Fig. 41 Cross Section A, B and C, North Suban Jeriji Area

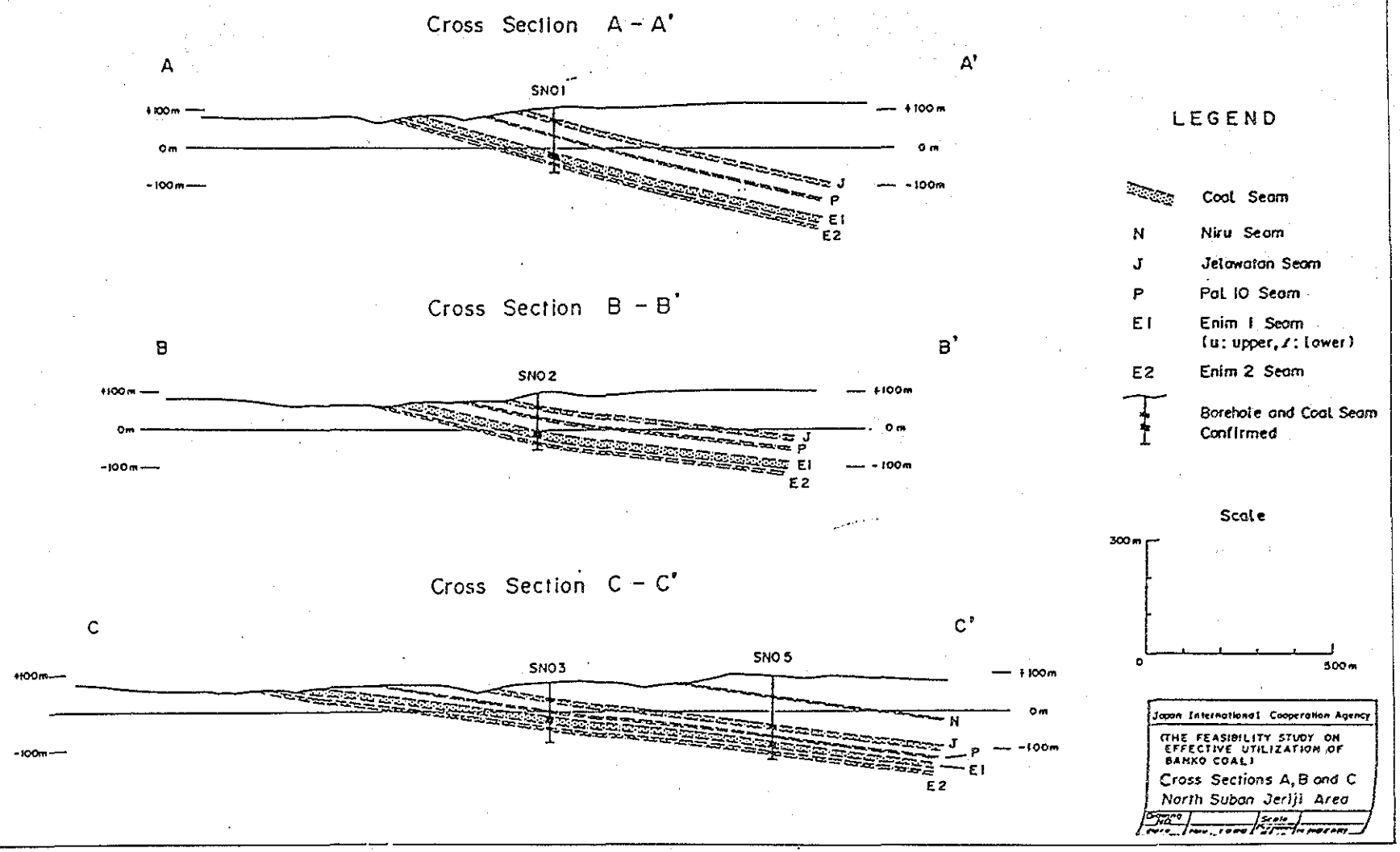
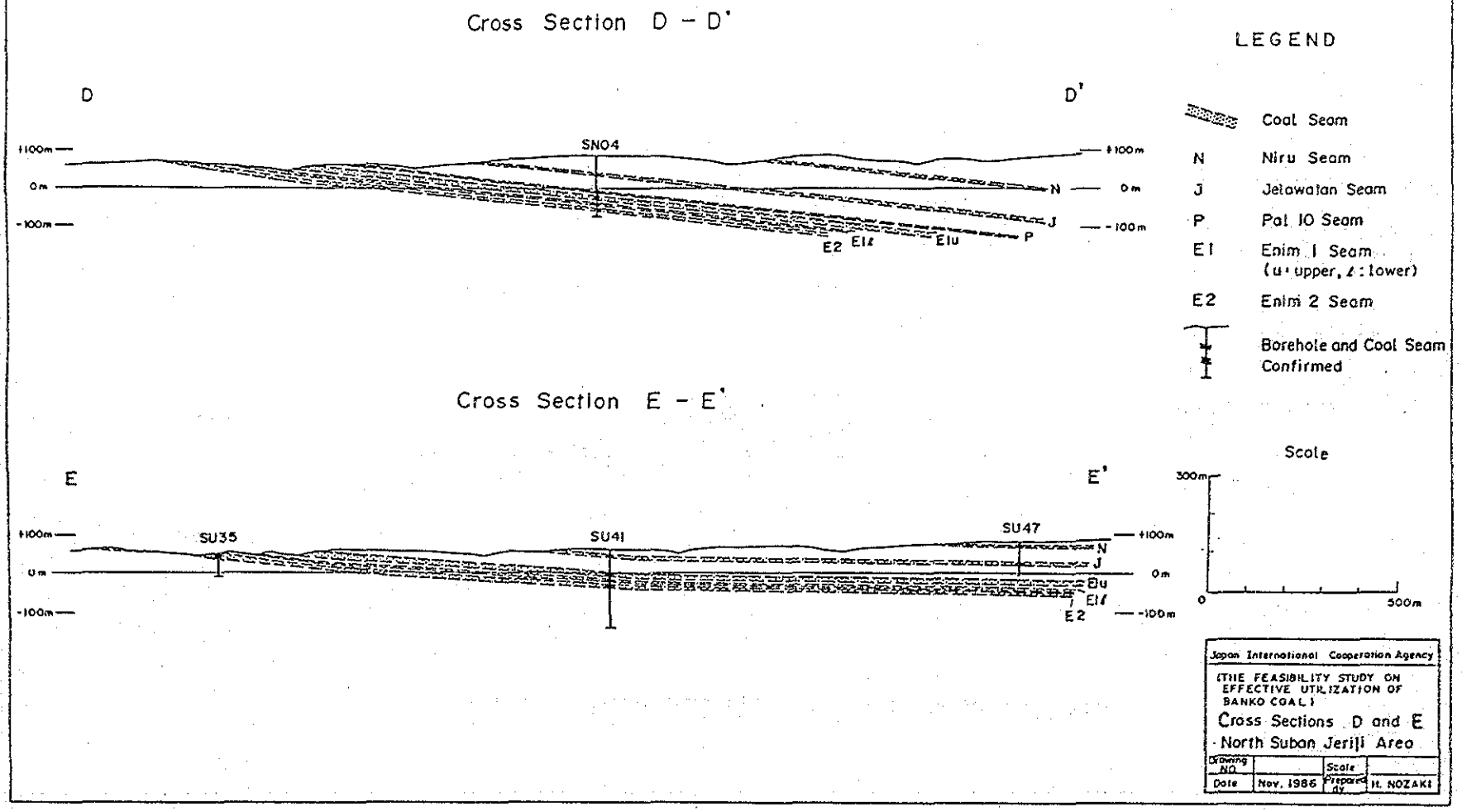


Fig. 42 Cross Seciton D and E, North Suban Jeriji Area



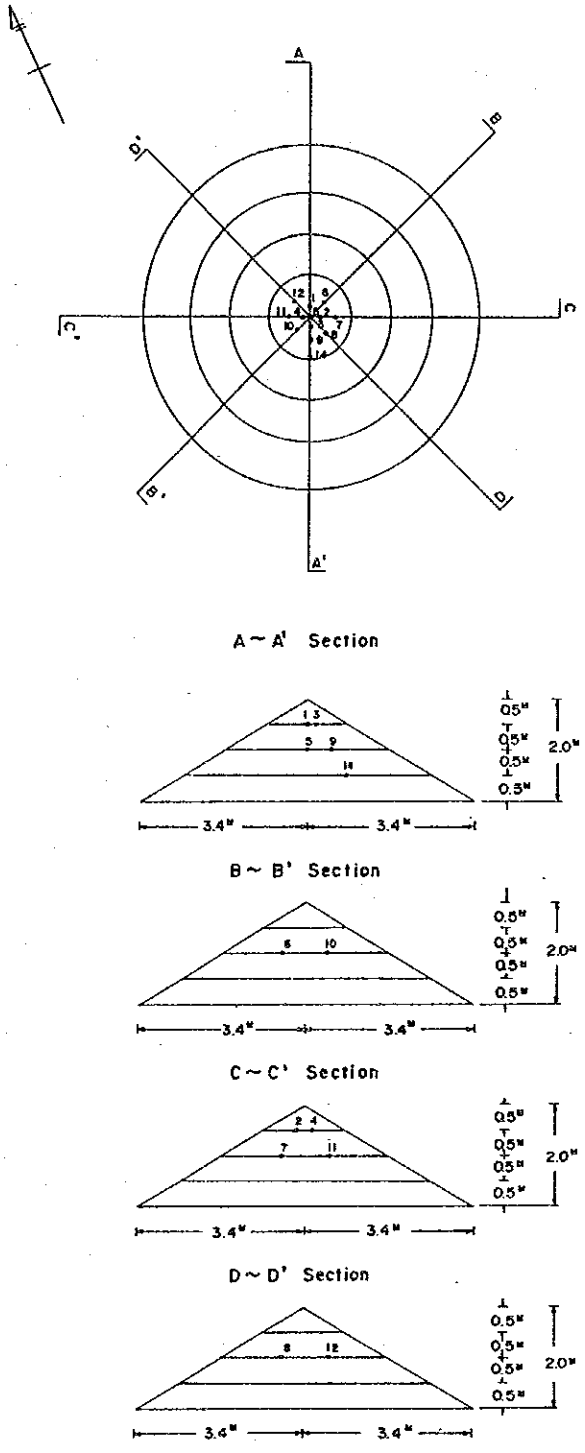


Fig. 43 Horizontal and Vertical Sections of No. 1 Coal Heap for Spontaneous Combustion Test Showing Thermometers Installed Position

Fig. 44 Change of Measured Temperature at each Measured Point (No. 1 Coal Heap)

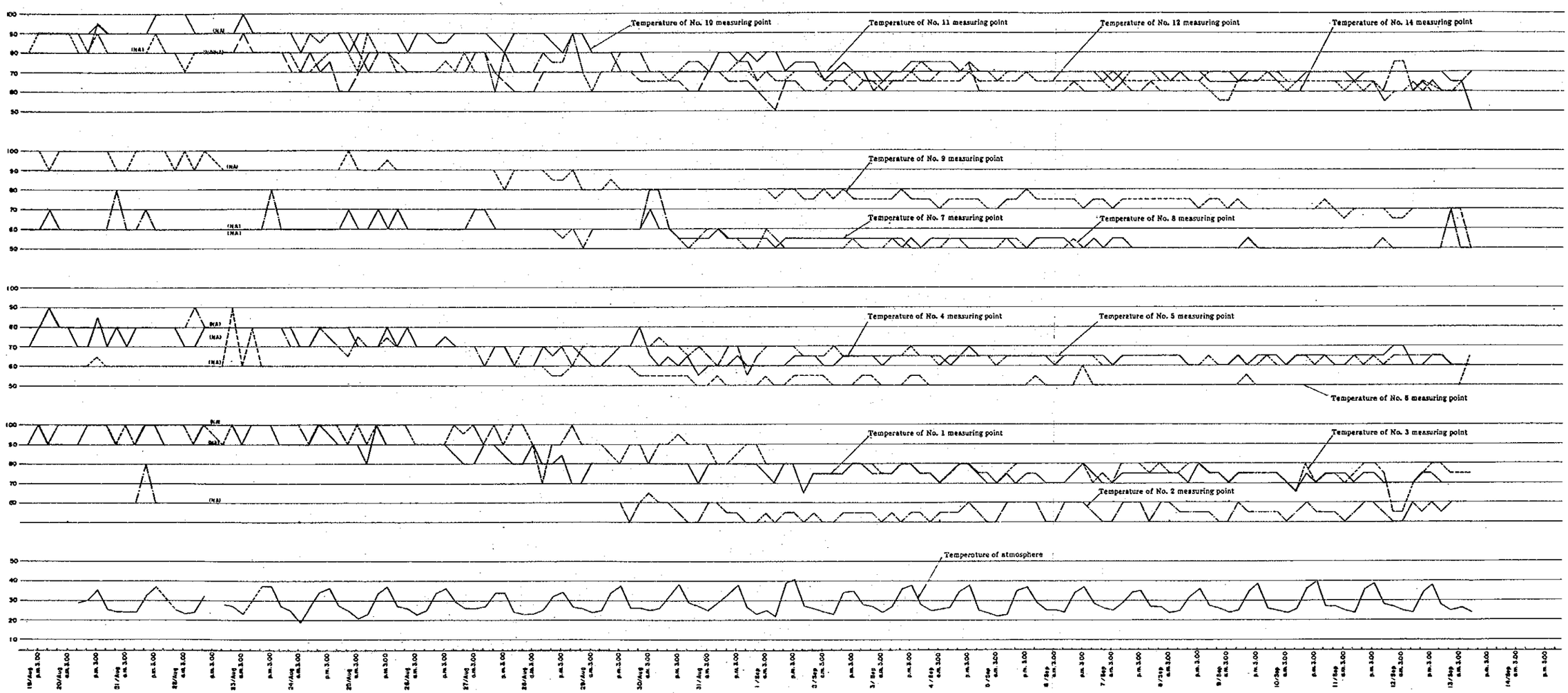
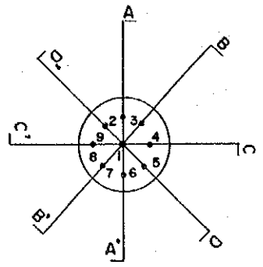
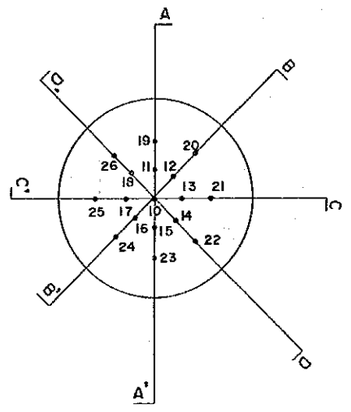


Fig. 45 Final Measured Temperature (No. 1 Coal Heap)

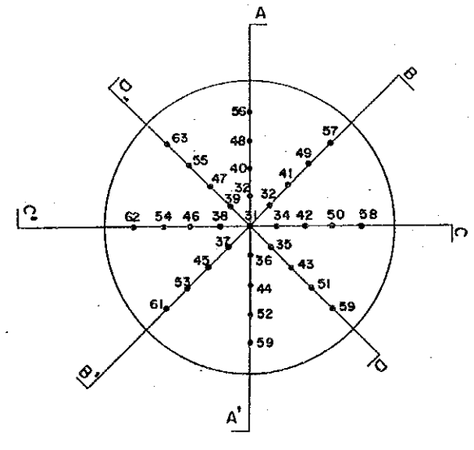
Below 0.5 meters from the top



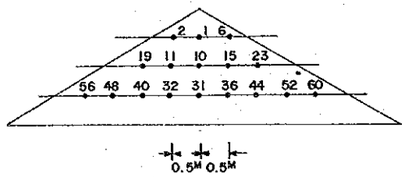
Below 10 meters from the top



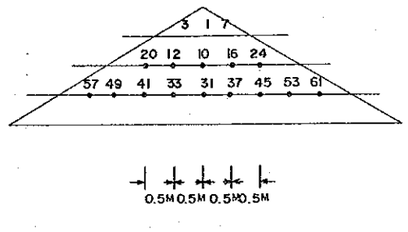
Below 15 meters from the top



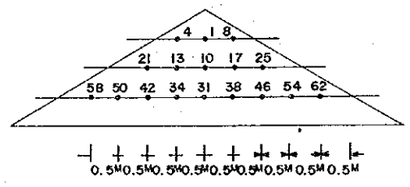
A ~ A' Section



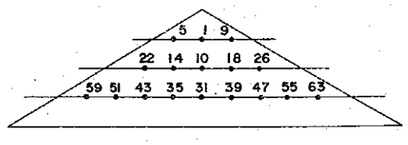
B ~ B' Section



C ~ C' Section



D ~ D' Section



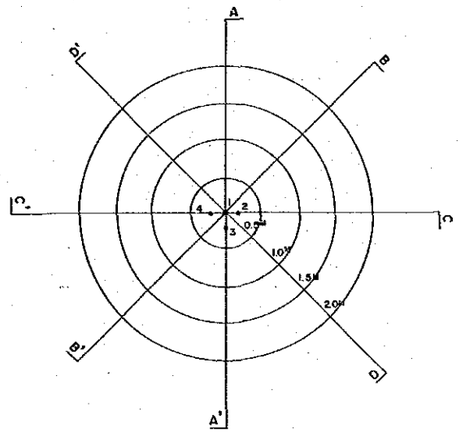
Level	Measuring point	Temperature -10cm* °C	-40cm*
0.5 m level	1	65	75
	2	50	55
	3	55	60
	4	50	50
	5	50	55
	6	60	65
	7	60	65
	8	50	60
	9	55	55

Level	Measuring point	Temperature -10cm* °C
10 m level	10	80
	11	55
	12	55
	13	50
	14	50
	15	60
	16	65
	17	60
	18	50
	19	50
	20	50
	21	45
	22	50
	23	55
	24	50
	26	50
	23	40

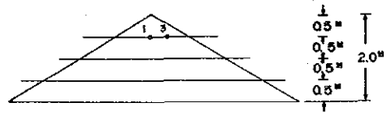
Level	Measuring point	Temperature -10cm* °C	-40cm*
1.5 m level	31	70	65
	32	60	60
	33	65	60
	34	60	60
	35	60	60
	36	70	75
	37	70	65
	38	70	50
	39	60	65
	40	60	60
	41	60	60
	42	60	55
	43	60	60
	44	60	60
	45	60	60
	46	65	50
	47	50	55
	48	55	50
	49	50	55
	50	50	50
	51	50	55
	52	60	55
	53	60	60
	54	50	
	55	50	55
	56	50	
	57	60	?
	58	45	
	59	45	
	60	55	
	61	60	?
	62	45	
	63	50	

(Note) * shows measured depth

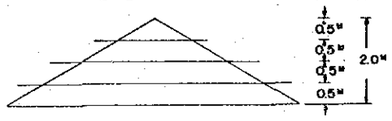
Fig. 46 Horizontal and Vertical Sections of No. 2 Coal Heap for Spontaneous Combustion Test Showing Thermometers Installed Positions and Observation Results



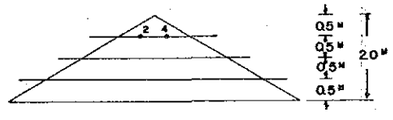
A~A' Section



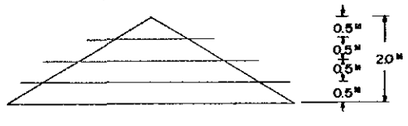
B~B' Section



C~C' Section



D~D' Section



Change of measured temperature at each point (No. 2 coal heap)

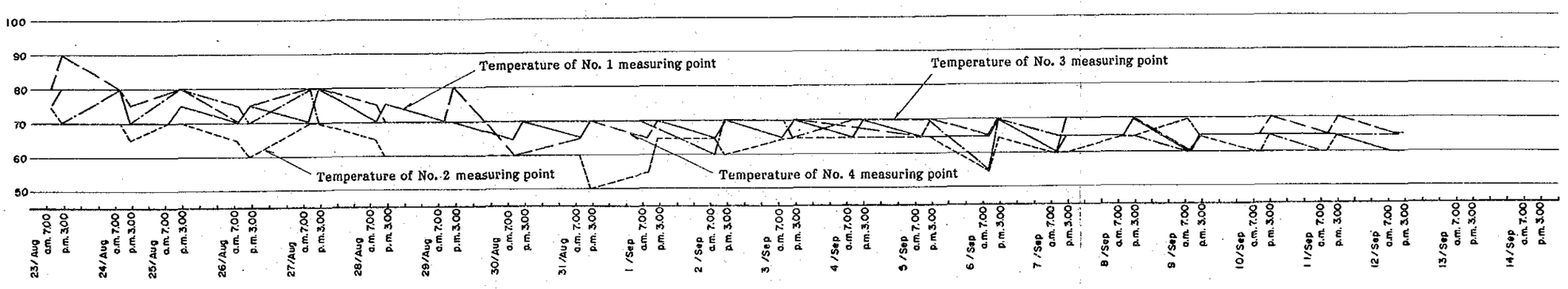
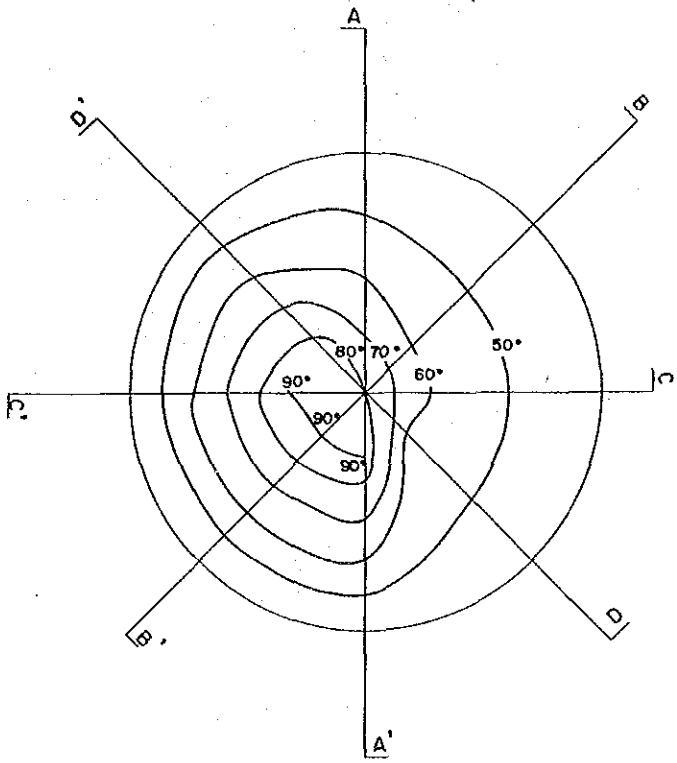
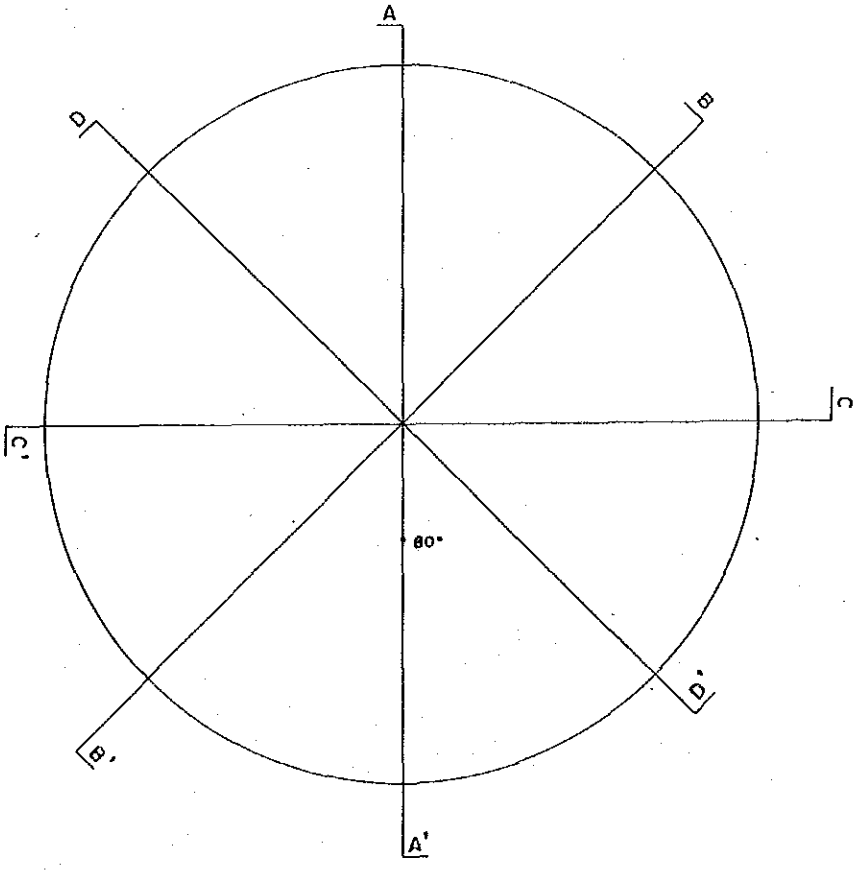


Fig. 47 Isothermal Line of the Inside of No. 1 Coal Heap at PM 7:00 on 22 August, 1987 (1) (Horizontal Section)

Below 10 meters from the top



Below 15 metes from the top Below



Below 5 meters from the top

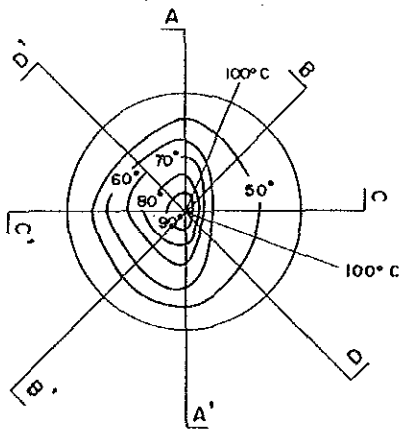
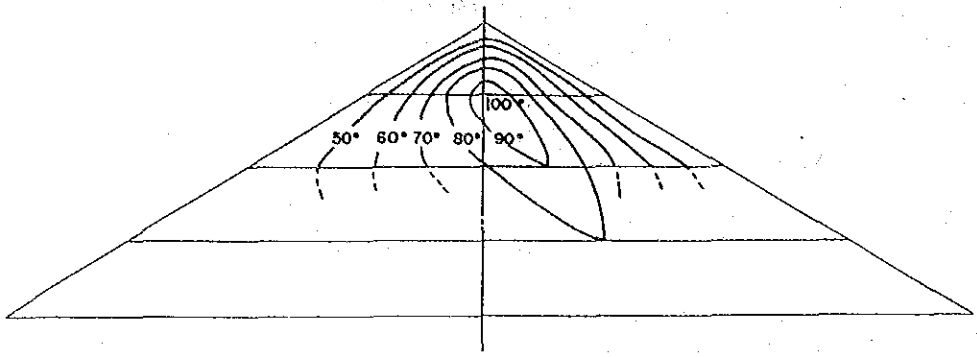
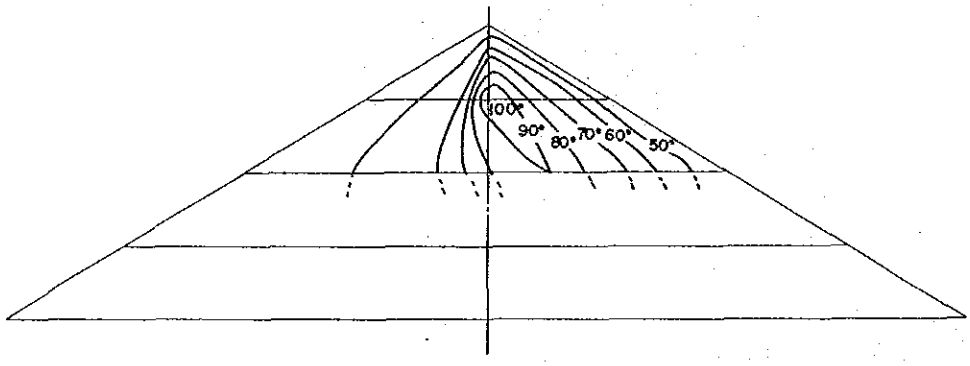


Fig. 48 Isothermal Line of the Inside of No. 1 Coal Heap at PM 7:00 on 22 August, 1987 (2) (Vertical Section)

