 set	
6260	Piping	1 set	
CS63	Electrical Equipment		
6310	Motors and sensors	1 set	
6320	Controller	1 set	1) PLC system
6330	Wiring	1 set	
CS7	Auxiliary Equipment		
CS71	Over head travel crane		
7110	Pickling yard crane	2	1) 30t/5t x 18.5 m span
7120	Mill yard crane	1 1	1) 65t/30t x 28.5 m span 2) 30t/5t x 28.5 m span
7130	Batch annealing yard crane	1	1) 50t/5t x 28.5 m span
7140	Recoiling yard crane	2	1) 30t/5t x 28.5 m span
7150	CGL yard crane	2	1) 30t/5t x 18.5 m span
CS72	Handling Equipment		
7210	Coil lifter	8	1) 25 ton max.
7220	Magnetic coil lifter	2	1) 25 ton max.
7230	Coil transfer car	2	1) 50 ton max.
7240	Chain conveyer	2	1) 2,500 mm pitch x 6 saddles 2) 125 ton max.

Figure 6-4-2 Push-pull Pickling Line Arrangement
(Reference Drawing)

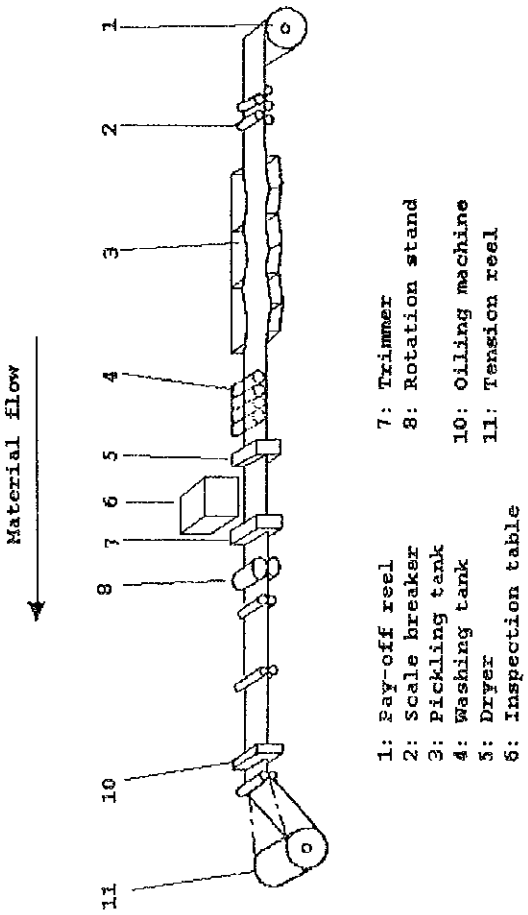


Figure 6-4-3 Reversing Cold Mill Arrangement
(Reference Drawing)

