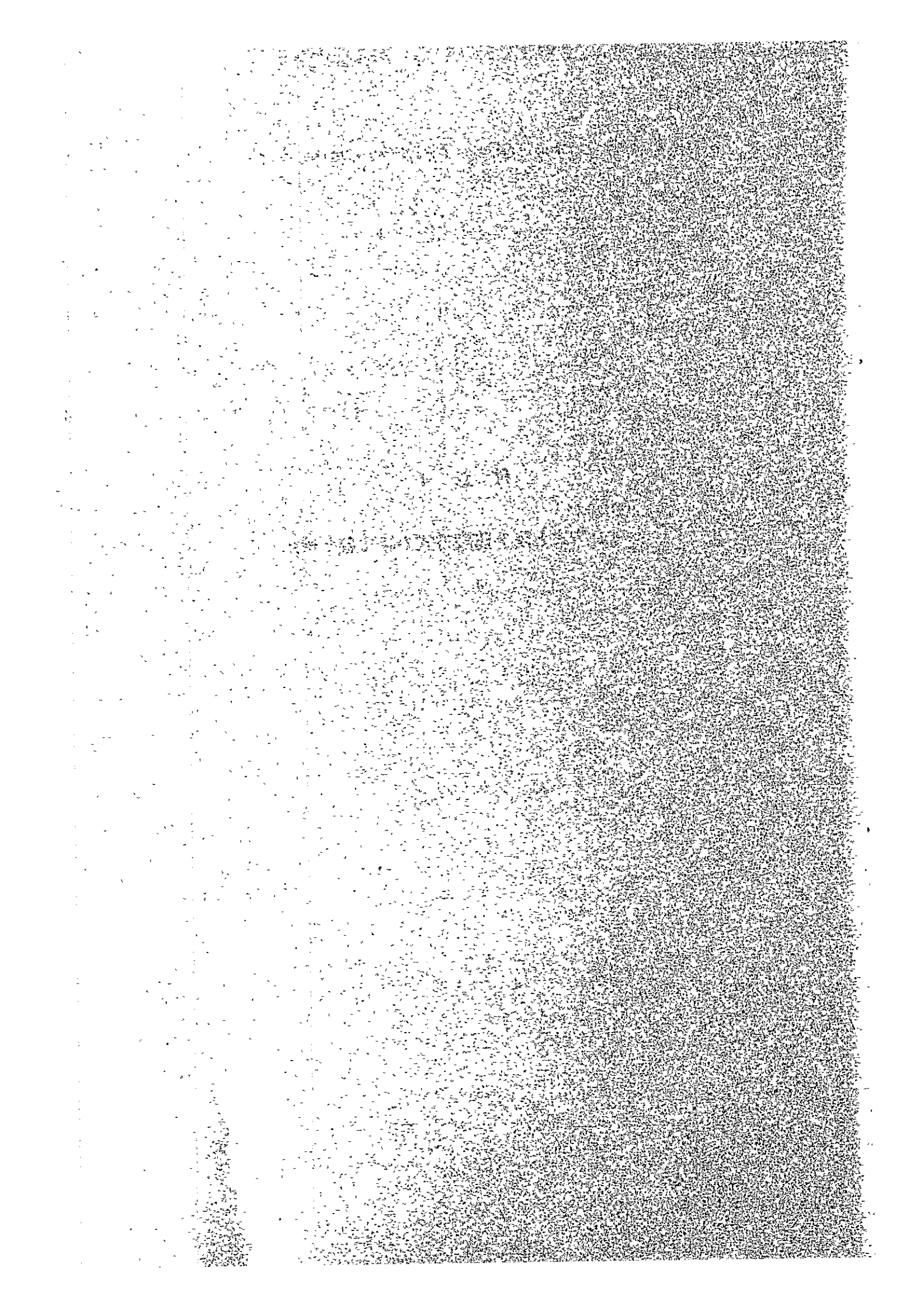


付 録 4

バージ方式と陸上建設方式の諸比較と選定



付録4. バージ方式と陸上建設方式の諸比較と選定

4.1 全 般

プラント建設方式には下記の2種類が考えられる。

- 1) 陸上建設方式
- 2) バージ建設方式

1) については、従来より行なわれている建設方式で、機器供給国より送られて来た各部品をプラント・サイトに於いて据付を行ない、各プラントの機能を現地に於いて連結させ、プラント全体としての機能を発揮させる一連の土木建築据付を行なり建設方式を総称する。

2) については比較的新しく開発された建設方式で最近では、各部品を超大型化して現地に運搬して据付を行なりユニット工法と云われている方式と共に脚光を浴びている最新工法である。機器供給国に於いて大型バージ上に供給機器を組付けプラントとしてバージ上で全て完成し、そのまま現地に曳航しバージをセッティングする方法をバージ方式と総称する。

本章に於いては、下記点に付き両方式について比較する。

- － プラント・コスト
- － プロジェクト遂行日程
- － 運転開始と生産性
- － プラントの品質

4.2 比較結果の取纏め及びリコmend

次項以後に記す両方式について比較した結果、陸上方式と比較してバージ方式は、下記の利点がある事が判明した。(主要利点のみ記載)