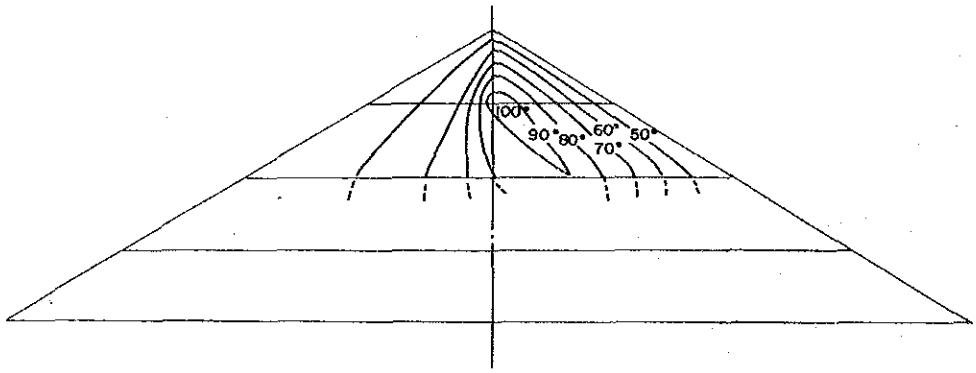
A~A' Section



B~B' Section



C~C' Section



D~D' Section

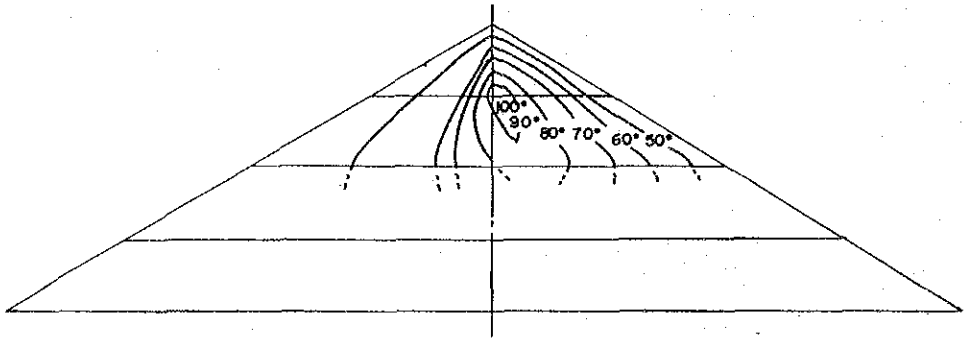
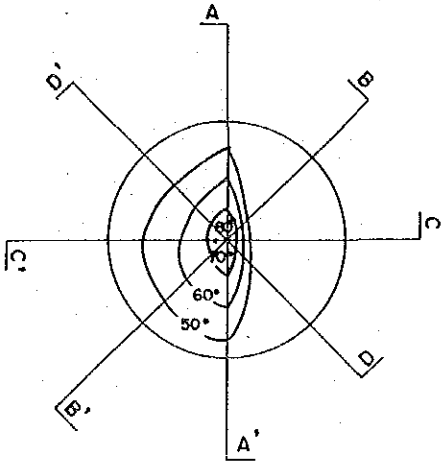
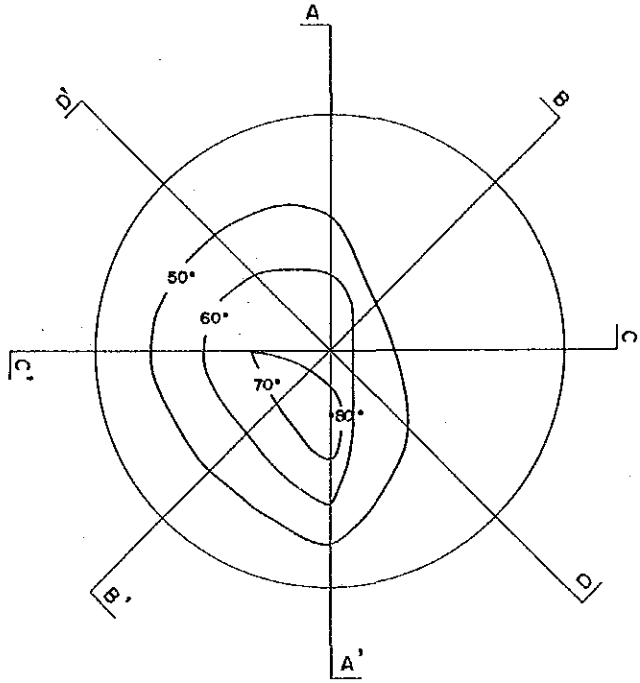


Fig. 49 Isothermal Line of the Inside of No. 1 Coal Heap at AM 11:00 on 2 September, 1987 (Horizontal Section)

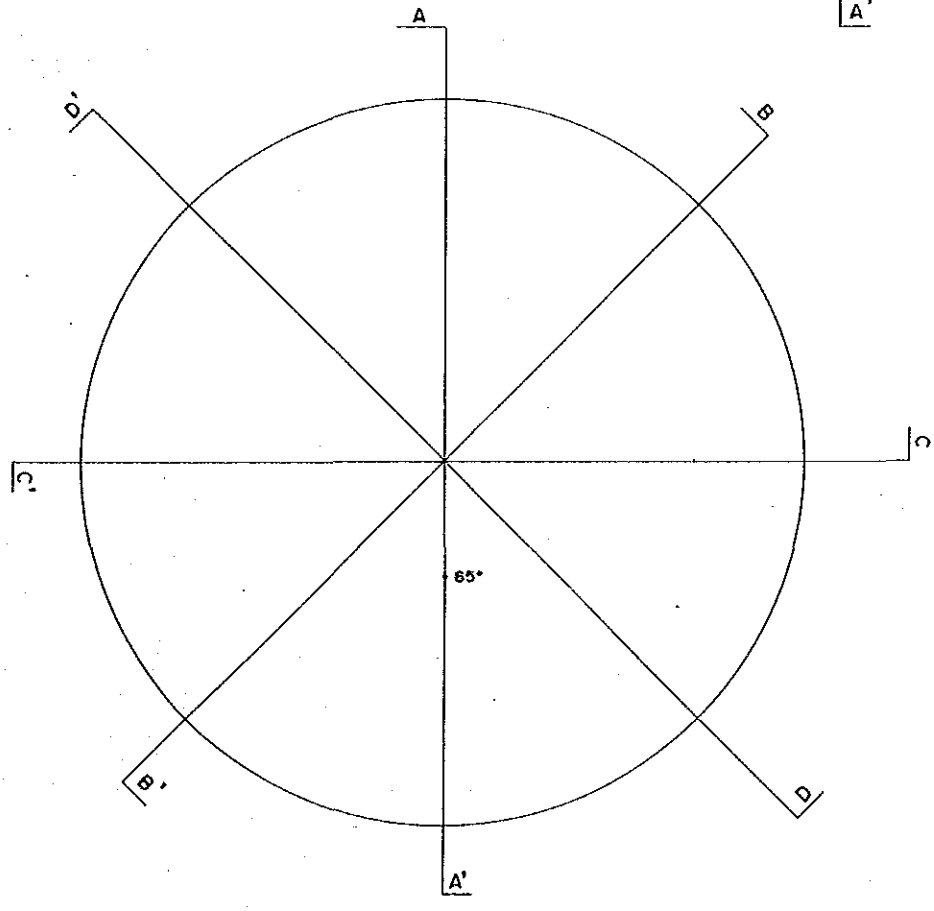
Below 5 meters from the top



Below 10 meters from the top



Below 15 metes from the top



ATTACHMENT 6-2

1. Relationship between Depth, Ash and Sodium Content

1. Relationship between Depth, Ash and Sodium Content

Fig. 50 Relationship between Total Ash (%) and Sodium Oxide in Ash

Fig. 51 Relationship between Sodium Content and Sampling Depth below Surface

Fig. 50 Relationship between Total Ash (%) and Sodium Oxide in Ash

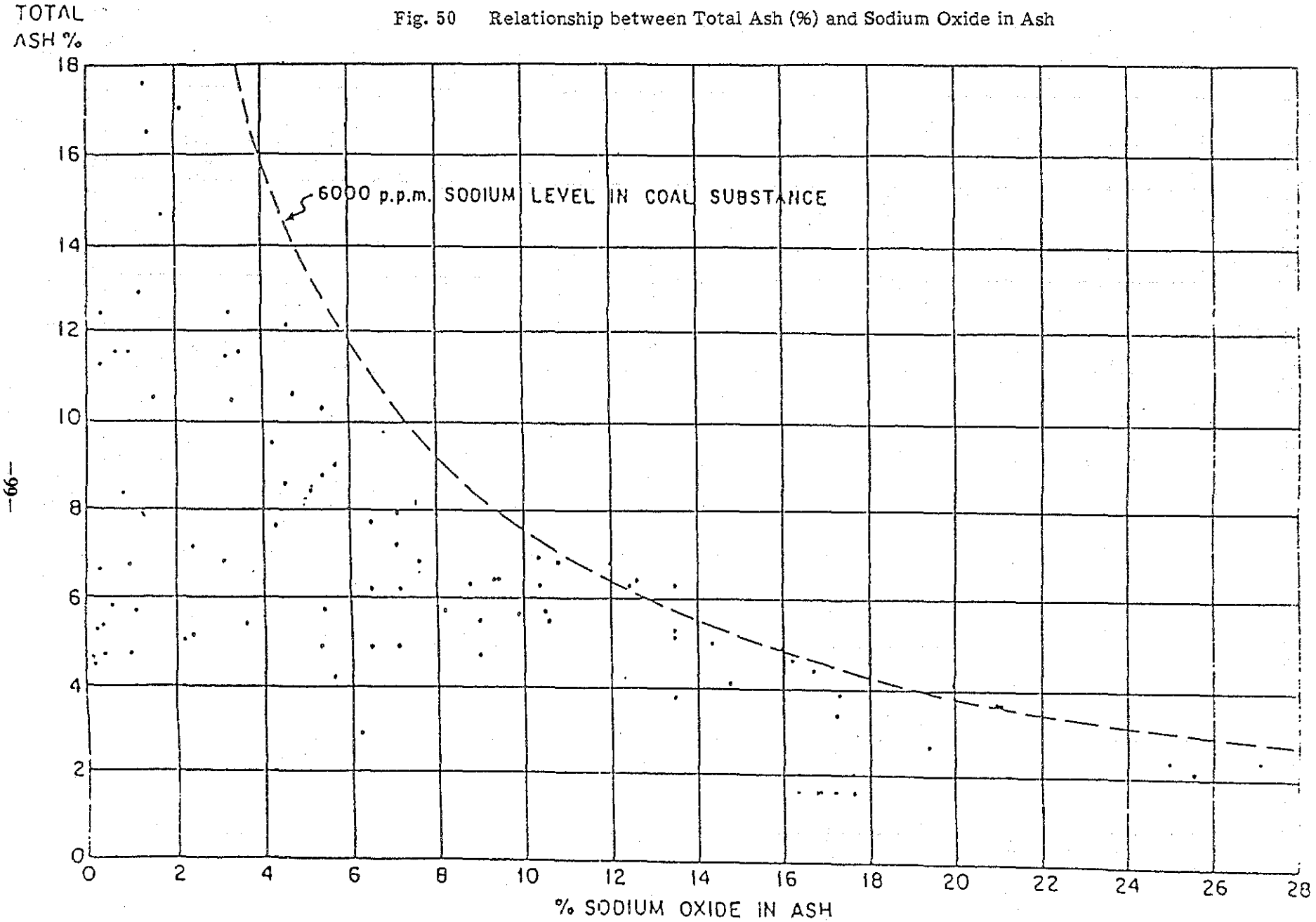
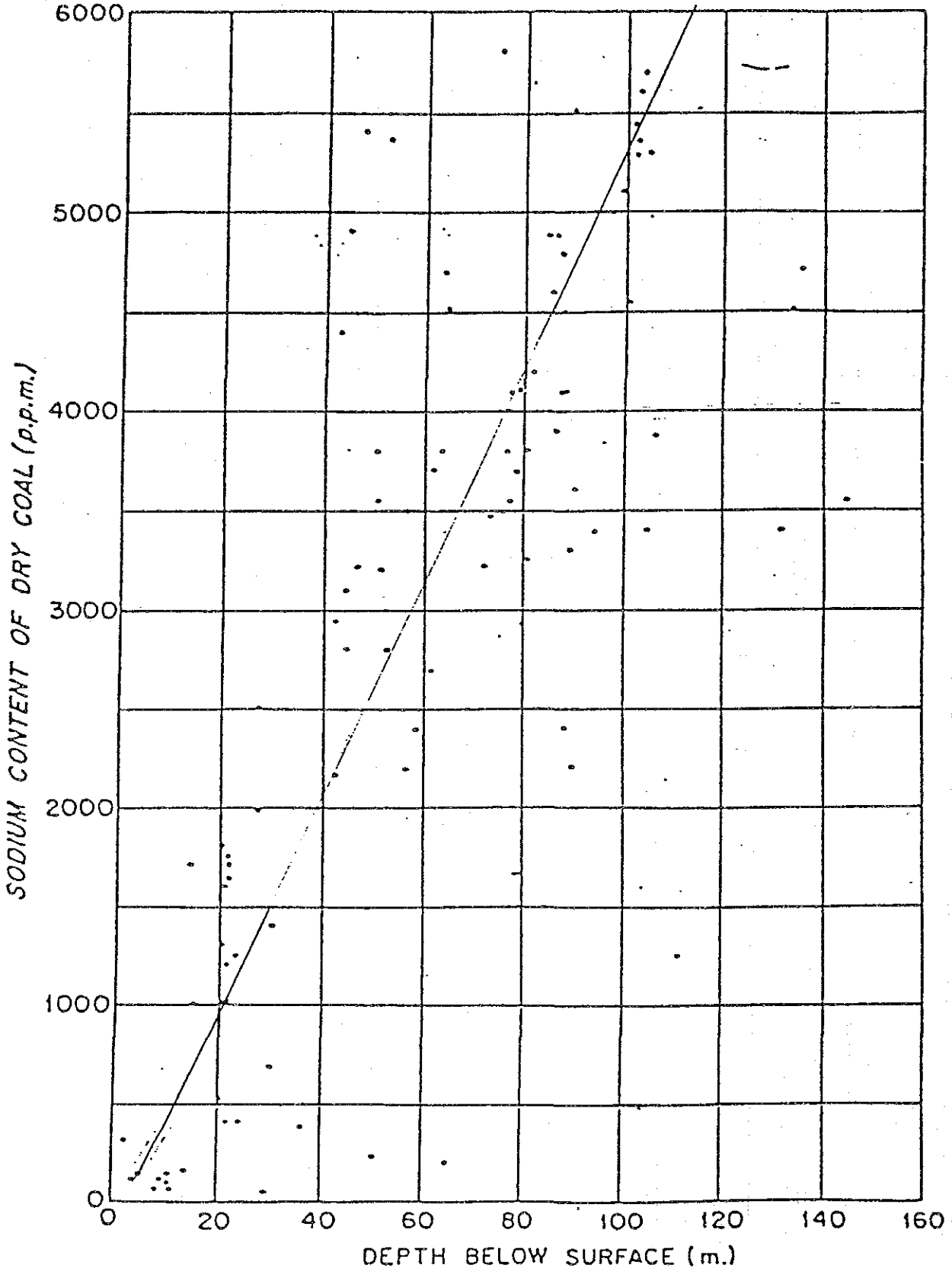


Fig. 51 Relationship between Sodium Content and Sampling Depth Below Surface



ATTACHMENT 8-1

1. Figures and Tables of Gasification Test Plant

2. Technical Specification for Erection Work

3. Request for Quotation

1. Figures and Tables of Gasification Test Plant

NAME	TAG NO	PHYSICAL PROPERTIES	UNIT	[illegible]/H COAL BLOWING	[illegible]/H COAL BLOWING	[illegible]/H COAL BLOWING
COAL	C-1	GRAIN SIZE	mm	10-25	→	→
		WATER CONTENT	%	5	→	→
	C-2	GRAIN SIZE	μm	74μ 70%	→	→
PIG IRON	F-1	WEIGHT	KG	300	→	→
		TEMPERATURE	°C	1400-1700	→	→
	F-2	WEIGHT	KG	300	→	→
		TEMPERATURE	°C	1500-1650	→	→
QUICK LIME	Ca-1	WEIGHT	KG	1.8	1.3	3.4
O_2 OXYGEN	O-1	PRESSURE	KG/cm^2G	9.9	→	→
	O-2	PRESSURE	KG/cm^2G	4-6	→	→
		FLOW RATE	Nm^3/H	19	12	24
N_2 NITROGEN	N-1	PRESSURE	KG/cm^2G	9.9	→	→
		FLOW RATE	Nm^3/H	65-72	→	→
	N-2	PRESSURE	KG/cm^2G	8-9.9	→	→
	N-3	PRESSURE	KG/cm^2G	6-8	→	→
	N-4	PRESSURE	KG/cm^2G	6-8	→	→
	N-5	PRESSURE	KG/cm^2G	4-6	→	→
		FLOW RATE	Nm^3/H	10.8	7.1	14.3
	N-6	PRESSURE	KG/cm^2G	6-8	→	→
		FLOW RATE	Nm^3/H	18	→	→
	N-7	PRESSURE	KG/cm^2G	6-8	→	→
		FLOW RATE	Nm^3/H	35-40	→	→
	N-8	PRESSURE	KG/cm^2G	6-8	→	→
		FLOW RATE	Nm^3/H	28.6	→	→
	N-9	PRESSURE	KG/cm^2G	6-8	→	→
		FLOW RATE	Nm^3/H	6	→	→
LPG LIQUID PROPANE GAS	L-1	PRESSURE	KG/cm^2G	1-2	→	→
	L-2	PRESSURE	mmAq	500	→	→
		FLOW RATE	Nm^3/H	3	→	→
	L-3	PRESSURE	mmAq	500	→	→
		FLOW RATE	Nm^3/H	0.83	→	→
	L-4	PRESSURE	mmAq	600	→	→
		FLOW RATE	Nm^3/H	1.6	→	→
COMPRESSED AIR	Ah-1	PRESSURE	KG/cm^2G	5-7	→	→
		FLOW RATE	Nm^3/H	43	→	→
	Ah-2	PRESSURE	KG/cm^2G	3-5	→	→
		FLOW RATE	Nm^3/H	22	→	→
	Ah-3	PRESSURE	KG/cm^2G	5-7	→	→
		FLOW RATE	Nm^3/H	21	→	→
AIR	Al-1	PRESSURE	mmAq	600	→	→
		FLOW RATE	Nm^3/H	100	→	→
	Al-2	PRESSURE	mmAq	500-600	→	→
		FLOW RATE	Nm^3/H	73	→	→
	Al-3	PRESSURE	mmAq	500-600	→	→
		FLOW RATE	Nm^3/H	21	→	→
PRODUCED GAS	G-1	PRESSURE	mmAq	±100	→	→
		FLOW RATE	Nm^3/H	64.5	43	88
		TEMPERATURE	°C	1300-1600	→	→
		CO	%	51.8	→	→
		CO_2	%	7.1	→	→
		H_2	%	24.1	→	→
		N_2	%	17.0	→	→
		DUST CONTENT	g/Nm^3	50	→	→
	G-2	PRESSURE	mmAq	-110~-120	→	→
		TEMPERATURE	°C	150	→	→
	G-3	PRESSURE	mmAq	-220~-230	→	→
		DUST CONTENT	g/Nm^3	28	→	→
	G-4	PRESSURE	mmAq	-420~-430	→	→
		DUST CONTENT	g/Nm^3	0.05	→	→
	G-5	PRESSURE	mmAq	-490~-480	→	→
	G-6	PRESSURE	mmAq	50-60	→	→
DUST COLLECTION	K-1	PRESSURE	mmAq	-200	→	→
		FLOW RATE	Nm^3/H	2800	→	→
COOLING WATER	W-1	PRESSURE	KG/cm^2G	10	→	→
		FLOW RATE	m^3/H	33.9	→	→
		TEMPERATURE	°C	32	→	→
	W-2	FLOW RATE	m^3/H	0.1	→	→
	W-3	FLOW RATE	m^3/H	20.4	→	→
	W-4	FLOW RATE	m^3/H	8.4	→	→
		TEMPERATURE	°C	55	→	→
	W-5	PRESSURE	KG/cm^2G	3.9	→	→
		FLOW RATE	m^3/H	12.0	→	→
	W-6	FLOW RATE	m^3/H	8.4	→	→
	W-7	FLOW RATE	m^3/H	3.3	→	→
		TEMPERATURE	°C	55	→	→
	W-8	FLOW RATE	m^3/H	1.7	→	→
		TEMPERATURE	°C	40	→	→
	W-9	FLOW RATE	m^3/H	10.9	→	→
		TEMPERATURE	°C	64.4	→	→
	W-10	FLOW RATE	m^3/H	7	→	→
		TEMPERATURE	°C	40	→	→
	W-11	FLOW RATE	m^3/H	33.5	→	→
		TEMPERATURE	°C	50	→	→

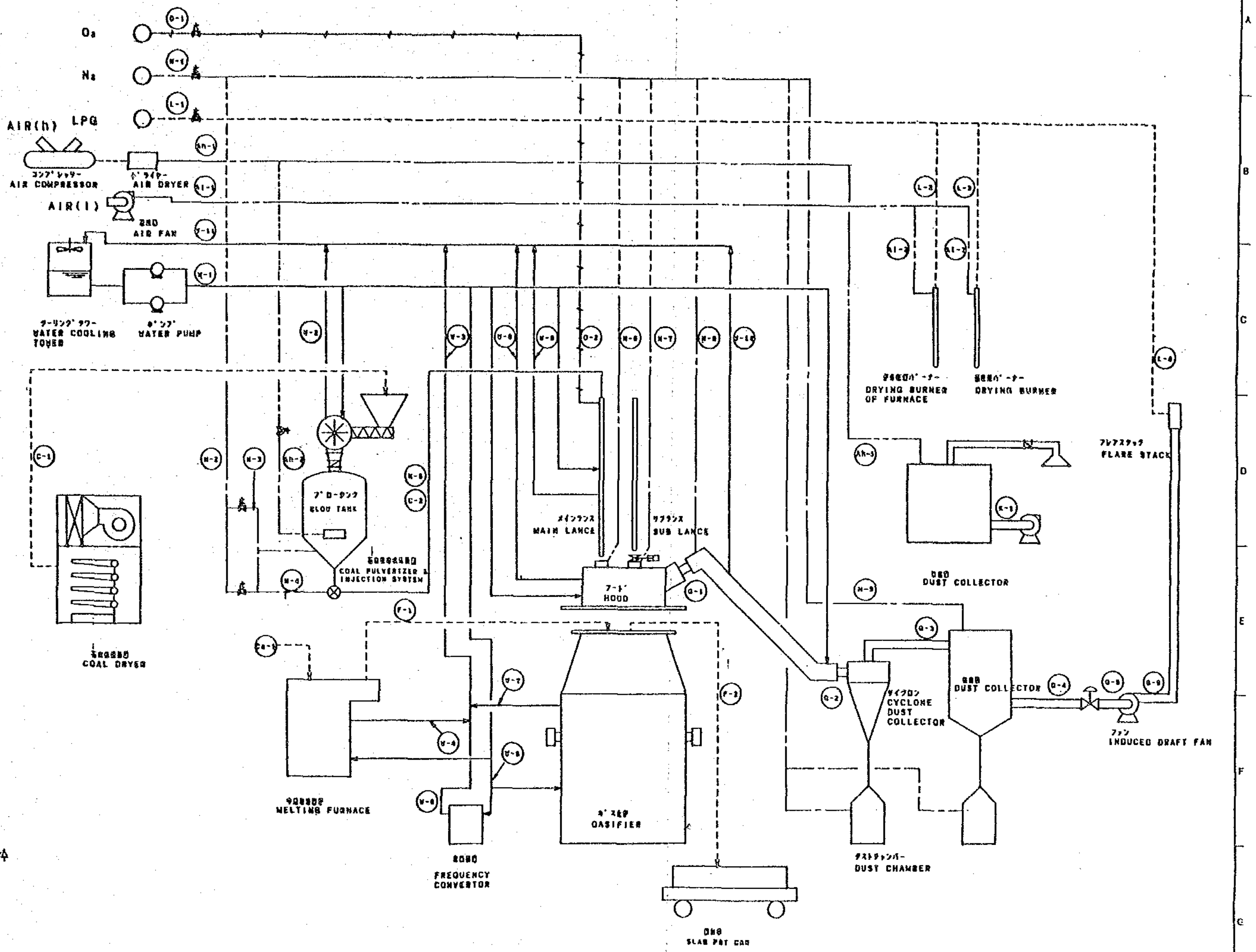


Fig. 8-1-1 Process Flow Diagram

BANKO COAL GASIFICATION TEST PLANT P.F.D.