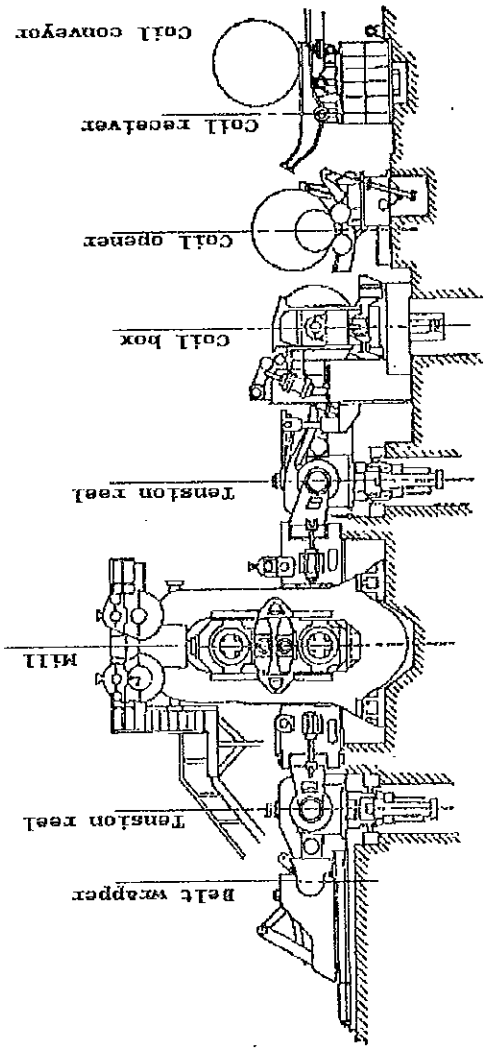


Figure 6-4-4 Single Stack Annealing Furnace Arrangement
(Reference Drawing)

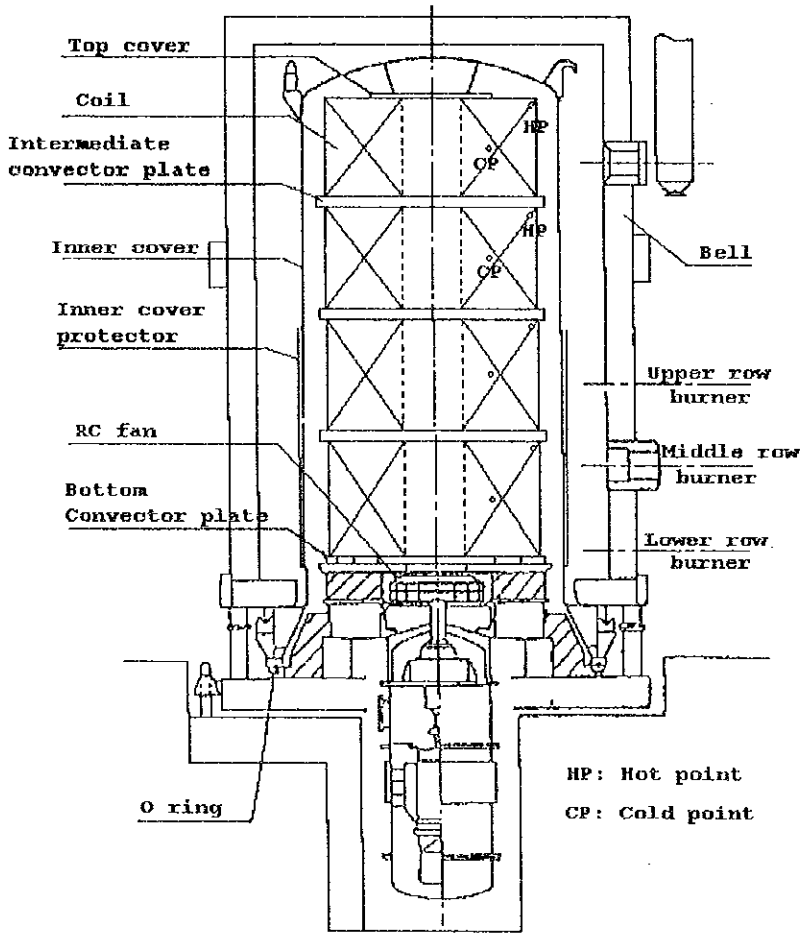


Figure 6-4-5 Temper Mill Arrangement
(Reference Drawing)