- － プラント・コストが小さい。
- － 建設期間が短い。
- － プラントの品質が高い。
- － 生産性が高い。

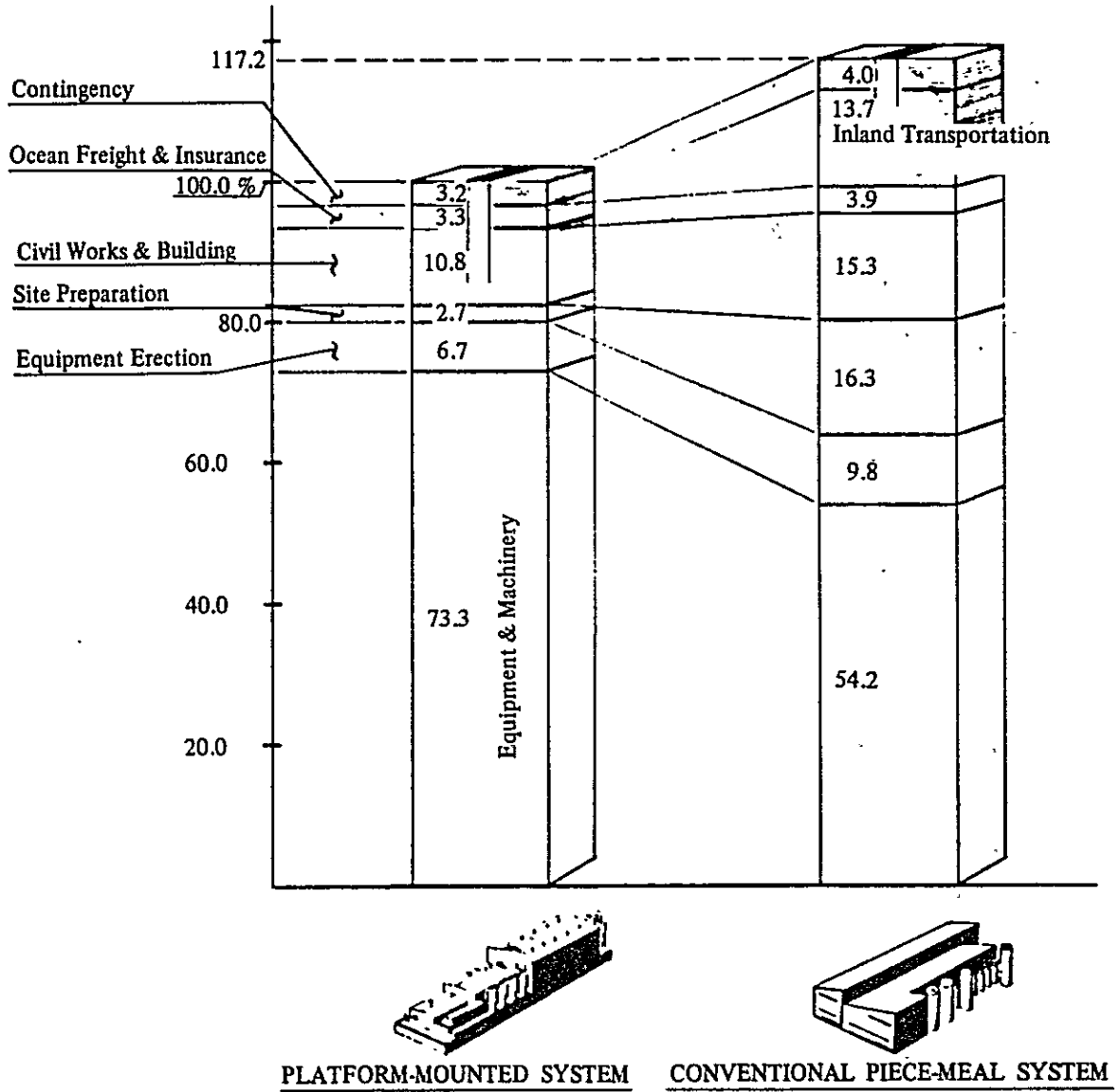
以上の比較結果及び本プロジェクトの現地の状況、国家方針等、総合判断の結果、本プロジェクトの建設方式はバージ方式を採用する事が妥当であると判断する。

4.3 プラント・コスト

総論すれば、建設期間の短縮に伴なり人件費や経費が少なく又必要敷地面積が少なくて済む

Fig. 4-1.