JAPAN INTERNATIONAL COOPERATION AGENCY

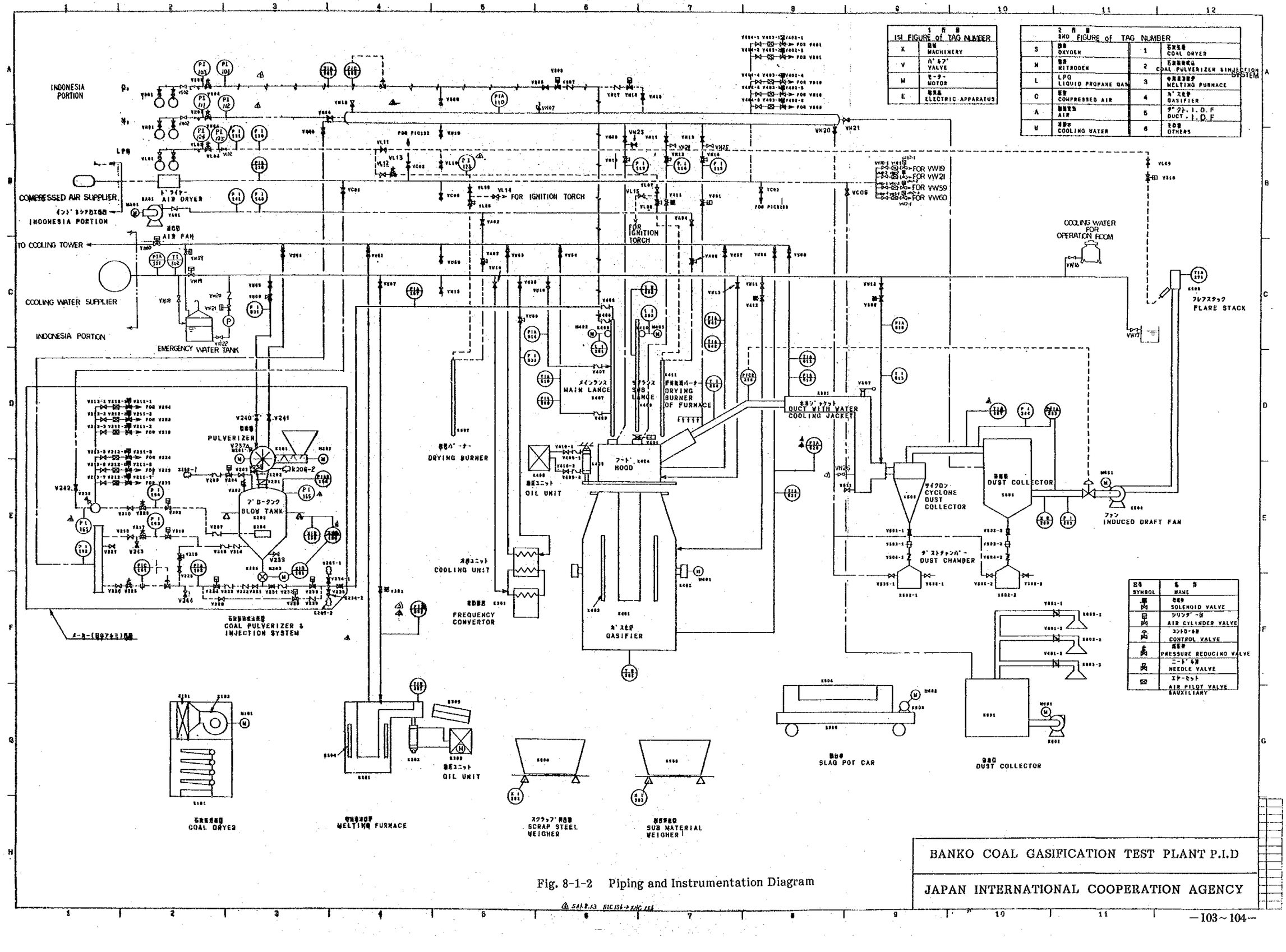


Fig. 8-1-2 Piping and Instrumentation Diagram

BANKO COAL GASIFICATION TEST PLANT P.I.D

JAPAN INTERNATIONAL COOPERATION AGENCY

Kashima Plant Kogyo Co., Ltd.	
APPD.	Y Otitomo
CHKD.	
DWN.	Y. Minami
DWG.NO	C-86221

ENG

DP3 DP2 TR1 TR2 DPI CPI-2 CPI-1

AIR TANK

COOLING WATER TANK

WATER COOLING UNIT

POWER TRANS

DUST COLLECTOR

DUST COLLECTOR FAN

SCR CONVERTER

MACHINE PANEL

CONTROL PANEL

FLOW DETECTOR

HYDRAULIC CONTROL SYSTEM

COAL PULVERIZE AND INJECTION SYSTEM

PREHEATING BURNER

CEILING FURNACE

PLANETARY FEEDER

SLAG POT CAR

CABLE BED

CONTROL ROOM GL+1800

VALVE STATION

DUST COLLECTOR

REVERSE JET FAN

GASIFIER

FLARE STACK (LIQUID FLARE BURNER)

WATER COOLING TOWER

Fig. 8-1-3 Drawing of Whole Plnat

BANKO COAL GASIFICATION TEST PLANT
WHOLE PLAN

JAPAN INTERNATIONAL COOPERATION AGENCY

Kashima Plant Kogyo Co., Ltd.	
APPD.	Y. Otsuka
CHKD.	
DWN.	Y. Minami
DWG.NO	B-86426

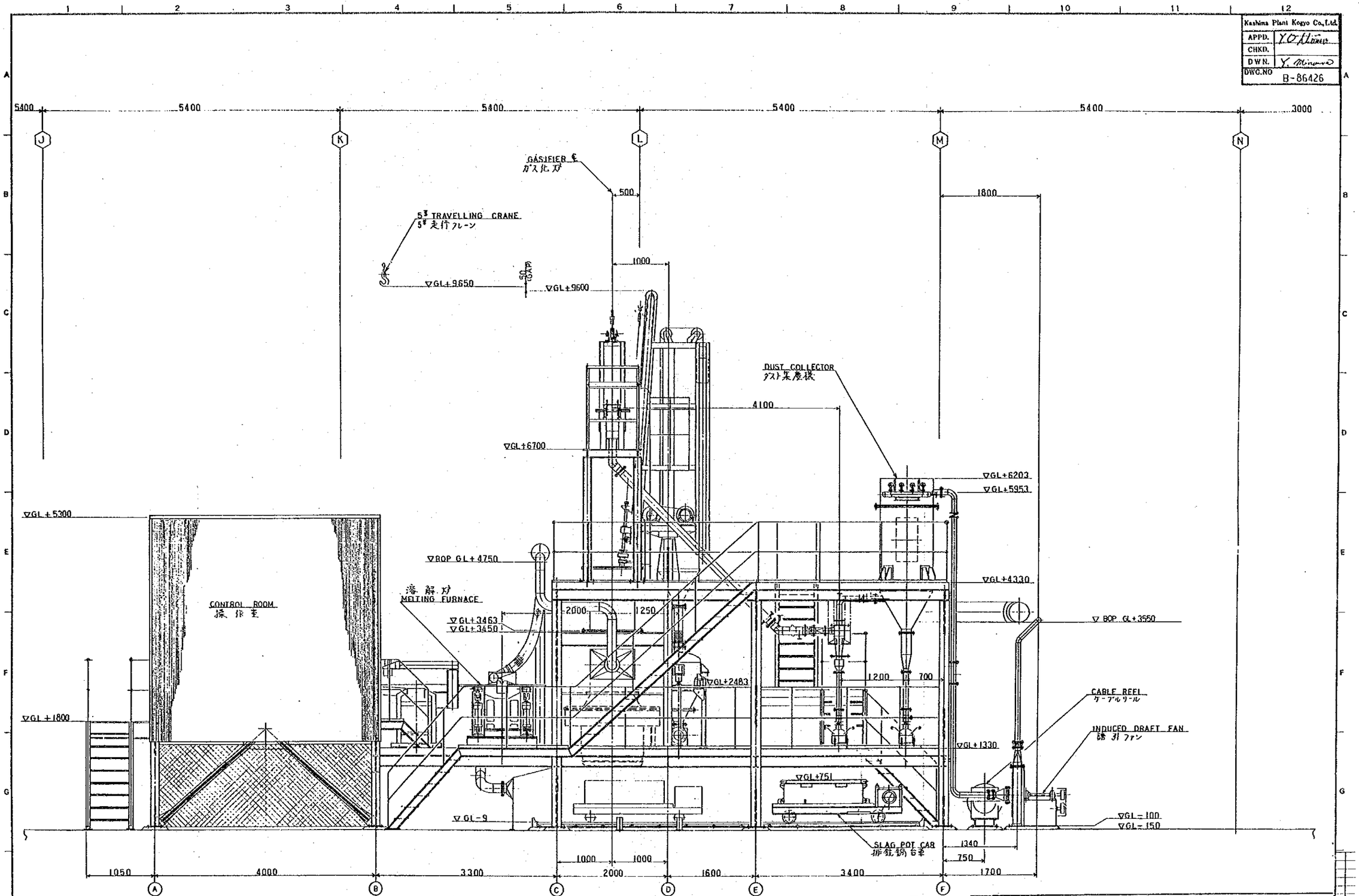


Fig. 8-1-4 Drawing of Front View

BANKO COAL GASIFICATION TEST PLANT
FRONT VIEW

JAPAN INTERNATIONAL COOPERATION AGENCY

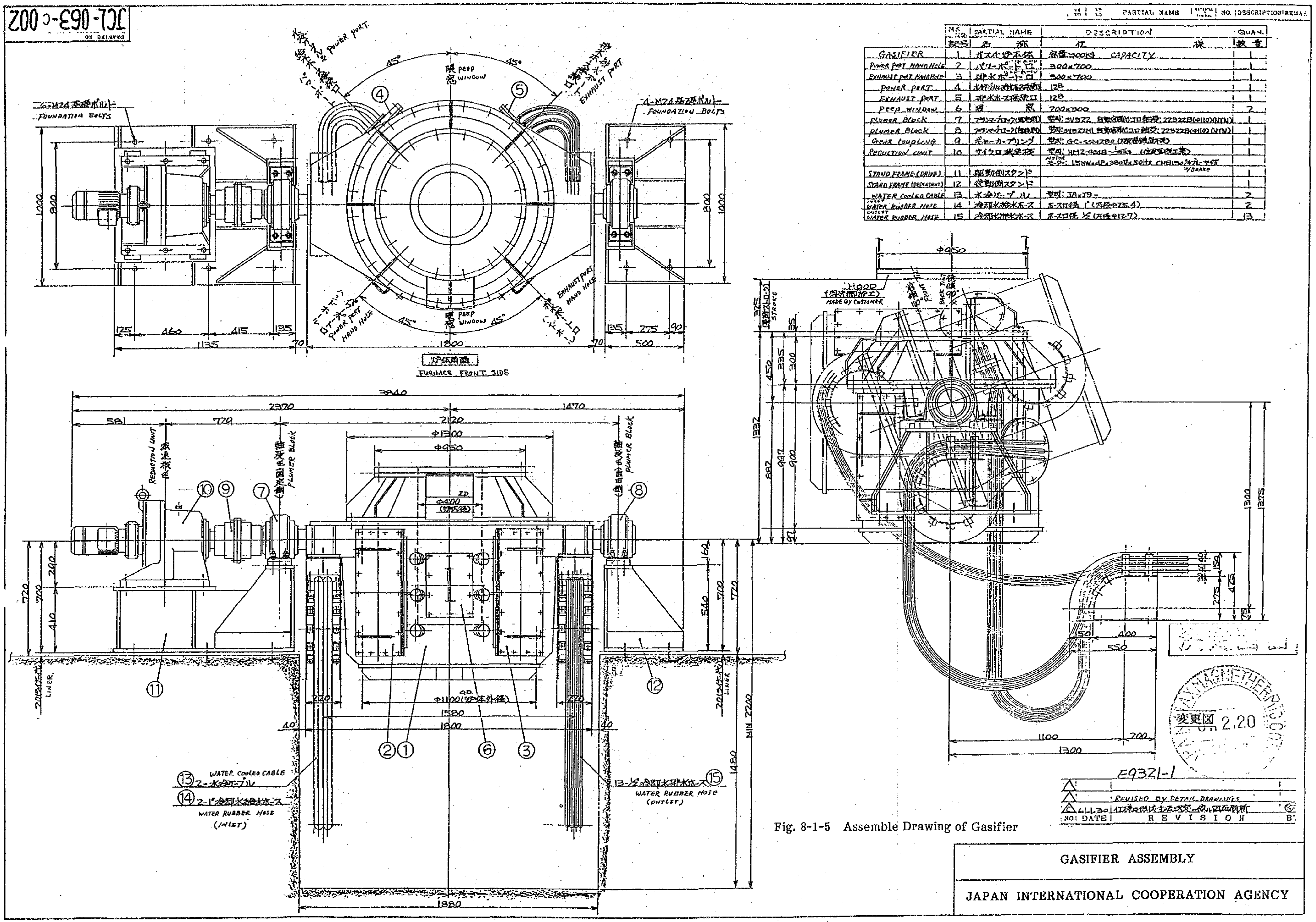
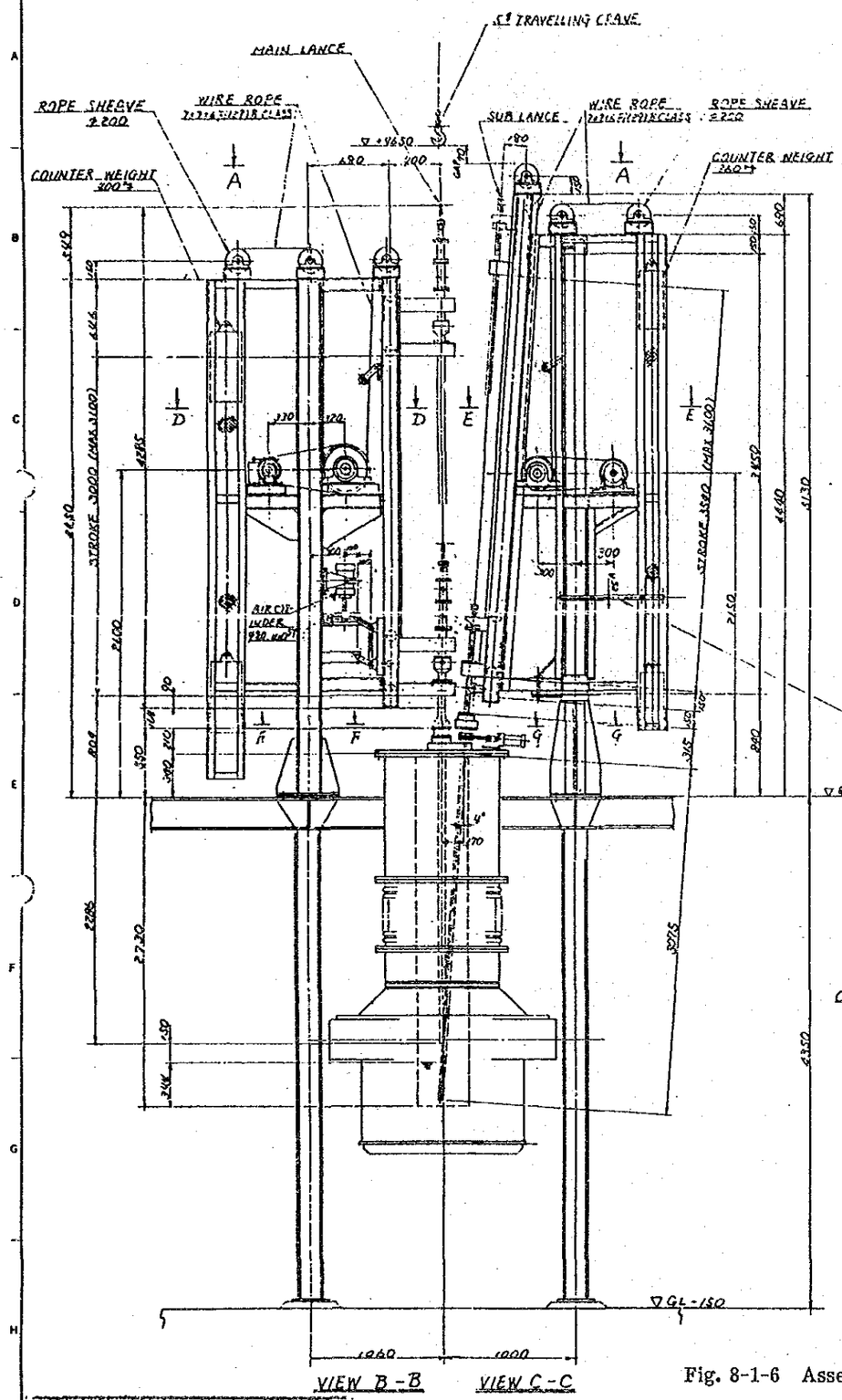
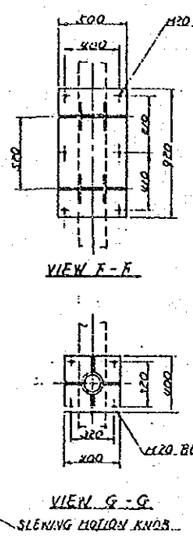


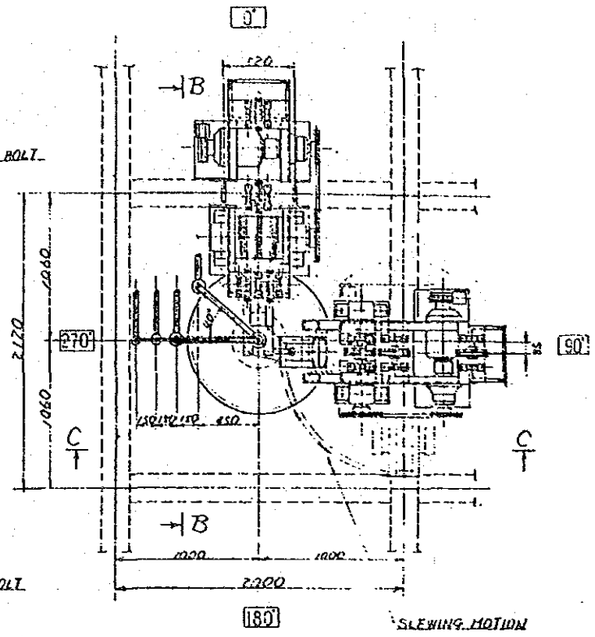
Fig. 8-1-5 Assemble Drawing of Gasifier

GASIFIER ASSEMBLY

JAPAN INTERNATIONAL COOPERATION AGENCY

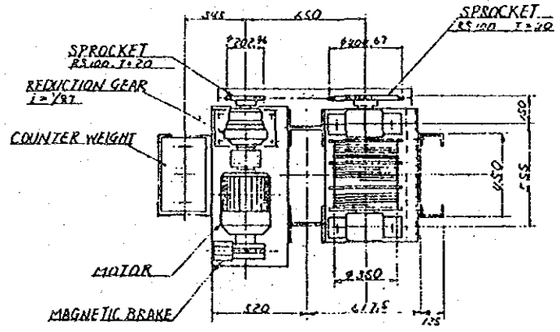






1t LS SPECIFICATION

メインランス MAIN LANCE	
巻上荷重（カウンターウェイト） WINDING LOAD	400 kg
昇降ストローク ELEVATOR STROKE	3000 mm
ドラム径 DRUM	φ 200 mm
ロープ径 WINDING ROPE	10 mm
ランス昇降速度 LANCE ELEVATOR SPEED	
高速 HIGH SPEED	10 m/min
低速 LOW SPEED	3.3 m/min
モーター MOTOR	15 kW 4P / 1.8 kW 4P
回転数 ROTATION FREQUENCY	1500 rpm / 500 rpm
非常巻上 EMERGENCY WINDING	カウンターウェイト COUNTER WEIGHT
減速比 REDUCTION RATIO	i = 1/87
サブランス SUB LANCE	
巻上荷重（カウンターウェイト） WINDING LOAD	260 kg
昇降ストローク ELEVATOR STROKE	3540 mm
ドラム径 DRUM	φ 200 mm
ロープ径 WINDING ROPE	φ 10 mm
ランス昇降速度 LANCE ELEVATOR SPEED	
高速 HIGH SPEED	10 m/min
低速 LOW SPEED	3.3 m/min
モーター MOTOR	15 kW 4P / 1.8 kW 4P
回転数 ROTATION FREQUENCY	1500 rpm / 500 rpm
非常巻上 EMERGENCY WINDING	カウンターウェイト COUNTER WEIGHT
減速比 REDUCTION RATIO	i = 1/87



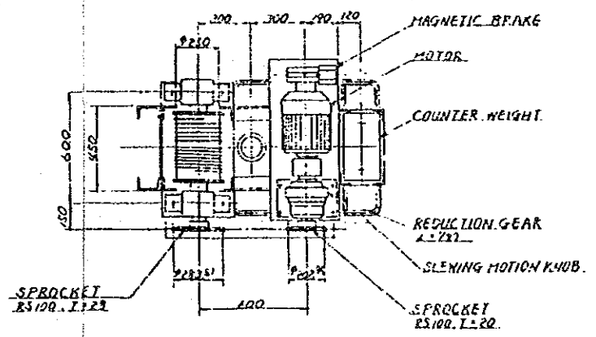


Fig. 8-1-6 Assemble Drawing of Main Lance and Sub-lance

BANKO COAL GASIFICATION TEST PLANT
MAIN LANCE · SUB LANCE LAYOUT
JAPAN INTERNATIONAL COOPERATION AGENCY

Table 8-1-1 (1) Design Condition

ITEM	DESIGN CONDITION	
1. Climate Data	Ambient Temperature	
	Daily maximum temperature	33.0°C
	Yearly maximum temperature	31.5°C
	Daily minimum temperature	21.0°C
	Yearly minimum temperature	22.5°C
	Daily normal/average temperature	24.0°C at 7:00
	Daily normal/average temperature	30°C at 13:00
	Daily normal/average temperature	26.5°C at 18:00
	Relative Humidity	
	Daily maximum humidity	96% 24°C at 7:00
	Daily minimum humidity	47% 32°C at 13:00
	Daily normal humidity	92% at 7:00
	Daily normal humidity	62% at 13:00
	Daily normal humidity	79% at 18:00
2. Materials		
(1) Coal	Moisture	Max. 35%
	Size	- 50 mm
(2) Calcined Lime	Component	90% CaO over
		4-8% CO_2
	Size	- 30 mm
(3) Scrapped Iron	Component	Fe 93-96%
		C 3-3.5%
		Si 1-2%
	Size	about 110 mm dia.
3. Utilities		
(1) Oxygen	as cylinders	
	Purity	99% over
	Temperature	ambient temperature
	Pressure	10 kg/cm^{2}G
(2) Nitrogen	as cylinders	
	Purity	99% over
	Temperature	ambient temperature
	Pressure	10 kg/cm^{2}G

Table 8-1-1 (2) Design Condition

	ITEM	DESIGN CONDITION	
(3)	Electric Power	Frequency	50Hz
		Phase	3 phase
		Voltage	380 V ± 10%
		Power	Max. 350 KVA
(4)	Compressed Air	Temperature	ambient temperature
		Pressure	Min. 6 kg/cm^{2}G
(5)	Compressed Air for Instrumentation	Temperature	ambient temperature
		Pressure	Min. 6 kg/m^{2}G
		Dew point	0°C
(6)	Cooling Water	Water analysis	
		Color	20 Pt.Co
		Turbidity	-
		Odor	No
		Taste	No
		PH	6.5
		Solid Content	4.1 ppm
		Conductivity	-
		Organic Contnet	4.4 ppm $KMnO_4$
		Free CO_2 Content	No
		Alkalinity	
		Phenol phtalein	0 ppm $CaCO_3$
		Methyl orange	40.0 ppm $CaCO_3$
		Carbonate	0 ppm $CaCO_3$
		Hydroxide	0 ppm $CaCO_3$
		Bicarbonate	40.0 ppm $CaCO_3$
		Hardness	
		Calcium	4.28 ppm Ca^{++}
		Magnesium	1.72 ppm Mg^{++}
		Iron content	negative
		Sulfate content	negative
		Phosphate	negative
		Ammonium content	negative
		Nitrate content	negative
		Silica content	-
		Chloride content	7.10 ppm Cl^-
		Residual chlorine	0.30 Cl_2
		Temperature	25-27°C
		Pressure	Min. 10 kg/cm^{2}G
(7)	Liquefied Petroleum Gas as cylinder		
		Calorific Value	24000 kcal/Nm^3 over
		Temperature	ambient temperature
		Pressure	2 kg/cm^{2}G

Table 8-1-1 (3) Design Condition

ITEM		DESIGN CONDITION
4. Waste		
(1) Cooling Water	Temperature	inlet temperature + Max. 10°C
(2) Dust	Component	Fe tot. 40 - 50% C 10 - 25%
	Flow rate	3 kg/h
(3) Slag	Basicity	CaO/SiO_2= 1.5
	Flow rate	2.4 kg/h
(4) Produced Gas	Flow rate	64.5 Nm^3/h

Table 8-1-2 Schedule of Construction Work and Trial Runs

	1986			1987		
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
(1) Construction Work	⊢———	———	———	———		
(2) Trial Runs						
1) Non-loading test				⊢——		
2) Loading test					⊢——	
3) Hot commissioning						⊢——

2. Technical Specification for Erection Work

Technical Specification for Erection Work

1. Mechanical Work

(1) General

1) The Contractor shall install the plant always bearing in mind that the plant after completed will function most satisfactorily.

2) The Contractor shall always use his best expertise in carrying out the installation work.

3) The installation process, installation procedure, welding procedure, piping procedure, painting procedure, inspection standard and so on, which are necessary for the erection work will be informed by the Consultant with drawing or documents principally.

4) The Contractor shall give a notice to the Consultant immediately after occurrence of any unexpected trouble while performing the works.

5) The Contractor shall ensure that the tools and measuring instruments shall be handled by skilled workers well acquainted with the mechanism and function of such tools and instruments.

6) All tools and measuring instruments for the installation work shall function properly and shall be checked at regular intervals and maintained in good condition.

7) Existing overhead crane in the building shall be available for the erection of the plant.

8) Temporary facilities and services (electrical power, air and water, etc.) necessary for erection of the plant shall be available at the battery limit.

(2) Preparing for Installation

1) The Contractor shall visually examine to see if the floor is sufficiently dry and free from cracks.

Morever, the Contractor shall visually inspect all anchor bolt holes to ensure absence of foreign matters which, if found, shall be removed.

2) The contractor shall confirm, together with the Consultant's and Supplier's, datum line and datum levels, for deciding to the levels, positions and direction of the plant to be installed.

3) Temporary bench marks shall be fixed by the Contractor on the floor surface for the identification of the accurate level of equipment to be installed.

4) Permanent bench marks and permanent center marks shall be fixed by the Contractor.

The Permissible tolerances in levels of bench marks shall be +1.0 mm from the datum levels.

(3) Installation of Machines

1) Alignment of Machines

a) Prior to the installation of machines, the lower part of machines and the top surface of the floor shall be thoroughly cleaned so as to be free from rust preventive paint, oil grease, dust, etc., and covers of anchor holes and foreign materials in the anchor bolt holes shall be removed.

b) Positioning of machines shall be determined using bench marks and center marks.

The Contractor shall carry out the alignment.

c) Grouting for the anchor bolt hole shall be carried out always after temporary alignment of machines.

d) After the grout in the anchor bolt holes has completely hardened, the anchor bolts shall be tightened and the final alignment shall be made.

e) The final inspection of alignment shall be made generally in presence of the Consultant's and Supplier's Supervisor, the results of which shall be submitted to the Consultant for his approval.

2) Assembling of Machine Parts

a) Each machine shall be assembled in compliance with drawings and documents.

b) Where required, rust preventive paint and/or oil coated at the shop must be thoroughly washed of, prior to be the assembling at the site, and any rust, foreign matter, etc., if found, must be removed.

c) During the site assembling of the machine, special attention must be paid to the matchmarks.

d) Seals, gasket and the like shall be set at the correct positions and shall be tightened uniformly.

e) Wood, synthetic resin, copper hammer, etc. shall be used for insertion of parts in assembling.

f) In the handling of parts during assembling, care shall be taken for the following:

- In the lifting of temporary storage of heavy and long items, no strain must be generated.
- In temporary storage of parts, suitable blocks shall be provided.

  Precision parts in particular must be protected with a cover provided.

(4) Field Bolting

Unless stipulated otherwise in the drawing, the tightening of bolts at the site shall be performed as stated below. Field connection of other materials if required shall also be in accordance with the drawings or the Consultant's specific instruction.

1) Tools used shall be suitable for the dimensions of bolts and nuts and the tightening work.

2) The tightening force shall be determined by the Contractor referring to appropriate standards and a most suitable method shall be selected such as torque wrench, turn-of-nut or bolt elongation, etc.

3) The Contractor shall submit to the Consultant for prior approval a proposal for the method and operating procedure of such tightening work.

4) Flushing work for piping shall be performed by the Contractor according to the provisions Japanese Standards, drawings and documents.

Prior to flushing work, instruments and control valves, etc. shall be removed and short pipes and/or hoses shall be installed for the portion of instruments and control valves, etc.

Short pipes and/or hoses and other necessary equipment and materials for flushing work shall be provided by the Contractor according to the provisions of the drawings and documents.

(2) General Precautions

In carrying out piping work the Contractor shall be fully aware of piping systems, pressure, flow amount, temperature, fluid characteristics in order to prevent any accidents which may result from defective work.

(3) Pipe Work

1) Pipes shall, as a rule, be cut mechanically be mean of pipe cutters, pipe gas cutters, high-speed cutters or the like.

2 Bevels for welding shall be cut as accurately as possible in according with the drawings.

3) Cut faces and bevel faces shall be free from cracks, flaws or slags.

4) Welding

Prior to welding, surfaces to be welded shall be completely cleaned to be free from such detrimental objects as rest, oil grease, etc.

Welding shall be in accordance with JIS standards.

Pipe jointing except by welding:

a) Threads shall be cut by treading machines which shall be provided by the Contractor.

b) Compounds or Teflon seal tapes shall be used for screwing and rejoining, except when a seal weld is specified, and these materials shall be provided. Packing such as hemp, jute, etc. shall not uses for

(5) Inspection

1) Upon completion of the alignment work of each equipment and before grouting, the Contractor shall carry out an alignment inspection which shall generally be witnessed by consistent with drawings and documents.

The Contractor shall not proceed to further work without the said inspection.

2) After inspection of equipment, the Contractor shall carry out the final inspection, generally in presence of the Consultant's or Supplier's Supervisor.

In the final inspection, the Contractor shall inspect and measure main parts of equipment and ensure that the equipment has been correctly assembled and installed with satisfactory accuracy.

Due care of the following in particular shall be taken.

a) Condition of bolts as tightened particularly those subjected to vibration.

b) Lubrication of where friction and rotating motions take place.

c) Should any defects be detected during the final inspection, the Contractor shall repair the defects so that they will not pose any hindrance to the subsequent tests and testing, etc.

d) The Contractor shall submit without delay a written report on the final inspection results to the Consultant for approval.

2. Piping Work

(1) General

1) This specification covers the general requirements for installation of all piping and piping system at the site.

2) Piping system covered herein are for fluids such as oxygen, nitrogen, LPG, compressed air, cooling water, oil and pulverized coal, etc.

3) Piping materials shall be prefabricated by the Client prior to shipment.

screwing.

Projection of seal tape to internal pipe shall be avoided.

c) After pipes have been screwed in screw type flange, pipe edges shall be flush with the flange surface.

If pipe edges project from the flange surface such edges shall be finished by a grinder or file without damaging flange surfaces.

In all cases, screwing less than the specified length of thread engagement shall be avoided.

5) Flushing for Piping

General:

The flushing work shall be to clean the inside of pipes by removing rust and other foreign matters.

All equipments and materials necessary for flushing work shall be provided by the Contractor.

Flushing oil, if required, shall be disposed most carefully.

The used oil shall be disposed in an appropriate manner off the site.

6) Inspection & Testing at the Site

All pipe works installed at the site prior to flushing shall be air pressure tested by the Contractor.

The test pressure shall be maintained for more than one hour.

3. Electrical Work

The electrical installation shall be complete in all respects and any item not included in the specification but essential for proper installation and functioning of the electrical system shall be deemed to be included in the scope of the specification whether specifically mentioned in this specifications or not.

(1) Conduit

1) Exposed conduit shall be installed either parallel with or perpendicular to structural members, unless impractical, and grouped wherever possible.
Conduits shall have a sufficient number of supports to structure framework by means of approved pipe straps, brackets, racks or other approved means.

2) Where all thread nipples are used between boxes and electrical equipment, they shall be installed so that no treads are exposed.