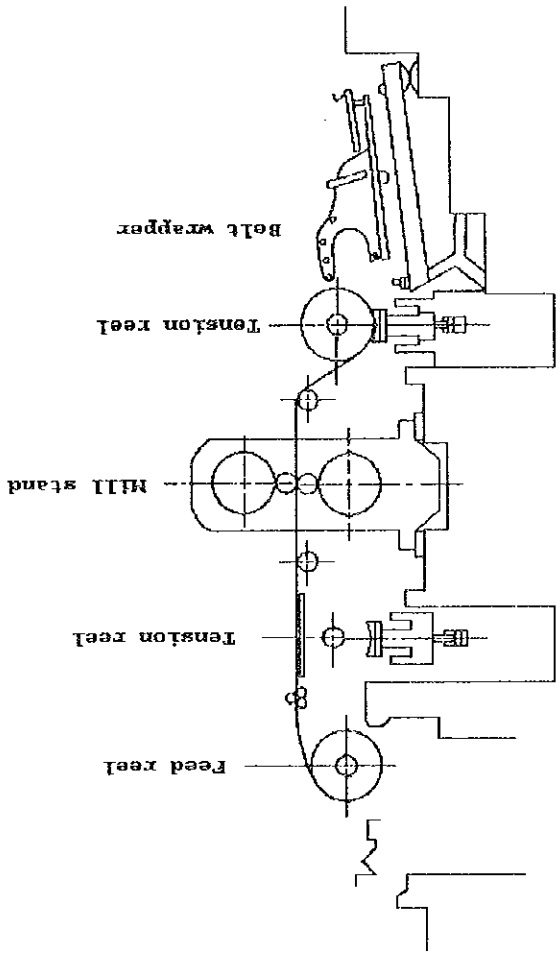


Figure 6-4-6 CGL Arrangement

(Reference Drawing)

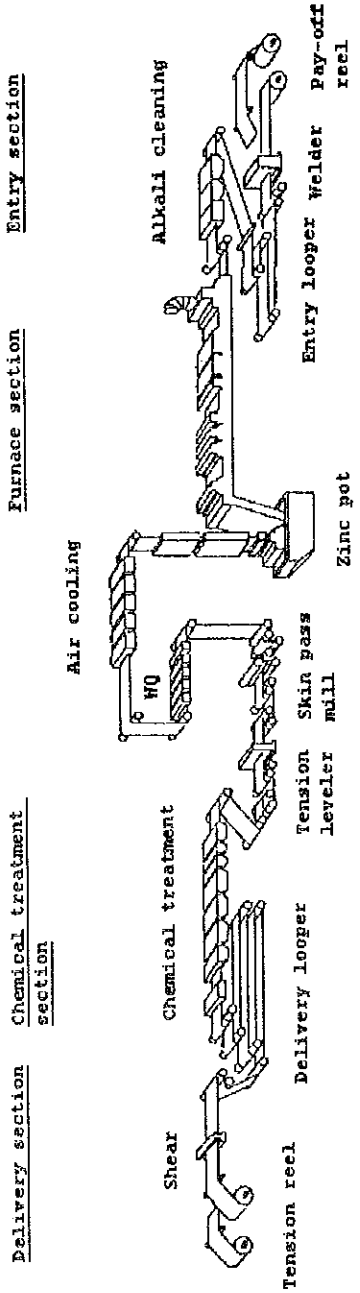
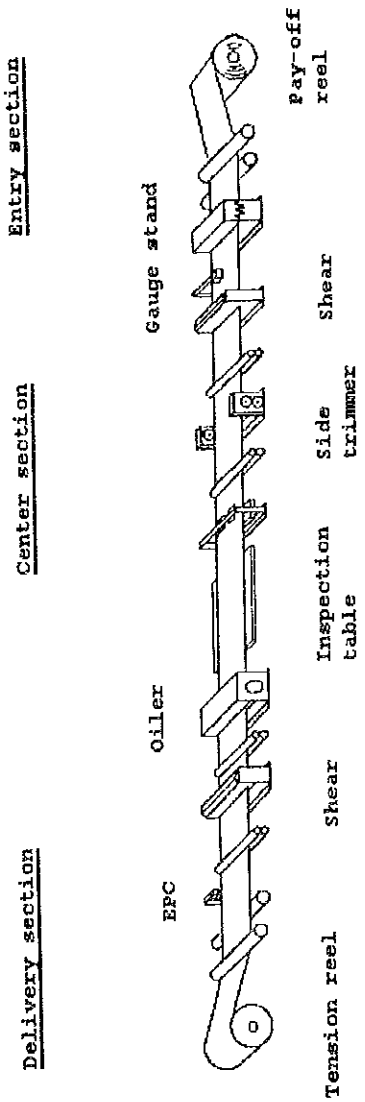