バース建設方式と陸上建設方式におけるプラント・コスト比較



ために土地造成費等土木工事費が少ない。一番大きな違いは、供給国にて機器が熟練工により据付けられる為能率が良く、かつ高品質が保持出来る為、現地に於ける据付費が安くなり、かつ運転後の生産の立上りが早く、工場経営に寄与する事が大であると共に附帯工事特にインフラストラクチャー等に投資する費用が少なく済む等、陸上方式と比較して約17%の投資額減少となる。

4.4 建設期間

建設期間の比較については、本文第11章に記述されている如くプラント契約後から比較すれば、バージ方式の方が約1年間短縮される。これらの主原因は下記の通りである。

- 一 船積納期がバージ上に機器を組付けているにもかかわらず、陸上方式の単品船積納期と比較して、早まっている。これは、サイト条件、受取、通関、船便等を考慮する事なく、一括して機器をプラント・サイトに運搬出来る事により生ずる差と考えられる。
- 一 バージ方式に於いては現地での作業量が陸上方式と比較して極端に少ない事により、サイトでの据付期間が短縮される。これは供給国に於いて熟練工により、大型機械、設備を使用して能率良くバージ上に機器が組付けられている為、サイトに於いては機器の再調整と地上との連結作業のみで作業量が少ない事によるものである。
- 一 サイト条件に左右されず作業が遂行出来る為、工事日程の確保が陸上方式と比較して非常に有利かつ容易におこなえる。特にサイトに於ける気象状況、船積毎のサイトでの通関内陸輸送等については機器一括サイト持込みのバージ方式では問題が非常に少ない。

4.5 プラント機器の品質

前項で記述した如く、バージ方式に於いては供給国の工場内で熟練工による組付が行なわれ、工場内での高い品質管理のもとに多数の検査員により、全ての面で品質がチェックされ、そのままの状態ですべてプラント・サイトに曳航される為、高品質がそのまま保持される。

したがって、悪条件のもとで機器を据付ける陸上方式と比較してはるかに品質は高い。特に悪条件での溶接作業、塗装作業、ライニング作業、熟練工の少ない電気、計装作業、据付精度を要する機器の仕上等の難作業を供給国工場内で実施出来る事は品質管理の観点から判断するとバージ方式が非常に有利である。