3) Conduit attachment to all electrical equipment including junction boxes, pull boxes, switches, push button stations, starters, etc., shall be made by the use of double steel locknuts.
Threaded insulated bushing shall be used on the end of each conduit terminating in such equipment.

4) Conduit will be cut square and reamed.
Joint will be coated with an electrical conductive sealant, and screwed tight to a shoulder in fittings and bushings to complete a continuity bond.

5) At the switchboard end, threaded insulated bushings for power and control conduits shall be installed.
For power conduit 1 1/2" and larger, an installed washer drilled with the correct size holes for the individual power conductors shall be installed.

6) Conduit shall be protected immediately after installation by means of installing flat non-corrosive metallic discs and steel bushings at each end.
Discs shall not be removed until it is necessary to clean conduit and pull cable or wire.

7) Prior to pulling in cables, each conduit shall be thoroughly cleaned inside by pulling a wire brush cleaner and then a swab through the conduit to remove all sand and particles of concrete.

8) No more than the equivalent of three 90 degree bends will be placed in any one conduit run.
Field bent, with approved tools, or factory bent elbows may be used on circuits 1000 volts and below.

9) Heating of conduit to facilitate bending is prohibited.

(2) Pullboxes, Junction Boxes and Supports

1) Pullbox shall be provided on all conduit runs exceeding 200-ft. and at a maximum of 200-ft. intervals.
2) All pullboxes, junction boxes, cabinets, switches and other electrical equipment shall be solidly supported prior to installation of conduit.
3) Holes for necessary conduit shall be made in each pullbox, junction box, cabinet, switch or other enclosure.
4) Pullboxes, junction boxes and enclosures shall be surface mounted, set true and plumb and shall be secured rigidly to the building or supporting steel or masonry walls.

(3) Cable Racks

1) Cable racks shall be installed either parallel with or perpendicular to structure members and shall be rigidly secured to structure steel, supporting steel, concrete slabs or masonry walls.
2) Cable rack supports shall be installed at 0'0" centers or less.
3) All cables or wire shall be lashed to the rungs of the cable trays on all vertical runs and at all points of taken-off or entry.
4) All cables or wires places in cable racks shall be aligned to make a neat looking installation.
5) All cable or wire take-offs from cable racks shall be supported in such a manner as to make a neat rigid installation.

(4) Wiring

1) Once a cable having paper of V.C. insulation is opened preparatory to splicing or terminating, the splicing or terminating shall proceed immediately and continue uninterrupted until completed.
2 All cable or wire take-offs from cable racks to conduit shall be supported in a manner so they will not rub the sides of the rack.

3) All equipment requiring control wiring must be wired with multiconductor color coded control cable.

4) Control cable through five conductor will be installed in 1" conduit.

   Control cable of six conductor and above will be installed 1 1/4" conduit.

   Control cable shall be run separate to power cables.

5) Circuits of different voltage shall not be included in one conduit or cable.

   All lighting circuits shall be run in conduit separate from equipment and control circuits.

6) When cables are laid at the high temperature places, trays, duct and rucks shall be protected by sheet steel covers, asbestos and so on.

7) Where there is a possibility of mechanical damage, cable trays, ducts, racks shall be protected by sheet steel covers.

8) In general, wires and cables for instruments except instrument panel shall be as follows:

USE	WIRES and/or CABLES
Instrument signal	600 V grade PVC insulated and sheathe control cables with copper shield tape. 2.0 mm^2 or above
Control signal	600 V grade PVC insulated and sheathed control cables. 2.0 mm^2 or above
Thermocouple line	Compensating lead wires

(5) Instrument Piping

1) Tap hole for pressure and/or differential pressure of Vena-contracta tapes orifice, in general, shall be 12 mm diameter, and tape tubing to be welded to tap hole shall generally be 100 mm long and 21.7 mm outer diameter.

2) Tap tubing from tap tubing with process isolation valve to instrument such as pressure and/or differential pressure transmitter shall be 21.7 mm outer diameter.

3) Tubing for pressure and/or differential pressure shall generally be carbon steel pipes.
Material of tubing shall be selected in accordance with process requirements.

4) Pneumatic control lines shall be 6 mm inside diameter and 8 mm outside diameter, copper tubing.

(6) Grounding

1) Grlounding conditions shall have the following sizes:

EQUIPMENT	CONDUCTOR SIZE
Motor below 3.7 kw	5.5 mm^2 or above
7.5 kw	8.0 mm^2 or above
15.0 kw	14.0 mm^2 or above
37.0 kw	22.0 mm^2 or above
above 37.0 kw	38.0 mm^2 or above
High voltage	38.0 mm^2 or above
Main line of grounding	100.0 mm^2 or above
Low voltage panel	5.5 mm^2 or above

2) Grounding conductors shall be laid in such a manner as not to touch other cable and conductors.

3) The earthing electrodes for the following equipment shall be installed separately from the ones for motors and motor control to avoid malfunction of the equipment.

EQUIPMENT	EARTHING RESISTANCE
PLC	less than 10 ohm
Thyristor unit (Induction heater)	less than 10 ohm

(7) Tests

1) Contractor shall perform test to insure the workmanship, methods, inspection and materials used in the erection and installation of the equipment.
He shall provide all necessary test equipment and provide reasonable cooperation to manufacturer's representatives who will witness the test.

2) All test shall be scheduled by the Contractor and cleared by the Owner's engineer.
No testing shall be performed without this clearance.

3) The Owner will approve final acceptance of the power wiring when all wiring considered as a complete system functions to operate all connected electrical equipment in the proper manner.

4) Upon completing wiring works, the following tests and inspections shall be made before energizing cables and wires.
   a) Measurement of earth resistance
   b) Measurement of insulation resistance
   c) Check of phase rotation
   d) Check of cable connection
   e) Others

5) After completing the above tests and inspections, the Contractor shall furnish four copies of all test data. If, in the opinion of Engineers, test results shown improper performance and such deficiencies are due to negligence or unsatisfactory installation by the Contractor, the Contractor shall furnish all labor and materials required to remedy the situation to the satisfaction of the engineer.

6) During no load and load test, the Contractor shall keep several reliable men on duty to repair, adjust or modify.

3. Request for Quotation

REQUEST for QUOTATION

Date Issued: th June 1986

Inquiry No. MP6-002

Dear Sirs.

We, Japan International Cooperation Agency INDONESIA Office (hereinafter called JICA), request you (hereinafter called Bidder) to quote in accordance with the applicable documents hereunder specified (hereinafter called Basic Documents), the fixed lump sum price (hereinafter called Price) in ten (10) copies valid for 90 days for the following construction of the Coal Gasification Test Facilities, to be installed in SERPONG OF INDONESIA provided that, it will be understood that unless exceptions, deviations or alternatives are clearly defined and listed separately, the Basic Documents will be deemed to be accepted by Bidder.

1. Scope of Work

Construction of the coal gasification test facilities in the existing pilot plant building at SERPONG OF INDONESIA.
Please refer the attached Requisition No. MP6-002.

2. Basic Document

Requisition No. MP6-002.

Project Specification No. MP6-002.

3. Schedule

Supply of equipment and materials --- the end of September, 1986

Mechanical completion — the end of January, 1987

4. Supervisory Services

Not required.

5. Payment Term

The payment will be carried out in Rupiah in cash within 1 (one) month after JICA receives the Bill which will be issued by the Contractor on or after the date of Completion of Construction.

The date of Completion of Construction shall be regarded as that on which the work has passed the mechanical test.

6. Closing Date

12:00 Noon on 15th July 1986.

7. Others

Quotation shall be written by English and submitted with one original and ten copies.

8. Note

1) This is not an order.

2) The inquiry number must be clearly indicated in quotation and documents attached hereto.

3) JICA reserves the right to accept other than the lowest quotation and to accept or reject any quotation in whole or in part.
Unless otherwise described herein, the cost of preparation for quotation shall be borne by Bidder.

4) Bidder who declines submitting a quotation or unsuccessful bidder shall return all the documents for inquiry purpose issued by JICA.

5) Quotation and any correspondence thereof shall be addressed to JICA, INDONESIA.

JICA, INDONESIA
Assistant Resident Representative
Mr. SUMIO AOKI

Japanese Embassy Compound
Jl. Thamrin 24, Jakarta

TELEX : 44198 JICA IA
TELEPHONE: 326818, 322387,324247,321394

Yours very truly,

JICA, INDONESIA

Hideo Endo
Resident Representative of Japan
International Cooperation Agency
Indonesia Office

Contents of Technical Specification for Erection Work

I Order Number — No.

II Project Name — BANKO PROJECT , Plant Installation Work

III Quanitity — One Complete Set

IV Date of delivery — Work completed : Jan.31th, 1987
Test work completed : Mar.25th,1987

V Place of delivery — The pilot plant Building Stage 1 in PUSPIPTEK, Serpong, Jakarta, The Republic of Indonesia

VI Specifications

1. General Outline
   (1) Weight for Erection work
   (2) Work schedule
2. Plant outline
   (1) Location
   (2) Climate data
   (3) Seismic design
3. Applied codes and standards
4. Scope of Estimation
   (1) Main Work
      A. Foundation Work
      B. Installation work for each facility
         a. Outline of all works
         b. Work for each facility
            (a) Main facilities
            (b) Spare parts,and others
      C. Utility Work
         a. Outline of all works
         b. Pipe work specification for each fluid
         c. Valve list

D. Electrical and Instrument Work
   a. Scope of Work
   b. Battery limit of electrical instrument work
   c. Electrical equipment list (supplied)
   d. Instrument equipment list (supplied)
   e. Electric wiring materials list
   f. Instrument " "

(2) Temporary Work and others
(3) Materials for erection works
(4) Machines and tools for erection works
(5) Transportation
(6) Construction Insurance
(7) Test run
(8) Document presentation
   A. Document presentation at the estimation
   B. Document presentation during works
   C. Document presentation after completion

5. Out of scope

6. System of work responsibility

7. Responsibility, Guarantee

8. Technical regulations
(1) Order of Installation
(2) Outline of Welding
   A. Outline of Welding
   B. Recommendation of welding rod
   C. Cautions

(3) Outline of Painting
    A. Necessary place of painting
    B. Unnecessary place of painting
    C. Outline of painting and coloring
(4) Inspection and passing standard
    A. Assignment of Work
    B. Items of Inspection

9. Outline of test works
(1) Outline
(2) Organization of Test run
(3) Preparation for test run
(4) No-load test run
(5) Individual load tests
(6) Synthetic load test run

10. General matters

11. Construction acceptance

12. Accompanying documents

Specification for Election Work

I Order Number No.

II Project Name BANKO PROEJECT, Plant Installation Work

III Quantity One Complete Set

IV Date of delivery Work completed : Jan. 31th, 1987
Test work completed : Mar. 25th, 1987

V Place of delivery The pilot plant Building Stage 1 in PUSPIPTEK, Serpong, Jakarta, The Republic of Indonesia.

VI Specifications

1. Outline

This work is an installation work of BANKO Coal Gasfication Test Facilities that is constructed in PUSPIPTEK, Serpong, The Republic of Indonesia.

This contractor's works are opening of the packed facilities which had been transported there, arrangements, supplementation of acceptance, transportation in site, temporary laying, indoor foundation work, painting (only touch up), no-load test run, attendance of individual load test,attendance of synthetic load test run,cleaning,and so forth.

Detail informations are given afterwards.

(1) Weight for Erection work

	(ton)	(ton)	(ton)
	Main facilities	Spare Parts	Total
Packed Weight	abt 110	abt 24.7	abt 134.7
Installation Weight	abt 91.6	abt 22.3	abt 113.9

(2) Work schedule

Installation starts : Beginning of Oct., 1986
Installation completes : End of Dec., 1986
Test run starts : Middle of Jan., 1987
Test run completes : Middle of Mar., 1987

2. Site information

(1) Location

The plant will be constructed in the pilot plant Building Stage 1 in PUSPIPTEK, Serperg, Jakarta, The Republic of Indonesia.

(2) Climate date (Indonesian data)

1) Ambient temperature

Daily maximum temperature	33°C
Yearly maximum temperature	31.5°C
Daily minimum temperature	21°C
Yearly minimum temperature	22.5°C
Daily normal/average temperature	24°C(at 07:00)
Daily normal/average temperature	30°C(at 13:00)
Daily normal/average temperature	26.5°C(at 18:00)

2) Relative humidity

Daily maximum humidity	96% (24°C at 07:00)
Daily minimum humidity	47%(32°C at 13:00)
Daily normal humidity	92%(at 07:00)
Daily normal humidity	62%(at13:00)
Daily normal humidity	79%(at18:00)

(3) Seismic design

$Fe = kw$

where, Fe = horizontal shear force
k = seismic coefficient
w = weight of the components

The "k" value is 0.2, as all the equipments are smaller than 16m and their specific period are shorter than 0.4 second.

3. Applied codes and standards

JIS, JEC, new JEM, Japanese code and standards

4. Scope of Estimation

(1) Main work

A. Foundation work

No.	Items	Qty. (set)	charge		Note
			Contractor	Indonesia	
1	Making holes for chemical anchor	one	o		Indoor foundation is concrete
2	Mortar work	"	o		already worked
3	Setting of base plate and chemical anchor	"	o		Including centering work
4	Ground concrete	"		o	
5	Making anchor holes for anchor bolts	"		o	Including centering work
6	Mortar work		o	o	
7	Setting of base plate and anchor bolts	"	o		

Refer to accompanying documents (10) ANCHOR PLAN

B. Installation work for each facility

a. Outline of all works

No.	Item	Q'ty (set)	Contractor's charge	Note
1	Planning	one	o	
2	Opening package & Checking, Keeping	"	o	Including rust remove
3	Liner adjustment	"	o	
4	Arrangement, fitting & finishing	"	o	
5	Cleaning	"	o	
6	Oiling	"	o	
7	Putting in order	"	o	
8	Miscellaneous works	"	o	
9	Painting	"	o	only touch up
10	Refractory lining work	"	o	
11	Air-conditioning work of central operation room	"	o	

b. Work for each facility
Installation of each facility should be refered to "installation outline chart". Details of installation should be followed by "handling notes" or "installation point book" supplied afterwards.

Installation outline chart

No.	Device	Installation position / method		Level adjustment	installation class
1	Flare stack	GL	direct hole (anchor flame)	straight liner	A
2	Indoor rotation device	GL	chemical anchor	straight liner	B
3	Structure, dust collector	GL	chemical anchor	Pad (non-shrink mortar) or straight liner	C
4	other GL installation	GL	hole in anchor	straight liner	D
5	Facilities needs accurate level ajustment like Lance elevator etc.	On the structure	Setting bolts	liner + shimm	E
6	Bolting fastening besides Item 5	"	Setting bolts	straight liner	F
7	Weld fastening facilities	"	Welding	-	G
8	Fireproof material lining facilities	-	-	-	H
9	Others	-	direct setting	-	I

(Note)
° The number of straight liner should be arranged minimum, tap welding should be done for slipping prevention.
° Refer to accompanying documents (2)-(4)

(a) Main facilities

No.	Machine Name	Q'ty (set)	Weight(ton) packed	Weight(ton) naked	Class	Welding	Painting	Note
1	Coal dryer	one	2.0	1.5	I	–	–	
2	Coal pulverizer	"	0.77	0.5	F	–	–	
3	Blow Tank	"	1.32	0.75	F	–	–	
4	Valve station & piping	"	1.78	1.17	F	o	o	For No.2 & 3
5	Transformer for Gasifier	"	1.42	1.12	C	–	–	
6	Pure water cooling unit	"	0.6	0.5	C	–	–	
7	Gasifier	"	3.36	3.05	E,H	–	–	
8	Melting furnace	"	2.0	1.5	F,H	–	–	
9	Oil unit	"	0.4	0.3	C	–	–	
10	Lining materials	"	2.0	1.8	–	–	–	For No.10 & 11
11	Accessaries	"	0.65	0.5	–	–	–	
12	Slag pot	"	3.2	1.38	–	–	–	set on No.13
13	Slag pot car	"		1.27	C,H	–	–	
14	Emergency pot	"	1.1	0.89	H,I	–	–	set on 1st floor
15	Runner for pig iron	"	0.8	0.65	H,I	–	–	" w/caster
16	Main lance	1	0.5	0.2	–	–	–	set on No.18
17	Sub-lance	1		0.02	–	–	–	set on No.19
18	Main lance elevator	"	2.4	1.9	E	–	–	
19	Sub-lance elevator	"	1.7	1.3	E	–	–	
20	Skirt hood	"	6.7	5.2	E,H	–	–	Oil unit included
21	Duct with water cooling jacket	"	3.5	2.7	F	o	o	
22	Dust chamber	2	0.15	0.11	I	–	–	
23	Dust collector & Cyclone	"	0.75	0.55	F	–	–	
24	Induced draft fan	"	0.6	0.46	B	–	–	
25	Flare stack	"	3.6	2.75	A	o	o	outdoor
26	Burner, Fan	"	0.39	0.3	B,G	o	o	
27	Hood & Duct	"	6.0	4.65	G	o	o	
	Total		47.69	37.02				

No.	Machine Name	Q'ty (set)	Weight(ton) packed	Weight(ton) naked	Class	Welding	Painting	Note
28	Dust collector & Fan	one	2.6	2.05	B,C	-	-	
29	Main lance deck	"	1.4	1.1	F	o	o	
30	Structure, Control room , etc.	"	40	35	C,G	o	o	
31	Cylinder collected equipment	"	1.3	1.0	D	-	-	Outdoor
32	Air conditioner & cooling tower	"	1.3	1.0	D	-	-	"
33	Castable refractories	"	2.1	1.9	-	-	-	For No.16, 17,18,19
34	Electrical & instrument items	"	12.3	11.05	-	-	-	
35	Engine pump & pipes	"	2	1.5	D,I	o	o	
	Total		63	54.6				
	Grand total		110.7	91.6				

(b) Spare parts, and others

No.	Facility Name	Q'ty (set)	Weight (ton) packed	Weight (ton) naked	Class	Welding	Painting	Note
1	Fork lift	one	7.2	7.2	I	-	-	no packing
2	Auxiliary (No.1)	"	2.1	1.6	I	-	-	lance, slag pot
3	" (No.2)	"	1.1	0.9	I	-	-	lance chip
4	Tools	"	1.3	1.0	I	-	-	
5	Fireproof materials for Gasifire (spare)	"	11	10	I	-	-	
6	Fireproof materials for M.F. (spare)	"	2.0	1.6	I			no opening
	Total		24.7	22.3				

C. Utility Work

Piping works for each facility (O_2, N_2, Compressed air line, cooling water, LPG)

a. Outline of all works

No.	Item	Q'ty (set)	Charge		Note
			Contractor	Indonesia	
1	Planning	one	o		
2	Opening, supplementation of acceptance	"	o		
3	Measuring of plant site	"	o		
4	Processing of pipes, finishing	"	o		Only dimension line adjustment
5	Welding of pipes	"	o		
6	Setting of piping support	"	o		
7	Repairing of pipes	"	o		
8	Flashing, Blowing	"	o		
9	Pickle, degrease	"	o		
10	Airtight test	"	o		
11	Ventilation, turning on fluid turning on electricity	"	o		
12	Setting of Valves	"	o		Oiling of cylinder valve's oiler included
13	Wiring & Installation of Electrical Equipments	"	o		
14	Cleaning	"	o		
15	Putting in order	"	o		
16	Miscellaneous works	"	o		
17	Painting	"	o		touch up & processing parts in site only
18	Remodeling of Flow detector	"	o		
19	Primary piping & Wiring work	"	o	o	Flow detector
20	Building of gas cylinders' house	"		o	Refer to 5. Out of scope
21	Piping around the engine pump	"	o		For emergency
22	Setting of N_2,O_2, LPG Cylinders	"		o	
23	Installation of Oil unit accumlator	"	o		
24	Oiling	"	o		supplied by Indonesia

(Note 1) Fluid name of pipes and flow signs for piping should be charge of Contractor.

b. Piping work specification for each fluid

No.	Fluid name	Pressure (MAX) kg/cm^2G	Bore (A) Max	Bore (A) Min	Materials	Connection in BL	Connection on BL	Blow	in*m
1	O_2	9.9	20	15	SUS304 TPS (sch40)	socket weld	flange	N_2 blow after cleaning with CCl_4	200
2	Pulverized coal + N_2	9.9	20	10	SUS304 TPS (sch80)	flange	flange	N_2	25
3	N_2	9.9	25	15	SGP	union	union	N_2	200
4	LPG	2.0	20	20	SGP	union	union	N_2	140
5	Air for combustion	600mmAq	80	32	SGP	welding	over 65A =flange under 50A =union	Air	180
6	Make up water for air conditioner	2.3	32	20	SGPW	union	union	water	100
7	Cooling water	10	100	15	SGP	welding	over 65A =flange under 50A =union	water	650
8	Compressed air	6	25	8	SGPW	union	union	air	200
9	Oil	70 80	20	10	STPG38 TPS &SUS304 (sch80)	socket weld	union	air	95

(Note) °Pipes inside of the structure area is only connection work in accordance with domestic prefabrication. Dimension adjustment parts and so forth should be worked in accordance with piping diagram which is supplied afterwards.
°Dimension adjustment parts & proceed parts in site are not painted yet, so contractor should painted there after piping work.
°Piping supports should be made in accordance with piping chart which is supplied afterwards.
°Refer to accompaing documents (5).
°Pipes outside of the structure area are handed as materials not processed.
°Flushing should be done for each pipe.

c. Valve list

(Except Instrument valve and fitting valve in devices)
Bore and numbers of valve may be slightly changed later.

Valve name	pressure (JIS)	Bore	Fluid name									
			O_2	*1	N_2	LPG	*2	*3	*4	*5	*6	oil
Safety valve	10K	20A	1	1								
		25A			1							
		8A								1		
		10A								2		
		15A			13	2			1	1	1	
		20A	1		11	7				2	8	
	10K	25A			3					4		
Globe valve		32A					2			4		
		40A							2	6		
		50A								2		
		100A								1		
	210K	15A										6
Ball valve	10K	10A		4								
		15A			3							
Needle valve	10K	20A			1	2						
		32A					2					
		40A			1			1				
		10A			4							
Check valve	10K	15K			2							
		20A			1							
		15A		2	2						2	
Valve drived by Aircylinder	10K	20A	1		1	1						
		40A			1							
		100A		1						4		
Direct drive solenoid valve	10K	15A			1							
		40A								2		
		50A								1		
Pressure reducing valve	10K	15A			1						1	
		20A			1	1						
		25A			1							
Grand total			3	8	48	14	4	4		30	12	6

*1 N_2 + Pulverized Coal
*2 Air for Combusion
*3 Make up water for Air conditioner
*4 Cooling water
*5 Compressed Air

D. Electrical and instrument work

a. Scope of work

All installation work for electrical and instrumentation equipment shown in the following table, lists and drawings shall be included in the scope of work.

No	Item	Q'ty (set)	Contractor's scope	Note
1	Erection of Electrical & Instrumentation equipment	one	o	Refer to the list of Electrical & Instrumentation equipment
2	Erection & wiring of Lighting, Receptacles and MCB boxes of welders for repair use.	"	o	
3	Erection of cable trays and racks	"	o	
4	Erection of conduit	"	o	
5	Piping	"	o	
6	Wiring	"	o	
7	Connection of cables and wires	"	o	
8	Grounding work including measurement of earth resistance	"	o	(Note 1)
9	Painting	"	o	
10	Measurement of insulation resistance	"	o	
11	Check of wire & cable connection	"	o	
12	No load test	"	o	
13	Sequence check	"	o	Attendance
14	Individual load test	"	o	"
15	Synthetic load test run	"	o	"

(Note 1) : The installation work for the independent earthing electrod for the following equipment shall be included in the scope of work.

(1) For electrical equipment --- Earthing Resistance less than 10 ohm
(2) For instrumentation--------- "
(3) For SCR Cubicle ---------- "
(4) For Slag Analyzer---------- "
(5) For Iron Analyzer---------- "

b. Battery limit of Electrical and instrument work

(a) Electric Power

The 380V 3 phase power is supplied from the power distributing panel PP-1B in the electric room at site. The Contractor shall include wiring work from the secondary terminals of MCB (630AF) in PP-1B to the test plant.

(b) Instrument Air

All wiring and all piping erection shall be included from outside of air compressor.
Air compressor will be installed by Indonesia counterpart.

c. Electrical equipment list (supplies)

No.	Symbol	Name	Q'ty	estimate weight(kg)	note
1	CP1-1	Control panel	1 (one) set	300	
2	" -2	"	"	200	
3	OP 1	Operating console	"	150	
4	" 2	Local operating panel of lance	"	50	
5	" 3	Mimic panel	"	70	
6	" 11	Local operating box for Crusher & S.C.	"	3	
7	" 12	Local operating box for Rotary feeder	"	3	
8	" 13	Local operating box for Coil cooling valve	"	3	
9	" 14	Local operating box for Induced draft fan	"	3	
10	" 16	Local operating box for air fan	"	2	
11	" 17	Local operating box for Dust collector	"	2	
12	" 18	Local operating box for Slag pot car	"	3	
13	DP 1	380V power distributing panel	"	120	
14	" 2	200V "	"	50	
15	" 3	100V "	"	50	
16	TR 1	Transformer 100kVA 3ϕ 380/210	"(pcs)	500	
17	" 2	" 10kVA 1ϕ 380/105	"	50	
18	ENG	Engine generator 18kVA 380V	"	850	
19		Control panel for Flare stuck	1(one)set	100	
20		Power trans cubicle(Gasifier)	"	2,000	
21		SCR converter (")	"	1,500	
22		Matching panel (")	"	1,000	
23		Control panel (")	"	200	
24		Control panel for Dust Collector	"	5	
25		" (Cyclone)	"	5	
26		Control Panel for coal dryer	"	10	
27		Interphone	1 complete set		
28		Lighting	"		
29		MCB boxes of welder for repair use	"		
30		Control Panel for engine pump	2 set	150	
31	OP-19	Local Operating Box for Gasifier Cooling Valve	1	3	
32		Control Panel for Cooling Tower	1	10	
33		MCB Box for Air Conditioner	1	3	

total (1) abt 7,500kg

d. Instrument list (supplies) -1

No	Symbol	Name	Q'ty	estimate weight(kg)	Note
1		Instrument Panel	one	900	
2		Gascromatgraph analyzer	"	120	
3		Standard gas bombe	three(pc)	63kg/pcs	+ 40[1]
4		Gas Analyzer ($O_2/H_2/CO_2/CO$)	one	600	
5		Air Dryer	one	500	constructed in plant site
6		Water heater for Gascromatograph	one	140	
		total(2)		2,449kg	

d. Instrument list (supplies)-2

No.	symbol	Name	Q'ty (pcs)	estimate weight (kg)	Note
7		Field Transmitter			
		Pressure transmitter	6		
		Differential-pressure transmitter	6		
		Orifice plates	2		
		Vortex Flowmeter	4		
		Thermocouples	7		
		Resistance Thermometer	6		
		Load Cell	3		
		Local type pressure meter	6		
		" " temperature meter	3		
		Local type flow meter	7		
8		Control valve	3		
9		Personal computer	1 (set)		PC-9801 with Floppy desk and printer
10		Gas detector	6		Indicator: Instrument Panel included
11		Slag Analyzer JSX-60PX Shaking mill Water circulation pump			Step down Tr (with constructor)
12		Iron Analyzer EMIA-220 Compressor	1 (set)		Step down Tr (with constructor)
13		Attachment of off-line analyzer, Jaw crusher Mill, Automatic Mortar, shiver, oven	1 (set)		Details are refered to chart
		Total		abt 1,200kg	
		Grand total		abt 11,050kg	

e. Electric wiring material list

NO	DESCRIPTION	MATERIAL	SIZE	RATING	QUANT	SUPPLER	REMARKS
-	CABLE	600V CV	2sq x 3C		500 M		
-	"	"	3.5sq x 3C		200 M		
-	"	"	5.5sq x 3C		35 M		
-	"	"	8sq x 3C		170 M		
-	"	"	50sq x 3C		50 M		
-	"	"	60sq x 3C		15 M		
-	"	"	100sq x 3C		65 M		
-	"	"	200sq x 3C		40 M		
-	"	"	3.5sq x 2C		140 M		
-	"	"	5.5sq x 2C		155 M		
-	"	"	14sq x 2C		60 M		
-	"	"	38sq x 2C		10 M		
-	"	600V CVV	2sq x 2C		500 M		
-	"	"	2sq x 3C		90 M		
-	"	"	2sq x 4C		300 M		
-	"	"	2sq x 6C		300 M		
-	"	"	2sq x 7C		80 M		
-	"	"	2sq x 10C		500 M		
-	"	"	2sq x 15C		50 M		
-	"	"	2sq x 20C		120 M		
-	"	"	2sq x 30C		400 M		
-	"	600V CVV-S	2sq x 3C		80 M		
-	"	"	2sq x 4C		50 M		
-	"	"	2sq x 5C		100 M		
-	"	"	2sq x 6C		60 M		