Figure 6-4-7 RCL Arrangement
(Reference Drawing)



Appendix 6A-5 LIME CALCINING PLANT

Appendix 6A-5-1 LIME CALCINING PLANT EQUIPMENT LIST

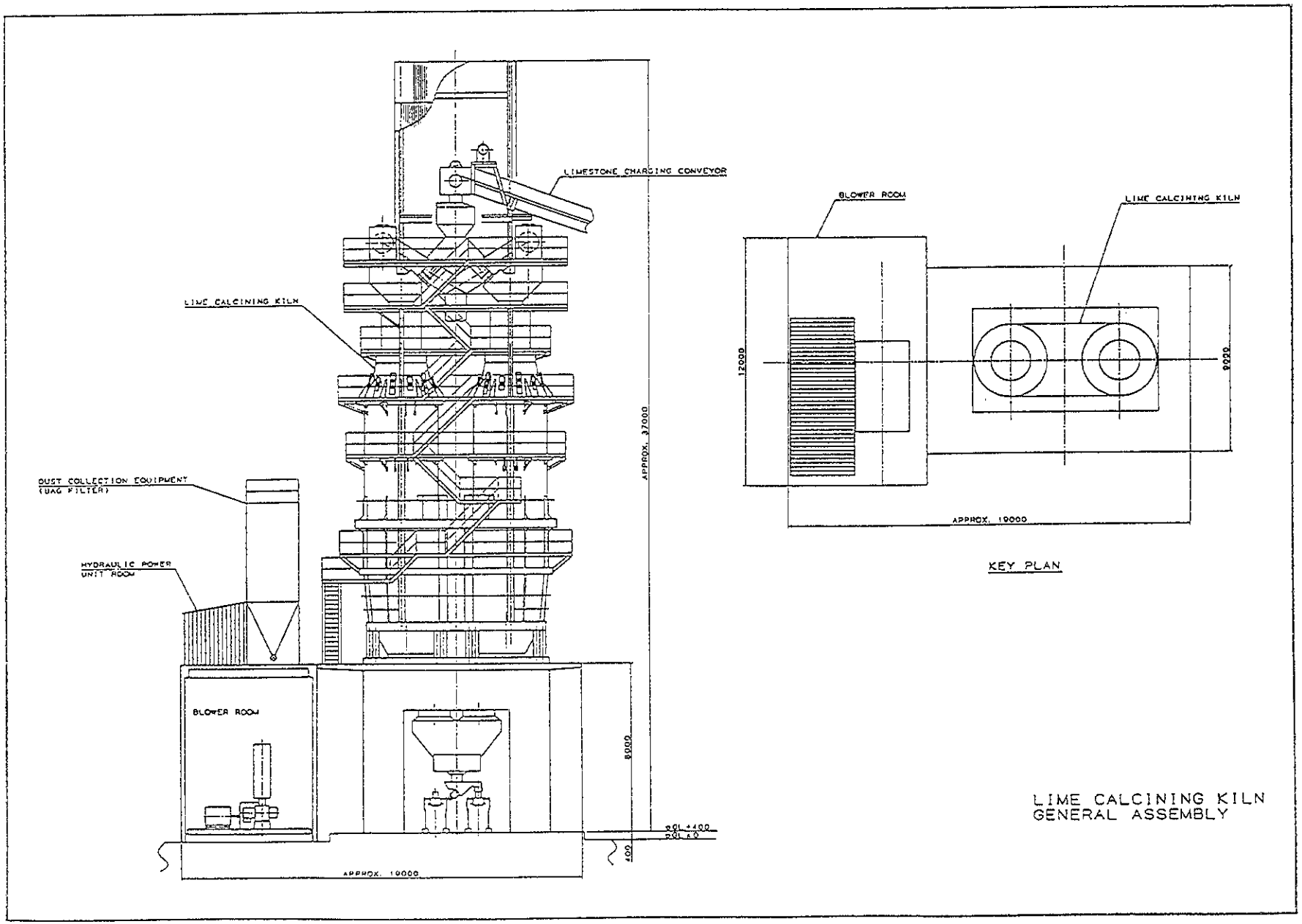
Appendix 6A-5-2 LIME CALCINING PLANT DRAWINGS