4.6 プラントの生産性

前項で記述した如く高品質にプラント機器が据付けられ建設されるバージ方式は、Fig. 4-2

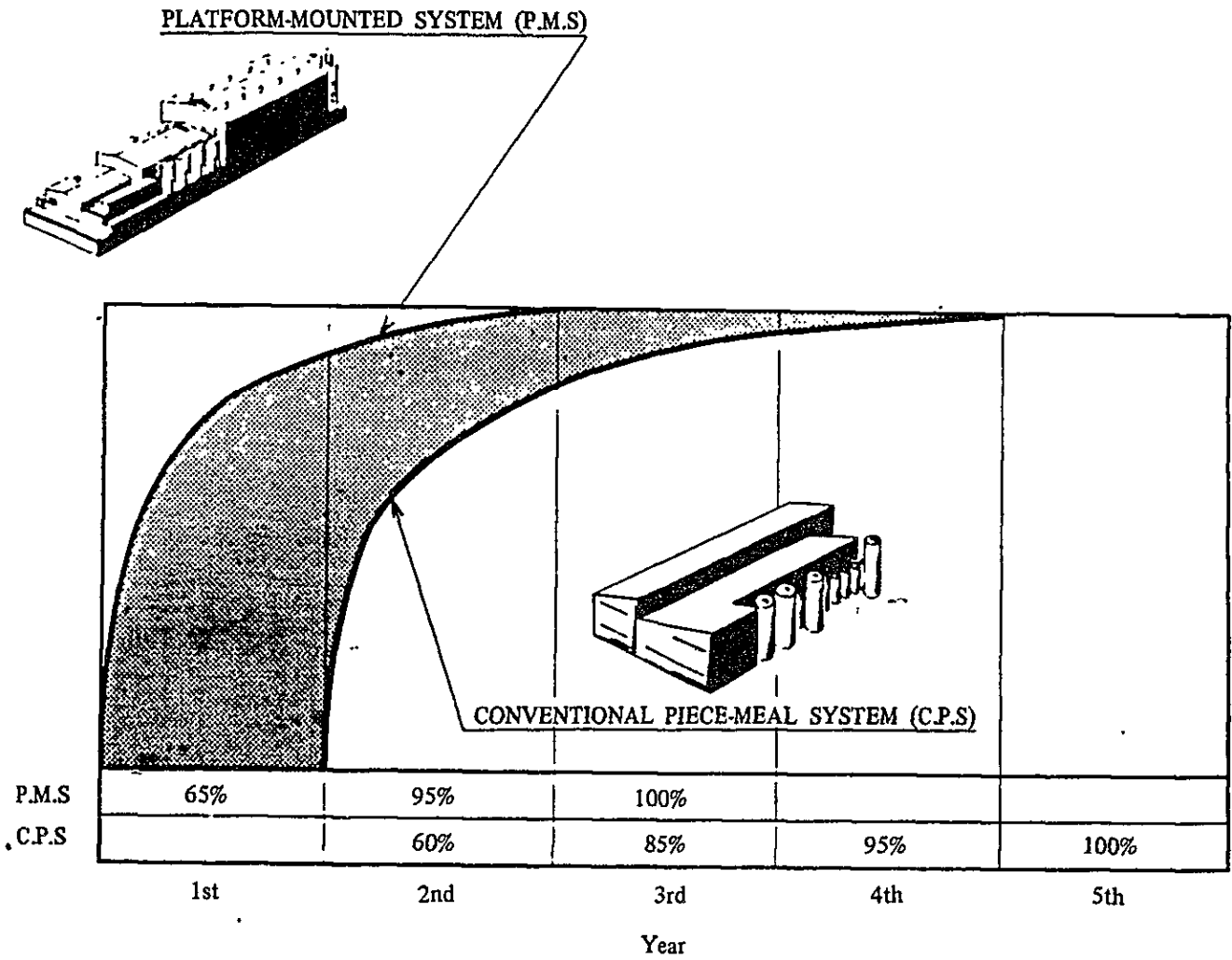
で示す如くプラントの立上りが非常に早く工場経営に寄与する事は大である。

立上りが陸上方式に比較し早い事は、操業開始後の保全計画、人員、販売計画等が非常に容易となり、早い時期に平常運転工場として管理出来る等計り知れない利益を生み出す事となる。

(注) 本表は、日本国に於いて建設されたバージ方式と世界的に云われている陸上建設方式による紙・パルププラントの立上り実績を表にしたものである。(生産量はフル・キャパシティーを100%とした)

Fig. 4 - 2.