NO	DESCRIPTION	MATERIAL	SIZE	RATING QUANT	SUPPLER	REMARKS
-	"	600V CVV-S	2sq x 10C		20 M	
-	"	"	2sq x 20C		50 M	
-	"	600V CV	100sq x 1C		170 M	
-	"	2PNCT	2sq x 3C		10 M	
-	"	LKGB	2sq x 2C		165 M	
-	"	VCTF	0.75sq x 2C		70 M	
-	WIRE	IV(G)	100sq		300 M	E1 x 2 E3 x 1
-	"	"	38sq		100 M	
-	"	"	14sq		100 M	
-	"	"	8sq		100 M	
-	"	"	5.5sq		300 M	
-	"	"	1.25sq		300 M	
-	"	IV(RED)	2sq		300 M	
-	"	IV(WHITE)	2sq		300 M	
-	CABLE	LKGB	3.5sq x 2C		100 M	
-	CABLE TERMINALS				1 Complete set	
-	CABLE TERMINAL INSULATION TREATING MATERIAL				1 Complete set	
-	CONDUIT		C19		75 PCS	
-	"		C25		100 "	
-	"		C31		80 "	
-	"		C39		30 "	
-	"		C51		10 "	
-	"		C63		10 "	
-	"		C75		10 "	

NO	DESCRIPTION	MATERIAL	SIZE	RATING	QUANT	SUPPLER	REMARKS
-	ACCESSORIES FOR CONDUIT				1 Complete set		
	CONDUIT SUPPORT MATERIAL				1 Complete set		
-	COPPER SHEET (for Grounding)		900sq x 1.5t		4 set		
-	PIPE STANTION	S.S.	1500		9 PCS		
-	STEEL ANGLE	"	L6x50x50		25 "		L= 5.5 M/PC
-	STEEL SHEET FOR LEVEL ADJUST	"			1 Complete set		
-	MCB BOX				1 "		
-	CABLE RACK	S.S.	SR-60		18 PCS		Straight shape
-	"	"	SR-40		10 "		"
-	"	"	SRLA-60		2 "		L shape
-	"	"	SRLA-40		2 "		"
-	"	"	SRT-60		3 "		T shape
-	"	"	SRI-60		2 "		"
-	ACCESSORIES FOR CABLE RACK				1 Complete set		
-	CABLE RACK SUPPORT MATERIAL				1 Complete set		
-	STEEL SHEET FOR CABLE PROTECTION				1 Complete set		
-	ASBESTO SHEET (for Cable Protection)				1 Complete set		

NO	DESCRIPTION	MATERIAL	SIZE	RATING	QUANT	SUPPLER	REMARKS
-	RECEPTACLES		WN318		10 "		
-	"		WN3710		10 "		
-	PLUG		WF7002		10 "		
-	INTERPHONE		VK-413A		1 SET		
-	" HAND SET		VK-508C		4 "		
-	LIGHTING FACILITY	S.S.	FA42275K		16 SET		40WX2 AC100V
-	LAMP		40W		32 PCS		40W AC100V
-	INSULATING TAPE				1 Complete set		
-	BOLT, NUT				1 "		
-	CABLE	600V MLFC	150sq x 1C		30 M	(AJAX)	
-	"	1500V	150sq x 1C	4M x 4	16 M	(AJAX)	
-	"	"	2sq x 1C	4M x 2	8 M	(AJAX)	
-	"	600V CVV	2sq x 2C		50 M	(AJAX)	
-	"	"	2sq x 6C		10 M	(AJAX)	
-	"	600V IV	8sq x 1C		20 M	(AJAX)	
-	WATER COOLED CABLE	1500V	52o	6.2M x 2	12.4M	(AJAX)	
-	"		52o	14.5Mx2	29 M	AJAX(for Gasifier)	
-							
-	CABLE TERMINALS				1 SET	AJAX	

f. Instrument material list

NO	DESCRIPTION	MATERIAL	SIZE	RATING	QUANT	SUPPLER	REMARKS
-	CABLE	600V CVV-S	2sq x 2C		960 M		
-	"	"	2sq x 3C		275 M		
-	"	"	2sq x 6C		60 M		
-	"	"	2sq x 8C		65 M		
-	"	"	2sq x 10C		20 M		
-	"	"	2sq x 30C		50 M		
-							
-	CABLE	600V CVV	2sq x 2C		320 M		
-	"	"	2sq x 4C		240 M		
-	"	"	2sq x 8C		65 M		
-							
-	COMPENSATED WIRE	RX-H	2sq x 1P		95 M		
-	"	"	2sq x 2P		45 M		
	"	VX-G	2sq x 5P		55 M		
-	WIRE	IV(G)	1.25sq		300 M		
-	"	"	5.5sq		300 M		
-	"	"	14sq		100 M		
-							
-	CONDUIT		C19		60 PCS		
-	"		C25		35 "		
-	"		C31		20 "		
-	ACCESSORIES FOR CONDUIT				1 SET		
-	PIPING SUPPORT				1 "		

NO	DESCRIPTION	MATERIAL	SIZE	RATING	QUANT	SUPPLER	REMARKS
-	COPPER SHEET FOR GRANDING		900sq x 1.5t		2 PCS		
-	ACCESSORIES FOR GRANDING				1 SET		
-	PIPE STANTION		L=1500		12 PCS		
-	STEEL ANGLE	S.S.	6tx50x50 L=5500		25 "		
-	STEEL SHEET FOR LEVEL ADJUST	"			1 SET		
-	TERMINAL BOX				3 PCS		
-	CABLE TERMINALS				1 SET		
-	BOLT, NUT	S.S.			1 SET		
-	PIPE	SGP(W)	15A L=5500		10 SETS		
-	"	STPT(Sch40)	15A		2 "		
-	"	SGP(B)	25A		2 "		
-	TUBE	SUS304	8/6 L=4000		2 "		
-	"	"	10/8o		2 "		
-	COPPER TUBE	Cut(PVC)	6/4o		10 "		
-	"	"	8/6o		10 "		
-	ACCESSORIES FOR PIPING				1 SET		
-	UNISARM (Pipe with heater)	Cu	8/6o		10 M		2200-41M10
-	"	SUS316	10/8o		10 M		2201-40M41

(2) Temporary work and others

No.	Item	Q'ty (set)	charge		Note
			Contractor	Indonesia	
1	All materials for temporary work	one	o		Scaffolding etc.
2	Office	"	o		
3	Lavatory	"		o	
4	Accomodation for workers	"	o		
5	Materials yard	"		o	
6	Meals for workers	"	o		
7	Telephone	"	o		
8	Facsimile	"	o		
9	Lighting apparatus	"	o		
10	Work of 7),8),9)	"	o		
11	Security of office	"	o		
12	Electric source	"		o	
13	Industrial Water	"		o	
14	Beverages	"		o	
15	Compressed air for work	"		o	Cap. 5t
16	Overhead crane	"		o	
17	Lighting equipments in the building				

(Note) ° Fork lift (Cap., 5 tons) besides above-mentioned is lended free.
But fuel is contractor's scope.

° Items 2),7),8),9),10) is happened to lended from Indonesia, but it should be estimated on this condition that these items should be distinguished from other ones.

(3) Materials for erection work

No	Item	Q'ty (set)	charge		content (*1)	Note
			Contractor	Indonesia		
1	O_2 for construction	one	o			
2	Acetylene "	"	o			
3	Welding rod	"	o			
4	Fuel for machinery	"		o		engine pump
5	Oil "	"		o		Hydraulically-operated oil, grease
6	Flushing Oil	"	o			
7	Oil cleaning	"	o			
8	Non-shrink mortar	"	o			
9	Cement	"	o			
10	Sand	"	o			
11	Gravels	"	o			
12	Base plate	"			o	w/flare stack anchor flame
13	Liner for installation	"	o			
14	Foundation B.N.	"	o			chemical anchor
15	Structure B.N.	"	o			
16	Support for pipes	"	o			
17	U bolts, bands	"	o			
18	B.N. without item, No. 14,15,17	"			o	
19	Gasket for flange	"			o	
20	Seal tape for pipes	"	o			
21	Gland packing	"			o	
22	Seats against rain	"	o			
23	Pipes	"			o	w/Valve, joints
24	Wires	"			o	
25	Bench mark	"	o			
26	Weskit	"	o			
27	Joints processed in site	"	o			
28	Miscellaneous materials not mentioned	"	o			
29	Materials of remodeling of flow detector	"	o			
30	Step down Tr.	"	o			for off-line analyzer

(*1) Included in transported machineries

(4) Machines and tools for erection works

Contractor should prepare all machines and tools for installation of this Gasification Test Facilities.

Still more, as regards installation it is desirable that contractor can prepare

A. Turning roller for welding 2 sets

B. Wrecking car 1 set (Cap. 10 ton) x 3 days
Wrecking car with gondola 1 set x 1 day

(5) Transportation

No.	Item		Maker	JICA	Contractor	BPPT
1	Transportaion in Japan	Maker → Yokohama	o			
2	Loading	Yokohama port		o		
3	Marine transportation	Yokohama → Jakarta		o		
4	Cutwater	Jakarta		o		
5	Land transportation	Jakarta → plant site				o
6	Unloading	Plant site				o
7	Opening				o	

All tools and machines (as to No.1-7) arranged by the contractor lies on the contractor's charges.

(6) Construction Insurance

No.	Kind of Insurance	Q'ty (set)	JICA	Contractor
1	Marine Cargo Insurance	one	o	
2	Construction Insurance	"		o
3	Workmen's Compensation Insurance	"		o
4	Employers' Liability Insurance	"		o
5	Overseas Travel Accident Insurance	"		o
6	Automobile Insurance	"		o
7	Tax	"	o	
8	Other Insurance which contractor needs	"		o

(7) Test run

No.	Item	Q'ty (set)	IEE	Contractor	Note
1	No-load test run	one		o	
2	Individual load test	"	o (operate)	o (attend)	
3	Synthetic load test run	"	"	"	Period of 2 months
4	Repairing	"		o	
5	Gathering data of test run	"		o	

(Note) As reagards details of test run, see " 9. Outline of test works."

(8) Document presentation

A. Document presentation at the estimation

Time limit S61 / /

No.	Item	Number of Issues	
		Japanese	English
1	Estimation sheet		
2	Estimation specification sheet		
3	Time schedule sheet for erection work		
4	Organization chart of erection work		
5	Planning of utilities's consumption		
6	Man-hour chart		
7	List of machine & material prepared by the contractor		
8	Personal history of person in charge		

B. Document presentation during work

No.	Item	Number of Issues	
		Japanese	English
1	Minutes		
2	Daily report		
3	Inspection work report		

C. Document presentation after completion

No.	Item	Number of Issues	
		Japanese	English
1	Construction record		
2	Test run report		
3			

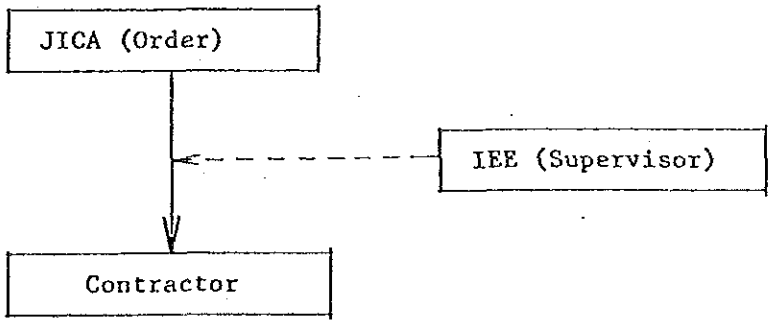
(Note) Contents of construction record should include
A. Minutes during construction
B. Inspection record, Test run record
C. Actual time schedule & man-hour chart
D. Daily report etc.

5. Out of scope

No.	Item	Q'ty (set)	Note
1	Outdoor foundation work	one	Refer to 4.(1)A
2	Construction of utilities cylinders' house	"	
3	Indoor wiring pit work	"	
4	Indoor lighting work	"	Lighting around facilities within scope of estimate
5	Primary utilities' work	"	(*1)
6	Sanitary plumbing	"	
7	Land transportation of installation facilities	"	
8	Power distribution facilities	"	
9	Heat insulation work	"	

(*1) Engine pump work for emergency and cable building work upto power distributing panel (AC 380V, 3ϕ) should be included.

6. System of work responsibility



7. Responsibility, Guarantee

No.	Situation	Contractor's	
		Scope	Out of scope
1	Damage of facilities at the opening	o	
2	Rust of facilities at the opening		o
3	Robbery of facilities during work	o	
4	Damage of facilities caused by miswork	o	
5	Lack of materials " "	o	
6	Function error " "	o	
7	Accidents of workers	o	
8	Delay of working term	o	

Contractor should pay compensation regarding the contractor's responsibility above mentioned.
Also, contractor should pay all cost if reconstruction work on item No. 4, 6 occurs.

8. Technical regulations

(1) Order of installation
This should be based on 12. accompaning documents (12), but changes are accepted according to the proceeding of construction work with agreement of supervisor or manager.

(2) Outline of welding

A. Outline of welding

Kind of welding	Outline of welding
Fillet welding	Depth of weld should be over 70% & under 100% of thinner base metal's thickness.
Butt-welding	Beveling type should be 60°V type or 50°V type.

B. Recommendation of welding rod

Welding materials	Welding rod in use
SS, SGP	Sumitomo welding rod 01A, 200, 300
STPG	" " 03A
SUS304	" " 308

C. Note

a. Temper color caused by welding of SUS304 should be removed by the sandpaper, etc.
b. Outline of each welding should be followed by the drawings.

(3) Outline of painting

A. Necessary place of painting
   a. weld fitting parts of pipes & processing ones in site
   b. connecting parts of structure
   c. setting bolts, head of anchor bolts
   d. weld fitting part
   e. touch up painting parts
   f. fluid name of pipes, flow sign

B. Unnecessary place of painting
   a. place painted in Japan
   b. SUS pipes
   c. cast metals such as slag pot
   d. standard device of maker (valve, oil cylinder, etc.)

C. Outline of painting and coloring

Outline of painting is refered to 12. accompanying document (13).
Coloring should be matched surrounding.

(4) Inspection and passing standard

A. Assignment of work

Item	Contractor	Supervisor
Inspection enforcement	o	
Reports preparation	o	
Judgement of passing		o

B. Item of inspection

No	Item	contents	Passing standard	Note
1	Structure	each floor level	± 3mm	
2	Main & Sub-lance elevator	position of installtion hight of installation horizontal, vertical	± 2mm 0.1mm/m	
3	Rotaring facilities pump blower,etc.	centering of shaft	under 0.05mm in face and circle	measured by dial gauge, space gauge
4	Piping, sleeve flange weld	color check	normal	depth of weld, Out of bead
5	Weld except item 4.	outlook	normal	
6	Painting	coloring and spots	judged by attendance	
7	Pipes airtight test	shown in following page		

Outline of pipes airtight test
These should be done before the pipe painting work.

No.	Piping line	kg/cm^2G test pressure	contents of inspection	passing standard
1	O_2	(N_2) 10	Soap test	No bubbling
2	Pulverized coal + N_2	(N_2) 10	"	"
3	N_2	(N_2) 10	"	"
4	LPG	(N_2) 2	"	"
5	Air for combusion	(air) blower pressure	"	"
6	Make up water for air conditioner	(water) pump pressure	Check of leak by watching	No leak
7	Cooling water(go) (device is not included)	(water) pump pressure	"	"
8	Cooling water (return)	(water) 2	"	"
9	Compressed air	(air) 6	Soap test	No bubbling
10	Oil pressure each using pressure	(hydraulically-operated oil)	Check of leak by watching	No leak

9. Outline of test works

(1) Outline

Each item of this outline shall be used for estimation of man power for organization of
accident prevention and checking points in test run period.
Contents in detail and passing standard is checked by supervisor according to data prepared by each maker.
And,for reference,independent equipments like motor,fan, pump, dryer, and so forth have been tested in Japan and their inspection sheets & reports of test run are packed with each equipment.

(2) Organization of test run

A. No-load test run

	Contractor (Mechanical, Electrical instrumentation)
Conductor	o
Assistant of conductor	o
Operator	o
Check, record	o

B. Individual load test, Synthetic load test run

	Operation manager (IEE)	Operator (IEE)	Supervisor of installation work (IEE)
Conductor	o		
Assistant of conductor			o
Operator		o	
Check, record		o	

(Note) Contractor should attend this period.

(3) Preparation for test run (checking items in following table)

	Checking items
Electricity	(1) Measurement of earth resistance (circuit, equipment) (2) Sequence check (3) Idling test (conductor, solenoid volve, LS) (4) Direction of motor's revolution (5) Alarm, indication
Oil pressure	(1) Quantity of oil in the oil unit (MF, Hood) (2) Oil temp. (3) Pressure (4) Reduction of air
Utility	(1) Pressure (2) Flow rate (3) Operating of dryer for instrument
Instrumentation	(1) Range adjustment of equipments (2) 0 point ajustment (3) Sequence check (4) Confirmation of indicator & controller by transmitter's signal
Others	(1) Flashing of pipes

(4) No-load test run

No.	Name	Objective device	Checking items
1	Electrical rotar	Coal pulverizer Screw feeder Rotary feeder I.D.F. Dust collecting fan Burner fan	Abnormal sound Abnormal vibration Mortar amp. Bearing temp.
2	Electrical reciprocator	Incling machine of Gasifier Main lance elevator Sub-lance elevator Slag pot car	Time required & limit switch adjustment Motor amp. Abnormal sound Abnormal vibration
3	Hydraulic reciprocator	Incling machine of M.F. Hood for gasifier	Stroke, time required pressure, Abnormal sound Indication of gauge
4	equipments drived by air cylinder	Valves drived by air cylinder Instrument control valve	Speed controller adjustment L.S. adjustment Indication of gauge Operating confirmation from controller
5	Blow tank's loadcell for P.C. injection	Loadcell	Adjustment Accuracy confirmation by weighing test
6	Overall	M.F. Runner for pig iron Gasifier Hood for gasifier Lance & Sub-lance elevator Others	Relative location Intervention Inter-rock test Sequence idling test

(5) Individual load tests

No.	test item	Contents	Checking items
1	Utilities	(1)Passing cooling water (2)Ajustment of O_2,N_2,LPG Reducing valves, etc. (3)Meter constant adjustment of controller	°Flow rate °Pressure
2	Emergency test	(1)Power failure (2)Suspension of water supply (3)Compressed air failure (4)Engine pump operation	°"open"&"close" of valves (cylinder valve, solenoid valve) °Counter weight of lance&sub-lance °Automatic operating of engine generator
3	Burner, Combustion test	(1)Burner's ignition for furnace (2)Burner's ignition for runner	°Rising temp. of furnace
4	Flare stack, Ignition test	Flare stack's ignition & accidental fire test	Inspection of accidental fire (thermo-couple)
5	Melting test	Feed the pig iron in gasifier after scrap melting	°Rising temp. of cooling water °Melting time °Temp. of pig iron °Locus of discharging pig iron °Electricity, Voltage, Amp.
6	Gasifier keeping test	Discharge the pig iron from gasifier after keeping in it for certain time	°Rising temp. of cooling water °Measurement by sub-lance °Locus of discharging pig iron °Amp., Electricity

No.	Item	Contents	Checking items
7	Coal drying test	Banko coal (120kg) drying in coal dryer	°Moisture measurement of coal before and after drying °Check of Amp.& smoke °Required time
8	Coal pulverizing	Pulverizing the dried coal & storing into blow tank	°Required time for pulvering °Grain size of pulverized coal °Amp. of motor
9	P.C.injection test	Giving pressure to blow tank and inject the P.C. and gather it by dummy bug filter	°Pressure of blow tank °Flow rate of N_2 °RPM of rotary feeder °Volume of P.C. recovered °Amp. of rotary feeder °Comparison of caluculated volume of PC with recoved volume of it

(6) Synthetic load test run

Items of (5) Individual load tests are done in accordance with actual operation system.
Operation plans are prepared by the operation manager of IEE.

10. General matters

(1) When extension of construction work out of contractor's scope occurs, another agreement should be done.
(2) The period of guarantee is one year from the day of completion of construction (after load tests of each facility).
(3) Overhead crane lended free from Indonesia and fork lift transportated may be possible to use. But their operation should be done by contractor.
(4) Necessary drawings for installation in site should be supplied afterwards. But adjustment in site should be treated in site condition, if necessary.
(5) Fitting and installation should be done by drawings and each specification. Order of construction and construction schedule should be determined with supervisor.
(6) Assembling of disintegrated facilities for the purpose of convenience in transportating should be done according to the marking which had been assembled in Japan or assembly drawings. And at this time,accracy of assembling should be keeped. (Fragile facilities are not apt to assemble.)
This item should be in the scope of contractor.
(7) Plant enforcement should be done by the lisenced welder.
(8) Plant installation site should be cleaned and put in order every day.
(9) Additional materials & man-hour by the modification for constructive convenience should not be regarded as the additional construction work.
Also,necessary incidental works judged by common sence which are not listed on specification and drawings should not be regarded as the additional ones.

11. Construction acceptance

Construction acceptance is done by inspection of supervisor or operation manager after the completion of the construction and synthetic load test run. This should be regarded as JICA's passing and construction acceptance.

12. Accompaning documents

(1) Location of construction site, PUSPIPTEK

(2) Whole plan

(3) Front view, side view

(4) Grand floor layout, First floor layout
2nd, 3rd floor layout

(5) Piping diagram (1/2)
" " (2/2)

(6) Electrical drawings
A. External shape of control panel, operating panel, etc.
B. Developing connection diagram
C. Wiring work drawings
(distribution diagram, mutual connection diagram, etc.)

(7) Instrument drawings
A. External shape of indication panel, gascro anlyzer
B. Hook up chart
C. Wiring work drawings
D. Pipe work drawings

(8) Cable tray arrangement drawing

(9) Lighting, Receptables, welder for repair

(10) Anchor plan

(11) Utilities match point

(12) Procedure of installation

(13) Specification of painting

(14) Work schedule (for reference)

ATTACHMENT 8-2

1. Test Conditions

2. Test Results

1. Test Conditions

RUN	Coal gasification - 1	RUN No.	CG001

DATE	1987.08.19. (Wed.)

1. PURPOSE of RUN
   1) Coal gasification for BUIA1 & BUIIA1 coal
   2)
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE – A

Sample number	BUIA1, BUIIA1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	22.21 %	C	75.1 %	SiO2	%
Ash	5.21 %	H	5.6 %	Al2O3	%
V.M.	35.03 %	N	1.1 %	CaO	%
F.C.	36.17 %	O	17.7 %	K2O	%
T.S.	0.31 %			Na2O	%

OPERATION CONDITION – A

Weight of molten iron	300	Kg
Flow rate of Oxygen	16.0	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	30.0	Kg/hr
Position of main-lance over bath surface	200, 150	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	≅ 1350	℃
Basicity of slag	1.5	
Weight of coal	≅ 50	wet Kg
Weight of burnt lime	2+2	Kg

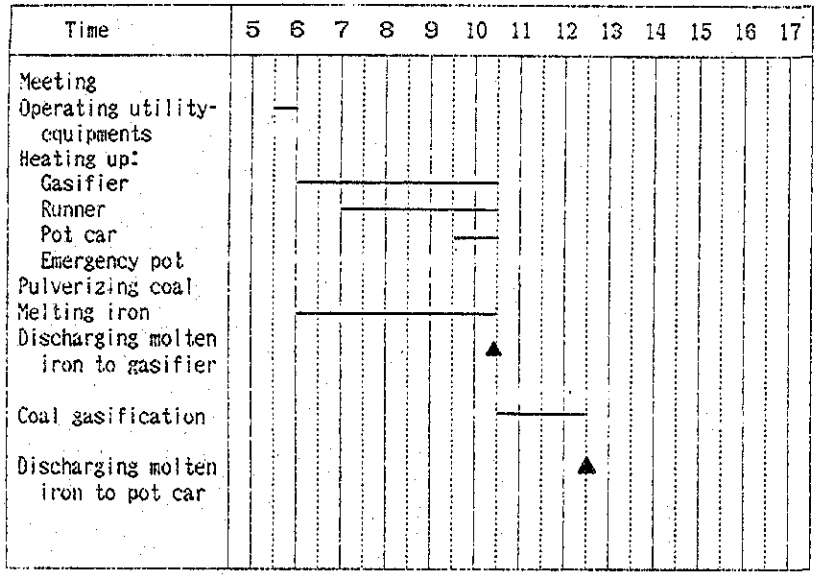
COAL SAMPLE – B

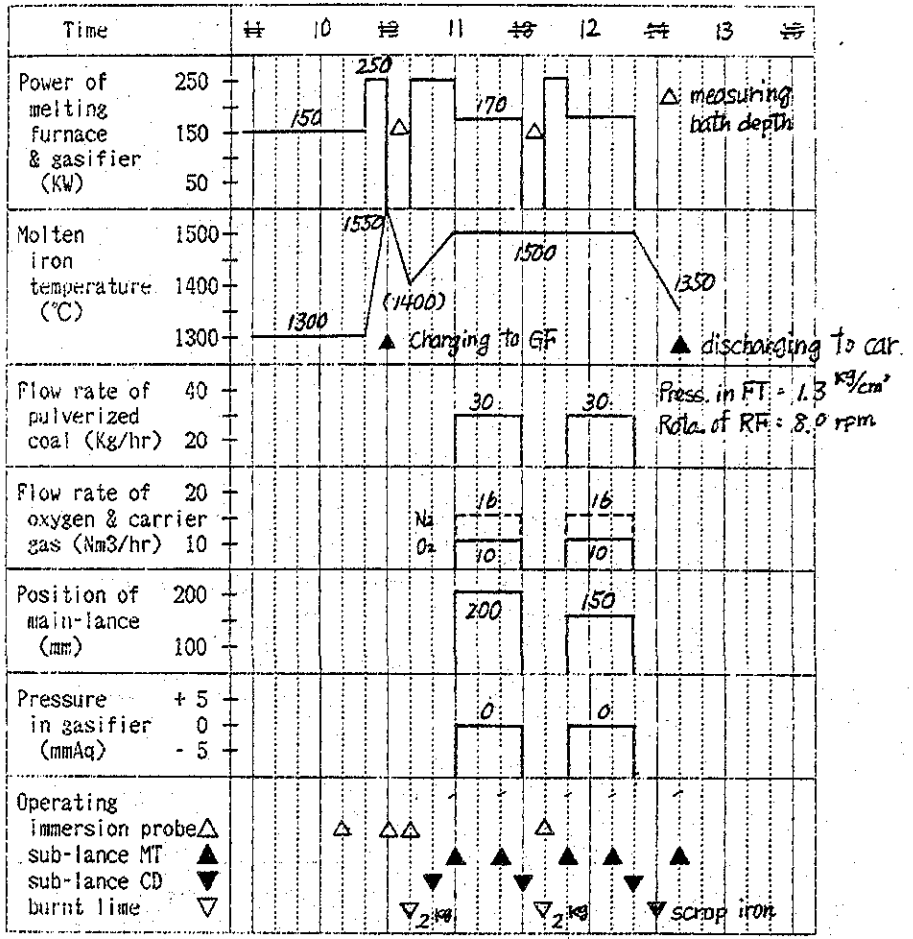
Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

OPERATION CONDITION – B

Weight of molten iron	300	Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag	1.5	
Weight of coal		wet Kg
Weight of burnt lime		Kg

4.SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car


Time
10 11 12 13
Power of melting furnace & gasifier (KW)
250
150
50
150
250
170
△ measuring bath depth
Molten iron temperature (°C)
1500
1400
1300
1300
1550
(1400)
1500
1350
▲ Charging to GF
▲ discharging to car
Flow rate of pulverized coal (Kg/hr)
40
20
30
30
Press. in FT = 1.3 kg/cm²
Rota. of RF = 8.0 rpm
Flow rate of oxygen & carrier gas (Nm3/hr)
20
10
N₂
O₂
16
10
16
10
Position of main-lance (mm)
200
100
200
150
Pressure in gasifier (mmAq)
+ 5
0
- 5
0
0
Operating
Immersion probe △
sub-lance MT ▲
sub-lance CD ▼
burnt lime ▽
▽2kg
▽2kg
▼ scrap iron

TEST000-1

DATA	1987.08.~~10~~.27. (Thu.)