Appendix 6A-5-1 Lime Calcining Plant Equipment List

No.	Equipment	Q'ty	Specification
LC01	Raw Material Receiving Section		
0101	Receiving hopper	1	
0102	Vibrating feeder	1	100 t/h
0103	Belt conveyor	1	100 t/h
0104	Single deck screen	1	72 t/h
0105	Belt conveyor	1	100 t/h
0106	Fines hopper	1	
0107	Conveyor scale	1	100 t/h
0108	Belt conveyor	1	60 t/h
0109	Submergible pump	1	
LC02	Lime Calcining Plant		
0201	Limestone storage bin	1	
0202	Belt conveyor	1	
0203	Calcining kiln	1	Shaft kiln type, 160 t/d
LC03	Product Handling System		
0301	Belt conveyor	1	20 t/h
0302	Damper	1	20 t/h
0303	Belt conveyor	1	20 t/h
0304	Belt conveyor	1	20 t/h
0305	Vibrating screen	2	200 t/h
0306	Jaw crusher	1	10 t/h
0307	Belt conveyor	1	20 t/h
0308	Belt conveyor	1	20 t/h
0309	Screw conveyor	1	3 t/h
0310	Chain conveyor	1	3 t/h
0311	Cushion hopper	1	15 t
0312	Screw conveyor	1	3 t/h
0313	Briquetting machine	1	2.5 t/h
0314	Belt conveyor	1	20 t/h
0315	Product bin	1	
0316	Vibrating feeder	1	200 t/h
0317	Belt conveyor	1	200 t/h
0318	Conveyor scale	1	200 t/h

No.	Equipment	Q'ty	Specification
0319	OHT hoist crane	1	5 t
0320	Dust collector	1	Bag type
0321	Bag filter	4	
LC04	Electrical Equipment		
0400	Power receiving and distribution system	1 set	
0420	Motors and motor controls	1 set	
0440	DC power supply system	1 set	
0460	Ancillary equipment	1 set	
0480	Cables and installation materials	1 set	
LC05	Instrumentation		
0500	Process supervising, sequencing control and data logging system	1 set	
0520	Instruments	1 set	
0540	Uninterruptible power supply system	1 set	
0560	Instrumental miscellaneous	1 set	

Appendix 6A-5-2 Lime Calcining Plant (Sectional View)