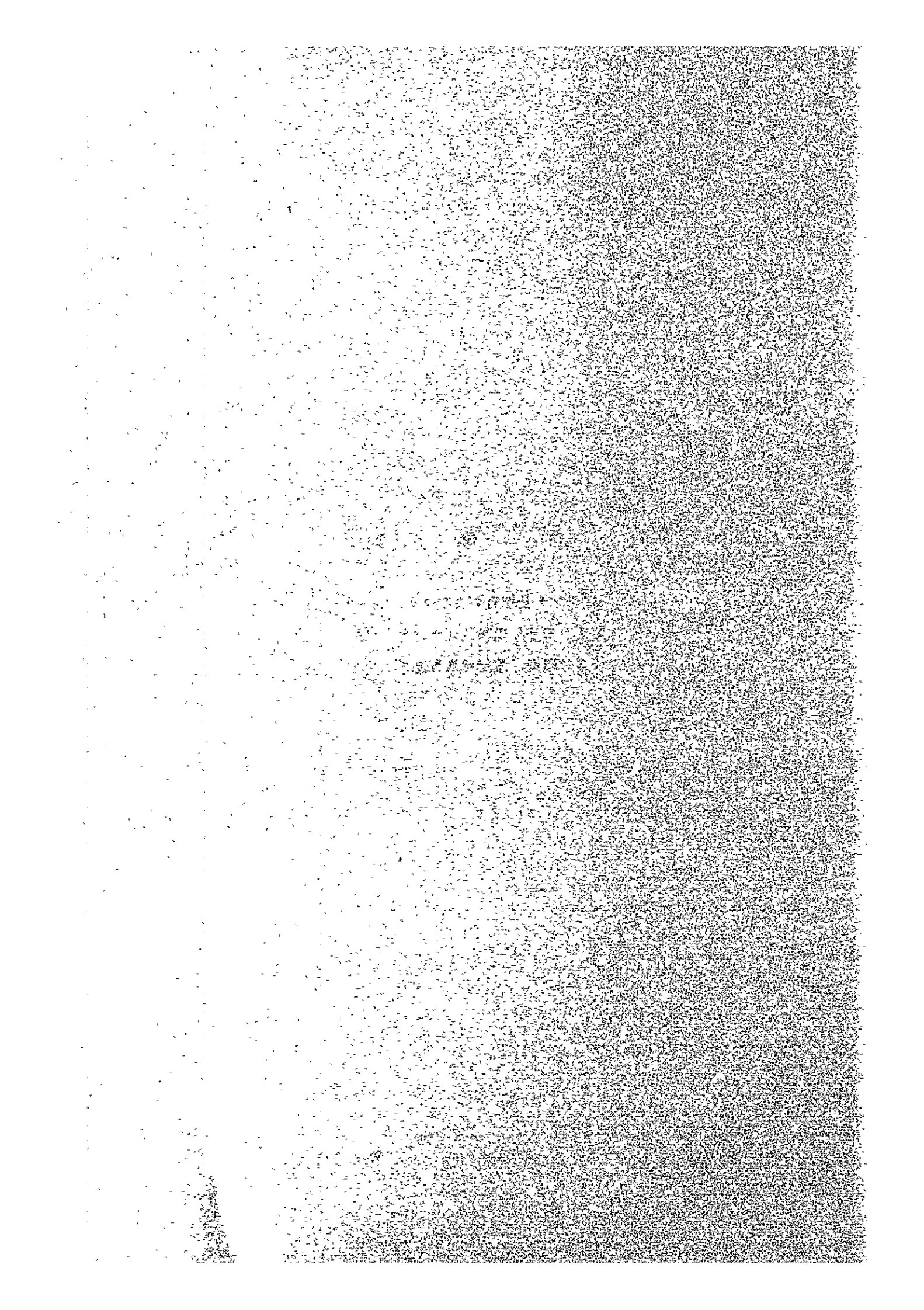
バージ方式と陸上方式における生産性比較表



付 録 5

プラント仕様書およびフローシート

1. 中芯原紙製造プラント
2. 印刷、筆記用紙製造プラント



付録 5 - 1 仕 様 書

中芯原紙製造プラント，主要機器，土木，建築工事仕様書

FOREST WORKS

Department 11 Logging Equipment

LOG HANDLING

Department 21 Log Handling and Chipping

PULP MAKING

Department 31 Cooking and Refining

Department 32 Brown Stock Washing and Screening

PAPER MAKING

Department 41 Stock Preparation

Department 42 Paper Machine

Department 43 Finishing

Department 44 Auxiliary Equipment for Paper Machine

CHEMICAL RECOVERY

Department 51 Black Liquor Evaporation

Department 52 Chemical Recovery Boiler

Department 53 Chemical Recovery

UTILITIES

Department 61 Fuel Supply

Department 62 Power Boiler

Department 63 Electrical Power Generation

Department	64	Substation and Electrical Power Distribution
Department	65	Electrical Equipment
Department	66	Instrumentation
Department	67	Water Supply
Department	68	Compressed Air Supply
Department	69	Mill Inter-connecting Piping

MILL SERVICE

Department	71	Maintenance Shop
Department	72	Laboratory
Department	73	Fire Protection System
Department	74	Vehicles
Department	75	Communication Equipment
Department	76	Mill Effluent Treatment

PLANT CONSTRUCTION

Department	90	Platform
Department	91	Civil Works
Department	92	Buildings and Structures

Department 11. Logging Equipment – On Shore

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
<u>Logging and Log Transportation Equipment</u>			
11101	22	Chain Saws	24 inch
11102	14	Angledozer	Equipped with towing winch
11103	4	Skid Loaders	
11104	26	Road Trucks	Capacity; 13 – 14 m ³
<u>Road Construction Equipment</u>			
11105	3	Angledozer	
11106	1	Angledozer	
11107	1	Bucket Loader	
11108	1	Back Hoe Shovel	
11109	1	Mobile Crane	Capacity; 16 tons
11110	1	Chain Saw	24 inch
11111	1	Tire Roller	Capacity; 8.5 tons
11112	1	Road Roller	McAdam-type, Capacity; 16 tons
11113	1	Motorized Piledriver	
11114	6	Dump Trucks	Capacity; 5 m ³
11115	1	Truck	Capacity; 8 tons
<u>Maintenance and Repair Equipment</u>			
11116	2	Trucks	

Item No.	Quantity	Equipment	Specification
11117	1 set	Machine Tools	
11118	1	Generating Set	
11119	1	Air Compressor	
<u>Construction Material Transportation Equipment</u>			
11120	3	Trucks	Capacity; 8 tons
<u>Fuel Distribution Equipment</u>			
11121	2	Tank Trucks	Capacity; 10 tons
<u>Lighting Equipment at Logging Camp Site</u>			
11122	22	Generating Sets	
<u>Administrative Equipment</u>			
11123	2	Passenger Buses	Capacity; 40 passengers
11124	5	Patrolling Cars	
11125	2	Generating Sets	

Department 21. Log Handling and Chipping – On Shore

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
<u>Pulpwood Handling and Chipping</u>			
21101	1	Truck Scale	
21102	1	No. 1 Log Deck	Chain live deck
21103	1	No. 2 Log Deck	Chain live deck with log kicker
21104	1	No. 1 Log Conveyors	Chain conveyor
21105	1	No. 2 Log Conveyors	Chain conveyor
21106	1	Chipper	Gravity Feed, top discharge chipper
<u>Large Pulpwood Handling</u>			
21107	1	Splitter	
<u>Chip Handling</u>			
21108	1	Chip Cyclone	Centrifugal cyclone
21109	1	Chip Feeder	Star type with chip bin
21110	1	Chip Screen	Rotary type
21111	1 set	Fines Conveyors	Belt conveyor
21112	1 set	Overs Conveyors	Belt conveyor
21113	1	Rechipper	Knife type rechipper with cyclone
21114	1 set	Chip Screen Outlet Conveyors	Belt conveyor
21115	1	Chip Stacker	Belt conveyor. for outside chip storage use

Item No.	Quantity	Equipment	Specification
21116	1	Chip Reclaimer	Chain conveyor
<u>Refuse Handling</u>			
21117	1 set	Bark and Dust Conveyors	Belt conveyor
<u>Auxiliary Equipment</u>			
21201	1 set	Pumps for Log Handling and Chipping Department	
21510	1 set	Electric Equipment	
21600	1 set	Scaffolding	
21700	1 set	Piping and Valves	