RUN	2nd Coal Gasification Test Run	RUN No.	CG002

1. PURPOSE of RUN
   1) Coal Gasification Test for BSIA2 & BSIIA2 Coal.
   2)
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE – A

Sample number	BSIA2 & BSIIA2				
Proximate analysis dry base		Ultimate analysis		Ash components	
Moisture	4.00 %	C	75.73 %	SiO2	%
Ash	4.32 %	H	5.87 %	Al2O3	%
V.M.	43.80 %	N	1.16 %	CaO	%
F.C.	47.88 %	O	17.03 %	K2O	%
~~T.S.~~	%	S	0.21	Na2O	%

COAL SAMPLE – B

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

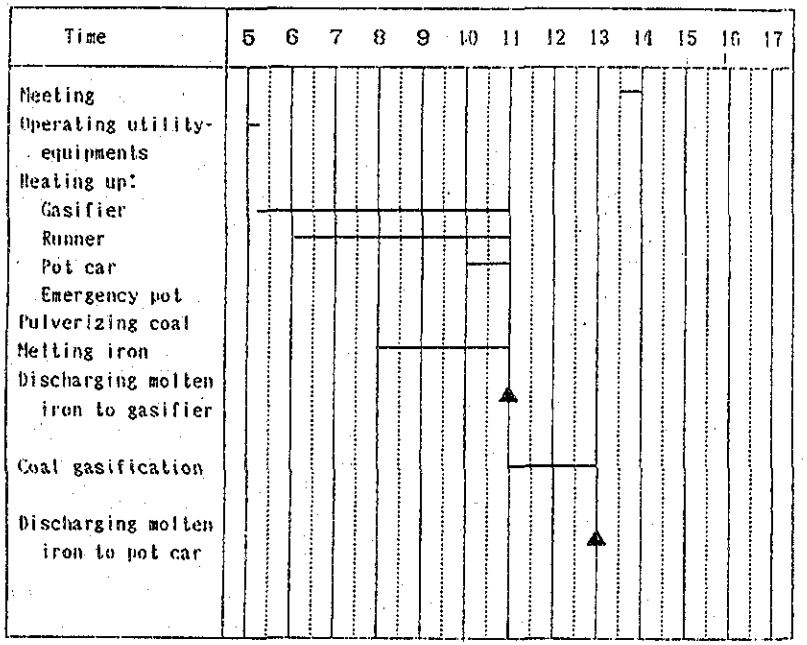
OPERATION CONDITION – A

Weight of molten iron	300	Kg
Flow rate of Oxygen	12, 15	Nm3/hr
Flow rate of carrier gas	10	Nm3/hr
Flow rate of pulverized coal	20, 25	Kg/hr
Position of main-lance over bath surface	200, 170	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	≒1350	℃
Basicity of slag	1.5	
Weight of coal	30	wet Kg
Weight of burnt lime	(1)	Kg

OPERATION CONDITION – B

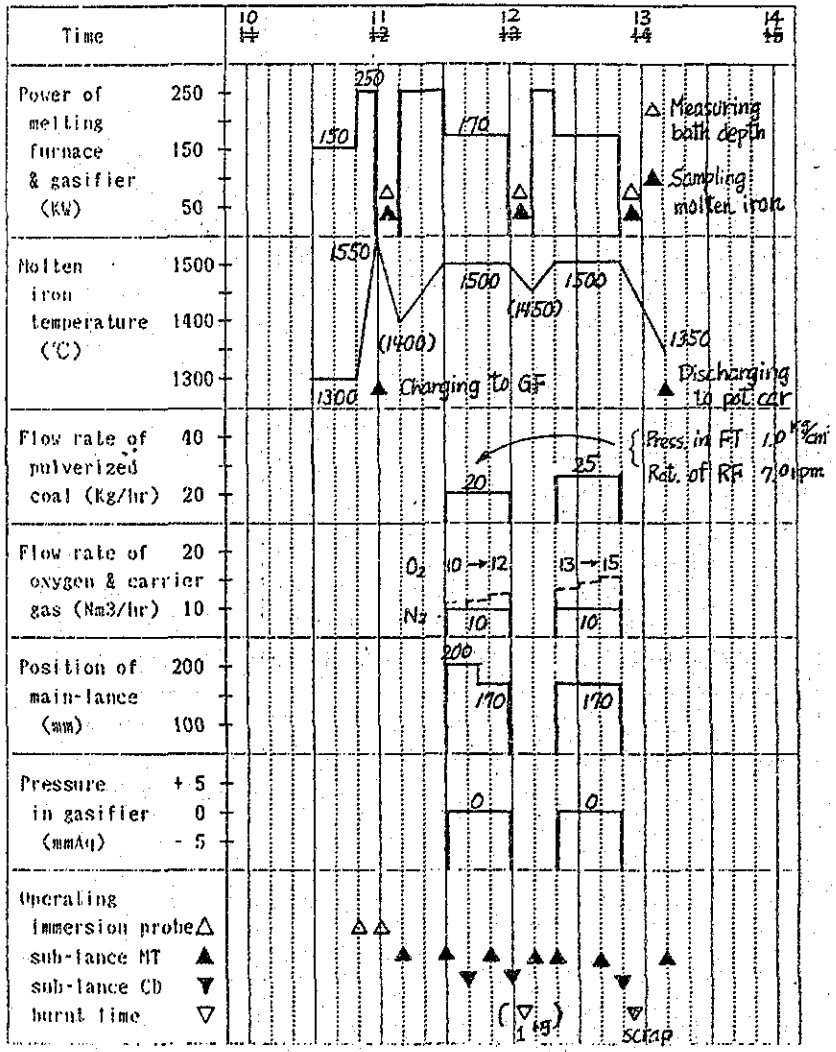
Weight of molten iron	300	Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag	1.5	
Weight of coal		wet Kg
Weight of burnt lime		Kg

4.SCHEDULE



After measuring bath depth

1) Raising bath temperature
2) Injecting Oxygen
3) Checking burning
4) Injecting PC



TEST000-1

DATA	1987. ~~08.10.~~ 9. 3.

RUN	Coal Gasification Test	RUN No.	CG003

1. PURPOSE of RUN

1) Coal Gasification Test for BUⅢB2

2)

3)

4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number		BUⅢB2			
Proximate analysis (dry base)		Ultimate analysis (d.a.f.)		Ash components	
Moisture	%	C	73.10 %	SiO2	%
Ash	2.29 %	H	5.80 %	Al2O3	%
V.M.	47.58 %	N	1.25 %	CaO	%
F.C.	48.02 %	O	18.51 %	K2O	%
~~T.S.~~	%	S		Na2O	%

COAL SAMPLE－B

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

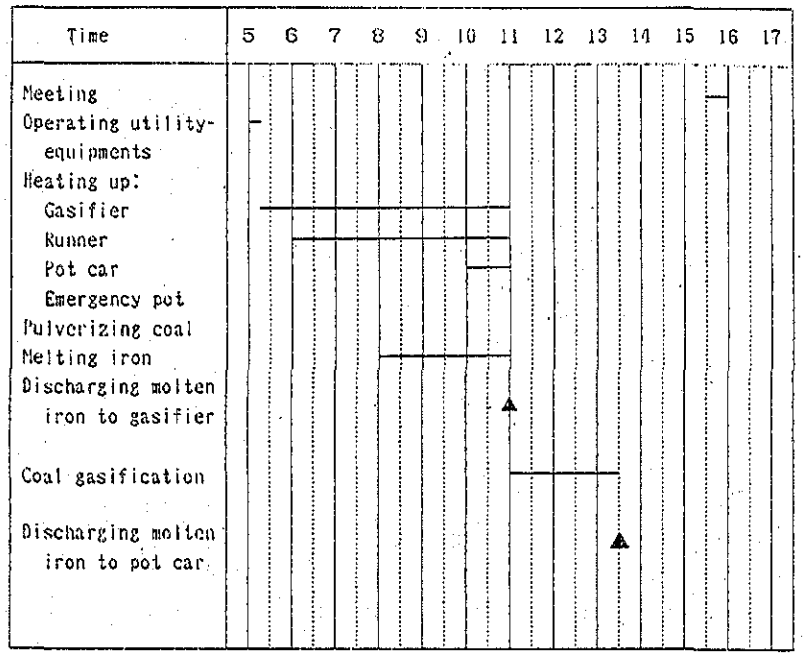
OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.7	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	≃ 1350	℃
Basicity of slag	1.5	
Weight of coal	30.	wet Kg
Weight of burnt lime	(1)	Kg

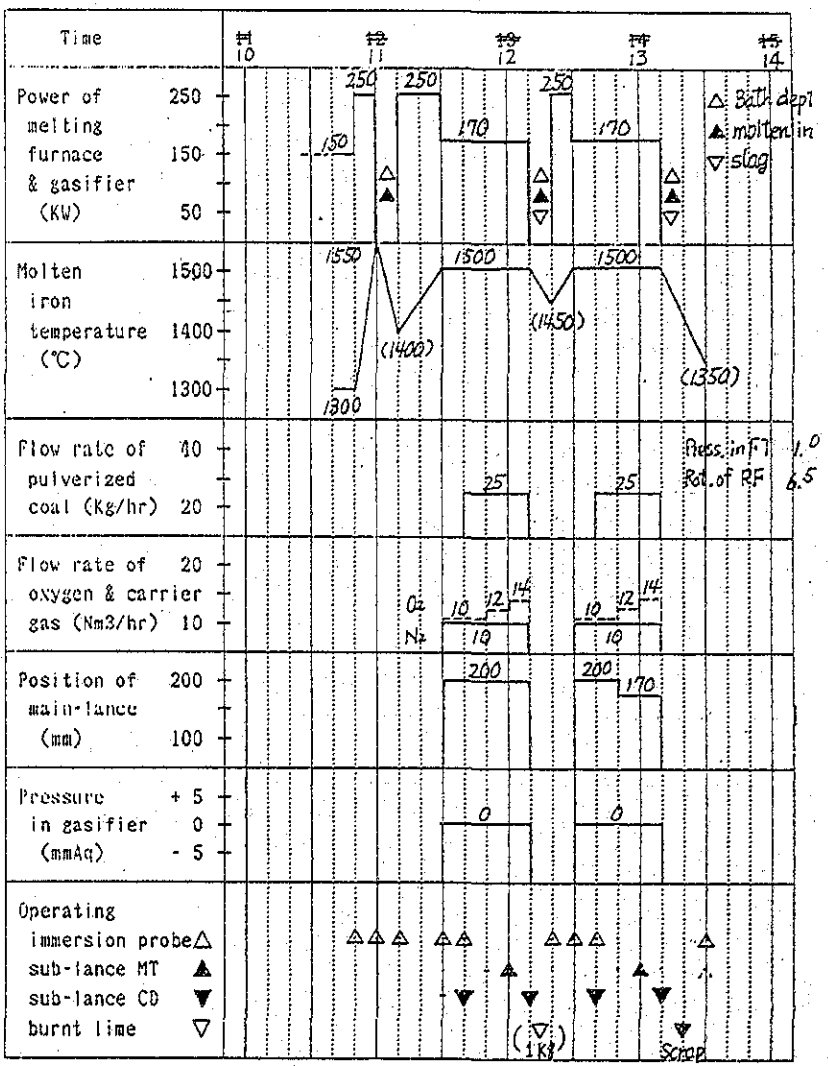
OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag	1.5	
Weight of coal		wet Kg
Weight of burnt lime		Kg

4.SCHEDULE



After measuring bath depth
1) Raising bath temperature
2) Injecting Oxygen
3) Tilting gasifier
4) Checking burnin
5) Injecting PC



RUN	4th Coal Gasification Test Run	RUN No.	CG004

DATE	1987.09.08 . (Tu)

1. PURPOSE of RUN
   1) Coal gasification test run for BSTVB coal.
   2)
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	BSTVB				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	73.69 %	SiO2	%
Ash	%	H	5.86 %	Al2O3	%
V.M.	%	N	1.13 %	CaO	%
F.C.	%	O	19.07 %	K2O	%
T.S.	%	T.S.	0.26	Na2O	%

COAL SAMPLE－B

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

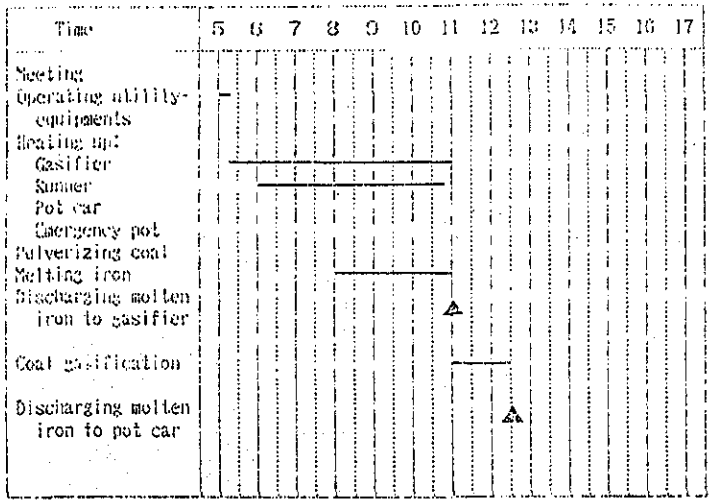
OPERATION CONDITION－A

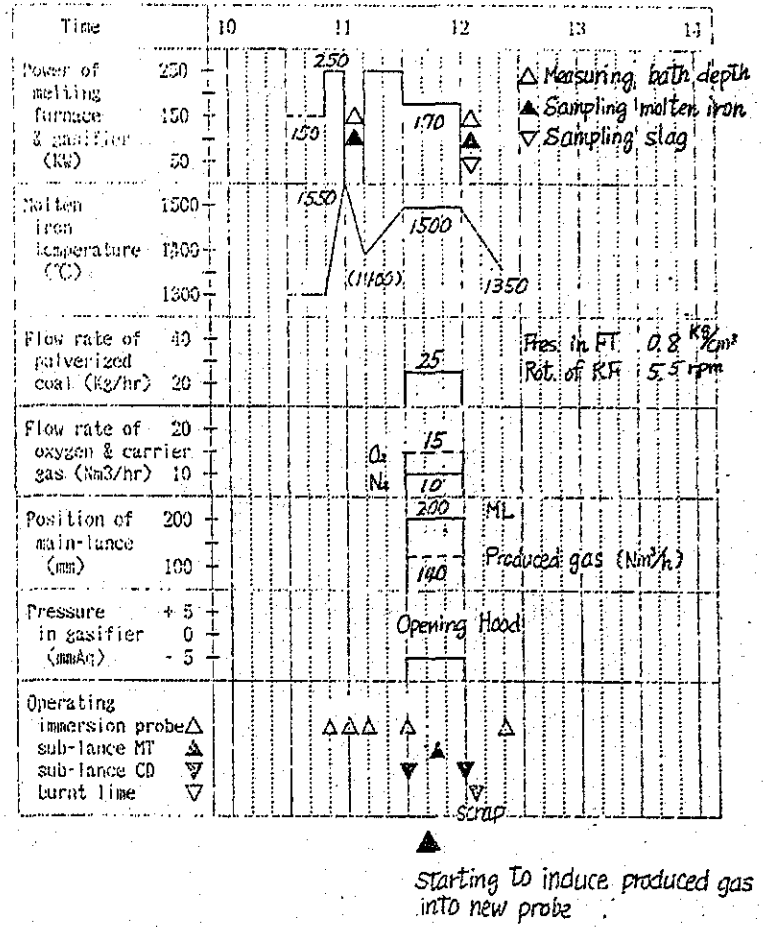
Weight of molten iron	300	Kg
Flow rate of Oxygen	7.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	15.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	0	Kg

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag	1.5	
Weight of coal		wet Kg
Weight of burnt lime		Kg

4. SCHEDULE





1) Measuring bath depth.
2) Heating up bath temperature.
3) Confirming bath temperature about 1500°C
4) Setting new probe for produced gas
5) Purging N_2 in new probe
6) Injecting O_2
7) Comfirming burning
8) Injecting PC.
↓ after 10 min.
9) Inducing produced gas into new probe.

RUN	5th Coal Gasification Test Run	RUN No.	CG005

DATE	1987.09.11 . (Fr)

1. PURPOSE of RUN
   1) Coal gasification test run for BSIC1 coal.
   2)
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	BSIC1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	76.4 %	SiO2	%
Ash	2.65 %	H	5.83 %	Al2O3	%
V.M.	46.95 %	N	1.40 %	CaO	%
F.C.	50.40 %	O	15.76 %	K2O	%
T.S.	0.58 %	T.S.	0.60	Na2O	%

COAL SAMPLE－B

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

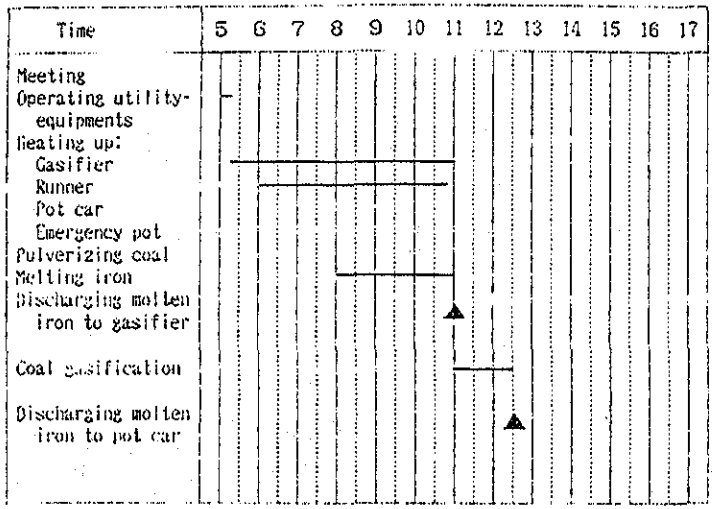
OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	0	Kg

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on discharge to pot car		℃
Basicity of slag	1.5	
Weight of coal		wet Kg
Weight of burnt lime		Kg

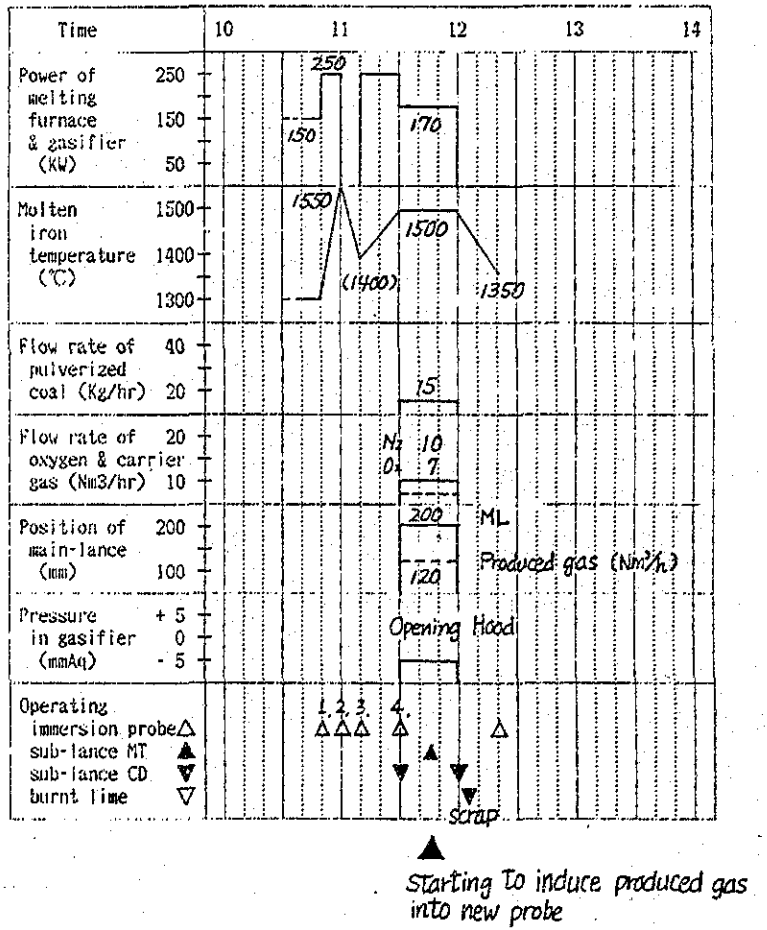
4.SCHEDULE



1) Measuring bath depth.
2) Heating up bath temperature.
3) Confirming bath temperature about 1500°C
4) Setting new probe for produced gas
5) Purging N_2 in new probe
6) Injecting O_2
7) Confirming burning
8) Injecting PC.

↓ after 15 min.

9) Inducing produced gas into new probe.



▲ Starting to induce produced gas into new probe

RUN	6th Coal Gasification Test Run	RUN No.	CG006

DATE	1987.09.16 . (Wed)

1. PURPOSE of RUN
   1) Coal gasification test run for BUIA2 & BUIIA2 coal
   2) Coal gasification test run for BUIIC1
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	BUIA2 & BUIIA2				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	— %	C	75.91 %	SiO2	%
Ash	3.29 %	H	6.03 %	Al2O3	%
V.M.	46.08 %	N	1.08 %	CaO	%
F.C.	50.63 %	O	16.73 %	K2O	%
T.S.	0.24 %	S	0.25	Na2O	%

OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.4	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE－B

Sample number	BUIIC1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	74.50 %	SiO2	%
Ash	1.90 %	H	5.43 %	Al2O3	%
V.M.	46.04 %	N	1.36 %	CaO	%
F.C.	52.06 %	O	18.26 %	K2O	%
T.S.	0.44 %	S	0.45	Na2O	%

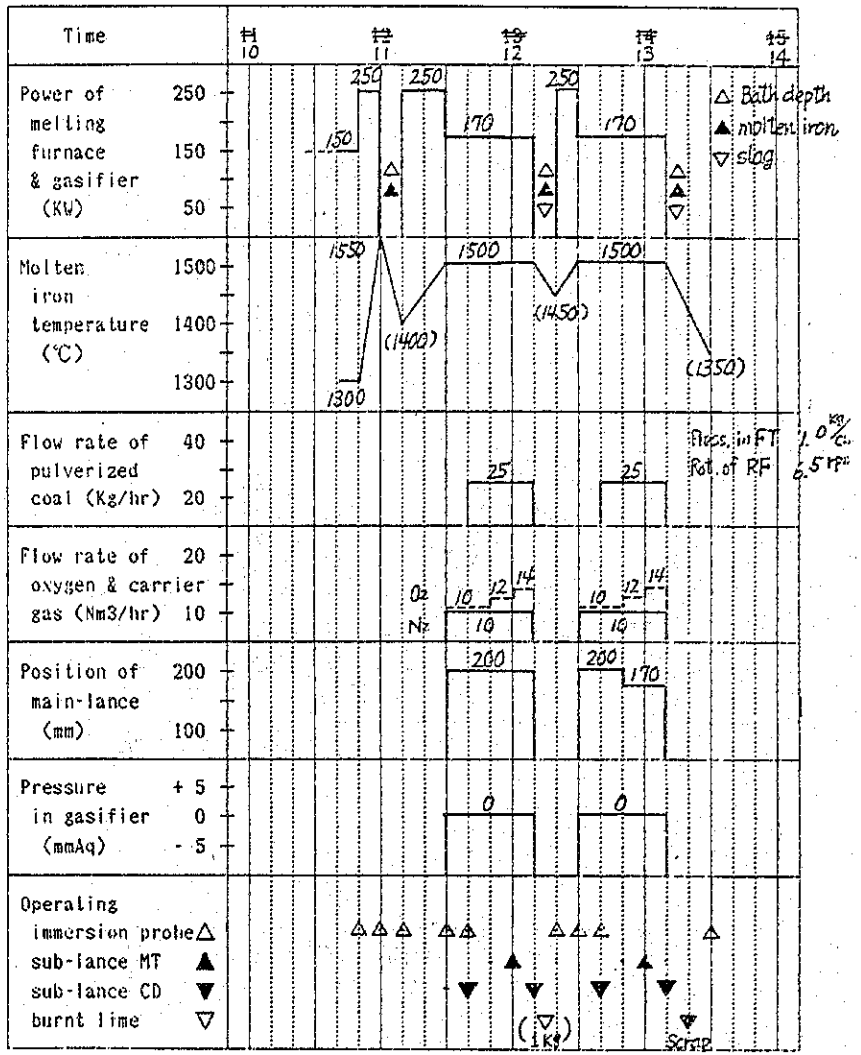
OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.9	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	—	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

4. SCHEDULE

Time	5	6	7	8	9	10	11	12	13	14	15	16	17
Meeting	–												
Operating utility-equipments													
Heating up:													
Gasifier		―	―	―	―	―	―						
Runner			―	―	―	―	―						
Pot car						―	―						
Emergency pot													
Pulverizing coal													
Melting iron				―	―	―	―						
Discharging molten iron to gasifier							▲						
Coal gasification							―	―	―	―			
Discharging molten iron to pot car										▲			

After measuring bath depth
1) Raising bath temperature
2) Injecting Oxygen
3) Tilting gasifier
4) Checking burnin
5) Injecting PC



RUN.	7th Coal Gasification Test Run	RUN No.	CG007

DATE	1987.09.22 . (Tu)

1. PURPOSE of RUN
   1) Coal gasification test run for CBB1
   2) Coal gasification test run for CBB2
   3) Coal gasification test run for AR
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	CBB1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	71.82 %	SiO2	%
Ash	5.79 %	H	5.83 %	Al2O3	%
V.M.	47.12 %	N	1.27 %	CaO	%
F.C.	47.09 %	O	20.73 %	K2O	%
T.S.	0.33 %	S	0.35 %	Na2O	%

COAL SAMPLE－B

Sample number	CBB2				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	73.08 %	SiO2	%
Ash	5.96 %	H	5.73 %	Al2O3	%
V.M.	46.15 %	N	1.24 %	CaO	%
F.C.	47.89 %	O	19.59 %	K2O	%
T.S.	0.34 %	S	0.36 %	Na2O	%

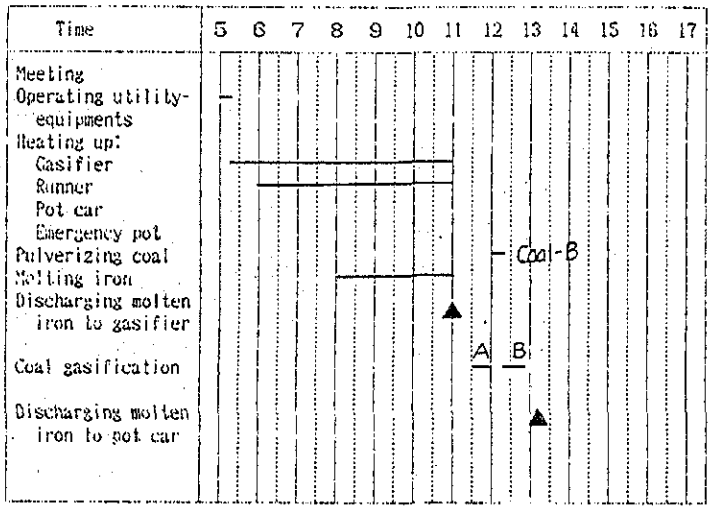
OPERATION CONDITION－A

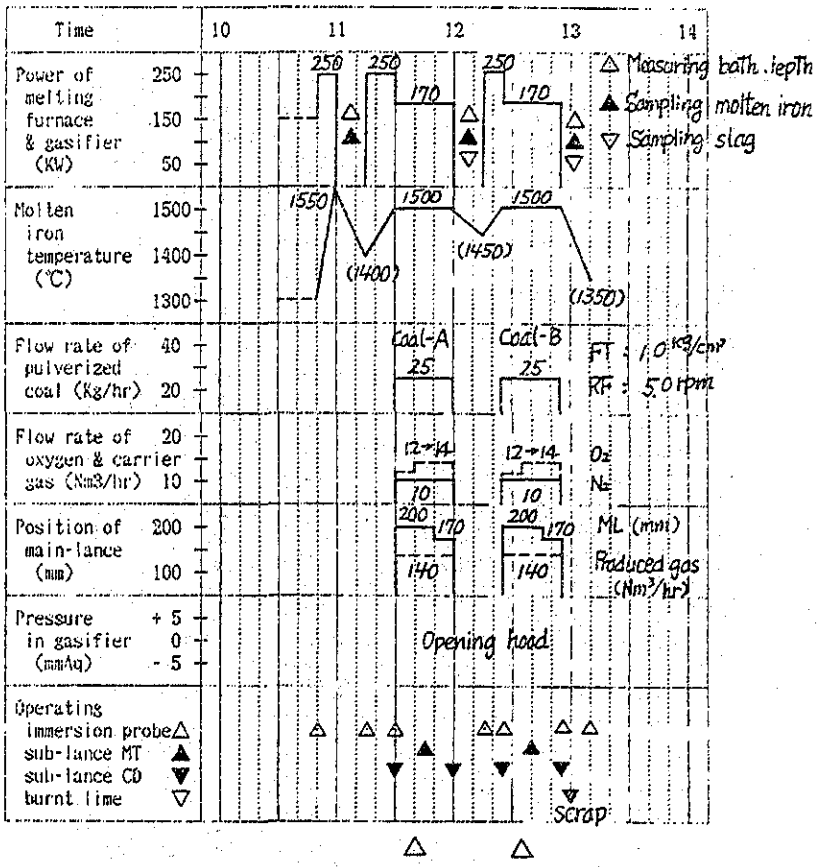
Weight of molten iron	300	Kg
Flow rate of Oxygen	12.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	13	wet Kg
Weight of burnt lime	－	Kg

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	12.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	－	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	13	wet Kg
Weight of burnt lime	－	Kg

4. SCHEDULE





After coal gasification test run for coal-A

1) Operating sublance-CD
2) Sampling slag
3) Removing slag
4) Sampling molten iron
5) Turning of GF at 250 KW
6) Confirming bath temperature at 1500°C
7) Setting new probe for produced gas

1) Releasing feedtank pressure.
2) Pulverizing coal-B
3) Closing pressure-releasing valve for feed tank

4) Pressurizing in feed tank

8) Injecting O_2

RUN	8th coal gasification test run	RUN No.	CG008

DATE	1987.09.25 . (Fri)

1. PURPOSE of RUN
   1) Coal gasification test run for BUIIB1, BUIVB1 & BUVB1 coal
   2) Coal gasification test run for BSIA2 & BSIIA2 coal
   3) Coal gasification test run for AL coal
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE – A

Sample number	BUIIB1, BUIVB1, BUVB1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	– %	C	73.19 %	SiO2	%
Ash	4.08 %	H	5.69 %	Al2O3	%
V.M.	45.92 %	N	1.20 %	CaO	%
F.C.	50.00 %	O	18.97 %	K2O	%
T.S.	0.91 %	S	0.95	Na2O	%

OPERATION CONDITION – A

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.2	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car		℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE – B

Sample number	BSIA2, BSIIA2				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	– %	C	75.73 %	SiO2	%
Ash	4.50 %	H	5.87 %	Al2O3	%
V.M.	45.62 %	N	1.16 %	CaO	%
F.C.	49.88 %	O	17.03 %	K2O	%
T.S.	0.20 %	S	0.21	Na2O	%

OPERATION CONDITION – B

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on dischare to pot car	--	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG008

DATE	1987.09. 25 . (FH)

1. PURPOSE of RUN

1)

2)

3)

4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE - C

Sample number	AL				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	— %	C	73.16 %	SiO2	%
Ash	15.12 %	H	6.11 %	Al2O3	%
V.M.	41.91 %	N	1.21 %	CaO	%
F.C.	42.97 %	O	17.25 %	K2O	%
T.S.	1.93 %			Na2O	%

OPERATION CONDITION — C

Weight of molten iron	300	Kg
Flow rate of Oxygen	11.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

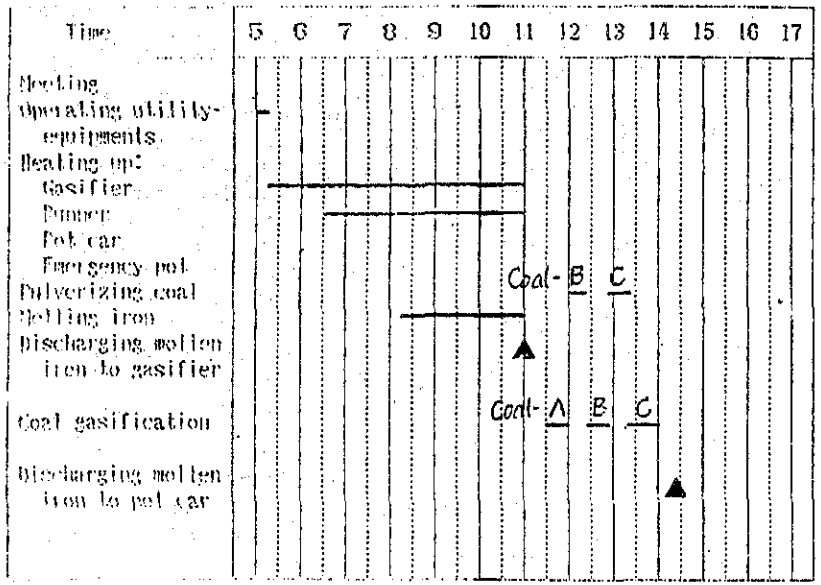
COAL SAMPLE — D

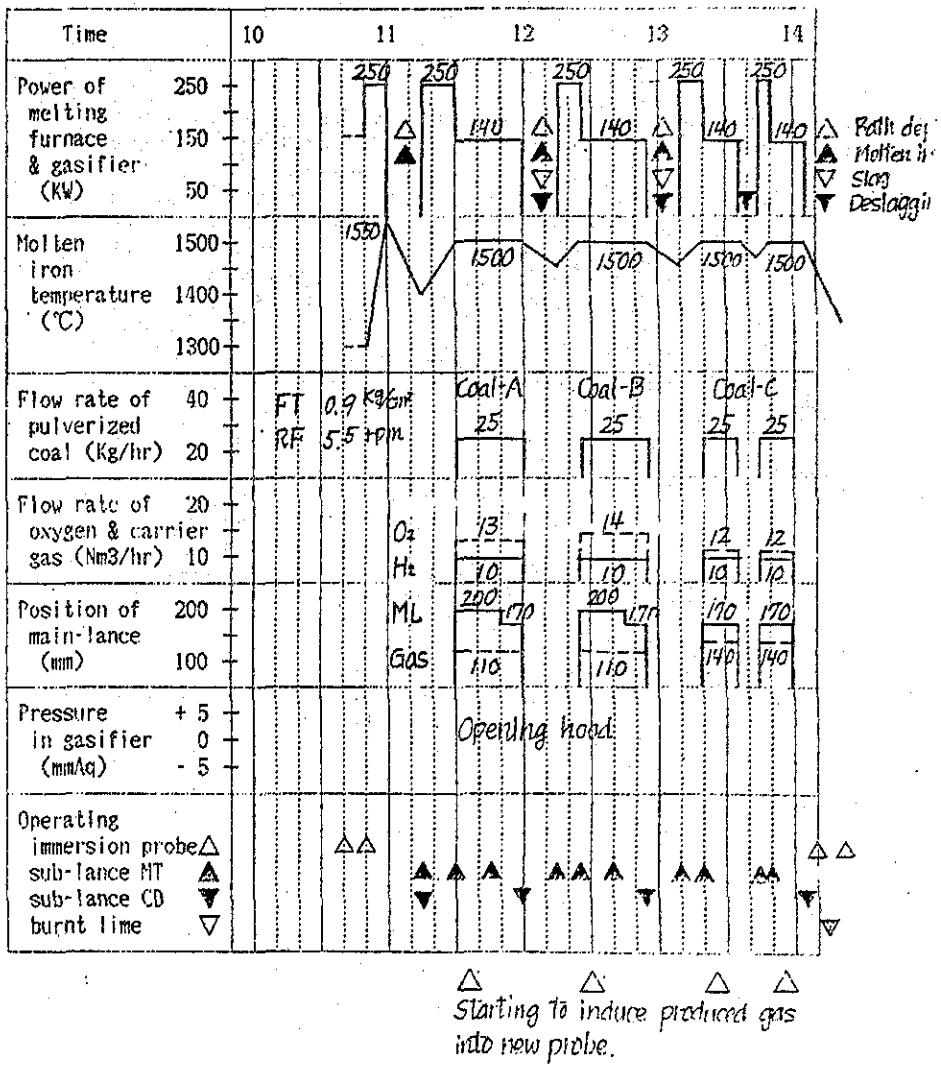
Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

OPERATION CONDITION — D

Weight of molten iron		Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag		
Weight of coal		wet Kg
Weight of burnt lime		Kg

4.SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up: Gasifier
Burner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal-A B C
Coal-A B C


Time
10 11 12 13 14
Power of melting furnace & gasifier (KW) 250 150 50
250 140
Molten iron temperature (°C) 1500 1400 1300
1500
Flow rate of pulverized coal (Kg/hr) 40 20
FT 0.9 Kg/cm²
RF 5.5 rpm
Coal-A 25
Coal-B 25
Coal-C 25 25
Flow rate of oxygen & carrier gas (Nm3/hr) 20 10
O₂ 13 14 12 12
H₂ 10 10 10 10
Position of main-lance (mm) 200 100
ML 200 170
Gas 110 140
Pressure in gasifier (mmAq) + 5 0 - 5
Opening hood
Operating immersion probe
sub-lance MT
sub-lance CD
burnt lime
Starting to induce produced gas into new probe.

RUN	9th coal gasification test run	RUN No.	CG009

DATE	1987.09.30 . (Wed.)

1. PURPOSE of RUN
   1) Investigation of gasification-characteristic
   2) for SJE1, SJE2 and BJS coal.
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	SJE2				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	70.41 %	SiO2	%
Ash	2.68 %	H	5.48 %	Al2O3	%
V.M.	50.15 %	N	1.10 %	CaO	%
F.C.	47.17 %	O	22.84 %	K2O	%
T.S.	－ %	S	0.17	Na2O	%

OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	12.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	16	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE－B

Sample number	BJS				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	68.52 %	SiO2	%
Ash	4.24 %	H	5.68 %	Al2O3	%
V.M.	49.97 %	N	1.15 %	CaO	%
F.C.	45.79 %	O	24.13 %	K2O	%
T.S.	－ %	S	0.52	Na2O	%

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	11.3	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on dischare to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	17	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG009

DATE	1987.09.30 . (Wed.)

1.PURPOSE of RUN
1)
2)
3)
4)

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－C

Sample number	SJE1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	70.32 %	SiO2	%
Ash	7.49 %	H	5.90 %	Al2O3	%
V.M.	57.00 %	N	1.03 %	CaO	%
F.C.	41.51 %	O	22.51 %	K2O	%
T.S.	－ %			Na2O	%

COAL SAMPLE－D

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

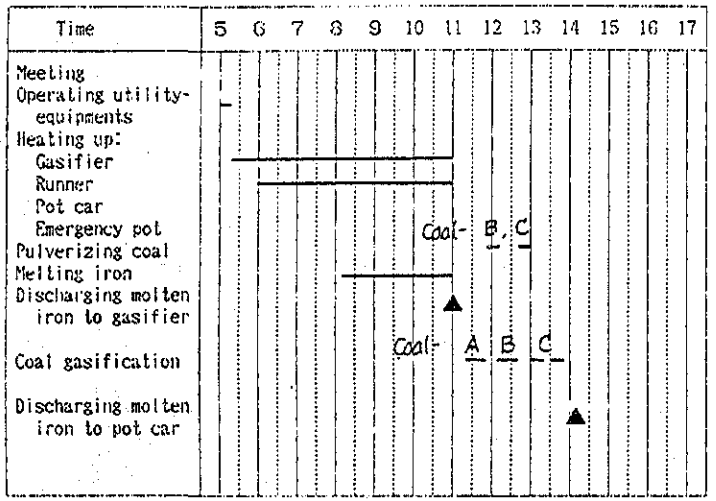
OPERATION CONDITION－A

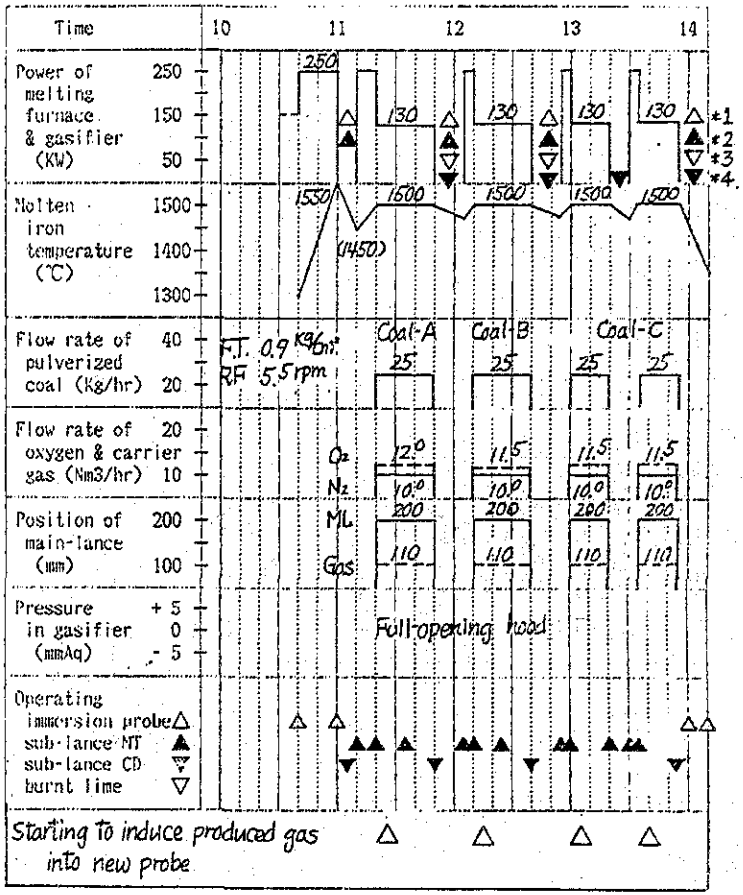
Weight of molten iron	300	Kg
Flow rate of Oxygen	11.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	－	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

OPERATION CONDITION－B

Weight of molten iron		Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag		
Weight of coal		wet Kg
Weight of burnt lime	0	Kg

4. SCHEDULE





*1 △ Measuring bath depth
*2 ▲ Sampling molten iron
*3 ▼ Sampling slag
*4 ▽ Deslagging

RUN	10th coal gasification test run	RUN No.	CG010

DATE	1987.10.6 . (Tu)

1. PURPOSE of RUN
   1) Investigation of gasification-characteristic
   2) for CBC, CBA1 and CBA2 coal
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	CBC				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	72.22 %	SiO2	%
Ash	6.15 %	H	5.88 %	Al2O3	%
V.M.	47.08 %	N	1.48 %	CaO	%
F.C.	46.77 %	O	20.05 %	K2O	%
T.S.	－ %	S	0.37	Na2O	%

COAL SAMPLE－B

Sample number	CBA2				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	71.56 %	SiO2	%
Ash	10.94 %	H	5.73 %	Al2O3	%
V.M.	45.01 %	N	1.16 %	CaO	%
F.C.	44.05 %	O	21.20 %	K2O	%
T.S.	－ %	S	0.35	Na2O	%

OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	12.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	16	wet Kg
Weight of burnt lime	－	Kg

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	11.5	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	－	℃
on coal gasification	1500	℃
on dischare to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	－	Kg

RUN		RUN No.	CG010

DATE	1987.09. . ( )

1. PURPOSE of RUN
   1)
   2)
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－C

Sample number	CBA1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	69.60 %	SiO2	%
Ash	17.03 %	H	5.76 %	Al2O3	%
V.M.	42.73 %	N	1.12 %	CaO	%
F.C.	40.24 %	O	21.81 %	K2O	%
T.S.	－ %	S	1.71	Na2O	%

OPERATION CONDITION－C

Weight of molten iron	300	Kg
Flow rate of Oxygen	10.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	－	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	0	Kg

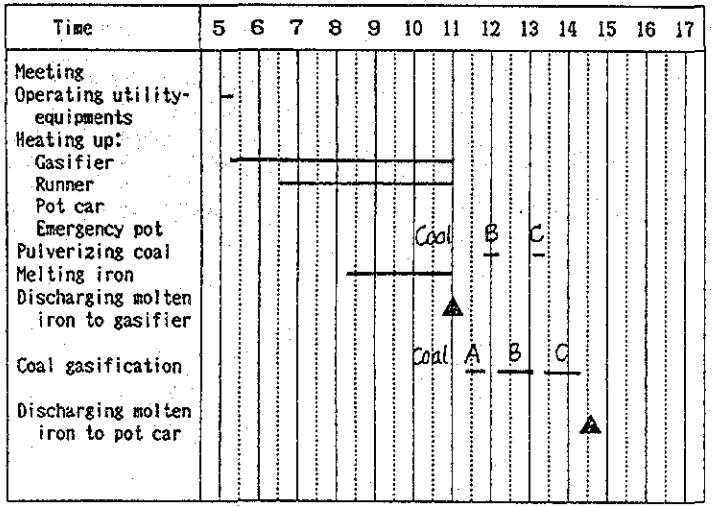
COAL SAMPLE－D

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

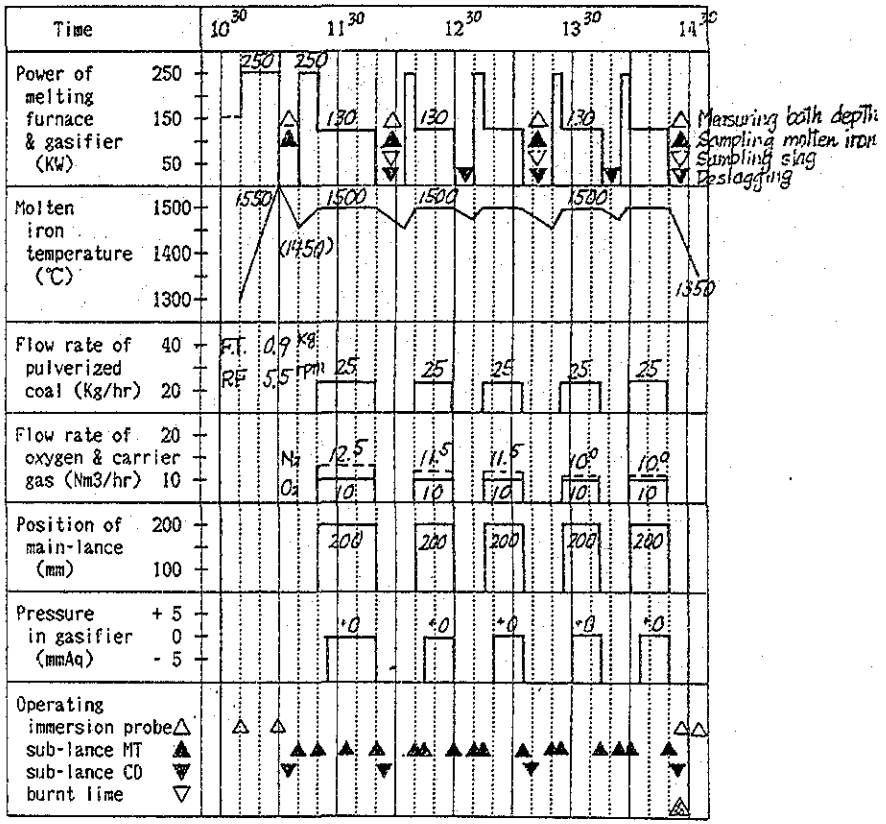
OPERATION CONDITION－D

Weight of molten iron		Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag		
Weight of coal		wet Kg
Weight of burnt lime		Kg

4.SCHEDULE



TEST000-2



RUN	11Th coal gasification test run	RUN No.	CG011

DATE	1987.10.09 . (Fri)

1. PURPOSE of RUN
   1) Investigation of gasification-characteristics
   ~~2)~~ for BSIVA1, BUIA1 and SJJ coal
   3)
   4)

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE—A

Sample	BSIA1 & BSIIA1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	— %	C	73.13 %	SiO2	%
Ash	4.29 %	H	5.72 %	Al2O3	%
V.M.	46.63 %	N	1.14 %	CaO	%
F.C.	49.08 %	O	19.30 %	K2O	%
T.S.	— %	S	0.71	Na2O	%

OPERATION CONDITION—A

Weight of molten iron	300	Kg
Flow rate of Oxygen	15.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on dischare to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE—B

Sample number	BUIVA1				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	— %	C	76.73 %	SiO2	%
Ash	7.06 %	H	5.97 %	Al2O3	%
V.M.	44.92 %	N	1.28 %	CaO	%
F.C.	48.02 %	O	15.43 %	K2O	%
T.S.	— %			Na2O	%

OPERATION CONDITION—B

Weight of molten iron	300	Kg
Flow rate of Oxygen	16.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on dischare to pot car	--	℃
Basicity of slag	1.5	
Weight of coal	15	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG011

DATE	1987.10.09 . (Fri)

1.PURPOSE of RUN

1)

2)

3)

4)

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－C

Sample number	SJJ				
Proximate analysis		Ultimate analysis		Ash components	
Moisture	－ %	C	67.83 %	SiO2	%
Ash	11.95 %	H	5.67 %	Al2O3	%
V.M.	47.28 %	N	1.06 %	CaO	%
F.C.	40.77 %	O	25.18 %	K2O	%
T.S.	－ %	S	0.26	Na2O	%

COAL SAMPLE－D

Sample number					
Proximate analysis		Ultimate analysis		Ash components	
Moisture	%	C	%	SiO2	%
Ash	%	H	%	Al2O3	%
V.M.	%	N	%	CaO	%
F.C.	%	O	%	K2O	%
T.S.	%			Na2O	%

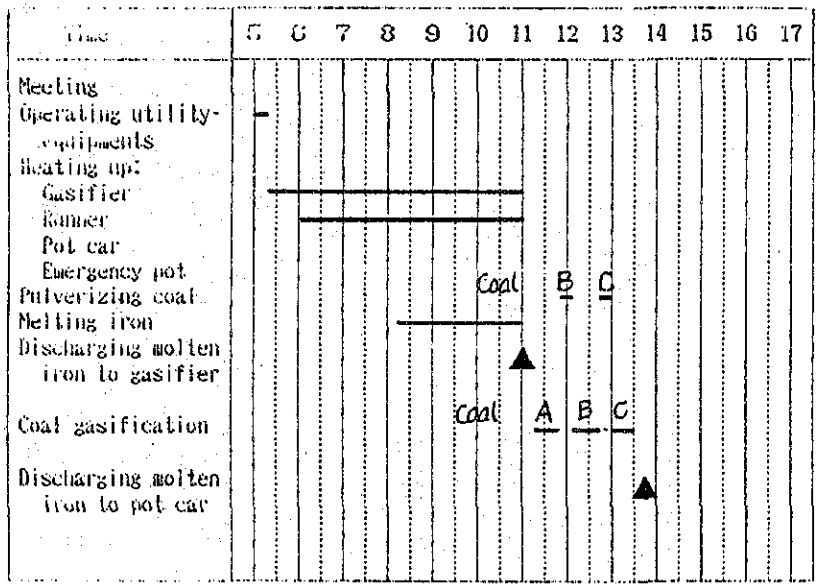
OPERATION CONDITION－C

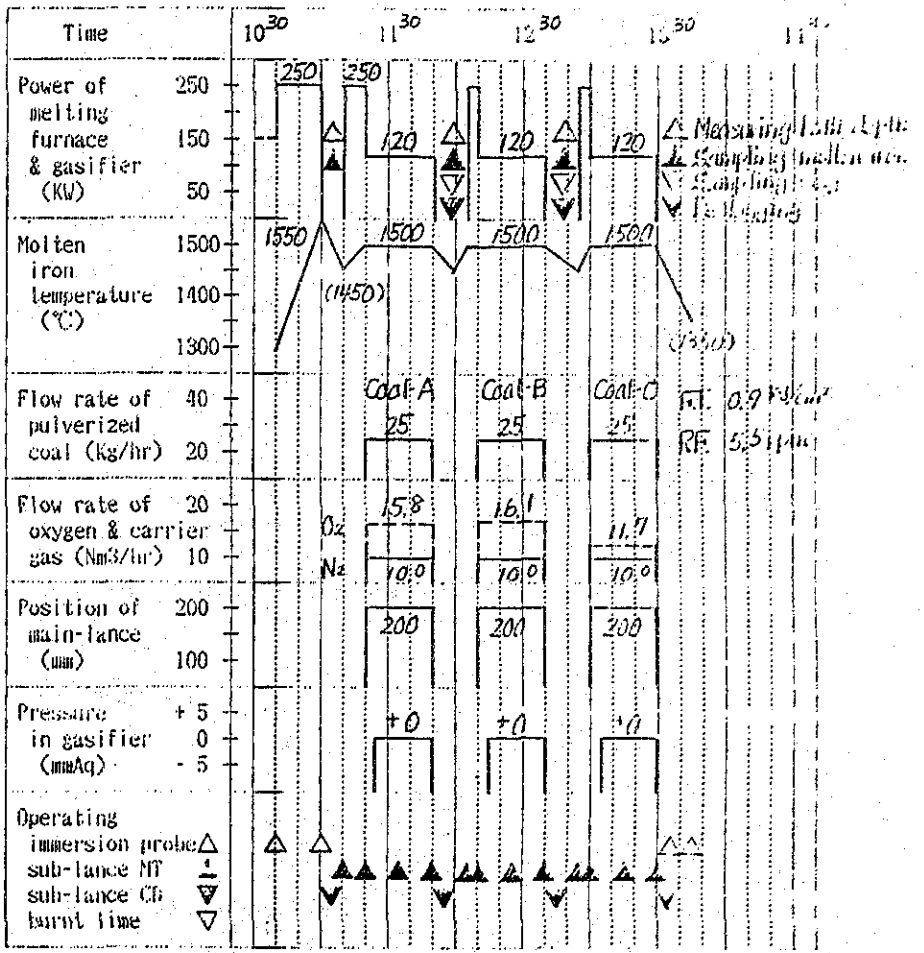
Weight of molten iron	300	Kg
Flow rate of Oxygen	11.7	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	25.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on dischare to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	16	wet Kg
Weight of burnt lime	0	Kg

OPERATION CONDITION－D

Weight of molten iron		Kg
Flow rate of Oxygen		Nm3/hr
Flow rate of carrier gas		Nm3/hr
Flow rate of pulverized coal		Kg/hr
Position of main-lance over bath surface		mm
Molten iron temperature		
on discharge to gasifier		℃
on coal gasification		℃
on dischare to pot car		℃
Basicity of slag		
Weight of coal		wet Kg
Weight of burnt lime		Kg

4. SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal
B
C
Coal
A
B
C


Time
10 30
11 30
12 30
Power of melting furnace & gasifier (KW)
250
150
50
250
250
120
120
120
Molten iron temperature (℃)
1500
1400
1300
1550
1500
1500
1500
(1450)
Flow rate of pulverized coal (Kg/hr)
40
20
Coal-A
Coal-B
Coal-C
25
25
25
Flow rate of oxygen & carrier gas (Nm3/hr)
20
10
O2
N2
15.8
16.1
11.7
10.0
10.0
10.0
Position of main-lance (mm)
200
100
200
200
200
Pressure in gasifier (mmAq)
+ 5
0
- 5
+0
+0
+0
Operating
immersion probe
sub-lance MT
sub-lance CB
burnt line

RUN	12 TH COAL GASIFICATION TEST RUN	RUN No.	CG012

DATE	1987.10. 15 . (Thu.)

1.PURPOSE of RUN

1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for
BUMB2, BSIC1 and BSIVB coal

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	BUMB2				
Proximate analysis		Ultimate analysis		Ash components	
Ash	2.29 %	C	73.10 %	SiO2	%
V.M.	47.58 %	H	5.80 %	Al2O3	%
F.C.	50.13 %	N	1.25 %	CaO	%
	%	O	18.15 %	K2O	%
		S	1.70 %	Na2O	%

(DRY BASE) (D.A.F)

OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	18.5	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	30.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	18	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE－B

Sample number	BSIC1				
Proximate analysis		Ultimate analysis		Ash components	
Ash	2.65 %	C	76.41 %	SiO2	%
V.M.	46.95 %	H	5.83 %	Al2O3	%
F.C.	50.40 %	N	1.40 %	CaO	%
	%	O	15.76 %	K2O	%
		S	0.60 %	Na2O	%

(DRY BASE) (D.A.F.)

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	16.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	30.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	18	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG012

COAL SAMPLE－C

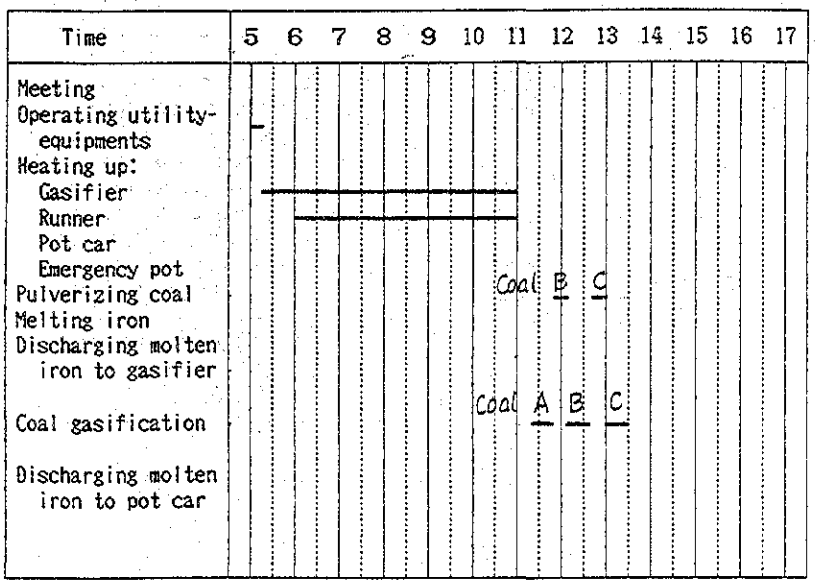
Sample number	BSⅣB				
Proximate analysis		Ultimate analysis		Ash components	
Ash	4.49 %	C	73.12 %	SiO2	%
V.M.	47.25 %	H	5.74 %	Al2O3	%
F.C.	48.26 %	N	1.13 %	CaO	%
	%	O	19.74 %	K2O	%
		S	0.26 %	Na2O	%

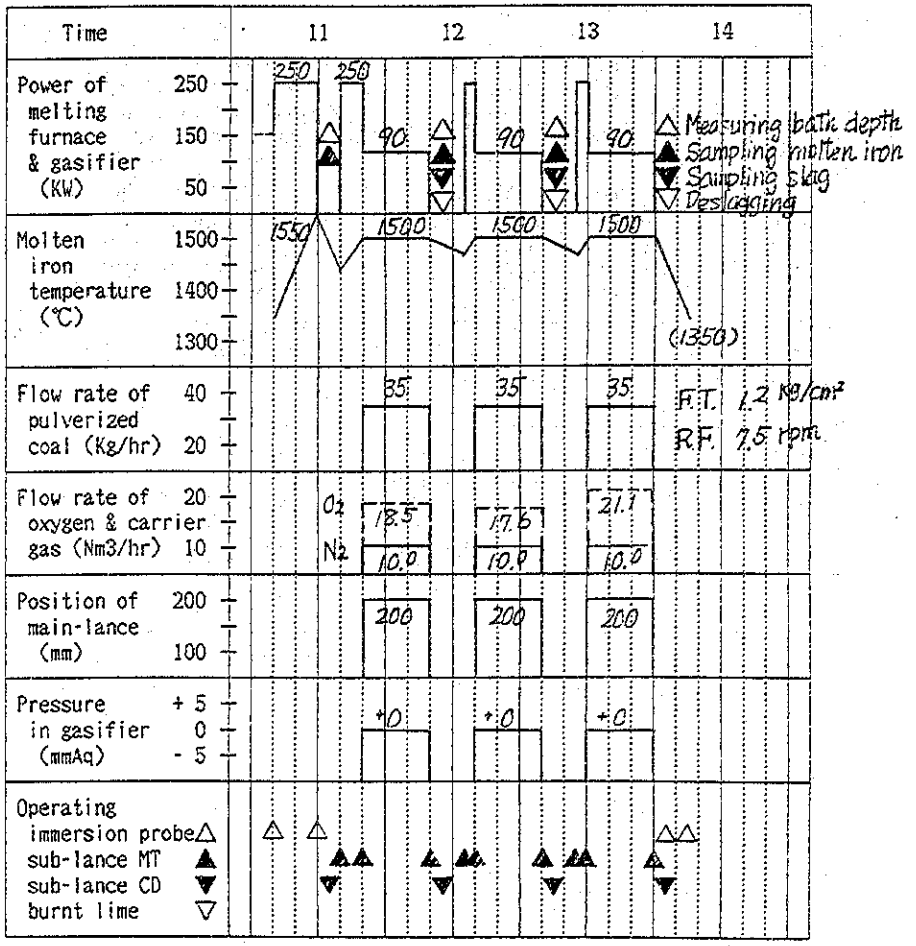
(DRY BASE)　　(D.A.F)

OPERATION CONDITION－C

Weight of molten iron	300	Kg
Flow rate of Oxygen	18.0	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	30.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	~~1550~~	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	17.	wet Kg
Weight of burnt lime	0	Kg

4.SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal A B C
Coal A B C


Time
11 12 13 14
Power of melting furnace & gasifier (KW)
250
150
50
250 250 90 90 90
Measuring bath depth
Sampling molten iron
Sampling slag
Deslagging
Molten iron temperature (℃)
1500
1400
1300
1550 1500 1500 1500 (1350)
Flow rate of pulverized coal (Kg/hr)
40
20
35 35 35
F.T. 1.2 Kg/cm²
R.F. 7.5 rpm
Flow rate of oxygen & carrier gas (Nm3/hr)
20
10
O2
N2
18.5 17.6 21.1
10.0 10.0 10.0
Position of main-lance (mm)
200
100
200 200 200
Pressure in gasifier (mmAq)
+ 5
0
- 5
+0 +0 +0
Operating
immersion probe△
sub-lance MT ▲
sub-lance CD ▼
burnt lime ▽

RUN	13 TH COAL GASIFICATION TEST RUN	RUN No.	CG013

DATE	1987.10. 20 . (Tue)

1.PURPOSE of RUN

1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for BUIA2, BUIIC2 and BUIIB1

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE—A

Sample number	BUIA2, BUIIA2				
Proximate analysis		Ultimate analysis		Ash components	
Ash	3.29 %	C	75.91 %	SiO2	%
V.M.	46.08 %	H	6.03 %	Al2O3	%
F.C.	50.63 %	N	1.08 %	CaO	%
	%	O	16.73 %	K2O	%
		S	0.25 %	Na2O	%

(DRY BASE) (D.A.F)

OPERATION CONDITION—A

Weight of molten iron	300	Kg
Flow rate of Oxygen	18.5	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	21	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE—B

Sample number	BUIIC1				
Proximate analysis		Ultimate analysis		Ash components	
Ash	1.90 %	C	74.50 %	SiO2	%
V.M.	46.04 %	H	5.43 %	Al2O3	%
F.C.	52.06 %	N	1.36 %	CaO	%
	%	O	18.26 %	K2O	%
		S	0.45 %	Na2O	%

(DRY BASE) (D.A.F.)

OPERATION CONDITION—B

Weight of molten iron	300	Kg
Flow rate of Oxygen	17.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	21	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG013

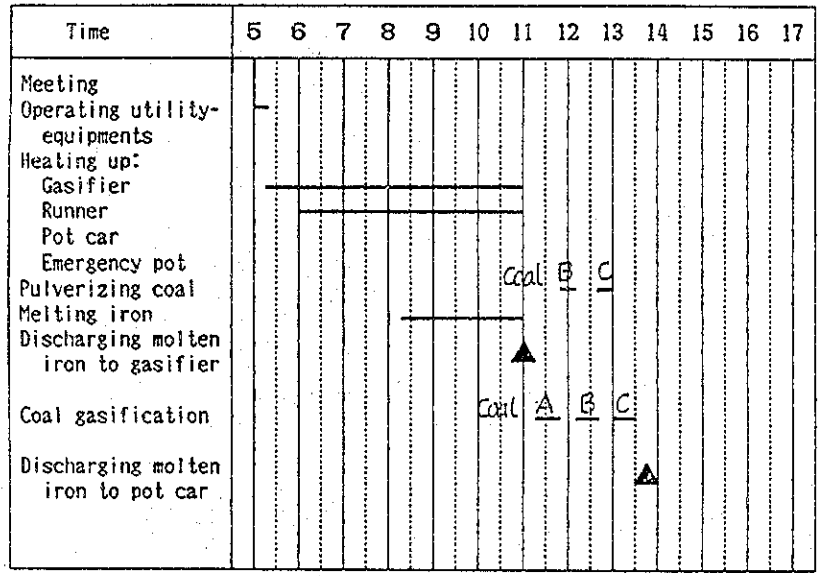
COAL SAMPLE－C

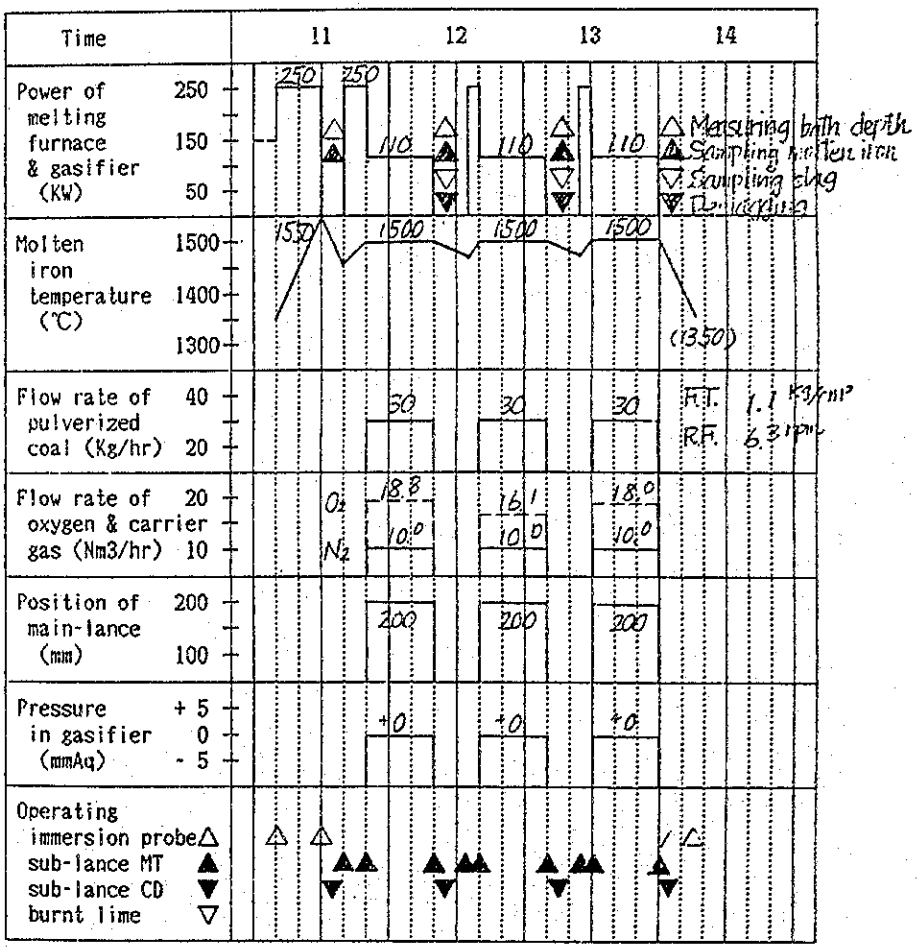
Sample number		BUIIB1, BUIVB1, BUVB1			
Proximate analysis		Ultimate analysis		Ash components	
Ash	4.08 %	C	73.19 %	SiO2	%
V.M.	45.92 %	H	5.69 %	Al2O3	%
F.C.	50.00 %	N	1.20 %	CaO	%
	%	O	18.97 %	K2O	%
		S	0.95 %	Na2O	%
	(DRY BASE)		(D.A.F)		

OPERATION CONDITION－C

Weight of molten iron	300	Kg
Flow rate of Oxygen	21.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	~~1550~~	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	21	wet Kg
Weight of burnt lime	0	Kg

4.SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal A B C
Coal A B C


Time
11 12 13 14
Power of melting furnace & gasifier (KW) 250 150 50
250 250 110 110 110
Molten iron temperature (℃) 1500 1400 1300
1550 1500 1500 1500 (1350)
Flow rate of pulverized coal (Kg/hr) 40 20
50 30 30
F.T. 1.1 Kg/m³
R.F. 6.3 m/s
Flow rate of oxygen & carrier gas (Nm3/hr) 20 10
O2 N2
18.8 10.0 16.1 10.0 18.0 10.0
Position of main-lance (mm) 200 100
200 200 200
Pressure in gasifier (mmAq) + 5 0 - 5
+0 +0 +0
Operating
immersion probe△
sub-lance MT ▲
sub-lance CD ▼
burnt lime ▽
Measuring bath depth
Sampling molten iron
Sampling slag
Discharging

RUN	14 TH COAL GASIFICATION TEST RUN	RUN No.	CG014

DATE	1987.10.23 . (Fri)

1.PURPOSE of RUN

1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for CBB1, CBC and SJJ.

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE—A

Sample number	CBB1				
Proximate analysis		Ultimate analysis		Ash components	
Ash	5.79 %	C	71.82 %	SiO2	%
V.M.	47.12 %	H	5.83 %	Al2O3	%
F.C.	47.09 %	N	1.27 %	CaO	%
	%	O	20.73 %	K2O	%
		S	0.35 %	Na2O	%

(DRY BASE) (D.A.F)

OPERATION CONDITION—A

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.4	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	22	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE—B

Sample number	CBC				
Proximate analysis		Ultimate analysis		Ash components	
Ash	6.15 %	C	72.22 %	SiO2	%
V.M.	47.08 %	H	5.88 %	Al2O3	%
F.C.	46.77 %	N	1.48 %	CaO	%
	%	O	20.05 %	K2O	%
		S	0.37 %	Na2O	%

(DRY BASE) (D.A.F.)

OPERATION CONDITION—B

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.5	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	22	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG014

COAL SAMPLE—C

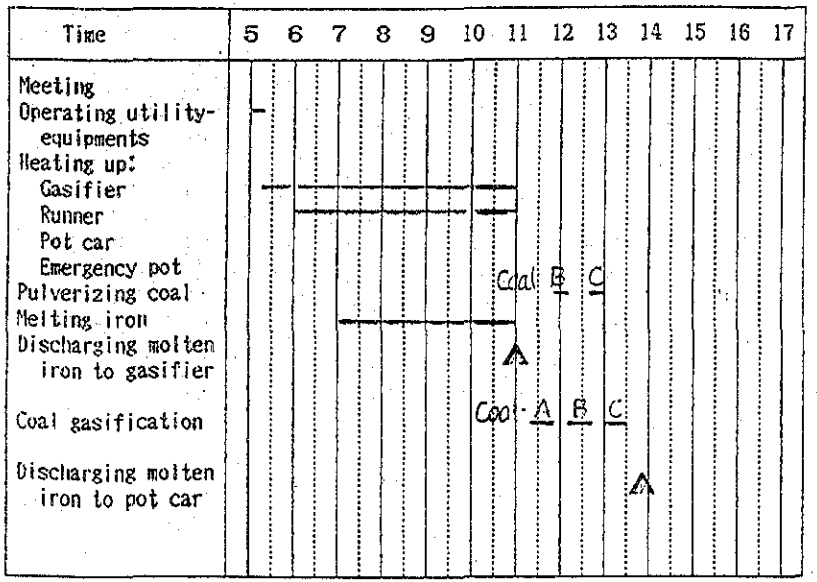
Sample number	SJJ				
Proximate analysis		Ultimate analysis		Ash components	
Ash	11.95 %	C	67.83 %	SiO2	%
V.M.	47.28 %	H	5.67 %	Al2O3	%
F.C.	40.77 %	N	1.06 %	CaO	%
	%	O	25.18 %	K2O	%
		S	0.26 %	Na2O	%

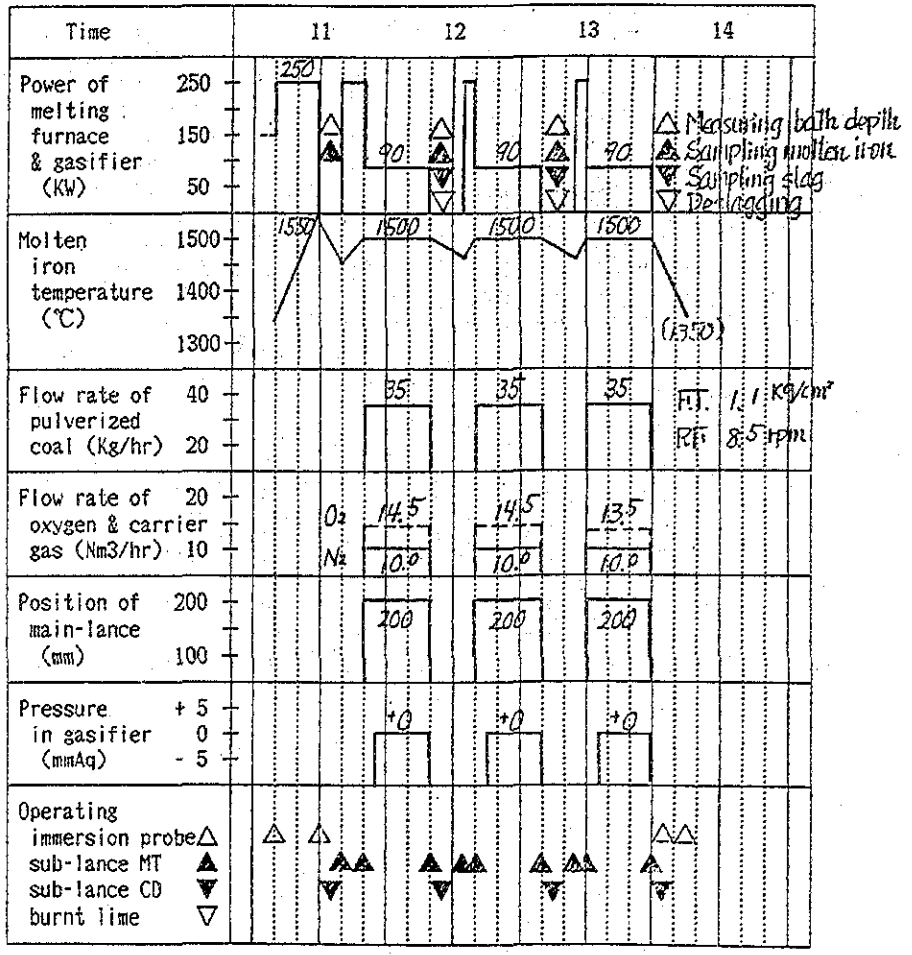
(DRY BASE) (D.A.F)

OPERATION CONDITION—C

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	~~1550~~	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	21	wet Kg
Weight of burnt lime	0	Kg

4. SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal
A
B
C
Coal
A
B
C


Time
11 12 13 14
Power of melting furnace & gasifier (KW)
250
150
50
250
90
90
90
Molten iron temperature (℃)
1500
1400
1300
1550
1500
1500
1500
(1350)
Flow rate of pulverized coal (Kg/hr)
40
20
35
35
35
Flow rate of oxygen & carrier gas (Nm3/hr)
20
10
O2
N2
14.5
14.5
13.5
10.0
10.0
10.0
Position of main-lance (mm)
200
100
200
200
200
Pressure in gasifier (mmAq)
+ 5
0
- 5
+0
+0
+0
Operating
immersion probe△
sub-lance MT ▲
sub-lance CD ▼
burnt lime ▽
Measuring bath depth
Sampling molten iron
Sampling slag
Deslagging
FJ.
RF
1.1 Kg/cm²
8.5 rpm

RUN	15 TH COAL GASIFICATION TEST RUN	RUN No.	CG015

DATE	1987.10.27 . (Tue.)

1.PURPOSE of RUN

1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for AR, CBB2 and AL

2.COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE—A

Sample number	AR				
Proximate analysis		Ultimate analysis		Ash components	
Ash	2.25 %	C	71.13 %	SiO2	%
V.M.	47.99 %	H	5.58 %	Al2O3	%
F.C.	49.76 %	N	1.01 %	CaO	%
	%	O	20.04 %	K2O	%
		S	2.24 %	Na2O	%

(DRY BASE) (D.A.F)

OPERATION CONDITION—A

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.8	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	22.	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE—B

Sample number	CBB1				
Proximate analysis		Ultimate analysis		Ash components	
Ash	5.96 %	C	73.08 %	SiO2	%
V.M.	46.15 %	H	5.73 %	Al2O3	%
F.C.	47.89 %	N	1.24 %	CaO	%
	%	O	18.42 %	K2O	%
		S	0.36 %	Na2O	%

(DRY BASE) (D.A.F.)

OPERATION CONDITION—B

Weight of molten iron	300	Kg
Flow rate of Oxygen	14.7	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on discharge to pot car	—	℃
Basicity of slag	1.5	
Weight of coal	21.	wet Kg
Weight of burnt lime	C	Kg

RUN		RUN No.	CG015

COAL SAMPLE－C

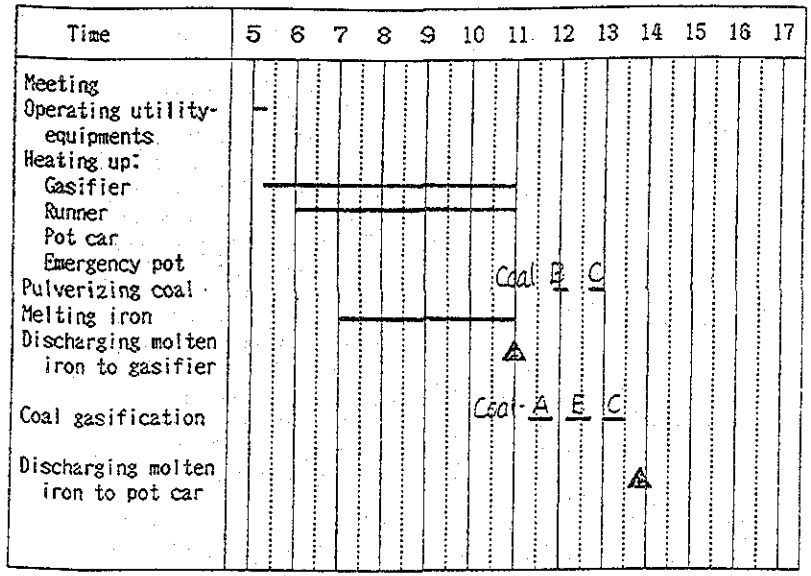
Sample number	AL				
Proximate analysis		Ultimate analysis		Ash components	
Ash	15.12 %	C	62.10 %	SiO2	%
V.M.	41.91 %	H	5.19 %	Al2O3	%
F.C.	42.97 %	N	1.03 %	CaO	%
	%	O	14.63 %	K2O	%
		S	1.93 %	Na2O	%

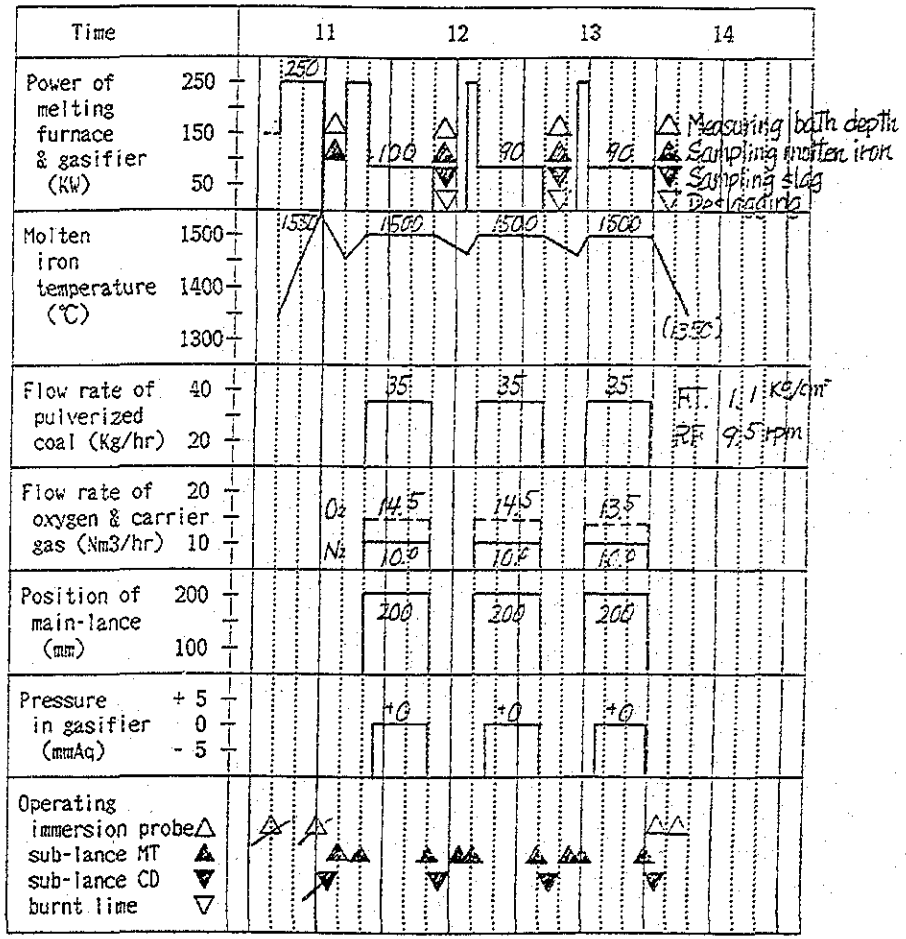
(DRY BASE) (D.A.F)

OPERATION CONDITION－C

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.6	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	~~1550~~	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	20	wet Kg
Weight of burnt lime	0	Kg

4.SCHEDULE


Time
5 6 7 8 9 10 11 12 13 14 15 16 17
Meeting
Operating utility-equipments
Heating up:
Gasifier
Runner
Pot car
Emergency pot
Pulverizing coal
Melting iron
Discharging molten iron to gasifier
Coal gasification
Discharging molten iron to pot car
Coal B C
Coal A E C


Time
11 12 13 14
Power of melting furnace & gasifier (KW)
250
150
50
Molten iron temperature (℃)
1500
1400
1300
Flow rate of pulverized coal (Kg/hr)
40
20
Flow rate of oxygen & carrier gas (Nm3/hr)
20
10
Position of main-lance (mm)
200
100
Pressure in gasifier (mmAq)
+ 5
0
- 5
Operating
immersion probe△
sub-lance MT ▲
sub-lance CD ▼
burnt lime ▽
△ Measuring bath depth
▲ Sampling molten iron
▼ Sampling slag
▽ Dolomite
250
100
90
90
1530
1500
1500
1500
(1350)
35
35
35
FT 1.1 Kg/cm²
RF 9.5 rpm
O₂ 14.5
N₂ 10.0
14.5
10.0
13.5
10.0
200
200
200
+0
+0
+0

RUN	16 TH COAL GASIFICATION TEST RUN	RUN No.	CG016

DATE	1987.10. 30 . (Fri.)

1. PURPOSE of RUN
   1) INVESTIGATIONS of GASIFICATION-CHARACTERISTIC for
      BSIA2, SJE1 and CBA2

2. COAL SAMPLE and OPERATION CONDITION

COAL SAMPLE－A

Sample number	BSIA2				
Proximate analysis		Ultimate analysis		Ash components	
Ash	4.50 %	C	75.73 %	SiO2	%
V.M.	45.62 %	H	5.87 %	Al2O3	%
F.C.	49.88 %	N	1.16 %	CaO	%
	%	O	17.03 %	K2O	%
		S	0.21 %	Na2O	%

(DRY BASE) (D.A.F)

OPERATION CONDITION－A

Weight of molten iron	300	Kg
Flow rate of Oxygen	16.1	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	1550	℃
on coal gasification	1500	℃
on discharge to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	22	wet Kg
Weight of burnt lime	0	Kg

COAL SAMPLE－B

Sample number	SJE1				
Proximate analysis		Ultimate analysis		Ash components	
Ash	7.49 %	C	70.32 %	SiO2	%
V.M.	51.00 %	H	5.90 %	Al2O3	%
F.C.	41.53 %	N	1.03 %	CaO	%
	%	O	22.51 %	K2O	%
		S	0.24 %	Na2O	%

(DRY BASE) (D.A.F.)

OPERATION CONDITION－B

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.5	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	--	℃
on coal gasification	1500	℃
on discharge to pot car	－	℃
Basicity of slag	1.5	
Weight of coal	21.	wet Kg
Weight of burnt lime	0	Kg

RUN		RUN No.	CG016

COAL SAMPLE－C

Sample number	CBA2				
Proximate analysis		Ultimate analysis		Ash components	
Ash	10.94 %	C	71.56 %	SiO2	%
V.M.	45.01 %	H	5.73 %	Al2O3	%
F.C.	44.05 %	N	1.16 %	CaO	%
	%	O	21.20 %	K2O	%
		S	0.35 %	Na2O	%
(DRY BASE)		(D.A.F)			

OPERATION CONDITION－C

Weight of molten iron	300	Kg
Flow rate of Oxygen	13.3	Nm3/hr
Flow rate of carrier gas	10.0	Nm3/hr
Flow rate of pulverized coal	35.0	Kg/hr
Position of main-lance over bath surface	200	mm
Molten iron temperature		
on discharge to gasifier	~~1550~~	℃
on coal gasification	1500	℃
on discharge to pot car	1350	℃
Basicity of slag	1.5	
Weight of coal	21.	wet Kg
Weight of burnt lime	0	Kg