Appendix 6A-6 POWER AND DISTRIBUTION FACILITIES

Appendix 6A-6-1 Equipment list of Power and Distribution

No.	Equipment	Q'ty	Specification
PW01	220 kV GIS		
011	Receiving unit	2 sets	
	1) Circuit breaker (CB)		245kV,1250A,40kA,2cycle Oil-hydraulic operation/ SF6 gas insulated
	2) Disconnect switch (DS)		245kV,1250A, 40kA(1 sec.) Motor operation / motor spring charge operation
	3) Earthing switch (ES)		245kV, 40kA(1 sec.) Motor operation / motor spring charge operation
	4) Lightning arrester (LA)		198kV, 10kA, Zinc oxide station type with discharge counter
012	Metering outfit (MOF)	2 sets	
	1) PT		220/$\sqrt{3}$kV:110/$\sqrt{3}$V 0.5 class
	2) CT		100/5A 0.5 class
013	Main and feeder bus bar	1 set	
	1) Main bus bar		Double bus bar type 245kV 1250A, 40kA (1 sec.)
	2) Feeder bus bar		Single bus bar type 245kV 1250A, 40kA (1 sec.)
014	PT	2 sets	
	1) Diconnect switch		245kV, 1250A, 40kA (1 sec.) Manual operation
	2) PT		220/$\sqrt{3}$kV : 110/$\sqrt{3}$V : 110/3V
015	Bus tie unit	1 set	
	1) Disconnect switch		245kV, 1250A, 40kA (1 sec.) Manual operation
	2) Earthing switch		245kV, 1250A, 40kA (1 sec.) Manual operation
	3) Circuit breaker		245kV, 1250A, 40kA, 2cycle, Oil-hydraulic operation, SF6 gas
016	Transformer feeder unit	3 sets	
	1) Circuit breaker (CB)		245kV, 1250A, 40kA, 2cycle Oil-hydraulic operation, SF6 gas insulated
	2) Disconnect switch (DS)		245kV, 1250A, 40kA (1 sec.) Motor spring charge operation
	3) Earthing switch (ES)		245kV, 40kA (1 sec.) Motor operation
017	Auxiliary devices	1 set	
	1) Local control panel		
	2) Gas monitering device		

Appendix 6A-6-1 Equipment list of Power and Distribution

No.	Equipment	Q'ty	Specification
PW02	220/33 kV power transformer		
021	220/33 kV 3-phase on-load tap changer	2 sets	
	1)Type		Oil immersed outdoor use
	2)Capacity		80/110 MVA at ONAN/ONAF
	3)Rated voltage		3-phase 50Hz, 220/33 kV
	4)Primary taps		220kV+12% to -21% (1.5% tapping) On-load tap changer
	5)Connection		Yyd5
	Primary		Wye (Solid grounding neutral)
	Secondary		Wye (100A resistor grounging neutral)
	Tertiary		Delta (30MVA) with two external terminals closed outside the transformer.
	6)Oil preservation		Diaphram type
	7)Accessories		
	DS, LA, Buchholz relay		
	8)Fire fighting equipment		
	Water pressure tank		
	Air compressor		
022	220/33 kV 3-phase on-load tap changer	1 set	
	1)Type		Oil immersed outdoor use
	2)Capacity		160MVA at ONAN
	3)Rated voltage		3-phase 50Hz, 220/33kV
	4)Primary taps		220kV+12% to -21% (1.5% tapping) On-load tap changer
	5)Connection		Yyd5
	Primary		Wye (Solid grounding neutral)
	Secondary		Wye (100A resistor grounging neutral)
	Tertiary		Delta with two external terminals closed outside the transformer
	6)Oil preservation		Diaphram type
	7)Accessories		
	DS, LA, Buchholz relay		
	8)Fire fighting equipment		
	Water pressure tank		
	Air compressor		
PW03	33 kV switchgears		
031	Neutral grounding resistor(NGR)	3 sets	
	1)NGR		33/$\sqrt{3}$kV,100A,190 ohm,10sec.
	2)DS		36kV,400A manual operation

Appendix 6A-6-1 Equipment list of Power and Distribution

No.	Equipment	Q'ty	Specification
032	Main panel 1)VCB	3 sets	 36kV,2400A, 25kA, Motor spring charger operation
033	Bus tie panel 1)VCB	1 set	36kV,2400A, 25kA, Motor spring charger operation
034	Feeder panel 1)VCB	13 sets	 36kV, 1250A, 25kA, Motor spring charger operation
035	GPT panel 1)GPT with fuse		 Single phase resin moded type 33/√3kV : 110/√3V : 110/3V
036	LA panel 1)LA	3 sets	 Zinc oxide type 42kV, 10A
037	SA panel 1)SA	3 sets	 36/√3kV, 0.1 micro F
038	Feeder panel for flicker compensator 1)GCB	2 sets	 36kV, 1250A, 25kA Motor spring charge operation
039	Feeder panel for EAF 1)GCB	2 sets	 36kV, 1250A, 25kA Motor spring charge operation
PW04	Flicker and power factor compensator (FPC) 1) High impedance transformer 2) Thyristor equipment 3) Auxiliary control panel and thyristor control panel 4) Filters 5) FPC supervisory panel	1 set	 30MVA 30MVA 2nd harmonic filter 4th harmonic filter 5th harmonic filter 6th harmonic filter
PW05	33/6.9 kV power transformer 1) Type 2) Capacity 3) Rated voltage 4) Primary taps 5) Connection Primary / Secondary 6) Oil presarvation	2 sets	(including one spare) Oil immersed outdoor use 20/24MVA at ONAN/ONAF 3-phase 50Hz 33/6.6kV 34.5/33.75/32.25/31.5kV at full cap. Dy11 Delta/Wye (10A resistor grounding neutral) Diaphram type

Appendix 6A-6-1 Equipment list of Power and Distribution

No.	Equipment	Q'ty	Specification
PW06	6.6 kV switchgears		
061	NGR panel		
	1) NGR	1 set	6.6/√3kV, 10A, 38 ohm continuous
	2) DS		Single phase type 7.2kV 100A manual operation
062	Main panel	1 set	
	1)VCB		7.2kV 2000A, 40kA Motor spring charge operation
063	Feeder panel	11 sets	
	1)VCB		7.2kV, 1250A, 40kA Motor spring charge operation
064	GPT and LA	1 set	
	1)GPT		3-phase resin molded type 6.6kV : 110V : 110/3V
	2)LA		Zinc oxide type 8.4kV, 10kA
065	Station service transformer	1 set	
	1)Type		Oil immersed outdoor type
	2)Capacity		500kVA, ONAN
	3)Rated voltage		6.6kV
	4)Rated secondary voltage		400V
	5)Connection		Delta/Wye, Dy11
	6)Oil preservation		Nitrogen sealed
066	Static capacitor unit	1 set	
	1)Static capacitor type		Outdoor use, mineral oil immersed, self cooled type
	2)Capacity		2000kVAR, 6.9kV
	3)Series reactor with discharging coil		Outdoor use, Oil immersed, self cooled type. 6.9kV 120kVA capacity
PW07	Diesel generators	2 sets	
071	Diesel engine		V-type, trunk piston type with super charger and intercooler output:2870PS, 1000rpm, 12 cylinder
072	Generator	2 sets	6.6kV, 2500kVA, pf : 0.8, insulation : F class, brushless, 6 poles star connection Over speed : 120% Protection : IP-23 ground resistor : 10A continuous

Appendix 6A-6-1 Equipment list of Power and Distribution

No.	Equipment	Q'ty	Specification
073	Distribution panels		
	1)6.6 kV main switchgears	2 sets	
	2)VCB		7.2kV, 1250A, 40kA Motor spring charge operation
	3)ES		7.2kV manual operation
	4)6.6 kV feeder switchgears	10 sets	Vacuum contactor 7.2kV, 450A
	5)Exitor panel		
	6)GPT cubicle		
	7)380 V distribution panel		
	8)NGR panel	2 sets	6.6/$\sqrt{3}$kV, 10A, 381 ohm continuous DS:100A 7.2kV, manual operation
074	Starting system		
	1) Type		Compressed air system
	2)Air tank		Capable of automatically starting 3 times.
	3)Air receiver		300 litre
	4)Air compressor		
075	Cooling system		Closed cooling system in two circuit arrangement for each engine and is equipped with cooling tower, jacket water pump and cooler water pump.
076	Fuel system	1 set	Fuel system is consisting of main storage tank, dry tank,oil transfer pump and fuel oil filter and fuel pump.
PW08	Supervisory control and relay panel	1 set	Supervisory and control panels and centralized monitoring system.
PW09	Fire protection system	1 set	
PW10	Telephone system	1 set	
PW11	Air conditoning system	1 set	
PW12	Cables and Materials	1 set	Cables & sub materials for 33kV, 6.6kV and other, and cable tray