Department 31. Cooking and Refining – On Platform

Item No.	Quantity	Equipment	Specification
31101	1	Chip Washer	Horizontal type chip washer
31102	1	Chip Feeding Conveyor	Inclined trough belt conveyor
31103	1	Chip Weighing Conveyor	Horizontal trough belt conveyor with weight meter and magnetic separator
31104	1 set	Chip Distribution Conveyors	Trough belt conveyors
31105	3	Chip Bins	Vertical cylindrical type chip bin
31106	3	Digesters	Rotary globe type batch digester, 4,800 mm diameter
31107	3	Blow Pulp Drainers	Blow pit
31108	1 set	Blow Pulp Conveyors	Screw conveyor
31109	1 set	Refiner Feed and Return Conveyors	Inclined belt conveyor
31110	3	Refiner Infeed Conveyor	Screw conveyor
31111	3	Refiners	Double disc refiner
31201	1 set	Pumps	
31301	1 set	Agitators	
31401	1 set	Tanks	
31510	1 set	Electric Equipment	
31520	1 set	Instrument	

Item No.	Quantity	Equipment	Specification
31700	1 set	Piping and Valves	
31600	1 set	Scaffolding	
31800	1 set	Insulation	

Department 32. Brown Stock Washing and Screening – On Platform

Item No.	Quantity	Equipment	Specification
32101	1	Brown Stock Washer	Two-stage drum washer
32102	1	Pulp Screen	Pressure type
32103	1	Thickener	Valveless type, 4,500 mm length and 3,000 mm diameter
32104	1	Rejects Thickener	Extractor type
32105	1	Rejects Conveyor	Screw conveyor
32106	1	Rejects Refiner	Disc refiner
32107	1	Black Liquor Screen	Inclined type
32201	1 set	Pumps	
32301	1 set	Agitators	
32402	1 set	Chests and Tanks	
32510	1 set	Electric Equipment	
32520	1 set	Instrument	
32700	1 set	Piping and Valves	
32600	1 set	Scaffolding	
32800	1 set	Insulation	

Department 41. Stock Preparation – On Platform

Item No.	Quantity	Equipment	Specification
41101	1	Pulp Refiner	Disc refiner
41102	1	Stock Mixer	Vertical cylindrical mixing tank with agitator
41103	1	Machine Refiner	Conical refiner
41104	1	Stuff Box	
41105	1	Machine Screen	Pressure type
41106	1	Tail Screen	Vibrating type
41107	1 set	Additive Chemicals Preparation Equipment	
41201	1 set	Pumps	
41301	1 set	Agitators	
41402	1 set	Chests and Tanks	
41510	1 set	Electric Equipment	
41520	1 set	Instrument	
41700	1 set	Piping and Valves	
41600	1 set	Scaffolding	
41800	1 set	Insulation	

Department 42. Paper Machine – On Platform

Item No.	Quantity	Equipment	Specification
42101	1	Head Box	Multi-tube flow distributor
42102	1	Fourdrinier	Cantilever quick wire changing type, no shaking. Wire width: Approx. 4,880 mm
42103	1 set	Press Part	Primary and secondary press. – comprising one grooved press roll and one fixed center roll installed between these two press rolls. Tertiary press. – straight-through grooved roll. Wringer press.
42104	1 set	Dryer Part	Double deck multi-cylinder type with vapour removal roll system. Gearing – closed gearing. Paper dryers – Approx. 1,520 mm diameter, 61 rolls.
42105	1 set	Reel	Horizontal surface reel, autoflyte type
42106	1 set	Dryer Hood Exhaust Fans	Centrifugal fan
42107	1	Size Preparation Screen	
42401	1	Machine Pit	
42402	1	Couch Pit	
42403	1	White Water Pit	
42404	1	Calender Broke Pit	

Department 43. Finishing – On Platform

Item No.	Quantity	Equipment	Specification
43101	1	Rewinder	
43102	1	Roll Weight Meter	
43103	1	Roll Packing Machine	
43104	1 set	Pneumatic Conveying System for Sheets Cutter	
43105	1 set	Pneumatic Conveying System for Rewinder	
43106	1 set	Core Making Machine	
43107	1 set	Core Cutter	

Department 44. Auxiliary Equipment for Paper Machine – On Platform

Item No.	Quantity	Equipment	Specification
44101	1 set	Paper Machine Drive	Sectional driving system by DC motors
44102	1 set	Hood and Air System	Total enclosed type with motorized sliding doors
44103	1 set	Hot Air Supply System for Vapour Removal Rolls	
44104	1 set	Fourdrinier Air Exhaust System	
44105	1 set	Machine Room Ventilation System	
44106	1 set	Steam and Condensate System	Cascade flush-blow through type
44107	1 set	Vacuum System	NASH type
44108	1 set	Lubrication System	Forced circulation central oil supply type
44109	1	Save-all	
44110	1	Over-head Crane	Load capacity-25 tons. Two crabs three Hooks with operating console
44111	1	Reel Crane	Load capacity-20 tons. Low speed two-hooks with pendant push button switch box
44201	1 set	Pumps	
44301	1 set	Agitators	

Item No.	Quantity	Equipment	Specification
44402	1 set	Chests and Tanks	
44510	1 set	Electric Equipment	
44520	1 set	Instrument	
44700	1 set	Piping and Valves	
44600	1 set	Scaffolding	
44800	1 set	Insulation	

Department 51. Black Liquor Evaporation – On Platform

Item No.	Quantity	Equipment	Specification
51101	1	First Effect Evaporator	Falling film type
51102	1	Second Effect Evaporator	Falling film type
51103	1	Third Effect Evaporator	Falling film type
51104	1	Fourth Effect Evaporator	Falling film type
51105	1	Surface Condenser	Shell and tube type
51106	1	Pre-cooler	Barometric type
51107	1	Steam Ejector	Two stage ejector
51201	1 set	Pumps	
51301	1 set	Agitators	
51401	1 set	Tanks and Towers	
51510	1 set	Electric Equipment	
51520	1 set	Instrument	
51600	1 set	Scaffolding	
51700	1 set	Piping and Valves	
51800	1 set	Insulation	

Department 52. Chemical Recovery Boiler -- On Platform

Item No.	Quantity	Equipment	Specification
52101	1 set	Recovery Boiler Proper	Steam evaporation; 8 t/hr Pressure; 12 kg/cm ² G Outside installation
52102	1 set	Boiler Furnace	Water cooled membrane wall construction
52103	1 set	Superheater	Pendant platen type
52104	1 set	Attemperature	Spray type
52105	1 set	Economizer	Bare tube vertical type
52106	1	Steam Air heater	
52107	1 set	Steel Framework for Boiler Support	
52108	1 set	Steel Casing for Boiler enclose	
52109	1 set	Soot Blower	Long retracting rack soot blower, steam blowing type
52110	1 set	Black Liquor Spray Apparatus	Hoseless type
52111	1	Cascade Evaporator	
52112	1 set	Electrostatic Precipitator	Horizontal flow, dry bottom
52113	1 set	Oil Burner	Y-jet steam atomizer with innitor
52114	1	Smelt Spout	Water cooled
52115	1	Forced Draft Fan	Backward bladed fan

Item No.	Quantity	Equipment	Specification
52116	1	Induced Draft Fan	Radial bladed fan
52118	1	Sampling Apparatus	Sampling for water and steam
52119	1	Boiler Stack	
52201	1 set	Pumps	
52301	1 set	Agitators	
52401	1 set	Tanks and Towers	
52510	1 set	Electric Equipment	
52520	1 set	Instrument	
52600	1 set	Scaffolding	
52700	1 set	Piping and Valves	
52800	1 set	Insulation	

Department 53. Chemical Recovery – On Platform

Item No.	Quantity	Equipment	Specification
53101	1	Smelt Screen	Drum screen
53102	1	Smelt Screen	Vibration screen
53103	1	Main Separator	Centrifugal separator
53104	1	Main Reactor	
53105	1	Reactor	
53106	1	SO ₂ Gas Absorber	
53107	1	Gas Washer	
53108	1	Sludge Filter	
53109	1	Gas Scrubber	
53201	1 set	Pumps	
53301	1 set	Agitators	
53401	1 set	Tanks	
53510	1 set	Electric Equipment	
53520	1 set	Instrument	
53600	1 set	Scaffolding	
53700	1 set	Piping and Valves	
53800	1 set	Insulation	

Department 61 Fuel Supply – On Shore

Item No.	Quantity	Equipment	Specification
61202	1 set	Heavy Oil Receiving Pumps	
61202	1 set	Diesel Oil Receiving Pumps	
61203	1 set	Gasoline Receiving Pumps	
61204	1 set	Heavy Oil Feed Pumps	
61205	1 set	Diesel Oil Feed Pumps	
61206	1 set	Gasoline Feed Pumps	
61401	1	Heavy Oil Storage Tank	
61402	1	Diesel Oil Storage Tank	
61403	1	Gasoline Storage Tank	
61510	1 set	Electric Equipment and Controls	
61600	1 set	Scaffolding	
61700	1 set	Piping and Valves	

Department 62. Power Boiler – On Platform

Item No.	Quantity	Equipment	Specification
62101	1 set	Boiler Proper	Steam evaporation; 50 t/hr Steam pressure; 42 kg/cm ² Steam temperature; 420°C Fuel; oil and hog Outdoor installation type comprises; Boiler furnace Water tube Headers, downcomers, feeders Drums Boiler bank tube Boiler bank skin casing
62102	1	Superheater	Pendant convection type
62103	1	Economizer	Bare tube convection type
62104	1	Air Heater	Tubular type
62105	1	Steam Air Heater	
62106	1	Boiler Casing	Ribbed aluminum cold sheet
62107	1 set	Steel Framework	
62108	1 set	Soot Blower	Long retractable or rotary type blower, steam blowing type
62109	1	Forced Draught Fan	Turbo fan
62110	1	Induced Draught Fan	Turbo fan
62111	1	Secondary Air Fan	Turbo fan

Item No.	Quantity	Equipment	Specification
62112	1 set	Chemical Dosing Equipment	Comprises: tanks, pumps and agitator for dosing chemicals of ammonia, hydrazine, disodium phosphate and trisodium phosphate.
62113	1 set	Sampling Equipment	
62114	1 set	Boiler Feed Pump	Multi-staged turbine pump
62115	1	Fuel Oil Heater	
62116	1 set	Fuel Oil Burner	Steam atomizing type
62117	1 set	Pilot Oil Burner	Air atomizing type
62118	1 set	Make-up Water Treatment Equipment	Mixed bed, polisher type
62119	1	Ion Exchanger	
62120	1 set	Process Return Water Treatment Equipment	
62121	1	Stack	
62122	1	Main Condenser	Divided water box type surface condenser
62123	1	Main Steam Jet Air Ejector	Twin element two stage steam jet ejector
62124	1	Starting Air Ejector	Single stage steam jet type
62125	1 set	Feed Water Heater	Shell and tube type heater
62126	1	Deaerator	Spray type
62201	1 set	Pumps for Water Make-up	

Item No.	Quantity	Equipment	Specification
62401	1 set	Tanks for Water, Chemicals and Fuels	
62510	1 set	Electric Equipment and Controls	
82520	1 set	Instrument	
62600	1 set	Scaffolding and Support	
62700	1 set	Piping and Valves	
62800	1 set	Insulation	

Department.63. Electrical Power Generation – On Platform

Item No.	Quantity	Equipment	Specification
63101	1	Steam Turbine	9,000 kVA. Single cylinder, Impules type double extraction condensing turbine
63102	1	Generator	9,000 kVA. Three phase synchronuous generator, open type forced air cooled, horizontal and gear coupled to steam turbine
63103	1 set	Protective Device	
63104	1 set	Lubrication System	
63105	1 set	Steam Seal System	
63106	1 set	Turning Gear Device	
63107	1 set	Air Cooler for Generator	
63108	1	Power Generator for Emergency	500 kVA. Diesel engine driven power generator
63201	1 set	Pumps	
63401	1 set	Tanks	
63510	1 set	Control System	Speed and pressure control
	1 set	Excitation System	Three phase full-wave bridge, self cooled rectifier utilizing silicon diodes
63520	1 set	Instrument	

Item No.	Quantity	Equipment	Specification
63700	1 set	Piping and Valves	
63800	1 set	Insulation	

Department 64. Substation and Electric Power Distribution – On Platform

Classification of Electric Power Distribution System

	Voltage	Frequency	Phases	Wires	Grounding system
High Voltage	3,300 V	60	3	3	Resister neutral
Low Voltage	440 V	60	3	3	Non-grounded
90 kW and above AC motor	3,300 V	60	3	3	Non-grounded
75 kW and below AC motor	440 V	60	3	3	Non-grounded
DC motor	440 V	–	–	2	Non-grounded
Control Circuit and Instrument	110 V	60	1	2	Non-grounded
Lighting	220 V	60	1	2	Non-grounded
Battery Lighting (D.C)	110 V	–	–	2	Non-grounded

Item No.	Quantity	Equipment	Specification
64501	1 set	3.3 kV High Voltage Sheet-steel Cubicle Switchgear	
64502	1 set	Electrical Cable	
		3.3 kV Class Power Cable	Cross-linked polyethylene insulated, polyvyniyle chloride sheated cable
		600 V Class Power Cable	Cross-linked polyethylene insulated, polyvinyle chloride sheated cable

Item No.	Quantity	Equipment	Specification
		600 V Class Control Cable	Polyvinyle chlorided insulated and sheathed control cable
		600 V Class Control Shield Cable	Polyvinyle chloride insulated and sheathed control cable with copper tape shield

Department 65. Electrical Equipment -- On Platform

Item No.	Quantity	Equipment	Specification
65501	1 set	High Voltage sheet-steel Cubicle Switchgear	Draw-out type
65502	1 set	High Voltage Motor Control Center	Draw-out type
65503	1 set	Low Voltage Load Center	Fixed type
65504	1 set	Low Voltage Motor Control Center	Draw-out type
65505	1 set	Operation Panel for Motors	
65506	1 set	Local Push Button Switch Box	
65507	1 set	Electrical Motor	

Department 66. Instrumentation -- On Platform

Supply Characteristics

Electric power for instrument operation will be made available at 110 V, 60 Hz, single phase.

General Specification

- 1) Control system type.
Control system will be mainly pneumatic and to be generally insulated on locally.
- 2) Transmission and control signal.
Electronic transmission and control signal range will be 4 to 20 mA. Pneumatic signal will be of 0.2 to 1.0 kg.f/cm² G.
- 3) Transmitter.
Transmitter will be of the force-balance type or, where specified, of the motion balance indicating type, except in case of electrical measurement or control signal.
- 4) Recorder.
Recorder will be of the standard transmitted signal range and contain multiple recording pens. Miniature recorder with folding strip chart will be used for general mill service.
- 5) Control Station.
Controller will be mounted on panel with vertical scale for set point and process variable indication.
- 6) Indicator.
Indicator will be of the vertical scale type and the standard transmission signal.
- 7) Chart Drive.
Recorder chart drive will be of 110 V, 60 Hz, single phase.

- 8) