CHAPTER 13

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## 13-16 Main piping

(1) 法法律法

13-16-1 General The overall yard piping has been so planned and designed that blast furnace gas (BFG), coke oven gas (COG), and LD converter gas (LDG) produced from the new steelworks and oxygen gas (O<sub>2</sub>), nitrogen gas (N<sub>2</sub>), both produced at the oxygen plant, and heavy oil and steam can be

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used effectively at each stage of use.

The system consists mainly of large-diameter gas lines, upon which smaller pipe lines rest. The main gas pipings have been planned so that they can be in service through stage II of the project.

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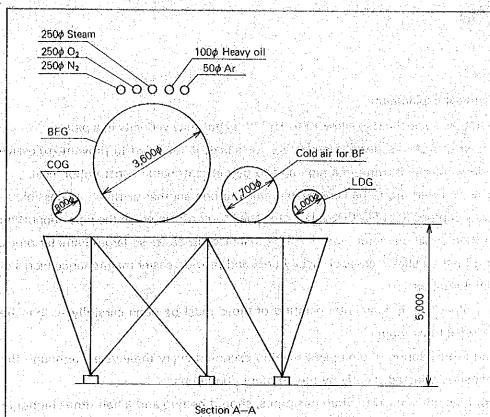
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13-16-2 Equipment specifications

The main specifications of yard piping are provided in Table 13-16-1.

Lìne	Pipe diameter mmø	Line length m	Remarks
(1) BFG line			
Mains	3,600	1,200	
(2) COG line			위한 역부의 분립 관리하다. 1997년 - 이상 관리
Mains (1)	1,700	1,100	
Mains (2)	800	200	
To LD	700	1,000	
To BF	400	800	
To pig casting machine	200	800	
(3) Mixed gas line			
Mains (1)	2,000	500	2,250 Kcal/Nm <sup>3</sup>
Maîns (2)	1,700	170	•
To hot strip mill	1,600	700	n Bardar a barden <b>er</b> berenden. Nejaria
To billet mill	600	120	н Н
To cokes	2,300	200	1,000 Kcal/Nm <sup>3</sup>
(4) LDG line			
To holder	2,300	150	
To power plant	1,000	1,500	
(5) Steam line			
Mains	300	250	
To B.F.	250	770	
To hot strip mill	200	1,100	
To cokes	150	80	
To billet mill	100	120	
To pig casting machine	80	600	
To main office	50	600	
To heavy oil tank	100	1,400	
To oxygen plant	50	100	
(6) BF blast line	1,700	800	
(7) Heavy oil line			
Mains	100	2,300	
To hot strip mill	80	1,100	
To billet mill	50	120	
(8) Oxygen line		120	
(o) Oxygen line Mains	050	700	
To BOF	250	700	STP G38 sch40
To BF	250 50	500	andra an transformation and the second se Second second
To pig casting machine	50 25	200 900	
	20	900	
(9) Nitrogen line			
Mains To BOF	250	700	
To BUF	250	500	
To hot strip mill	250	200	
To not strip mill To cokes	100	1,100	
To pig casting machine	100	80	enno november por la seconda de las Centras de las compositos de las compos
문제가 있는 것도 한 것 같아요. 한 것 같아요. 이 것 같아요. 이 것	25	900	
(10) Compressed air line			
Mains	25	700	
To BOF	25	500	
To BF	25	200	
To warehouse	25	400	

## Table 13-16-1 Equipment specifications for yard piping



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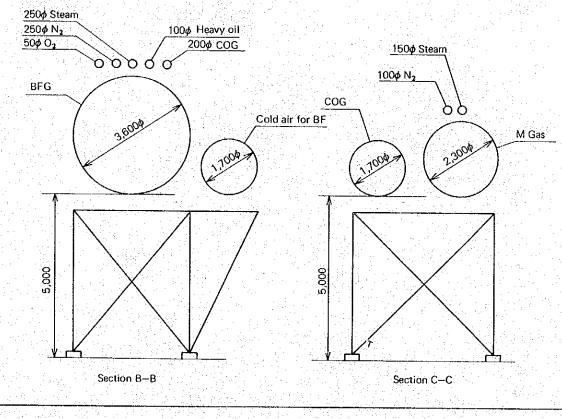


Fig. 13-16-1 Cross-section of pipe line

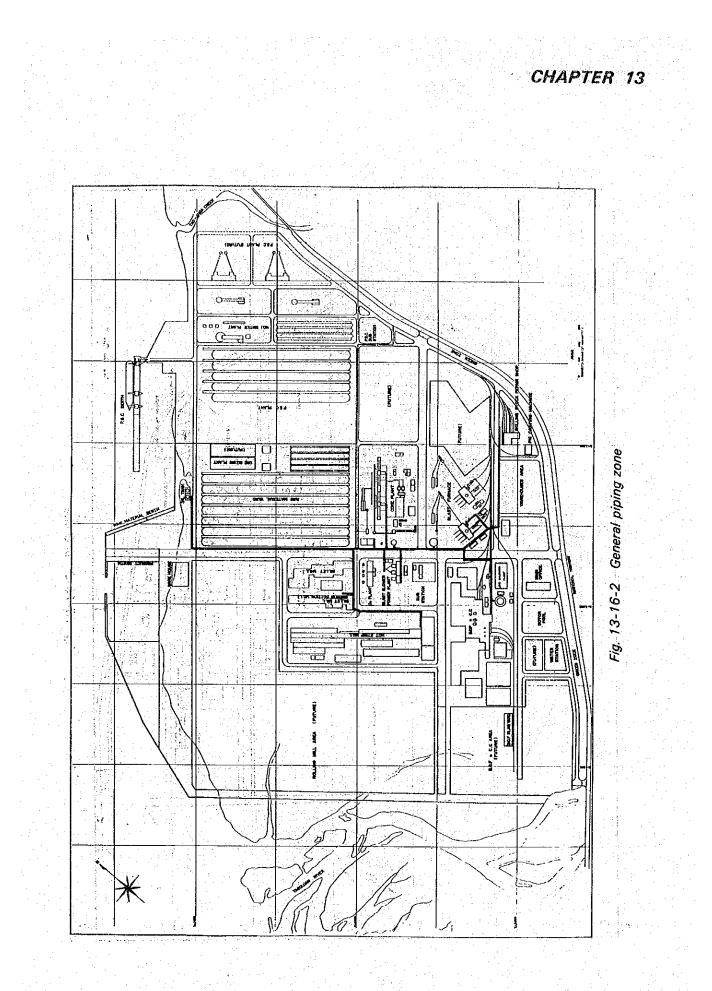
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#### 13-16-3 Technical explanation

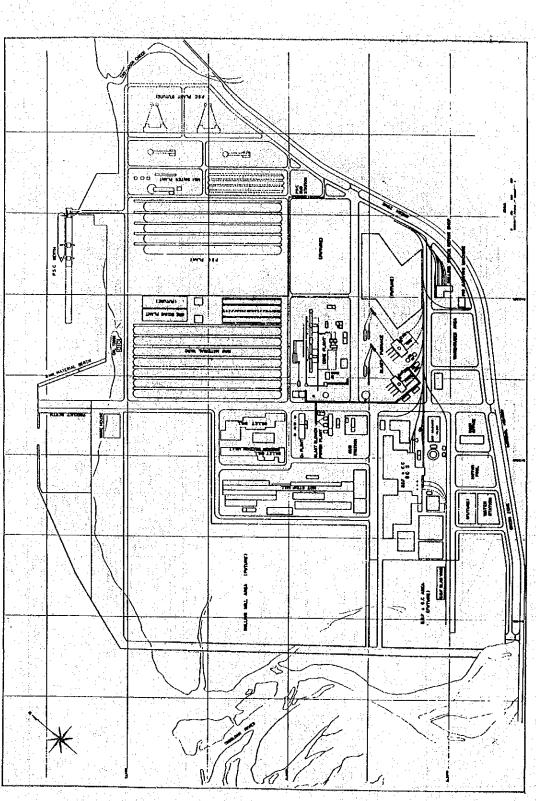
- (1) A pipe diameter is specified to allow 12 to 15<sup>m/sec.</sup> of gas flow verlocity in a pipe. The diameter of pipes, especially necessary for gases, is intended to prevent excessive pressure-down of gas flowing in a pipe and to permit reasonable construction cost.
- (2) In piping work, pipes are to be constructed close to one another as much as possible. Large-diameter pipes (for BFG, COG, LDG, etc.) shall be constructed on the pipe supporting table and then small-diameter pipes shall be installed up on these large-diameter pipes. This piping method allows cheaper facility cost and provide easier maintenance works of small-diameter pipes.
- (3) In painting pipes, the fundamental painting of pipes must be done carefully so that the pipe paint would last longer.

Re-painting or inspection of pipe paint may be executed every three years, although the paint life span is affected greatly by the ambient conditions.

- (4) The seal pot, which is used to drain gas pipes, should be two and a half times higher in pressure than a low pressure gas and one and a half times higher in pressure than a high pressure gas.
- (5) For safety, gas pipes shall be provided with water seal valves at adequate sections of the pipe.

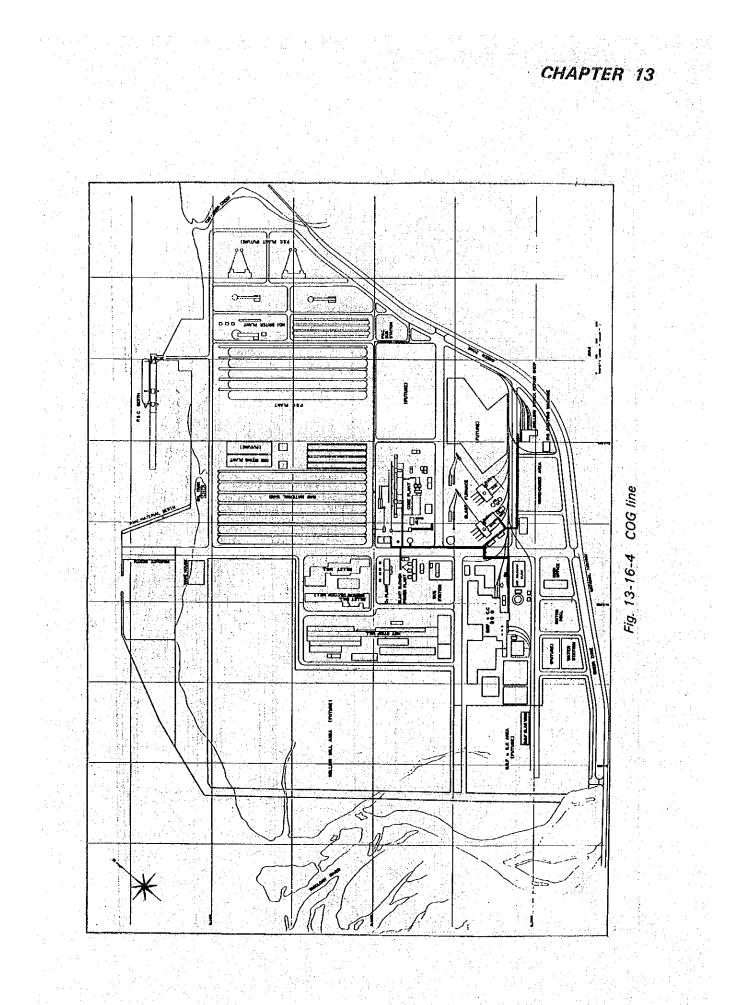


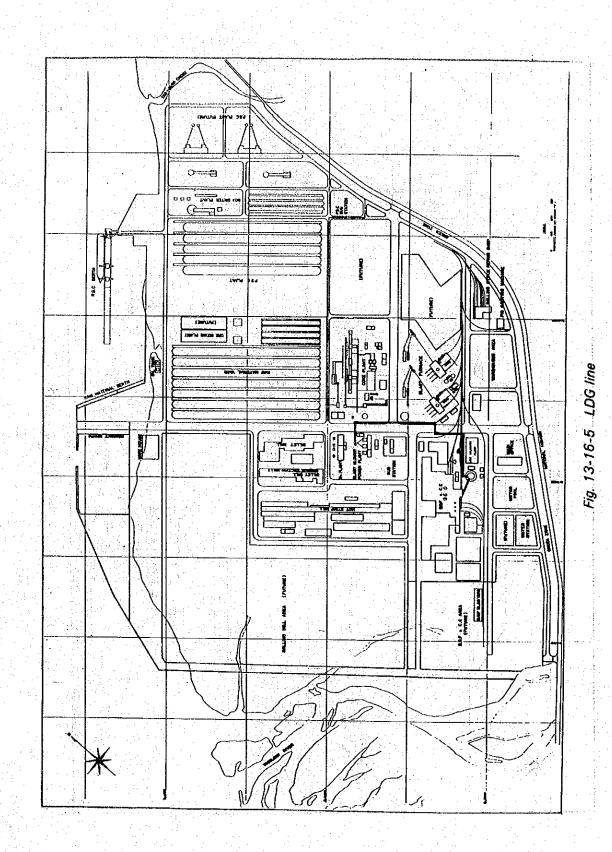


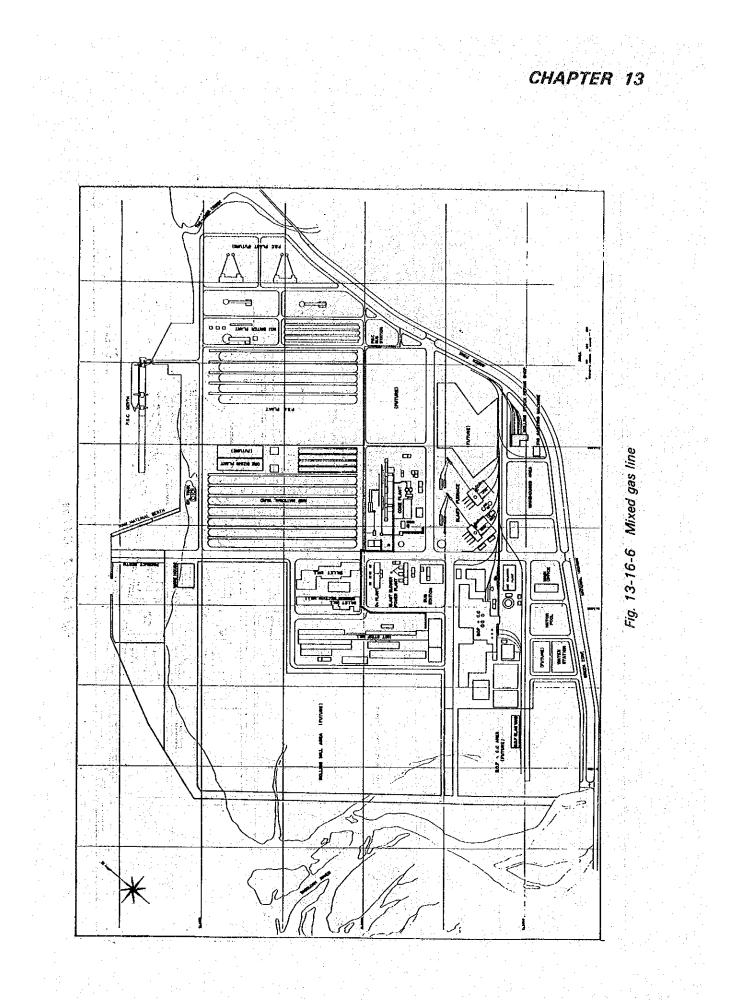


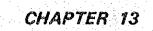
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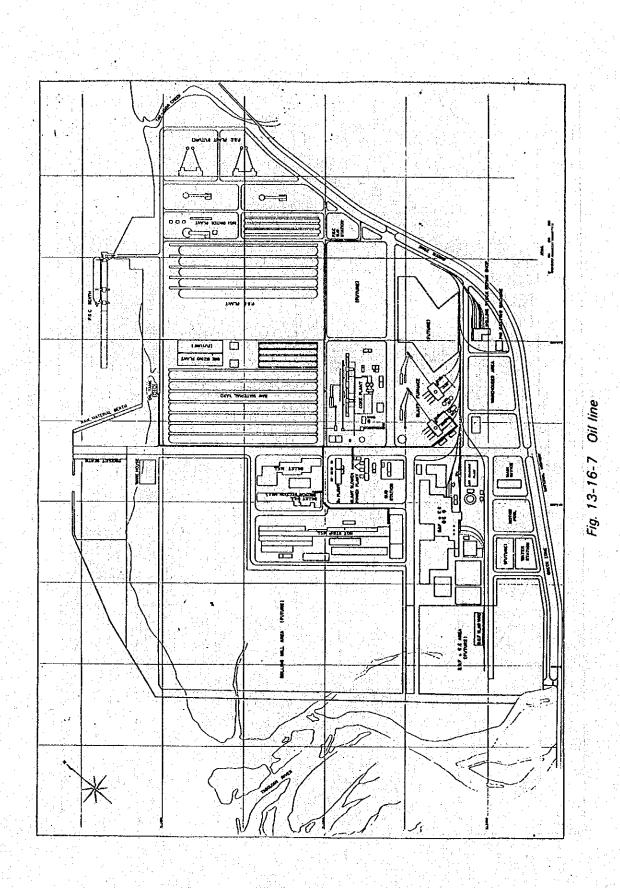
Fig. 13-16-3 BFG line

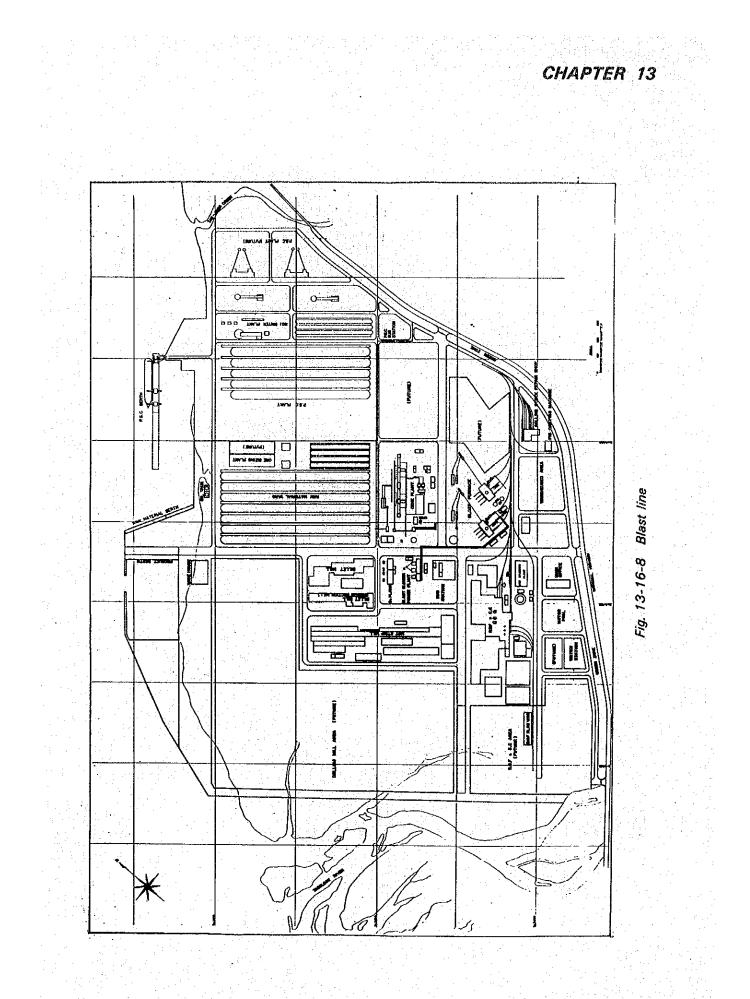






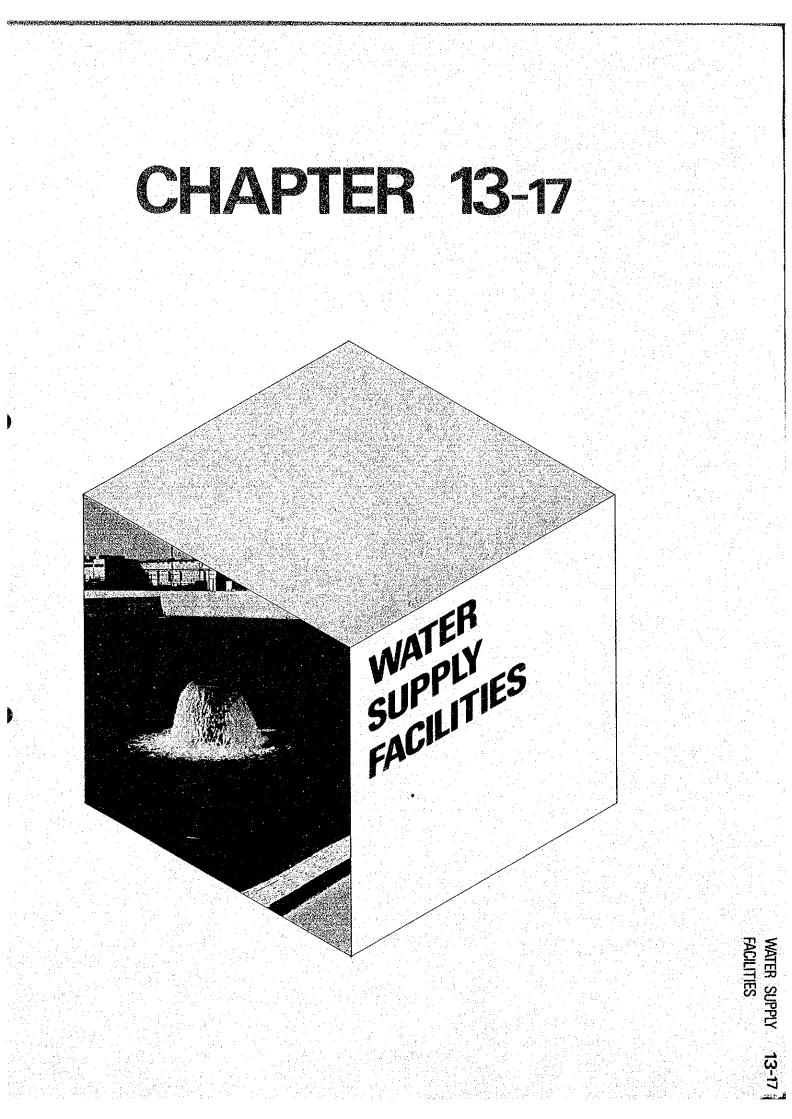


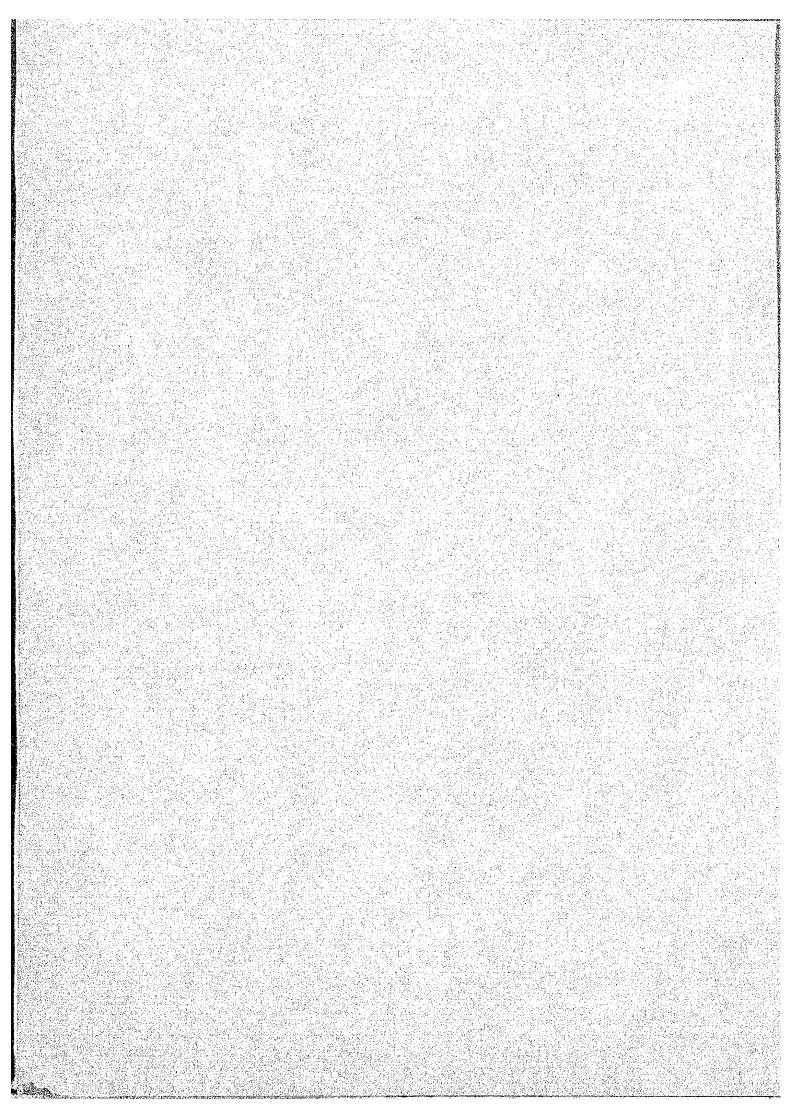




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#### 13-17 Water supply facilities

13-17-1 General Contract Contr

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The water requirements of the new steelworks relies on two sources, river water and sea water. Water taken from the river first enters the reservoir. Next it is sent to the potable water/industrial water center, where it is treated in the coagulation sedimentation basin and separated into the industrial water system and potable water system.

The industrial water thus separated is distributed through an industrial water line via the head tank, to each water recirculation system for use as make-up water.

The potable water, on the other hand, filtered and sterilized with chlorine after being treated in the coagulation-sedimentation basin mentioned above, is distributed through a potable water line via the head tank as cooling and/or service water.

Sea water is taken from the sea area near the end of the new steel works and transported, after removal of rubbish by a travelling screen and sterilization with chlorine, and is distributed through a sea water line to the oxygen plant, coke by-product plant and the power station. Moreover, diesel engine pumps are installed at industrial water system and sea water system for emergencies.

	5 153	er ersenned vier	n de la composition d En la composition de l				(Unit	: m³/min
		Plant name	C Day 1	Stage 1			Stage II	
5 16 2	No.		, al.Wa	D.W.	S.W.	LW.	D.W.	S.W.
,e7 :	्त	Coka plant	1.70	0.11	32.2	3.47	0.14	64.4
	2	8.F.	11.19	0.04	·	19.38	0.07	
	3	8.0.F.	3.25	0.56	-	6.50	1.13	·
: ···•	4	Lime calcining	0.63	0.02		1.26	0.04	-
	· 6	c.c.	4.92	0.13		9.84	0.25	2012 - A
	6	Billet (1st)	0.58	0.22	1 <u>4</u>	1.32	0.23	
	7	Billet (2nd)	-	-		1.64	0.23	
	8	Hot strip mill	.11.0	0.9	-	15.0	1.20	-
	9	Main office		0.18	-	· -	0.18	· _
	10	Power plant	0.5	0.01	300	1.2	0.01	520
	11	O <sub>2</sub> plant	1.0	0.01	30.5	1.5	0,01	61.0
S.,	12	Scrap yard	0.12	0.18			a ang s	
	13	Raw material yard	0.6	$i \rightarrow i$	-		te fe s	
	14	Ware houses	-	0.18	_		· · ·	
· ·.	15	Pig machine	-	0.12	-			
	16	Yard office		0.06	-			
±14	17	Coal berth		0.48	-			
С	18	Product berth		0.54	-			
, <sup>1</sup>		Total	35,49	3.74	362.7			

Table 13-17-1 Quantity of required water

I.W. : Industrial water D.W.: Orinking water

S.W. : Sea water

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#### 13-17-2 Preconditions

The quantity of water required by each system is shown in *Table 13-17-1*. The quality and so on of water for each system is shown in *Table 13-17-2*.

No.	Item		Conditions
		Raw water quality:	SS max. 1,000 mg/1 ave. 30 mg/1
			PH 5.8 - 8.6
1.	Industrial water	Quality of treated water:	SS max. 15 mg/1
			PH 5.8 - 8,6
			Other variables should be in accordance with Japanese standards for industrial water quality.
		Water temperature:	29 ± 5°C
		Raw water quality:	SS max. 15 mg/1
			PH 5.8 - 8.6
2	Drinking water	Quality of treated water:	Turbidity – not more than 2°,
			PH 5.8 - 8.6
			Other variables should be in accordance with Japanese standards for potable water quality.
		Water temperature:	29±5°C
3	Sea water	Sea water temperature:	Around 30°C
		Sea water level:	HWL + 1,280
			LWL ± 0

Table 13-17-2 Quality and others of water

CHAPTER 13

## 13-17-3 Equipment plan

(1) Equipment specifications

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	Table	e 1	3-1	7-3	Sp	ecifi	ication

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	Item	Stage I	Stage II
(1)	Water reservoir facilities	150 <sup>m</sup> x 100 <sup>m</sup> x 6 <sup>mH</sup> x 1 reservoir Semi-underground 90,000 <sup>m<sup>3</sup></sup> HWL GL + 600 <sup>mm</sup> LWL GL 5,400 <sup>mm</sup>	Constructed in stage I so as to supply the quantity of water that will be used in stage I and II.
(2)	Potable water/industrial, water center facilities 1) Coagulation sedimentation basin: 2) Treated water tank 3) Filtration tank	2,500 <sup>m<sup>3</sup></sup> × 1 basin (with declined parallel plates) 1,500 <sup>m</sup> × 1 tank 5 <sup>m</sup> × 10 <sup>m</sup> × 5 <sup>mH</sup> × 1 tank	Same as at left
	<ol> <li>4) Potable water storage tank</li> <li>5) Sterilizing equipment</li> <li>6) Head tank (for industrial water)</li> <li>7) Head tank (for potable water)</li> </ol>	1,000 <sup>m<sup>3</sup></sup> x 1 tank 1 set 200 <sup>m<sup>3</sup></sup> x 1 unit 100 <sup>m<sup>3</sup></sup> x 1 unit	<ul> <li>μ</li> <li>μ</li></ul>
	8) Pumps & others Potable water line Industrial water line	1 set Piping & valve, 1 set Piping & valve, 1 set	
	Sea water intake facilities 1) Water intake tower 2) Screening facilities 3) Water supply tank	8 <sup>m¢</sup> x 2.5 <sup>mH</sup> x 2 units 1 set 1,500 <sup>m<sup>3</sup></sup> x 2 tanks	Constructed in stage I so as to supply the quantity of water that will be used in stage I and II.
(6)	<ol> <li>4) NaClO generator</li> <li>Sea water supply facilities</li> <li>1) Pumps &amp; others</li> <li>2) Sea water line</li> </ol>	1 set 1 set Piping & valve, 1 set	Same as at left

- (2) Water supply system figures
  - Figure 13-17-1 Industrial water supply system
  - Figure 13-17-2 Industrial water supply line layout
  - Figure 13-17-3 Potable water supply system
  - Figure 13-17-4 Potable water supply line layout
  - Figure 13-17-5 Sea water supply system
  - Figure 13-17-6 Sea water supply line layout
- 13-17-4 Technical explanation
- (1) Water reservoir facilities
  - River water will enter into the reservoir by gravity from the intake of the river. Retention time (Stage I) 38.2<sup>hrs</sup>
- (2) Potable water/industrial water center facilities (stage I only)
  - 1) Coagulation sedimentation basin
    - Retention time 63.7<sup>min</sup>
    - Settling velocity 0.1-0.2<sup>m/min</sup>
  - Treated water tank
     Retention time 38.2<sup>min</sup>
  - Filtration tank (rapid filtration by gravity)
     Rate of filtration 108<sup>m/d</sup>
     Filtration area 50<sup>m<sup>2</sup></sup>
  - Potable water storage tank
     Retention time 4.6<sup>hr</sup>
  - Head tank (for industrial water 200<sup>m<sup>3</sup></sup>)
     Retention time 5.6<sup>min</sup>
  - 6) Head tank (for potable water 100<sup>m<sup>a</sup></sup>)
     Retention 26.7<sup>min</sup>
- (3) Sea water intake facilities
  - Deep zone sea water intake system. (Sea bottom intake pipe system)
     The deep zone sea water intake system is employed to minimize the fluctuation of
     sea water temperature caused by hot drainage or the weather etc. Among the deep
     zone sea water intake systems, sea bottom intake pipe system will be used, which
     has little influence of suspended matter coming in and wave height.

# (Thermocline) Tip of water intake Intake velocity 0.2 m/sec. Muddy belt INTHERE

CHAPTER 13

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2) NaCIO generator NaCIO is generated by electrolyzing sea water and NaCIO is used for chlorine

sterilization. (Reaction formula)

anode  $2CI^- \rightarrow Cl_2 + 2e^-$ 

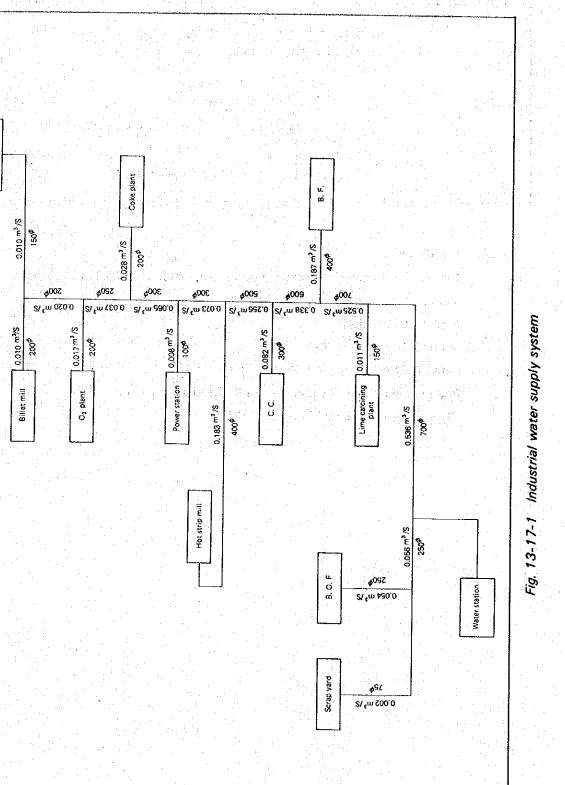
cathode  $2Na^+ + 2H_2O + 2e^- \rightarrow 2NaOH + H_2$ 

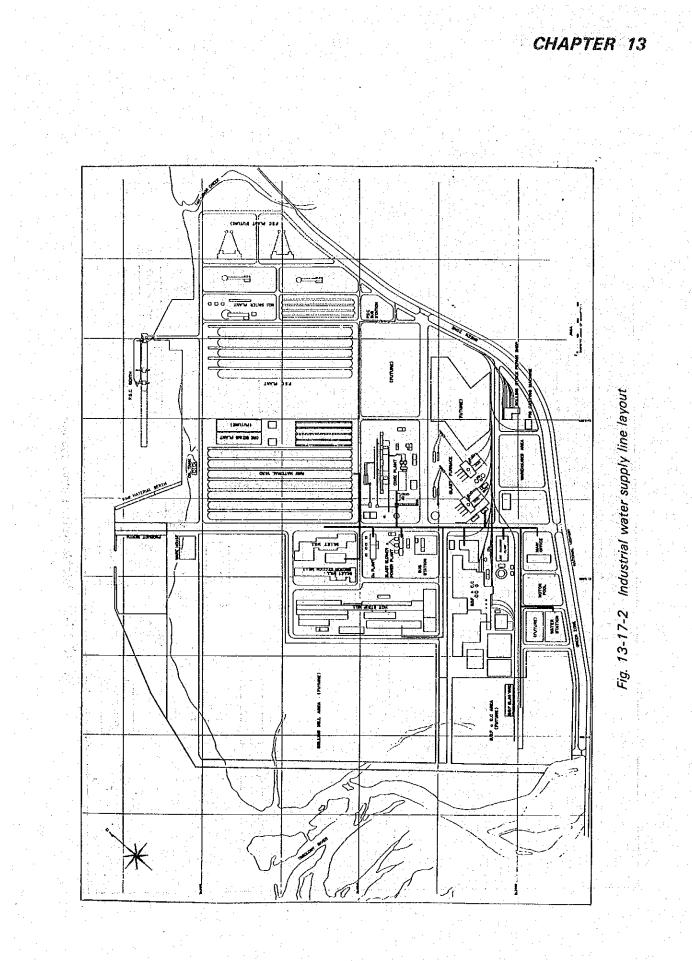
Reaction was made as follows inside the electrolysis tank.

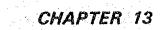
 $CI_2 + 2NaOH \rightarrow NaCIO + NaCI + H_2O$ 

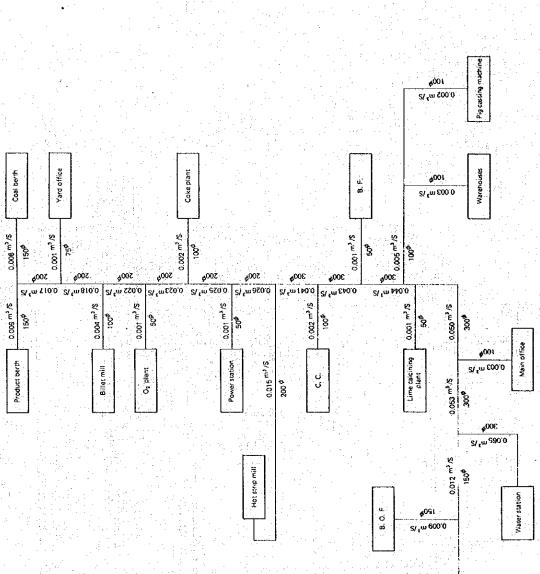


Raw material yard







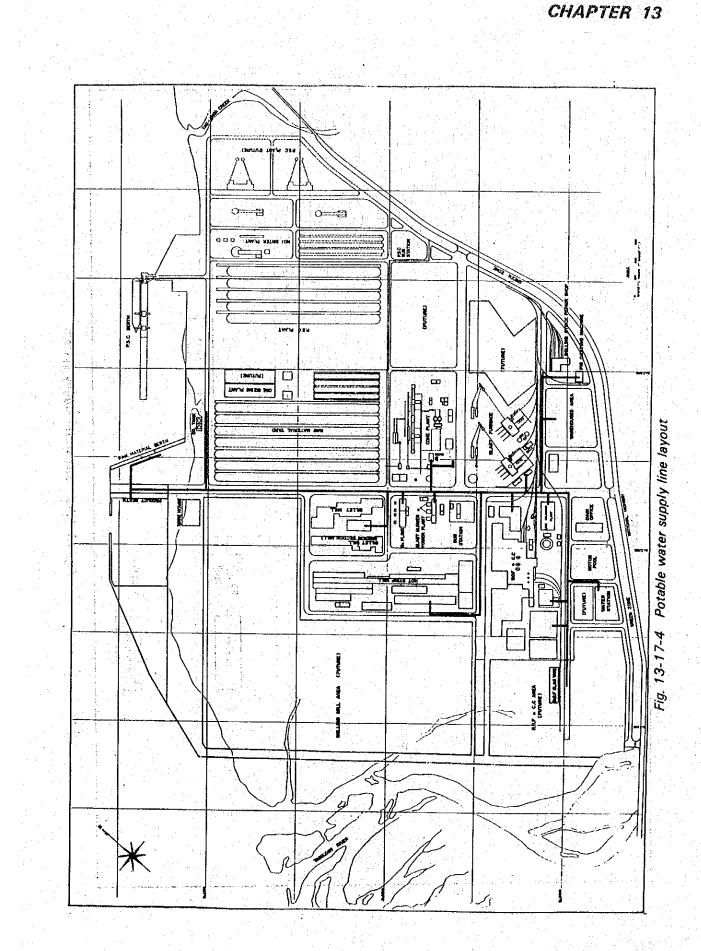


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0.003 m<sup>3</sup> /S

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Fig. 13-17-3 Potable water supply system



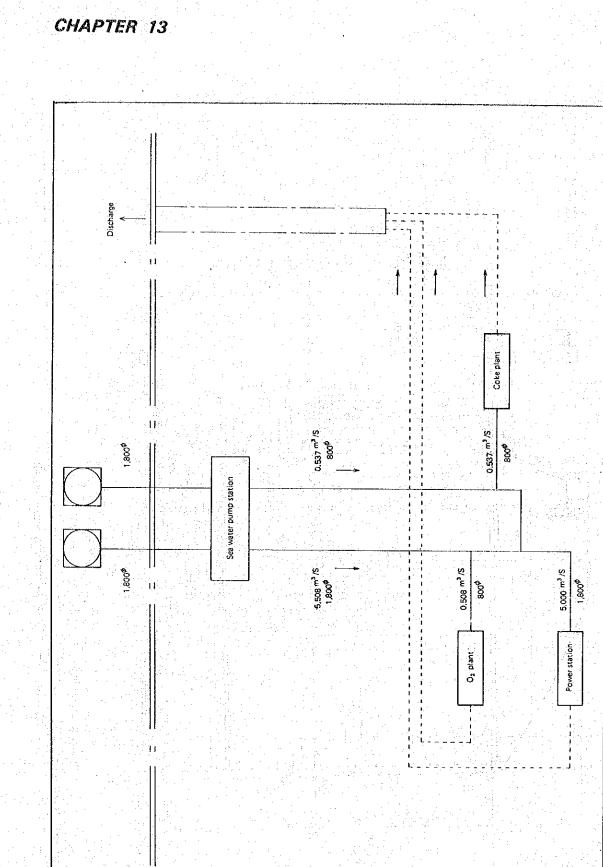
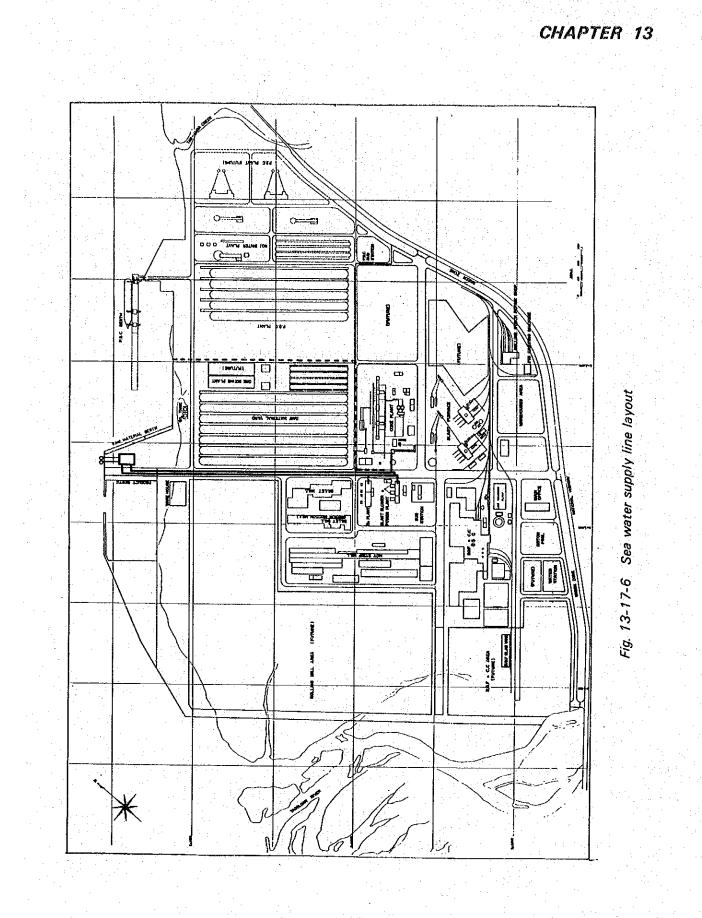
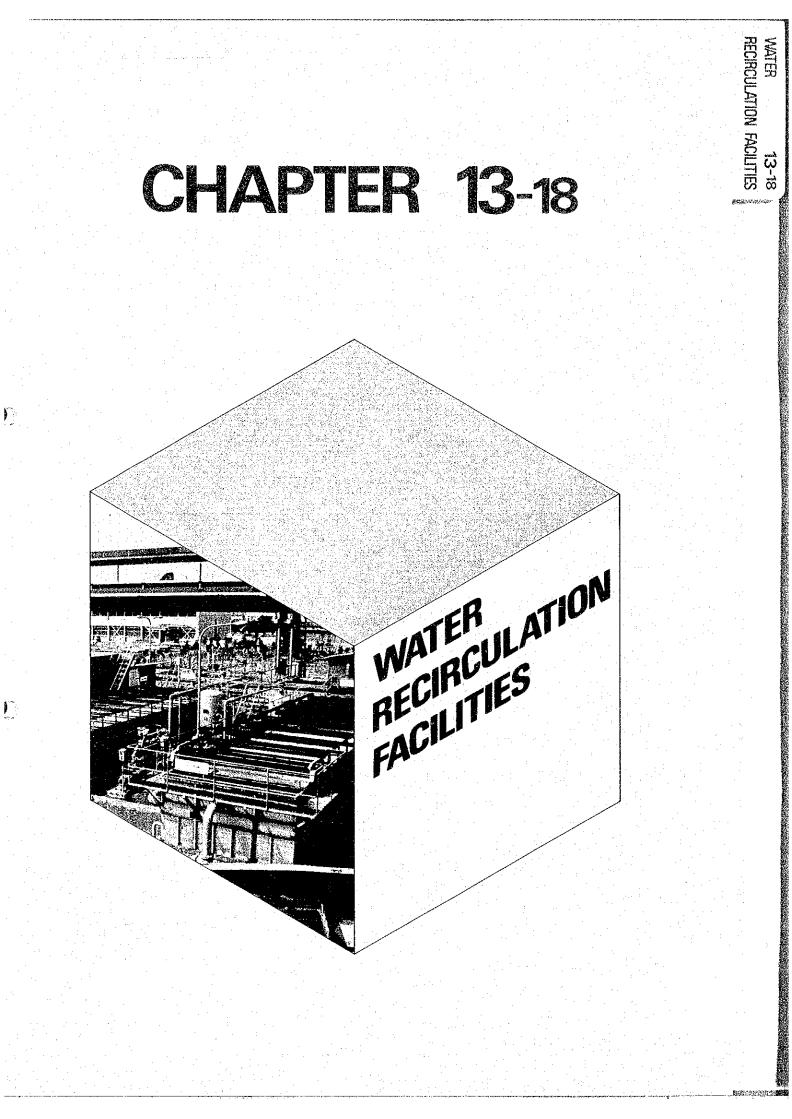
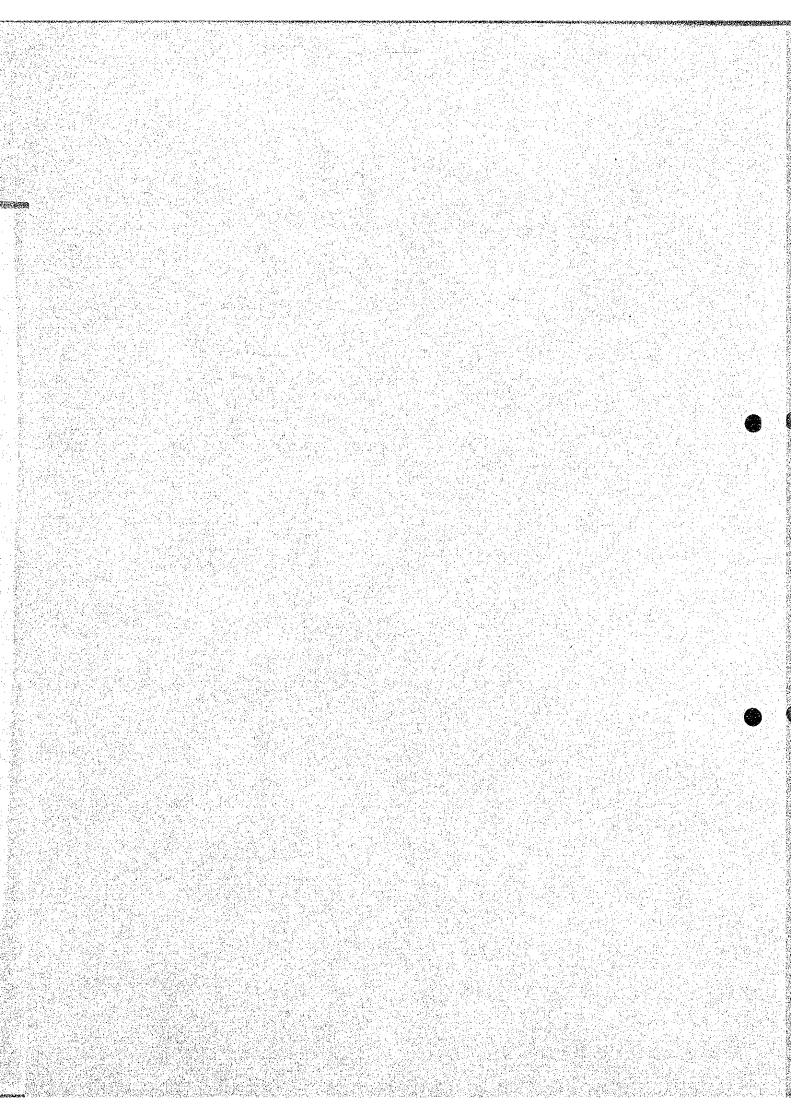


Fig. 13-17-5 Sea water supply system







CHAPTER 13

#### 13-18 Water recirculation facilities

#### 13-18-1 General

Fresh water to be used in each plant will be treated with independent water recirculating facilities installed in each plant for recirculation.

Recirculating water is roughly divided into the direct cooling water system and the indirect cooling water system.

In the direct cooling water system, return water from plants is high in both suspended solid content and water temperature. To cope with this, therefore, return water in the direct cooling water system will be treated as follows. It is first treated in the scale pit, sedimentation basin and filter to reduce the suspended solid content. Treated water is then collected in the return water pit and fed to the cooling tower to lower the water temperature. Since repeated recirculation increases salt concentration, some water is forcibly blown down.

In the indirect cooling water system, return water is not with suspended solids, unlike the direct cooling water system, so only the water temperature is raised. Return water in the indirect cooling water system is first collected in the return water pit and then fed to the cooling tower to lower water temperature. Cooled water is fed to the feed water pit where it is pumped to each plant. In the indirect cooling water system, too, repeated recirculation increases the salt concentration, so some water is forcibly blown down. As a rule, water recirculation facilities will be operated automatically, but the feed pumps for plants will be remote controlled from the operation room of each plant. The water recirculation facilities will be operated from the operation room of the dehydrater will be operated from the operation room of the dehydrater will be installed in the water recirculation facilities. In plants where emergency water supply is required, elevated tanks and diesel engine pumps will be installed.

13-18-2 Preconditions

Table 13-18-1 Shows preconditions for return water equipment.

Items	Stage I	<b>4</b> 11	Stage II
Water recirculation facilities for coke oven and coke by- product plant			
(1) Coke oven plant			
1) Quenching tower	Amount of recirculating water Suspended solids (hereinafter r as 'SS') in recirculating water: Feed water temperature: Return water temp. Feed water pressure:	eferred to	540 m <sup>3</sup> /hr
2) Máchinery cooling	Amount of water recirculating: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure;	70 m <sup>3</sup> /hr 20 ppm 35°C 40°C 3 kg/cm <sup>2</sup>	130 m <sup>3</sup> /hr
3) Dust collection water for larry car	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure;	110 m <sup>3</sup> /hr 100 ppm 60°C 60°C 2 kg/cm <sup>2</sup>	210 m³ /hr
4) Miscellaneous water	Amount of feed water: Feed water temperature: Feed water pressure:	60 m <sup>3</sup> /hr 35°C 2 kg/cm²	60 m³ /hr
(2) Coke by-product			
1) Machinery cooling	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	80 <sup>m3</sup> /hr 20 ppm 35°C 40°C 2 kg/cm <sup>2</sup>	150 m³/hr
2) Metal cooling	Amount of feed water: Feed water temperature: Feed water pressure:	20 m <sup>3</sup> /hr 35°C 1 kg/cm <sup>2</sup>	40 m³ <i>/</i> hr
Water recirculation facilities for blast furnace			
(1) Cooling system for tuyeres, etc.			
1) Cooling of tuyeres, etc.	Amount of recirculation water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	2,600 m <sup>3</sup> /hr 20 ppm 35°C 41°C 5 kg/cm <sup>2</sup>	5,200 m <sup>3</sup> /hr
2) Cooling of cooling plate	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	1,600 m <sup>3</sup> /hr 20 ppm 35°C 41°C 5 kg/cm <sup>2</sup>	3,200 m³/hr
3) Cooling of hot blast valve	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	700 m <sup>3</sup> /hr 20 ppm 35° C 41° C 5 kg/cm <sup>2</sup>	1,400 m <sup>3</sup> /hr

Table 13-18-1 Pre-condition for recirculation water

Items	Stage I		Stage II
4) Miscellaneous water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp,: Feed water pressure:	500 m <sup>3</sup> /hr 20 ppm 35°C 41°C 5 kg/cm <sup>2</sup>	1,000 m³ <i>/</i> hr
(2) Hearth bottom cooling	Amount of recirculating water: SS in recirculating water: Feed water temperature: Feed water pressure:	1,500 m <sup>3</sup> /hr 20 ppm 50°C 2 kg/cm <sup>2</sup>	3,000 m <sup>3</sup> /hr
(3) Dust collection system			
1) Dust collection water	Amount of recirculating water: 1 vs 850 m <sup>3</sup> /hr, 2 vs 850 m <sup>3</sup> SS in recirculating water: Feed water temperature:	/hr 100 ppm 35°C	1 vs 1,700 m <sup>3</sup> /hr 2 vs 1,700 m <sup>3</sup> /hr
(4) Dry pit system	Return water temp.: Feed water pressure:	45°C 8 kg/cm²	
1) Dry pit water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Feed water pressure:	200 m <sup>3</sup> /hr 50 ppm 60°C 4 kg/cm <sup>2</sup>	400 m³/hr
(5) Pig casting machine system		anda 2014 - Angelandar Angelandar 2014 - Angelandar Angelandar Angelandar Angelandar Angelandar Angelandar Angelandar Angelandar Angelandar Angel	
(1) Pig casting machine water	Amount of recirculating water: Feed water temperature: Feed water pressure:	600 m <sup>3</sup> /hr 75°C 2 kg/cm²	600 m³ <i>/</i> hr
Water recirculation facilities for lime plant			
(1) Limestone cleaning system	Amount of limestone treated: 219,630 t/y = 25.1 t/hr Amount of treating water: Feed water quality:	200 m³/hr	440,540 t/y = 50.3 t/hr 400 m³/hr
	SS: Temp : The rate of suspended solid gene assumed to be 1% of raw limesto Therefore, the amount of susper will be 250 kg/hr Feed water pressure:	one.	500 kg/hr
	Remarks The amount of suspended s depending on the extent to treatment of raw limestone cleaning, etc.) has been made This plan is based on the assu	which pre- e (flushing, in the mine. imption that	
	1% of raw limestone to be tre generated as suspended solids because of lack of information size distribution of suspende course grain separating tank wil	ated will be In addition, on the grain of solids, a I be installed	
	to prevent coarse grains over from entering the sedimentatic subsequent processes.	100 in size	den de la composition de la composition de la composition de la composition de la composition de la composition de la c
(2) Dehydrator cleaning water and dust collecting system	Amount of treating water: Feed water quality: SS: Temp.:	220 m <sup>3</sup> /hr 100 ppm 50°C	440 m³/hr

(3) Machinery cooling system       Feed water pressure: Dehydrator system: 3 kg/cm² Dust collector system: 2 kg/cm²       140 m³/hr         (3) Machinery cooling system       Amount of recirculating water: 70 m³/hr       140 m³/hr         (3) Machinery cooling system       Amount of recirculating water: 70 m³/hr       140 m³/hr         (1) OG cooling system       Temp.: 35°C       Feed water pressure: 5 kg/cm²       140 m³/hr         (1) OG cooling system       Amount of recirculating water: 5 kg/cm²       Max. 3,500 m³/hr         (1) OG cooling of lance and vessel       Amount of recirculating water: 50°C       Max. 1,000 m³/hr         (2) Cooling of lance and vessel       Amount of recirculating water: 11 kg/cm²       Max. 1,000 m³/hr         (2) Dust collecting system       Amount of recirculating water: 30°C       Max. 1,000 m³/hr         (2) Dust collecting system       Amount of recirculating water: 11 kg/cm²       Max. 1,000 m³/hr         (2) Dust collecting system       Amount of recirculating water: 30°C       Max. 1,000 m³/hr         (2) Dust collecting system       Amount of recirculating water: 100 ppm       Max. 2,400 m³/hr         (2) Dust collecting system       Amount of recirculating water: 100 ppm       Max. 1,600 m³/hr         (2) Dust collecting system       Amount of recirculating water: 100 ppm       Max. 2,400 m³/hr         (2) Higb-pressure       Amount of recirculating water: 5	(3) Machinery cooling system       Feed water pressure: Dely dretor system: Status       3 kg/cm³ 2 kg/cm³         (3) Machinery cooling system       Amount of recirculating water: Tentp: Status       20 ppm 35 kg/cm³         (4) Mathinery cooling system       Amount of recirculating water: Tentp: Status       20 ppm 35 kg/cm³         (1) OG cooling system       Amount of recirculating water: Max. 3,200 m³/hr, Avg, 1,200 m³/hr Status       Max. 3,600 m³/hr Avg. 2,400 m³/hr Avg. 2,400 m³/hr         (2) Cooling of lance and vessel       Amount of recirculating water: Max. 700 m³/hr, Avg, 350 m³/hr Feed water pressure: 11 kg/cm³       Max. 1,000 m³/hr Avg. 700 m³/hr Avg. 700 m³/hr         (2) Dust collecting water       Amount of recirculating water: Max, 1,000 m³/hr, Avg, 350 m³/hr Feed water pressure: 14 kg/cm³       Max. 1,000 m³/hr Avg. 1,000 m³/hr         (2) Dust collecting water       Amount of recirculating water: Max, 1,000 m³/hr, Avg, 300 m³/hr Feed water pressure: 30 miscellaneous water       Amount of recirculating water: Max, 200 m³/hr, Avg. 300 m³/hr Avg. 200 m³/hr         (3) Miscellaneous water       Amount of recirculating water: Max. 300 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr         (4) Soft water       Amount of recirculating water: Mak. 420 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr         (2) High-pressure miscellaneous water       Amount of recirculating water: Max. 30 m3/hr Avg. 200 m³/hr	(3) Machinery cooling system       Feed water pressure: Dely dretor system: Status       3 kg/cm³ 2 kg/cm³         (3) Machinery cooling system       Amount of recirculating water: Tentp: Status       20 ppm 35 kg/cm³         (4) Mathinery cooling system       Amount of recirculating water: Tentp: Status       20 ppm 35 kg/cm³         (1) OG cooling system       Amount of recirculating water: Max. 3,200 m³/hr, Avg, 1,200 m³/hr Status       Max. 3,600 m³/hr Avg. 2,400 m³/hr Avg. 2,400 m³/hr         (2) Cooling of lance and vessel       Amount of recirculating water: Max. 700 m³/hr, Avg, 350 m³/hr Feed water pressure: 11 kg/cm³       Max. 1,000 m³/hr Avg. 700 m³/hr Avg. 700 m³/hr         (2) Dust collecting water       Amount of recirculating water: Max, 1,000 m³/hr, Avg, 350 m³/hr Feed water pressure: 14 kg/cm³       Max. 1,000 m³/hr Avg. 1,000 m³/hr         (2) Dust collecting water       Amount of recirculating water: Max, 1,000 m³/hr, Avg, 300 m³/hr Feed water pressure: 30 miscellaneous water       Amount of recirculating water: Max, 200 m³/hr, Avg. 300 m³/hr Avg. 200 m³/hr         (3) Miscellaneous water       Amount of recirculating water: Max. 300 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr         (4) Soft water       Amount of recirculating water: Mak. 420 m³/hr Avg. 200 m³/hr Avg. 200 m³/hr         (2) High-pressure miscellaneous water       Amount of recirculating water: Max. 30 m3/hr Avg. 200 m³/hr		Items	Stage I	Stage II
(3) Machinery cooling system       Amount of recirculating water: 70 m <sup>3</sup> hr Feed water quality: S: 20 ppm Temp.: 35°C Feed water pressure: 5 kg/cm <sup>3</sup> 140 m <sup>3</sup> /hr         Water recirculation facilities for BOF plant       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Si ni recirculating water: Max. 2,300 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Heat water temp.: 83°C Return water temp.: 70°C Return water temp.: 70°C Feed water pressure: 14 kg/cm <sup>3</sup> Max. 1,000 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h Avg. 2,000 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 350 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 360 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 360 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr, Avg. 100 ppm Feed water temperature: 50°C Return water temp.       Max. 2,000 m <sup>3</sup> /hr Avg. 1,600 m <sup>3</sup> /hr Max. 200 m <sup>3</sup>	(3) Machinery cooling system       Amount of recirculating water: 70 m <sup>3</sup> hr Feed water quality: S: 20 ppm Temp.: 35°C Feed water pressure: 5 kg/cm <sup>3</sup> 140 m <sup>3</sup> /hr         Water recirculation facilities for BOF plant       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Si ni recirculating water: Max. 2,300 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Heat water temp.: 83°C Return water temp.: 70°C Return water temp.: 70°C Feed water pressure: 14 kg/cm <sup>3</sup> Max. 1,000 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h Avg. 2,000 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 350 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 360 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr. Avg. 360 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr Max. 200 m <sup>3</sup> /hr, Avg. 100 ppm Feed water temperature: 50°C Return water temp.       Max. 2,000 m <sup>3</sup> /hr Avg. 1,600 m <sup>3</sup> /hr Max. 200 m <sup>3</sup>	(3) Machinery cooling system       Amount of recirculating water: 20 m <sup>3</sup> hr Feed water quality: SS 20 ppm Temp: 35°C Feed water temperature: 5 kp/cm <sup>3</sup> 140 m <sup>3</sup> /hr         (1) OG cooling system       Amount of recirculating water: Max: 2,300 m <sup>3</sup> /hr, Avg. 1,200 m <sup>3</sup> /hr Sin recirculating water: Max: 2,300 m <sup>3</sup> /hr, Avg. 1,200 m <sup>3</sup> /hr       Max: 3,500 m <sup>4</sup> /hr Avg. 2,400 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /hr Sin recirculating water: Max: 3,500 m <sup>3</sup> /hr Feed water temperature: 53°C Feed water temperature: 53°C Feed water temperature: 50°C Feed water temperature: 50°C Feed water temperature: 50°C Feed water temperature: 30°C Feed water temperature: 30°C Amount of water to be treated: 9 m <sup>3</sup> /hr Ouality of raw water: Max: 230 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr Avg. 280 m <sup>3</sup> /hr Max: 420 m <sup>3</sup> /hr Max: 420 m <sup>3</sup> /hr Max: 420 m <sup>3</sup> /hr Max: 420 m <sup>3</sup> /hr Max: 30°C m <sup>3</sup> /hr So for water         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr Ouality of raw water: SS 30 ppm SS 0 ppm SS 30 ppm SS 30 ppm SS 30 ppm SS 30 ppm       Max: 420 m <sup>3</sup> /hr Avg. 280 m <sup>3</sup> /hr         1) Mould (slab)       Amount of recirculating water: 20 ppm       1,700 m <sup>3</sup> /hr			Dehydrator system 3 kg/cm <sup>2</sup>	
SS Tend 20 Tend 20 Tend 20 Tend 20 To BOE plantSS SC Teed warter pressure: $35^{\circ}C_{\circ}$ Teed warter pressure:Max. 3.500 m³/hr Avg. 1.200 m³/hr Avg. 2.400 m³/hr Avg. 2.00 m³/hr Avg. 2.00 m³/hr Avg. 2.00 m³/hr Avg. 2.60 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 2.60	SS Tend 20 Tend 20 Tend 20 Tend 20 To BOE plantSS SC Teed warter pressure: $35^{\circ}C_{\circ}$ Teed warter pressure:Max. 3.500 m³/hr Avg. 1.200 m³/hr Avg. 2.400 m³/hr Avg. 2.00 m³/hr Avg. 2.00 m³/hr Avg. 2.00 m³/hr Avg. 2.60 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 2.60	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Amount of recirculating water: 70 m <sup>3</sup> /hr	140 m³/hr
Water recirculation facilities for BOE plant       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Avg. 1,200 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h S in recirculating water: Feed water remportance: S in recirculating water: Feed water pressure: 11 kg/cm <sup>3</sup> Max. 3,500 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h Avg. 7,00 m <sup>3</sup> /h Avg. 2,00 m <sup>3</sup> /h Avg	Water recirculation facilities for BOE plant       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Avg. 1,200 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h S in recirculating water: Feed water remportance: S in recirculating water: Feed water pressure: 11 kg/cm <sup>3</sup> Max. 3,500 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h Avg. 7,00 m <sup>3</sup> /h Avg. 2,00 m <sup>3</sup> /h Avg	Water recirculation facilities for BOF plant       Amount of recirculating water: Max. 2,000 m <sup>3</sup> /nr. Avg. 1,200 m <sup>3</sup> /nr SS in recirculating water: Max. 2,000 m <sup>3</sup> /nr. Avg. 1,200 m <sup>3</sup> /nr SS in recirculating water: Return water temp.:       Max. 3,500 m <sup>3</sup> /nr Avg. 2,400 m <sup>3</sup> /nr SS in recirculating water: Return water temp.:       Max. 3,500 m <sup>3</sup> /nr Avg. 2,400 m <sup>3</sup> /nr Avg. 2,000 m <sup>3</sup> /nr Max. 3,500 m <sup>3</sup> /nr Max. 2,000 m <sup>3</sup> /nr Si nit recirculating water: Max. 2,000 m <sup>3</sup> /nr Si nit recirculating water: Max. 2,000 m <sup>3</sup> /nr Max.			SS: 20 ppm Temp.: 35°C	
(1) OG cooling system       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Ayg. 1,200 m <sup>3</sup> /hr Sin incicculating water: Sin incicculating water: Feed water temperature: Sin cricculating water: Max. 3,500 m <sup>3</sup> /hr Feed water temperature: Sin cricculating water: Max. 1,000 m <sup>3</sup> /hr Return water temp: Water       Max. 3,500 m <sup>3</sup> /hr Ayg. 2,400 m <sup>3</sup> /h Ayg. 2,400 m <sup>3</sup> /hr Ayg. 2,400 m <sup>3</sup> /hr Feed water pressure: Max. 1,000 m <sup>3</sup> /hr Return water temp: Max. 700 m <sup>3</sup> /hr Return water temp: Max. 700 m <sup>3</sup> /hr Return water temp: Sin inter cricculating water: Max. 1,600 m <sup>3</sup> /hr Ayg. 2,60 m <sup>3</sup> /hr Ayg	(1) OG cooling system       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Ayg. 1,200 m <sup>3</sup> /hr Sin incicculating water: Sin incicculating water: Feed water temperature: Sin cricculating water: Max. 3,500 m <sup>3</sup> /hr Feed water temperature: Sin cricculating water: Max. 1,000 m <sup>3</sup> /hr Return water temp: Water       Max. 3,500 m <sup>3</sup> /hr Ayg. 2,400 m <sup>3</sup> /h Ayg. 2,400 m <sup>3</sup> /hr Ayg. 2,400 m <sup>3</sup> /hr Feed water pressure: Max. 1,000 m <sup>3</sup> /hr Return water temp: Max. 700 m <sup>3</sup> /hr Return water temp: Max. 700 m <sup>3</sup> /hr Return water temp: Sin inter cricculating water: Max. 1,600 m <sup>3</sup> /hr Ayg. 2,60 m <sup>3</sup> /hr Ayg	(1) OG cooling system       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Avg. 1,200 m <sup>3</sup> /hr Si in recirculating water: Si mericulating water: Si mericulating water: Wassel       Max. 3,500 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h Avg. 2,000 m <sup>3</sup> /h Avg. 2,000 m <sup>3</sup> /h Avg. 3,000 m <sup>3</sup> /h Avg. 2,000 m <sup></sup>				
1) OG cooling       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Aug. 1,200 m <sup>3</sup> /hr S in recirculating water: Feed water temperature: S <sup>3</sup> C Feed water pressure: 11 kg/cm <sup>3</sup> Max. 3,500 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h         2) Cooling of lance and vessel       Amount of recirculating water: Feed water pressure: 11 kg/cm <sup>3</sup> Max. 1,000 m <sup>3</sup> /hr Avg. 700 m <sup>3</sup> /hr         2) Dust collecting system       Amount of recirculating water: Max. 1,600 m <sup>3</sup> /hr, Avg. 350 m <sup>3</sup> /hr       Max. 1,000 m <sup>3</sup> /hr         1) Dust collecting water       Amount of recirculating water: Max. 1,600 m <sup>3</sup> /hr, Avg. 300 m <sup>3</sup> /hr       Max. 2,400 m <sup>3</sup> /h Avg. 700 m <sup>3</sup> /h         2) High-pressure miscellaneous water       Amount of recirculating water: Max. 280 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr       Max. 380 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         3) Miscellaneous water       Amount of recirculating water: miscellaneous water       Amount of recirculating water: Max. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         5) C = 2 prom (as CaCO <sub>3</sub> ) SO <sub>4</sub> So ~ 62 ppm (as CaCO <sub>3</sub> ) SS = 10 ppm Ca = 1 ppm Ca = 1 ppm (as CaCO <sub>3</sub> ) pH Neutral	1) OG cooling       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr, Aug. 1,200 m <sup>3</sup> /hr S in recirculating water: Feed water temperature: S <sup>3</sup> C Feed water pressure: 11 kg/cm <sup>3</sup> Max. 3,500 m <sup>3</sup> /hr Avg. 2,400 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h         2) Cooling of lance and vessel       Amount of recirculating water: Feed water pressure: 11 kg/cm <sup>3</sup> Max. 1,000 m <sup>3</sup> /hr Avg. 700 m <sup>3</sup> /hr         2) Dust collecting system       Amount of recirculating water: Max. 1,600 m <sup>3</sup> /hr, Avg. 350 m <sup>3</sup> /hr       Max. 1,000 m <sup>3</sup> /hr         1) Dust collecting water       Amount of recirculating water: Max. 1,600 m <sup>3</sup> /hr, Avg. 300 m <sup>3</sup> /hr       Max. 2,400 m <sup>3</sup> /h Avg. 700 m <sup>3</sup> /h         2) High-pressure miscellaneous water       Amount of recirculating water: Max. 280 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr       Max. 380 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         3) Miscellaneous water       Amount of recirculating water: miscellaneous water       Amount of recirculating water: Max. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /h Avg. 280 m <sup>3</sup> /hr         5) C = 2 prom (as CaCO <sub>3</sub> ) SO <sub>4</sub> So ~ 62 ppm (as CaCO <sub>3</sub> ) SS = 10 ppm Ca = 1 ppm Ca = 1 ppm (as CaCO <sub>3</sub> ) pH Neutral	1) OG cooling       Amount of recirculating water: Max. 2,300 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Si ni recirculating water: Si ni recirculating water: Si ni recirculating water: Max. 700 m <sup>3</sup> /hr. Avg. 1,200 m <sup>3</sup> /hr Feed water pressure: 11 kg/cm <sup>3</sup> Max. 1,000 m <sup>3</sup> /h Avg. 2,400 m <sup>3</sup> /h Avg. 700 m <sup>3</sup> /h Avg. 260				
2)Cooling of lance and vesselFeed water temp.erature: Return water temp. Bax 700 m²/hr, Avg. 350 m³/hr Neturn water temp. Max. 700 m²/hr, Avg. 350 m³/hr Return water temp. Teed water pressure:Max. 1,000 m³/kr Avg. 700 m²/hr Avg. 700 m²/hr(2)Dust collecting systemAmount of recirculating water: Max. 1,600 m³/hr, Avg. 800 m³/hr SS in the recirculating water: Max. 1,600 m³/hr, Avg. 800 m³/hr SS in the recirculating water: Teed water pressure:Max. 2,400 m³/kr Avg. 1,600 m²/hr Avg. 1,600 m³/hr Avg. 1,600 m³/hr SS in the recirculating water: Teed water pressure: Max. 250 m²/hr, Avg. 130 m³/hr Feed water pressure: Teed	2)Cooling of lance and vesselFeed water temp.erature: Return water temp. Bax 700 m²/hr, Avg. 350 m³/hr Neturn water temp. Max. 700 m²/hr, Avg. 350 m³/hr Return water temp. Teed water pressure:Max. 1,000 m³/kr Avg. 700 m²/hr Avg. 700 m²/hr(2)Dust collecting systemAmount of recirculating water: Max. 1,600 m³/hr, Avg. 800 m³/hr SS in the recirculating water: Max. 1,600 m³/hr, Avg. 800 m³/hr SS in the recirculating water: Teed water pressure:Max. 2,400 m³/kr Avg. 1,600 m²/hr Avg. 1,600 m³/hr Avg. 1,600 m³/hr SS in the recirculating water: Teed water pressure: Max. 250 m²/hr, Avg. 130 m³/hr Feed water pressure: Teed	2) Cooling of lance and vessel       Feed water temperature:       53°C         7       Feed water pressure:       11 kg/cm³         2) Cooling of lance and vessel       Amount of recirculating water:       Max. 1,000 m³/r         (2) Dust collecting system       Amount of recirculating water:       Max. 2,400 m³/r         1) Dust collecting water       Amount of recirculating water:       Max. 2,400 m³/r         2) High-pressure       Amount of recirculating water:       Max. 2,400 m³/r         2) High-pressure       Amount of recirculating water:       Max. 2,400 m³/r         3) Miscellaneous water       Max. 220 m³/hr, Avg. 130 m³/hr       Max. 380 m³/r         4) Soft water       Amount of feed water:       Max. 240 m³/hr         4) Soft water       Amount of tecirculating water:       Max. 240 m²/hr         4) Soft water       Amount of water to be treated: 9 m³/hr       Max. 420 m²/hr         4) Soft water       Amount of water to be frequed: 9 m³/hr       Max. 420 m²/hr         4) Soft water       Amount of water to be frequed: 9 m³/hr       Max. 420 m²/hr         5) Solid bar of treater to be treated: 9 m³/hr       Max. 420 m²/hr         4) Soft water       Amount of tecirculating water:       70 ppm (as CaCo <sub>3</sub> )         Solid bar of treater water       Solid bar       Solid bar of treater		A second s	Amount of recirculating water: Max, 2,300 m <sup>3</sup> /hr, Avg, 1,200 m <sup>3</sup> /hr SS in recirculation water: 5 PPM	Max. 3,500 m <sup>3</sup> / Avg. 2,400 m <sup>3</sup> /
2)       Cooling of lance and vessel       Amount of recirculating water: Max, 700 m <sup>3</sup> /hr, Avg, 350 m <sup>3</sup> /hr, Avg. 700 m <sup>3</sup> /h       Max, 1,000 m <sup>3</sup> /hr, Avg. 350 m <sup>3</sup> /hr, Avg. 700 m <sup>3</sup> /h         (2)       Dust collecting system       1       Dust collecting water       Max, 1,600 m <sup>3</sup> /hr, Avg. 360 m <sup>3</sup> /hr, Avg. 100 ppm         1)       Dust collecting water       Amount of recirculating water: 100 ppm       Max. 2,400 m <sup>3</sup> /hr, Avg. 100 ppm         2)       High-pressure miscellaneous water       Amount of recirculating water: 20° C       Max. 380 m <sup>3</sup> /hr         3)       Miscellaneous water       Amount of recirculating water: 35° C       Max. 250 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water treated: 9 m <sup>3</sup> /hr, Avg. 260 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr, Avg. 260 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water: Max. 250 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4)       Soft water       Amount of feed water: Max. 230 m <sup>3</sup> /hr, Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         5)       Qa framewater: Distributer: 35° C       Peed water treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4)       Soft water       Amount of feed water: 35 C       Max. 280 m <sup>3</sup> /hr       Max. 280 m <sup>3</sup> /hr         6)       Ga framewater: 35       Ga 20 ppm (as CaCO <sub>3</sub> )       So 4 5 ~ 38 ppm (as CaCO <sub>3</sub> )       So 7 60 ppm         10       Nol	2)       Cooling of lance and vessel       Amount of recirculating water: Max, 700 m <sup>3</sup> /hr, Avg, 350 m <sup>3</sup> /hr, Avg. 700 m <sup>3</sup> /h       Max, 1,000 m <sup>3</sup> /hr, Avg. 350 m <sup>3</sup> /hr, Avg. 700 m <sup>3</sup> /h         (2)       Dust collecting system       1       Dust collecting water       Max, 1,600 m <sup>3</sup> /hr, Avg. 360 m <sup>3</sup> /hr, Avg. 100 ppm         1)       Dust collecting water       Amount of recirculating water: 100 ppm       Max. 2,400 m <sup>3</sup> /hr, Avg. 100 ppm         2)       High-pressure miscellaneous water       Amount of recirculating water: 20° C       Max. 380 m <sup>3</sup> /hr         3)       Miscellaneous water       Amount of recirculating water: 35° C       Max. 250 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water treated: 9 m <sup>3</sup> /hr, Avg. 260 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr, Avg. 260 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water: Max. 250 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4)       Soft water       Amount of feed water: Max. 230 m <sup>3</sup> /hr, Avg. 280 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         5)       Qa framewater: Distributer: 35° C       Peed water treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4)       Soft water       Amount of feed water: 35 C       Max. 280 m <sup>3</sup> /hr       Max. 280 m <sup>3</sup> /hr         6)       Ga framewater: 35       Ga 20 ppm (as CaCO <sub>3</sub> )       So 4 5 ~ 38 ppm (as CaCO <sub>3</sub> )       So 7 60 ppm         10       Nol	2) Cooling of lance and vessel       Amount of recirculating water: Max, 700 m <sup>3</sup> /hr, Ayg, 350 m <sup>3</sup> /hr Return water tempersure: Max, 1,600 m <sup>3</sup> /hr, Ayg, 300 m <sup>3</sup> /hr       Max, 1,000 m <sup>3</sup> /h Ayg, 700 m <sup>3</sup> /h         (2) Dust collecting system       Amount of recirculating water: Max, 1,600 m <sup>3</sup> /hr, Ayg, 800 m <sup>3</sup> /hr Sin the recirculating water: Max, 1,600 m <sup>3</sup> /hr, Ayg, 100 m <sup>3</sup> /hr       Max, 2,400 m <sup>3</sup> /h Ayg, 1,600 m <sup>3</sup> /hr         (2) High-pressure miscellaneous water       Amount of recirculating water: Max, 250 m <sup>3</sup> /hr, Ayg, 130 m <sup>3</sup> /hr       Max, 380 m <sup>3</sup> /h Ayg, 260 m <sup>3</sup> /hr         3) Miscellaneous water       Max, 250 m <sup>3</sup> /hr, Ayg, 140 m <sup>3</sup> /hr       Max, 320 m <sup>3</sup> /hr         4) Soft water       Amount of feed water: Maklainity for aw water: Maklainity of raw water: Maklainity for aw park is So <sub>4</sub>			Feed water temperature: 53°C Return water temp.: 83°C	an an Antoniadh An Antoniadh An Antoniadh
(2) Dust collecting systemFeed water pressure: $14 \text{ kg/cm}^2$ (2) Dust collecting waterAmount of recirculating water:Max. $2,400 \text{ m}^3/\text{hr}$ (2) Dust collecting waterAmount of recirculating water:100 ppmSin the recirculating water: $50^\circ$ CReturn water tempe: $70^\circ$ CFeed water temperature: $50^\circ$ CReturn water temp: $70^\circ$ CFeed water temperature: $30^\circ$ CFeed water pressure:Max. $380 \text{ m}^3/\text{h}$ 3) Miscellaneous waterAmount of recirculating water:Max. $420 \text{ m}^3/\text{h}$ 4) Soft waterAmount of teed water to be treated: $9 \text{ m}^3/\text{h}$ Max. $420 \text{ m}^3/\text{h}$ $0ultry of raw water:$ Malkalinity $50 \sim 62 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ ) $18 \text{ m}^3/\text{hr}$ Mg $10 \sim 32 \text{ ppm}$ (as $CaCO_3$ )SK $10 \text{ ppm}$ (as $CaCO_3$ ) $14 \text{ m}^3/\text{hr}$ Water recirculation facilities for continuous casting $1,700 \text{ m}^3/\text{hr}$ $1,700 \text{ m}^3/\text{hr}$ (1) Mould (slab)Amount of recirculating water: $840 \text{ m}^3/\text{hr}$ $1,700 \text{ m}^3/\text{hr}$	(2) Dust collecting systemFeed water pressure: $14 \text{ kg/cm}^2$ (2) Dust collecting waterAmount of recirculating water:Max. $2,400 \text{ m}^3/\text{hr}$ (2) Dust collecting waterAmount of recirculating water:100 ppmSin the recirculating water: $50^\circ$ CReturn water tempe: $70^\circ$ CFeed water temperature: $50^\circ$ CReturn water temp: $70^\circ$ CFeed water temperature: $30^\circ$ CFeed water pressure:Max. $380 \text{ m}^3/\text{h}$ 3) Miscellaneous waterAmount of recirculating water:Max. $420 \text{ m}^3/\text{h}$ 4) Soft waterAmount of teed water to be treated: $9 \text{ m}^3/\text{h}$ Max. $420 \text{ m}^3/\text{h}$ $0ultry of raw water:$ Malkalinity $50 \sim 62 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ )SO_4 $5 \sim 38 \text{ ppm}$ (as $CaCO_3$ ) $18 \text{ m}^3/\text{hr}$ Mg $10 \sim 32 \text{ ppm}$ (as $CaCO_3$ )SK $10 \text{ ppm}$ (as $CaCO_3$ ) $14 \text{ m}^3/\text{hr}$ Water recirculation facilities for continuous casting $1,700 \text{ m}^3/\text{hr}$ $1,700 \text{ m}^3/\text{hr}$ (1) Mould (slab)Amount of recirculating water: $840 \text{ m}^3/\text{hr}$ $1,700 \text{ m}^3/\text{hr}$	(2) Dust collecting systemFeed water pressure: $14 \text{ kg/cm}^2$ 1) Dust collecting waterAmount of recirculating water: Max 1,600 m³/hr, Avg, 800 m³/hr SS in the recirculating water: Teed water temperature: Beturn water temperature: Max 250 m³/hr, Avg, 130 m³/hr Feed water temperature: SS chart for constraint waterMax. 2400 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 1.600 m³/hr Avg. 250 m³/hr, Avg. 130 m³/hr Avg. 250 m³/hr Avg. 260 m³/hr Avg. 260 m³/hrMax. 390 m³/hr Avg. 260 m³/hr Avg. 260 m³/hr Avg. 260 m³/hr Avg. 260 m³/hr3) Miscellaneous waterAmount of recirculating water: Makalinity 50 ~62 ppm (as CaCO_3) SO4 5 ~38 ppm (as SO_4) C1 - 5 ~ 10 ppm (as CaCO_3) SO4 5 ~38 ppm (as SO_4) Ca 16 ~35 ppm (as CaCO_3) SS 10 ppm Total hardness: 129 ~ 166 ppm (as CaCO_3) SS 10 ppm Total hardness: 129 ~ 166 ppm (as CaCO_3) pH NeutralMax. 420 m³/hr Avg. 280 m³/hrWater recirculation facilities for continuous casting (1) Mould (slab)Amount of recirculating water: 840 m³/hr1,700 m³/hr1) Mould (slab)Amount of recirculating water: 20 ppm1,700 m³/hr1,700 m³/hr			Amount of recirculating water: Max, 700 m <sup>3</sup> /hr, Avg, 350 m <sup>3</sup> /hr	Max. 1,000 m <sup>3</sup> / Avg. 700 m <sup>3</sup> /
1) Dust collecting water       Amount of recirculating water:       Max. 1,600 m³/hr; Avg. 800 m³/hr; Avg. 100 ppm         Sin the recirculating water:       100 ppm         Sin the recirculating water:       100 ppm         Feed water temperature:       50° C         Return water temp:       70° C         Feed water temperature:       35 kg/cm²         Amount of recirculating water:       Max. 380 m³/hr; Avg. 130 m³/hr;         Feed water temperature:       35° C         7       Feed water temperature:       35° C         8       Max. 280 m³/hr, Avg. 140 m³/hr       Avg. 280 m²/hr         4) Soft water       Amount of water to be treated: 9 m³/hr       Max. 420 m²/h         0a at 5 ~ 38 ppm (as CaCO <sub>3</sub> )       SO <sub>4</sub> 5 ~ 38 ppm (as SO <sub>4</sub> 18 m³/hr         18 m³/hr       Ouality of reaveater:       Sof water:       Max       18 m³/hr         18 m³/hr       Oppm       as CaCO <sub>3</sub> )       SS       10 ppm       10 ppm	1) Dust collecting water       Amount of recirculating water:       Max. 1,600 m³/hr; Avg. 800 m³/hr; Avg. 100 ppm         Sin the recirculating water:       100 ppm         Sin the recirculating water:       100 ppm         Feed water temperature:       50° C         Return water temp:       70° C         Feed water temperature:       35 kg/cm²         Amount of recirculating water:       Max. 380 m³/hr; Avg. 130 m³/hr;         Feed water temperature:       35° C         7       Feed water temperature:       35° C         8       Max. 280 m³/hr, Avg. 140 m³/hr       Avg. 280 m²/hr         4) Soft water       Amount of water to be treated: 9 m³/hr       Max. 420 m²/h         0a at 5 ~ 38 ppm (as CaCO <sub>3</sub> )       SO <sub>4</sub> 5 ~ 38 ppm (as SO <sub>4</sub> 18 m³/hr         18 m³/hr       Ouality of reaveater:       Sof water:       Max       18 m³/hr         18 m³/hr       Oppm       as CaCO <sub>3</sub> )       SS       10 ppm       10 ppm	1)       Dust collecting water       Amount of recirculating water:       Max. 1,600 m³/hr         water       Sin the recirculating water:       100 ppm         Sin the recirculating water:       50°C         Return water temperature:       50°C         Return water temperature:       50°C         Return water temperature:       85 kg/cm²         Amount of recirculating water:       Max. 380 m³/n         Max. 2200 m³/hr, Avg. 130 m³/hr       Avg. 260 m³/n         Amount of recirculating water:       8.5 kg/cm²         Max. 220 m³/hr, Avg. 130 m³/hr       Avg. 260 m³/n         Amount of recirculating water:       Max. 420 m³/n         Max. 280 m³/hr, Avg. 140 m³/hr       Avg. 280 m³/n         Amount of trecirculating water:       Max. 420 m³/n         Amount of water to be treated: 9 m³/hr       Max. 420 m³/n         Amount of water to be treated: 9 m³/hr       Max. 420 m³/n         Arg. 280 m³/n; Avg. 280 m³/n;       Max. 280 m³/n;         Amount of water to be treated: 9 m³/hr       Max. 420 m³/n;         Max. 280 m³/n; Avg. 140 m³/hr       Max. 420 m³/n;         Max. 280 m³/n; Avg. 140 m³/n;       Max. 420 m³/n;         Max. 280 m³/n; Avg. 140 m³/n;       Max. 420 m³/n;         Max. 160 ppm       Soft water         Mag 10 ~ 32 ppm				
waterMax. 1,600 m?/nr. Avg. 800 m²/nrAvg. 1,600 m²/nrSin the recirculating water:100 ppmFeed water temperature:50°CReturn water temp:70°CFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/hrMax. 250 m³/hr, Avg. 130 m³/hrAvg. 1600 m³/nFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/nMax. 250 m³/hr, Avg. 130 m³/hrAvg. 260 m³/nFeed water pressure:7 kg/cm²Amount of feed water temperature:35°CFeed water pressure:7 kg/cm²Amount of feed water:Max. 420 m²/nMax. 280 m³/hr, Avg. 140 m³/hrAvg. 280 m²/n4) Soft waterAmount of water to be treated: 9 m³/hrMax. 1600 content of a state temperature:950pm (as CaCO3)SO45 $\sim$ 38 ppm (as CaC)SO223 $\sim$ 95 ppm (as CaC)SS10 ppmSS10 ppmTotal hardness129 $\sim$ 166 ppm (as CaCO3)SS10 ppmTotal hardness129 $\sim$ 166 ppm (as CaCO3)PH7.5 $\sim$ 8Quality of treated water:SSSS3 ppmCa1 ppm (as CaCO3)pHNeutralMater recirculation facilitiesfor continuous casting(1) Mould (slab)Amount of recirculating water:840 m³/hr1Amount of recirculating water:840 m³/hr11Amount of recirculating water:840 m³/hr <td>waterMax. 1,600 m?/nr. Avg. 800 m²/nrAvg. 1,600 m²/nrSin the recirculating water:100 ppmFeed water temperature:50°CReturn water temp:70°CFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/hrMax. 250 m³/hr, Avg. 130 m³/hrAvg. 1600 m³/nFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/nMax. 250 m³/hr, Avg. 130 m³/hrAvg. 260 m³/nFeed water pressure:7 kg/cm²Amount of feed water temperature:35°CFeed water pressure:7 kg/cm²Amount of feed water:Max. 420 m²/nMax. 280 m³/hr, Avg. 140 m³/hrAvg. 280 m²/n4) Soft waterAmount of water to be treated: 9 m³/hrMax. 1600 content of a state temperature:950pm (as CaCO3)SO45 <math>\sim</math> 38 ppm (as CaC)SO223 <math>\sim</math> 95 ppm (as CaC)SS10 ppmSS10 ppmTotal hardness129 <math>\sim</math> 166 ppm (as CaCO3)SS10 ppmTotal hardness129 <math>\sim</math> 166 ppm (as CaCO3)PH7.5 <math>\sim</math> 8Quality of treated water:SSSS3 ppmCa1 ppm (as CaCO3)pHNeutralMater recirculation facilitiesfor continuous casting(1) Mould (slab)Amount of recirculating water:840 m³/hr1Amount of recirculating water:840 m³/hr11Amount of recirculating water:840 m³/hr<td>WaterMax. 1,600 III/III. Avg. 800 m²/nr Feed water temperature:Avg. 1,600 m²/n feed water temperature:Avg. 260 m²/n feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 280 m³/n for feed water:Max. 420 m²/n for feed water:Max. 420 m</td><td>•</td><td>1</td><td></td><td></td></td>	waterMax. 1,600 m?/nr. Avg. 800 m²/nrAvg. 1,600 m²/nrSin the recirculating water:100 ppmFeed water temperature:50°CReturn water temp:70°CFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/hrMax. 250 m³/hr, Avg. 130 m³/hrAvg. 1600 m³/nFeed water pressure:8,5 kg/cm²Amount of recirculating water:Max. 380 m³/nMax. 250 m³/hr, Avg. 130 m³/hrAvg. 260 m³/nFeed water pressure:7 kg/cm²Amount of feed water temperature:35°CFeed water pressure:7 kg/cm²Amount of feed water:Max. 420 m²/nMax. 280 m³/hr, Avg. 140 m³/hrAvg. 280 m²/n4) Soft waterAmount of water to be treated: 9 m³/hrMax. 1600 content of a state temperature:950pm (as CaCO3)SO45 $\sim$ 38 ppm (as CaC)SO223 $\sim$ 95 ppm (as CaC)SS10 ppmSS10 ppmTotal hardness129 $\sim$ 166 ppm (as CaCO3)SS10 ppmTotal hardness129 $\sim$ 166 ppm (as CaCO3)PH7.5 $\sim$ 8Quality of treated water:SSSS3 ppmCa1 ppm (as CaCO3)pHNeutralMater recirculation facilitiesfor continuous casting(1) Mould (slab)Amount of recirculating water:840 m³/hr1Amount of recirculating water:840 m³/hr11Amount of recirculating water:840 m³/hr <td>WaterMax. 1,600 III/III. Avg. 800 m²/nr Feed water temperature:Avg. 1,600 m²/n feed water temperature:Avg. 260 m²/n feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 280 m³/n for feed water:Max. 420 m²/n for feed water:Max. 420 m</td> <td>•</td> <td>1</td> <td></td> <td></td>	WaterMax. 1,600 III/III. Avg. 800 m²/nr Feed water temperature:Avg. 1,600 m²/n feed water temperature:Avg. 260 m²/n feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 380 m³/n for feed water:Max. 280 m³/n for feed water:Max. 420 m²/n for feed water:Max. 420 m	•	1		
2) High-pressure miscellaneous water       Feed water pressure:       8.5 kg/cm <sup>2</sup> 3) Miscellaneous water       Amount of recirculating water:       30 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr, Feed water pressure:       7 kg/cm <sup>2</sup> 4) Soft water       Amount of feed water; Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /, Avg. 280 m <sup>2</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         Max 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 380 m <sup>3</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /hr         (h) Soft water       Amount of pepm (as CaCO <sub>3</sub> )       Max. 420 m <sup>3</sup> /hr         (h) A treater       So 10 ppm       Mas CaCO <sub>3</sub> (h) H       Ne	2) High-pressure miscellaneous water       Feed water pressure:       8.5 kg/cm <sup>2</sup> 3) Miscellaneous water       Amount of recirculating water:       30 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr, Feed water pressure:       7 kg/cm <sup>2</sup> 4) Soft water       Amount of feed water; Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /, Avg. 280 m <sup>2</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         4) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         Max 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 380 m <sup>3</sup> /hr         (h) Soft water       Amount of water to be treated: 9 m <sup>3</sup> /hr       Max. 420 m <sup>3</sup> /hr         (h) Soft water       Amount of pepm (as CaCO <sub>3</sub> )       Max. 420 m <sup>3</sup> /hr         (h) A treater       So 10 ppm       Mas CaCO <sub>3</sub> (h) H       Ne	2)       High-pressure miscellaneous water       Feed water pressure:       8,5 kg/cm <sup>2</sup> 3)       Miscellaneous water       Amount of recirculating water:       Max. 250 m <sup>3</sup> /hr, Avg. 130 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water temperature:       3 month frequencies       9 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr         4)       Soft water       Amount of feed water:       Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /Avg. 280 m <sup>3</sup> /hr         4)       Soft water       Amount of ted water:       Max. 280 m <sup>3</sup> /hr, Avg. 140 m <sup>3</sup> /hr       Max. 420 m <sup>2</sup> /Avg. 280 m <sup>2</sup> /hr         4)       Soft water       Amount of ted water:       Max. 380 m <sup>3</sup> /hr       Max. 220 m <sup>2</sup> /hr         5)       Quality of raw water:       Max. 380 m <sup>3</sup> /hr       Max. 220 m <sup>2</sup> /hr         6)       Soft water       Amount of ted water:       Max. 380 m <sup>3</sup> /hr         5)       Ca       16 may ppm (as CaCO <sub>3</sub> )       SO <sub>4</sub> 5)       Ca       16 may ppm (as CaCO <sub>3</sub> )       SO <sub>4</sub> 6)       10 mm       (as CaCO <sub>3</sub> )       SS       10 ppm         7       Total hardness:       12 p m (as CaCO <sub>3</sub> )       SS       3 ppm         7       Si n recirculating water:       S40 m <sup>3</sup> /hr       1,700 m <sup>3</sup> /hr         1)       Mould (slab)       Amount o			Max. 1,600 m <sup>3</sup> /hr, Avg, 800 m <sup>3</sup> /hr SS in the recirculating water: 100 PPm Feed water temperature: 50°C	Max. 2,400 m <sup>9</sup> / Avg. 1,600 m <sup>3</sup> /
miscellaneous waterMax. 250 m³/hr, Avg. 130 m³/hr Feed water temperature: 35°C Feed water temperature: 35°C Feed water pressure: 7 kg/cm²Avg. 260 m³/hr Aug. 270 m³/hr3) Miscellaneous waterAmount of feed water: Max. 280 m³/hr, Avg. 140 m³/hrMax. 420 m²/ Avg. 280 m²/h4) Soft waterAmount of water to be treated: 9 m³/hr Ouality of raw water: M-alkalinity 50 ~ 62 ppm (as CaCO_3) SO_4 5 ~ 38 ppm (as CaCO_3) SO_4 5 ~ 38 ppm (as CaCO_3) Ca 16 ~ 35 ppm (as CaCO_3) Ca 16 ~ 35 ppm (as CaCO_3) SS 10 ppmMax. 420 m²/ Avg. 280 m²/hr $Max. 420 m²/hrMax. 420 m²/hr18 m³/hrMax. 200 m²/hrSoft waterMax. 420 m²/hrMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrSoft waterSoft wate$	miscellaneous waterMax. 250 m³/hr, Avg. 130 m³/hr Feed water temperature: 35°C Feed water temperature: 35°C Feed water pressure: 7 kg/cm²Avg. 260 m³/hr Aug. 270 m³/hr3) Miscellaneous waterAmount of feed water: Max. 280 m³/hr, Avg. 140 m³/hrMax. 420 m²/ Avg. 280 m²/h4) Soft waterAmount of water to be treated: 9 m³/hr Ouality of raw water: M-alkalinity 50 ~ 62 ppm (as CaCO_3) SO_4 5 ~ 38 ppm (as CaCO_3) SO_4 5 ~ 38 ppm (as CaCO_3) Ca 16 ~ 35 ppm (as CaCO_3) Ca 16 ~ 35 ppm (as CaCO_3) SS 10 ppmMax. 420 m²/ Avg. 280 m²/hr $Max. 420 m²/hrMax. 420 m²/hr18 m³/hrMax. 200 m²/hrSoft waterMax. 420 m²/hrMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrMax. 200 m²/hr18 m³/hrMax. 200 m²/hrSoft waterSoft waterMax. 200 m²/hrSoft waterSoft wate$	miscellaneous waterMax. 250 m³/hr, Avg. 130 m³/hr Feed water temperature:Avg. 260 m³/ hr S5°C Feed water pressure:Avg. 260 m³/ hr3) Miscellaneous waterAmount of feed water temperature:35°C Feed water pressure:Max. 420 m²/hr Avg. 280 m²/hr4) Soft waterAmount of feed water: Max. 280 m³/hr, Avg. 140 m³/hr Quality of raw water: M-atkalinityMax. 420 m²/hr Avg. 280 m²/hr 18 m³/hrMax. 420 m²/hr Avg. 280 m²/hr 18 m³/hr4) Soft waterAmount of water to be treated: 9 m³/hr Quality of raw water: M-atkalinityMax. 55 m³/hr S0 62 PDm (as CaCO3) S04 Ca 16 ~ 35 PDm (as Ca^1-) SiO2 Ca 23 ~ 95 PDm (as Ca^2+1) Mg SS S 10 PDm Total hardness SS S 10 PDm Total hardness SS Ca 1 PPm (as CaCO3) PH Total hardness SS S 3 PDm Ca 1 PPm (as CaCO3) PH NeutralAvg. 260 m³/hr Avg. 280 m²/hr 18 m³/hrWater recirculation facilities for continuous casting (1) Mould (slab)Amount of recirculating water:840 m³/hr 1,700 m³/hr1) Mould (slab)Amount of recirculating water: SS in recirculating water: 20 Ppm1,700 m³/hr			Feed water pressure: 8.5 kg/cm <sup>2</sup>	
<ul> <li>3) Miscellaneous water</li> <li>4) Soft water</li> <li>5) So<sub>4</sub> = 5 ~ 38 ppm (as CaCO<sub>3</sub>)</li> <li>5) So<sub>4</sub> = 5 ~ 38 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>8) So<sub>2</sub> = 0 ppm (as Ca<sup>2+1</sup>)</li> <li>9) Mathematical states</li> <li>9) Ph</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>9) Ph</li> <li>9) Nould (slab)</li> <li>9) Amount of recirculating water: 840 m<sup>3</sup>/hr</li> <li>1,700 m<sup>3</sup>/hr</li> </ul>	<ul> <li>3) Miscellaneous water</li> <li>4) Soft water</li> <li>5) So<sub>4</sub> = 5 ~ 38 ppm (as CaCO<sub>3</sub>)</li> <li>5) So<sub>4</sub> = 5 ~ 38 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>4+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>6) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>8) So<sub>2</sub> = 0 ppm (as Ca<sup>2+1</sup>)</li> <li>9) Mathematical states</li> <li>9) Ph</li> <li>7) So<sub>2</sub> = 23 ~ 95 ppm (as Ca<sup>2+1</sup>)</li> <li>9) Ph</li> <li>9) Nould (slab)</li> <li>9) Amount of recirculating water: 840 m<sup>3</sup>/hr</li> <li>1,700 m<sup>3</sup>/hr</li> </ul>	3) Miscellaneous water       Amount of feed water: Max. 280 m³/hr, Avg. 140 m³/hr       Max. 420 m²/h Avg. 280 m²/hr         4) Soft water       Amount of water to be treated: 9 m³/hr Ouality of raw water: M-alkalinity 50 ~ 62 ppm (as CaCO <sub>3</sub> ) SO <sub>4</sub> 5 ~ 38 ppm (as CaCO <sub>3</sub> ) C1 <sup>-</sup> 5 ~ 10 ppm (as C1 <sup>-</sup> ) SiO <sub>2</sub> 23 ~ 95 ppm (as SiO <sub>4</sub> ) Ca 16 ~ 35 ppm (as Ca <sup>++</sup> ) (Na + K) 10 ppm (as CaCO <sub>3</sub> ) SS 10 ppm Total hardness 129 ~ 166 ppm (as CaCO <sub>3</sub> ) pH 7.5 ~ 8 Ouality of treated water: SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> ) pH Neutral       Max. 420 m²/h Avg. 280 m²/hr         Water recirculation facilities for continuous casting       Amount of recirculating water: 840 m³/hr       1,700 m³/hr         (1) Mould machine system       Amount of recirculating water: 20 ppm       1,700 m³/hr       1,700 m³/hr			Feed water temperature: 35°C	
4) Soft waterAmount of water to be treated: $9 \text{ m}^3/\text{hr}$ Quality of raw water: M-alkalinity $50 \sim 62 \text{ Ppm}$ (as CaCO3) $SO_4$ $5 \sim 38 \text{ ppm}$ (as SO4) $C1$ $SiO_2$ $23 \sim 95 \text{ ppm}$ (as C1) $SiO_2$ $Ca = 16 \sim 35 \text{ ppm}$ (as Ca^+) Mg = 10 $\sim 32 \text{ ppm}$ (as Ca^+) Mg = 10 $\sim 32 \text{ ppm}$ (as CaCO3) SS = 10 ppm Total hardness = 129 $\sim 166 \text{ ppm}$ (as CaCO3) SS = 10 ppm Total hardness = 129 $\sim 166 \text{ ppm}$ (as CaCO3) pH = 7.5 $\sim 8$ Quality of treated water: SS = 3 ppm Ca = 1 ppm (as CaCO3) pH Neutral1,700 m^3/\text{hr}Water recirculation facilities for continuous castingAmount of recirculating water: 840 m^3/\text{hr}1,700 m^3/\text{hr}	4) Soft waterAmount of water to be treated: $9 \text{ m}^3/\text{hr}$ Quality of raw water: M-alkalinity $50 \sim 62 \text{ Ppm}$ (as CaCO3) $SO_4$ $5 \sim 38 \text{ ppm}$ (as SO4) $C1$ $SiO_2$ $23 \sim 95 \text{ ppm}$ (as C1) $SiO_2$ $Ca = 16 \sim 35 \text{ ppm}$ (as Ca^+) Mg = 10 $\sim 32 \text{ ppm}$ (as Ca^+) Mg = 10 $\sim 32 \text{ ppm}$ (as CaCO3) SS = 10 ppm Total hardness = 129 $\sim 166 \text{ ppm}$ (as CaCO3) SS = 10 ppm Total hardness = 129 $\sim 166 \text{ ppm}$ (as CaCO3) pH = 7.5 $\sim 8$ Quality of treated water: SS = 3 ppm Ca = 1 ppm (as CaCO3) pH Neutral1,700 m^3/\text{hr}Water recirculation facilities for continuous castingAmount of recirculating water: 840 m^3/\text{hr}1,700 m^3/\text{hr}	4) Soft waterAmount of water to be treated: $9 \text{ m}^3/hr$ Quality of raw water: M-alkalinity SO4 $18 \text{ m}^3/hr$ 18 m³/hr $18 \text{ m}^3/hr$ C1 $5 \sim 38 \text{ ppm} (as CaCO_3)$ SO4SO2 $23 \sim 95 \text{ ppm} (as Cl^-)$ SIO2C1 $5 \sim 10 \text{ ppm} (as Cl^-)$ SIO2Ca $16 \sim 35 \text{ ppm} (as Ca^{+1})$ MgMg $10 \sim 32 \text{ ppm} (as Mq^{+1})$ (Na + K) S 10 ppmTotal hardness $129 \sim 166 \text{ ppm} (as CaCO_3)$ pH7.5 $\sim 8$ Quality of treated water: S 3 ppm CaS $3 \text{ ppm}$ CaCa $1 \text{ ppm} (as CaCO_3)$ pHPHNeutral		3) Miscellaneous water	Amount of feed water:	
$ \begin{array}{c cccc} \mbox{M-alkalinity} & 50 \sim 62 \mbox{ ppm} (as CaCO_3) \\ \mbox{SO}_4 & 5 \sim 38 \mbox{ ppm} (as SO_4^{}) \\ \mbox{C1}^{} & 5 \sim 10 \mbox{ ppm} (as SiO_2) \\ \mbox{Ca} & 16 \sim 35 \mbox{ ppm} (as Ca^{++}) \\ \mbox{Mg} & 10 \sim 32 \mbox{ ppm} (as Ca^{++}) \\ \mbox{Mg} & 10 \sim 32 \mbox{ ppm} (as CaCO_3) \\ \mbox{SS} & 10 \mbox{ ppm} \\ \mbox{Total hardness} & 129 \sim 166 \mbox{ ppm} (as CaCO_3) \\ \mbox{SS} & 10 \mbox{ ppm} \\ \mbox{Total hardness} & 129 \sim 166 \mbox{ ppm} (as CaCO_3) \\ \mbox{pH} & 7.5 \sim 8 \\ \mbox{Quality of treated water:} \\ \mbox{SS} & 3 \mbox{ ppm} \\ \mbox{Ca} & 1 \mbox{ ppm} \\ \mbox{Mater recirculation facilities} \\ \mbox{for continuous casting} \\ \mbox{(1) Mould machine system} \\ \mbox{1) Mould (slab)} \end{array} $	$ \begin{array}{c cccc} \mbox{M-alkalinity} & 50 \sim 62 \mbox{ ppm} (as CaCO_3) \\ \mbox{SO}_4 & 5 \sim 38 \mbox{ ppm} (as SO_4^{}) \\ \mbox{C1}^{} & 5 \sim 10 \mbox{ ppm} (as SiO_2) \\ \mbox{Ca} & 16 \sim 35 \mbox{ ppm} (as Ca^{++}) \\ \mbox{Mg} & 10 \sim 32 \mbox{ ppm} (as Ca^{++}) \\ \mbox{Mg} & 10 \sim 32 \mbox{ ppm} (as CaCO_3) \\ \mbox{SS} & 10 \mbox{ ppm} \\ \mbox{Total hardness} & 129 \sim 166 \mbox{ ppm} (as CaCO_3) \\ \mbox{SS} & 10 \mbox{ ppm} \\ \mbox{Total hardness} & 129 \sim 166 \mbox{ ppm} (as CaCO_3) \\ \mbox{pH} & 7.5 \sim 8 \\ \mbox{Quality of treated water:} \\ \mbox{SS} & 3 \mbox{ ppm} \\ \mbox{Ca} & 1 \mbox{ ppm} \\ \mbox{Mater recirculation facilities} \\ \mbox{for continuous casting} \\ \mbox{(1) Mould machine system} \\ \mbox{1) Mould (slab)} \end{array} $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		4) Soft water	Amount of water to be treated: 9 m <sup>3</sup> /hr	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	SiO <sub>2</sub> 23~95 ppm (as SiO <sub>2</sub> ) Ca 16~35 ppm (as Ca <sup>++</sup> ) Mg 10~32 ppm (as Mg <sup>++</sup> ) (Na + K) 10 ppm (as CaCO <sub>3</sub> ) SS 10 ppm Total hardness 129~166 ppm (as CaCO <sub>3</sub> ) pH 7.5~8 Quality of treated water: SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr SS in recirculating water: 20 ppm 1,700 m <sup>3</sup> /hr			$\begin{array}{llllllllllllllllllllllllllllllllllll$	
(Na + K) 10 Ppm (as CaCO <sub>3</sub> ) SS 10 ppm Total hardness 129 ~ 166 ppm (as CaCO <sub>3</sub> ) pH 7.5~8 Quality of treated water: SS 3 ppm Ca 1 Ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	(Na + K) 10 Ppm (as CaCO <sub>3</sub> ) SS 10 ppm Total hardness 129 ~ 166 ppm (as CaCO <sub>3</sub> ) pH 7.5~8 Quality of treated water: SS 3 ppm Ca 1 Ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	(Na + K) 10 Ppm (as CaCO <sub>3</sub> ) SS 10 ppm Total hardness 129 ~ 166 Ppm (as CaCO <sub>3</sub> ) pH 7.5~8 Quality of treated water: SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr SS in recirculating water: 20 ppm 1,700 m <sup>3</sup> /hr			SiO <sub>2</sub> 23 ~ 95 ppm (as SiO <sub>2</sub> ) Ca 16 ~ 35 ppm (as Ca <sup>++</sup> )	
pH       7.5~8         Quality of treated water:         SS       3 ppm         Ca       1 ppm (as CaCO <sub>3</sub> )         pH       Neutral         Water recirculation facilities for continuous casting         (1) Mould machine system         1) Mould (slab)         Amount of recirculating water:         840 m³/hr         1,700 m³/hr	pH       7.5~8         Quality of treated water:         SS       3 ppm         Ca       1 ppm (as CaCO <sub>3</sub> )         pH       Neutral         Water recirculation facilities for continuous casting         (1) Mould machine system         1) Mould (slab)         Amount of recirculating water:         840 m³/hr         1,700 m³/hr	pH       7.5~8         Quality of treated water:         SS       3 ppm         Ca       1 ppm (as CaCO <sub>3</sub> )         pH       Neutral         Water recirculation facilities for continuous casting         (1)       Mould machine system         1)       Mould (slab)         Amount of recirculating water:       840 m <sup>3</sup> /hr         1700 m <sup>3</sup> /hr       Sin recirculating water:         20 ppm       1,700 m <sup>3</sup> /hr			(Na + K) 10 Ppm (as CaCO <sub>3</sub> ) SS 10 Ppm	
SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> ) pH Neutral Water recirculation facilities for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	SS       3 ppm         Ca       1 ppm (as CaCO <sub>3</sub> )         pH       Neutral         Water recirculation facilities for continuous casting		en e	pH 7.5∼8	
for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	for continuous casting (1) Mould machine system 1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr SS in recirculating water: 20 ppm 1,700 m <sup>3</sup> /hr			SS 3 ppm Ca 1 ppm (as CaCO <sub>3</sub> )	
1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr 1,700 m <sup>3</sup> /hr	1) Mould (slab) Amount of recirculating water: 840 m <sup>3</sup> /hr SS in recirculating water: 20 ppm 1,700 m <sup>3</sup> /hr				
		SS in recirculating water: 20 ppm		(1) Mould machine system		
		510		1) Mould (slab)		1,700 m³/hr

Items	Stage I		Stage II
	Feed water temperature: Return water temp.: Feed water pressure:	35°C 45°C 10 kg/cm²	
2) Mould (bloom)	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp. Feed water pressure:	600 m <sup>3</sup> /hr 20 ppm 35°C 45°C 10 kg/cm <sup>2</sup>	1,200 m <sup>3</sup> /h
3) Machine (slab)	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temperature: Feed water pressure:	1,800 m <sup>3</sup> /hr 20 ppm 35°C 45°C 5 kg/cm <sup>2</sup>	3,600 m <sup>3</sup> /h
4) Machine (bloom) & air conditioner	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp:: Feed water pressure:	800 m <sup>3</sup> /hr 20 ppm 35°C 45°C 5 kg/cm <sup>2</sup>	1,600 m <sup>3</sup> /h
(2) Spray system			
1) Slab	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	840 m <sup>3</sup> /hr 20 ppm 35°C 45°C 11 kg/cm <sup>2</sup>	1,700 m <sup>3</sup> /hi
,2) Bloom	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp. Feed water pressure:	740 m <sup>3</sup> /hr 20 ppm 35°C 45°C 11 kg/cm <sup>2</sup>	1,500 m <sup>3</sup> /hi
(3) Scarfer dust collection system	n 1999 - Santa Andrea, andrea 1999 - Santa Andrea, andrea andrea		
1) Scarfer dust collection water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Feed water pressure:	150 m <sup>3</sup> /hr 50 ppm 60°C 6 kg/cm <sup>2</sup>	300 m <sup>3</sup> /hr
(4) Scarfer recirculation system	1997年1月1日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日		
1) Scarfer scale removal water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Feed water pressure:	1,200 m <sup>3</sup> /hr 100 ppm 60°C 15.5 kg/cm <sup>2</sup>	2,400 m <sup>3</sup> /hr
2) Scarfer spray	Amount of recirculating water: SS in recirculating water: Feed water temperature: Feed water pressure:	300 m <sup>3</sup> /hr 100 ppm 60°C 5 kg/cm <sup>2</sup>	600 m <sup>3</sup> /hr
Water recirculation facilities for hot strip mill			
(1) Reheating furnace cooling system	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	2,200 m <sup>3</sup> /hr 20 ppm 35°C 55°C 3 kg/cm <sup>2</sup>	3,400 m³/hr
(2) Indirect cooling system	Amount of recirculating water: SS in recirculating water: Feed water temperature:	2,300 m <sup>3</sup> /hr 20 ppm 35°C	3,500 m <sup>3</sup> /hr

Items	Stage I		Stage II
	Return water temp.: Feed water pressure:	40°C 3 kg/cm²	
(3) Direct cooling system			
1) Roughing mill cooling water	Amount or recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	1,900 m <sup>3</sup> /hr 20 ppm 35°C 42°C 3 kg/cm <sup>2</sup>	2,900 m <sup>3</sup> /ł
2) Finishing mill cooling water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	4,900 m <sup>3</sup> /hr 20 ppm 35°C 42°C 3 kg/cm <sup>2</sup>	4,900 m³/h
(4) Runout table cooling system	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	6,200 <sup>m³</sup> /hr 50 ppm 35°C 39°C 3 kg/cm²	9,200 m³/h
Water facilities for billet mill and medium section mill			
(1) Reheating furnace system			
1) Reheating furnace cooling water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp. Feed water pressure:	360 m <sup>3</sup> /hr 20 ppm 35°C 45°C 2.5 kg/cm <sup>2</sup>	1,200 m³/h
2) Indirect cooling water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp:: Feed water pressure:	360 m <sup>3</sup> /hr 20 ppm 35°C 45°C 2.5 kg/cm <sup>2</sup>	2,000 m³/hi
(2) Direct cooling system			
1) Direct cooling water	Amount of recirculating water: SS in recirculating water: Feed water temperature: Return water temp.: Feed water pressure:	270 m <sup>3</sup> /hr 20 ppm 35°C 45°C 2.5 kg/cm <sup>2</sup>	1,300 m <sup>3</sup> /hi

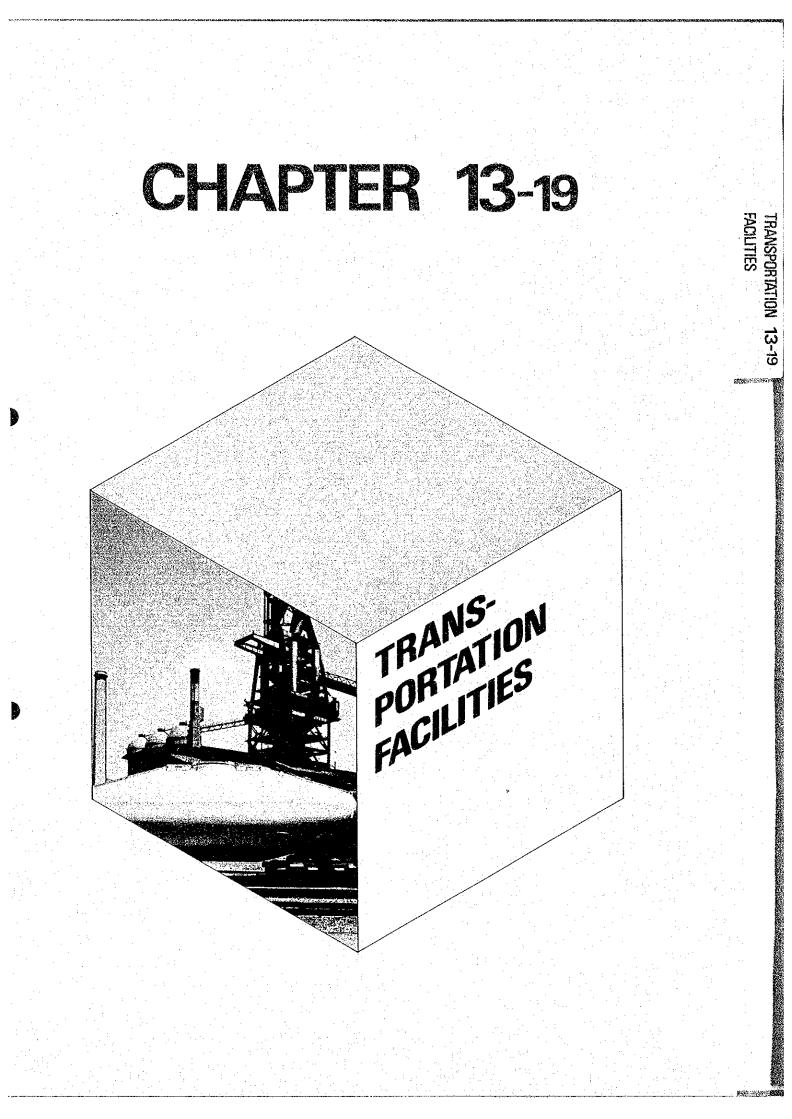
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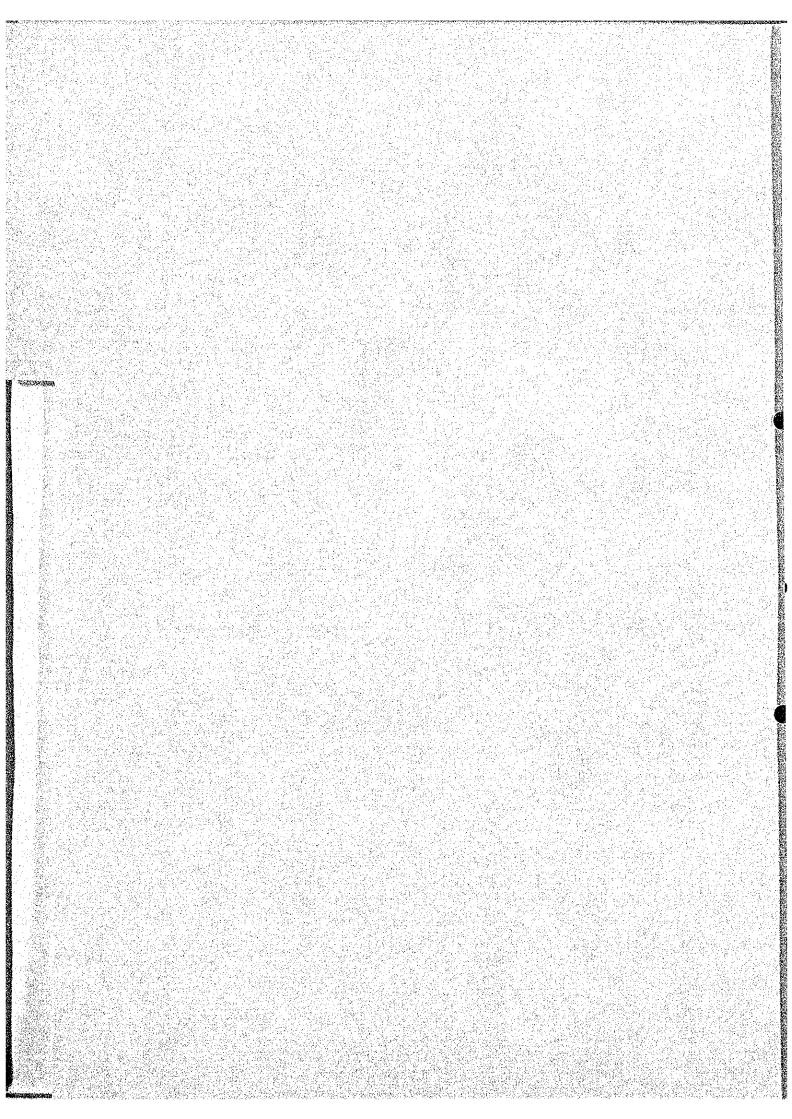
	lance				
			Stage.1		Stage II
	nuaudunda io annau	Quantity	Specifications	Quantity	Specifications
<ol> <li>Water recirculation facilities for coke oven and by-product plant</li> </ol>					
1) Quenching tower	Sedimentation basin Feed water pit Pümps, etc.	1 unit 1 unit 1 set	680 m <sup>3</sup> /unit 70 m <sup>3</sup> /unit	1 unit 1 unit 1 set	Same as at left Same as at left
2) Coke oven dust collecting system	Thickener Feed water pit Pumps, etc.	1 unit 1 unit 1 set	420 m <sup>3</sup> /unit 60 m <sup>3</sup> /unit		
3) Coke by product machinery cooling system	Return water pit Cooling tower Feed water pit Pumps, etc.	1 unit 1 unit 1 set	20 m³/unit 4 m x 4 m x 3 m/unit 50 m³/unit	1 unit 1 unit 1 unit 1 set	Same as at left Same as at left Same as at left
(2) Water recirculating facilities for blast furnace					
<ol> <li>Cooling system for tuyers, etc.</li> </ol>	Return water pit Cooling tower Feed pump pit Pumps, etc.	1 units 3 units 1 set	450 m <sup>3</sup> /unit 12 m x 15 m x 5 mH/unit 900 m <sup>3</sup> /unit	1 unit 3 units 1 unit	Same as at left Same as at left Same as at left
2) Hearth bottom cooling system	Feed water pit Pumps, etc.	1 unit 1 set	250 m <sup>3</sup> /unit	1 unit 1 set	Same as at left
3) Dust collection system	Thickener Return water pit Cooling tower 2 VS Feed water pit 1 VS Feed water pit austic soda dosing equipment Polymer soda dosing equipment Pumps, etc.	2 unit unit 1 set 1 set 1 set 1 set 1 set	2,100 m <sup>3</sup> /unit 70 m <sup>3</sup> /unit 210 m <sup>3</sup> /unit 210 m <sup>3</sup> /unit	set set	Same as at left Same as at left Same as at left Same as at left Same as at left

	Name of en linment		Stage 1		Stage II
		Quantity	Specifications	Quantity	Specifications
4) Dry-pit system	Return water pit Feed water pit Pumps, etc.	l unit 1 unit 1 set	20 m³/unit 60 m³/unit	1 unit 1 unit 1 set	Same as at left Same as at left
5) Pig casting machine system	Sedimentation basin Feed water pit Pumps, etc	1 unit 1 unit 1 set	600 m <sup>3</sup> /unit 150 m <sup>3</sup> /unit		
(3). Water recirculation facilities for limestone					
1) Limestone cleaning system	Coarse particle separator	2 units	70 m³/unit	2 units	Same as at left
	Thickener Feed water pit Pumps, etc	2 units 1 unit 1 set	520 m³/unit 90 m³/unit	1 unit 1 unit 1 set	Same as at left Same as at left
2) Dehydrator cleaning water, dust collector system	Thickener Feed water pit Pumps, etc.	1 unit 1 unit 1 set	580 m³/unit 110 m³/unit	1 unit 1 unit 1 set	Same as at left. Same as at left
3) Machinery cooling system	Cooling tower Feed pump pit Pumps, etc.	1 unit 1 set 1 set	2 m × 3 m × 3 mH/unit 20 m³/unit	1 unit 1 unit 1 set	Same as at left Same as at left
(4) Water recirculation facilities for BOF plant					
1) OG cooling system	Cooling tower Feed water pit Anti-corrosive dosing equipment Soft water making equipment Pumps, etc.	1 set 1 tunit 1 set 1 set 1 tunit	12 m × 15 m × 9 mH/unit 500 m <sup>3</sup> /unit	1 set set	Same as at left Same as at left
2) Dust collection system	Dust separator Thickener Return water pit Cooling tower Feed water pit Plymer dosing	2 units 2 units 1 unit 1 unit 1 unit 1 set	20 m <sup>3</sup> /unit 800 m <sup>3</sup> /unit 70 m <sup>3</sup> /unit 8.5 m x 9 m x 7 mH/unit 200 m <sup>3</sup> /unit	2 units 2 units 1 unit 1 unit 8 et	Same as at left Same as at left Same as at left Same as at left Same as at left

			Stage		Stage II
	1112111drinba 10 Stuber	Quantity	Specifications	Quantity	Specifications
	Caustic soda dosing equipment Sulfuric acid dosing equipment Pumps, etc.	1 set		1 set 1 set 1 set	
(5) Water recirculation facilities for continuous casting plant					
1) Mould, machine system	Cooling tower Feed water pit Elevated tank Pumps, etc	2 units 1 unit 1 set	11 m x 15 m x 6 mH/unit 1,000 m <sup>3</sup> /unit 210 m <sup>3</sup> /unit	2 units 1 unit 1 unit 1 set	Same as at left Same as at left Same as at left
2) Spray system	Sedimentation basin Filter Cooling tower Feed water pit Pumps, etc.	2 units 5 units 2 units 1 unit 1 set	600 m <sup>3</sup> /unit 4.5 m¢ × 5 mH/unit 10 m × 12 m × 6 mH/unit 600 m <sup>3</sup> /unit	2 units 5 units 2 units 1 unit 1 set	Same as at left Same as at left Same as at left Same as at left
3). Scarter dust collection, system	Return water pit Thickener Coagulation dosing equipment Pumps, etc.	1 unit 1 unit 1 set 1 set	15 m <sup>3</sup> /unit 300 m <sup>3</sup> /unit	1 unit 1 unit 1 set 1 set	Same as at left Same as at left
<ol> <li>Scarfer recirculating system</li> <li>system</li> <li>system</li> <li>system</li> <li>system</li> <li>for hot strip mill</li> </ol>	Cooling tower Pumps, etc.	tiunit.	4 m x 8 m × 8 mH/unit	1 unit 1 set	
<ol> <li>Reheating furnace cooling system</li> </ol>	Return water pit Cooling tower Feed water pit Elevated tank Pumps, etc.	Lunit Lunit 1 unit 1 set	190 m <sup>3</sup> /unit 12 m × 15 m × 8 mH/unit 370 m <sup>3</sup> /unit 560 m <sup>3</sup> /unit	Lunit 1 unit 1 unit 1 set	70 m³ /unit Same as at left 190 m³ /unit
2) Indirect cooling system	Return water pit Cooling tower Feed water pit Pumps, etc.	1 units set	190 m³/unit 10 m × 15 m × 5 mH/unit 380 m³/unit		100 m <sup>3</sup> /unit Same as at left 200 m <sup>3</sup> /unit

			Stage I		Stage II
EL 91		Quantity	Specifications	Quantity	Specifications
3) Direct cooling system	Roughing sedimentation	2 units	1,100 m³/unit	1 unit	Same as at left
	Finishing sedimentation basin	2 units	1,700 m³/unit		
	Filter Cooling tower Feed water pit	8 units 3 units 1 unit	5 mǿ x 5 mH/unit 12 m x 15 m x 5.5 mH 1,700 m³/unit	1 unit 1 unit	Same as at left 300 m <sup>3</sup> /unit
<ol> <li>Runout table cooling system</li> </ol>	Cooling tower Pumps, etc.	2 units 1 set	11 m x 15 m x 5 mH/unit	l unit 1 set	Same as at left
(7) Water recirculation facilities for billet mill and medium section mill	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			
1) Reheating furnace system	Return water pit Cooling tower Feed water pit Elevated tank Pumps. etc.	1 unit 1 unit 1 unit 1 unit 1 set	7 m × 10 m <sup>3</sup> /unit 7 m × 10 m × 6 mH/unit 120 m <sup>3</sup> /unit 60 m <sup>3</sup> /unit	1 unit 4 units 1 unit 1 set	210 m <sup>3</sup> /unit Same as a left 420 m <sup>3</sup> /unit 140 m <sup>3</sup> /unit
2) Direct cooling system	Sedimentation basin Filter Cooling tower Feed water pit Pumps, etc.	2 unit unit set	320 m <sup>3</sup> /unit 3 mǿ x 4.5 mH/unit 5 m x 7 m x 6 mH/unit 70 m³/unit	2 units 3 units 3 units 1 unit 1 set	Same as at left Same as at left Same as at left 250 m <sup>3</sup> /unit





## 13-19 Transportation facilities

## 13-19-1 General

The purpose of transportation facilities is the transportation of raw materials, by-products and semi-finished products in the steel-works site.

The railway facilities shall be used for the transportation of such high-temperature and heavyweight materials as molten iron, BOF slag and steel ingots.

The road transportation shall be the method for transporting other kinds of raw materials and by-products.

## (1) Railway transportation

As for the transportation of molten pig iron, the torpedo cars shall be used because molten pig iron is a high-temperature and heavy-weight material to be carried in a large amount at once. The torpedo car, widely used in steelworks of many countries, has an advantage in operation transportation costs and the quality aspects of products.

The BOF slag generated in the BOF plant shall be transported by effective means of slag ladle cars equipped with tilting functions.

The flat cars shall be used for transporting ingots. Diesel locomotives shall be used to pull these types of railway transportation equipment.

The auxiliary facility shall include a locomotive shed, which is used when the diesel locomotives are being checked for a daily inspection or are being fueled or being supplied with water, and the crossing signals and track illuminating equipment to enhance safety of railway transportation.

The rail gauge shall be 1,435<sup>mm</sup> in consideration of the possibility of use by large trains.

## (2) Road transportation

Flat-topped trucks shall be used for the transportation of maintenance materials, oil/grease, refractories and so on. Dump trucks and self-loading trucks shall be used to transport raw materials and by-products, which are loaded or unloaded by means of bulldozers, shovel loaders or crawler cranes. Truck cranes shall be used for the loading or unloading operations at the ingot yard and trailers shall be used for transporting ingots to the port.

The auxiliary facilities of road transportation shall include the automobile weighing equipment, (automobile weigh-bridge) which is used to grasp the transportation situation and make a record of stock, and the gas stations for supplying fuel to the vehicles. The width or other elements of the roads are determined according to the types and traveling frequency of passing vehicles.

- 13-19-2 Preconditions
- (1) The volume of transportation
  - The material balance sheet (*Fig. 13-19-1* and *13-19-2*) shows the volume of transportation, which is the basis for the transportation equipment plan.
- (2) Operation conditions

3 shifts of continuous operations shall be the principle of transportation operations but the daytime operation shall be applied to the transportation of relatively small amount of items.

(3) Loading efficiency

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The loading rate of torpedo cars, slag ladle cars and flat cars shall be 90% of their maximum loading capacity, and that of trucks shall be 50 to 100% depending on what kind of material they carry.

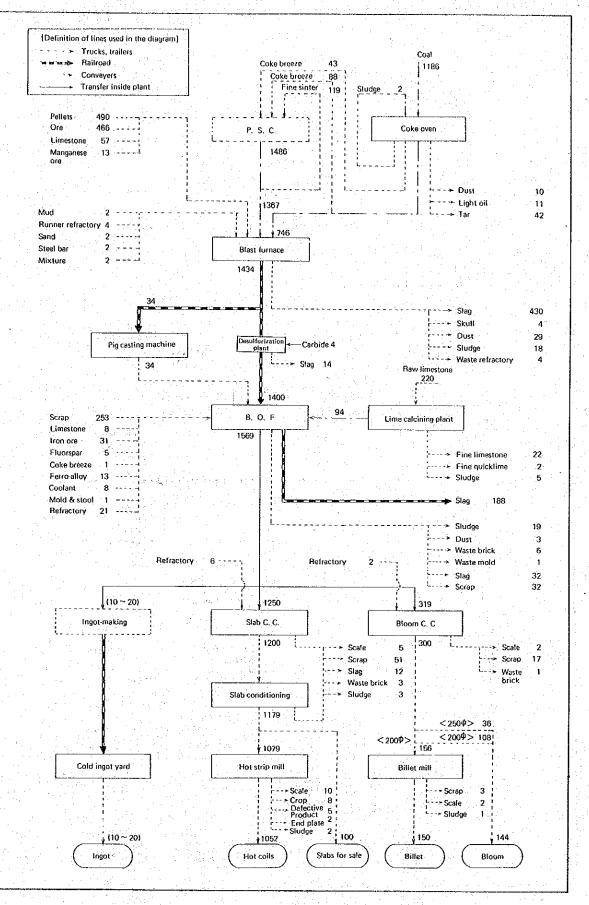


Fig. 13-19-1 Material balance flow sheet (unit: 1,000<sup>t/y</sup>) stage I

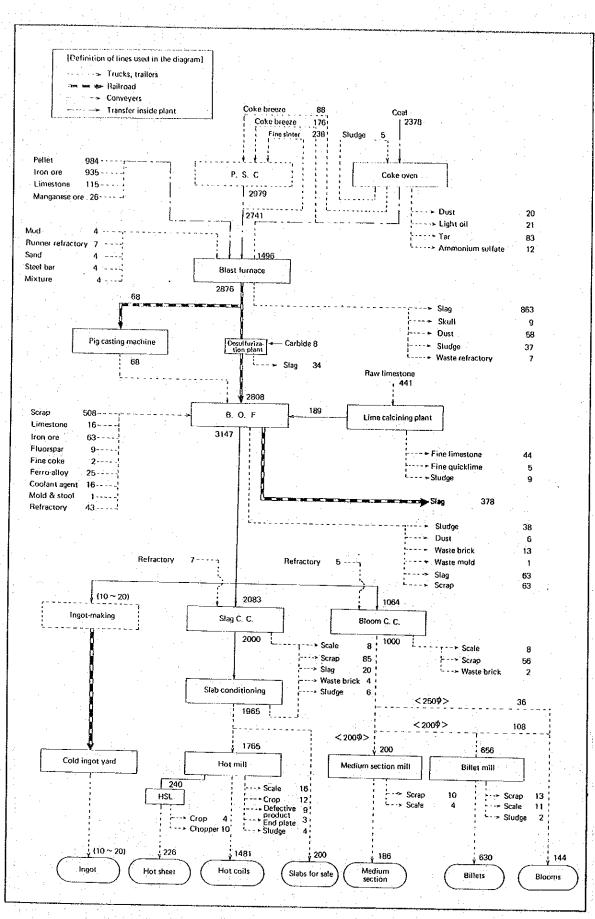


Fig. 13-19-2 Material balance flow sheet (unit: 1,000<sup>t/y</sup>) stage II

	<b></b>	<u> </u>	- 											· .		~ <b></b>										. :		
		Stage II		$320^{t} \times 12$ units	20 <sup>t</sup> × 6 units	20 <sup>t</sup> × 6 units		$60^{t} \times 1 \text{ units}$	25 <sup>t</sup> x 1 units			ine 60 kg/m 1 km	• • • •		11 tv 2	11 × 2 unus 11 <sup>t</sup> × 16 units	30 <sup>t</sup> x 1 unit	15 <sup>t</sup> × 6 units	1.5 m <sup>2</sup> × 2 units	Capacity (own weight) 20 <sup>†</sup> x 2 units	$20^{\text{t}} \times 2^{\text{units}}$	•1	· · · ·					
-	Specifications			Load capacity			"	Own weight	•			1 435 mm of oaline 60 kg/m	1 set		Lood manager				Capacity	Capacity (own v	Lifting capacity	-						
	Specifi	Stage		$320^{t} \times 12$ units	20 <sup>t</sup> × 6 units	$20^{\text{t}} \times 6 \text{ units}$	250 <sup>t</sup> x 8 units	60 <sup>t</sup> x 4 units	$25^{t} \times 2$ units	bell type 4 set	ded 1 set	60 kg/m 10 km	1		11 <sup>t</sup> x 3 uni <del>r</del> e	11 <sup>t</sup> × 26 units	30 <sup>t</sup> × 2 units	15 <sup>t</sup> × 6 units	1.5 m <sup>3</sup> x 5 units	ht) 20 <sup>t</sup> x 5 units	$20^{\text{t}} \times 3 \text{ units}$	$40^{\circ}$ x 1 unit	1 set	60 <sup>t</sup> x 1 unit		2,000 <sup>m<sup>2</sup></sup> × 1	Approx. 17,810 <sup>m</sup> Approx. 333.150 <sup>m</sup> <sup>2</sup> )	
		St		Load capacity	<b>2</b>		<b>2</b>	Own weight		Electronic electric bell type	Fuel station is provided	1,435 mm of gauge, 60 kg/m	1 set		Load capacity				Capacity	Capacity (own weight) 20 <sup>t</sup> x 5 units	Lifting capacity	Lifting capacity	For diesel fuel	Weighing capacity		Area	Total length: (Paved road area:	
	tter tter tter tter tter tter tter tter		) Railway equipment	1 Torpedo car	2 Stag ladle car	3 Slag ladle	4 Flat-topped car	5 Diesel locomotive	<b>9</b>	7 Highway crossing alarm	8 Locomotive shed	9 Railway track	10 Track illuminating devices	Road transportation equipment	1 Flat truck	2 Dump truck	3 Self-loading truck	4 Slag ladle	5 Shovel toader	6 Bulldozer	7 Crawler crane	8 Truck crane		10 Automobile weigh bridge	Shared facility	Sub-center	Road	
			<u> </u>							-			<u> </u>	(2)				··· ·						: 	ල	: .		

# 13-19-4 Technical explanation

- (1) Torpedo car
  - 1) Features

The usual hot metal ladle car has been widely used as a transportation method for the hot metal of steelworks. In this method, a hot metal ladle car receives hot metal from the blast furnace, carries it to the steel-making plant to store it in the mixer and, later, to supply it to the steel-making furnace.

Recently, however, the hot metal ladle car is being replaced by the torpedo car which carries hot metal from the blast furnace but eliminates the need of use of the mixer. Since the furnace capacity of the torpedo car is larger, the composition of hot metal is effectively made uniform and the torpedo car is able to achieve the purpose of the conventional mixer, and therefore, eliminates the necessity for constructing mixers. The torpedo car has a cylindrical furnace body with conical ends.

Since the furnace has an opening at the center of the top, the torpedo car provides a higher heat-retaining capacity than the ladle car which has a fully open top. Furthermore, it becomes possible to make the capacity of torpedo cars larger by lowering the gravity center of the cylindrical furnace body with conical ends. Thus, use of torpedo cars simplifies the transportation of the hot metal and process-

Structure

2)

ing of hot metal.

For containing hot metal, the furnace of torpedo cars is constructed of welded steel plate.

The furnace has cast steel-trunnions at both ends and the inside of the furnace is covered with refractory materials.

The tilting equipment shall be mounted at the trunnion on either side of the furnace body and shall be controlled in operation by the control device installed on the ground. *Fig. 13-19-3* Shows the appearance of torpedo car.

3) Capacity of torpedo car

The iron production of the blast furnace is maximum 540<sup>t</sup> per tapping, and the steel production of the converter is maximum 160<sup>t</sup> per heat.

The torpedo car capacity is planned at 320<sup>t/unit</sup> so that two torpedo cars can receive the iron produced by one tapping of the blast furnace and one torpedo car can store the molten pig iron required to supply two heats of the BOF.

## 4) Maintenance

The maintenance of torpedo cars may be divided into the maintenance for mechanical portions and the repairing and maintenance for furnace brick portions. Since the mechanical portion is a very few, most of the maintenance work shall be the bricklaying work for the brick portions.

Relining of the furnace brick shall be executed after every 600 to 700 uses for hot metal receiving. Partial repairing or relining of the brick performed several times during the period between two total relining works. The maintenance rate of torpedo cars is 75 to 80%.

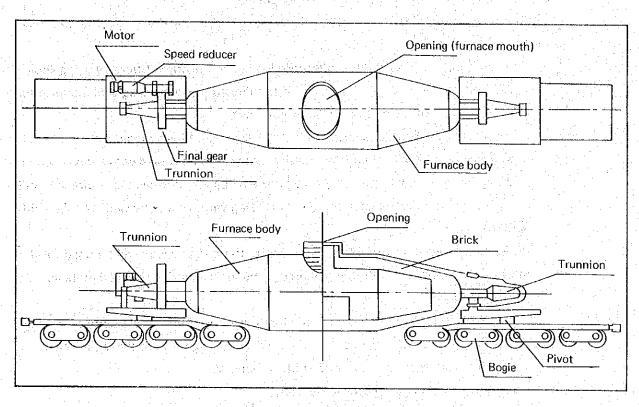


Fig. 13-19-3 Appearance of torpedo car

# (2) Road transportation

- 1) Transportation of limestone and iron ore for steel-making.
  - Limestone is unloaded at the raw material berth, and carried by conveyer belt to the raw material yard for storage. In the same way as for iron ore and sintered ore, limestone shall be transported to the storage bin of the blast furnace by conveyer belt.
  - As for the limestone and iron ore for the lime calcining plant and the steelmaking plant, however, we recommend to use dump trucks for their transportation (700<sup>t/d</sup>) because of their small amounts.
  - In the raw material yard, bulldozers and shovel loaders shall be used for loading

2)

3)

4)

limestone and iron ore onto the dump trucks and for gathering scattered limestone and iron ore. Dump trucks shall be used for transporting the limestone undersize, burnt lime undersize and lime sludge, which are generated in the lime calcining plant. For the loading of sludge, the shovel loaders in the raw material yard shall be used when they are not used for other purposes.

In general, these transportation operations shall be done during daytime.

Transportation of slag, sludge and other waste.

The slag of the blast furnaces shall be thrown into the dry pit and cooled with sprayed water.

The cooled slag is gathered by bulldozers, loaded on the dump trucks by using shovel loaders, and transported to the place for abandoned slag. This slag shall be used for the reclamation of the site or for other purposes.

The BOF slag shall be transported to the BOF slag yard by slag ladle cars on the railway, and they are thrown out from the slag ladle car to be cooled with sprayed water. The slag ladle is used to receive the slag made by continuous casting equipment and the self-loading truck transports it to the BOF slag yard, where the slag is cooled with sprayed water.

In the same way as for the blast furnace slag, the cooled slag shall be used for the reclamation of the site after it is gathered by bulldozers and is removed metallic part by magnet separater.

For the purpose of land reclamation or other purposes, dump trucks carry other slag, sludge, waste brick and others from their places of origin to the place for abandonment. This work shall be done in 3 shifts in general.

Transportation of scrap and cast pig iron

The scrap and cast pig iron shall be carried from their respective plants to the scrap yard by dump trucks, where they are stored.

The imported scraps also are transported from the berth to this scrap yard by dump trucks.

After the scraps are calssified and cut in the scrap yard, they are carried to the steelmaking plant's scrap pit by dump trucks, according to necessity.

A crawler crane with a lifting magnet shall be used to handle the scraps gathered in the scrap yard and to load them on dump trucks.

In general, this transportation operation shall be done by 3-shift operation system. Transportation of dust, under-sized material and scale

The dust and under-sized material generated at the blast furnace and ore bin and the mill scale generated in the rolling mill plant shall be carried to the raw material yard

by dump truck because they can be used as raw material for sintering. The dust and under-sized material, which are generated at the coke plant and coke bin, shall be transported to the sinter plant yard so that they can be used as sinter feed. In this transportation work, the transportation of under-sized material shall be done in 3 shifts of work and the transportation of others shall be daytime work.

Transportation of other types of material and by-products

5)

6)

In general, the flat-topped trucks shall take care of transporting runner refractory, tap hole mud, and steel bars for blast furnace, refractory for converters, fine coke for steel making, carbide for dusulfurization of molten iron, maintenance materials and grease/oil, etc.

Dump trucks shall be used to carry ferro-alloy, fluorspar, cast house sand and others. As for other types of materials and by-products, flat-topped trucks, dump trucks, or trailer trucks shall be used depending on the necessity.

In general, this transportation activity shall be done during daytime.

Distribution of trucks for 3-shifts of work and daytime work.

	3 shift work	Daytime work	Reserves	Total
Flat-topped trucks		3 (5)		3 (5)
Dump trucks	10 (17)	13 (21)	3 (4)	26 (42)
Self-loading trucks	1 (2)		(1)	2 (3)

Note: ( ) shows the figures for stage II. Spare vehicles shall be provided for the vehicles to be used for 3 shifts of work.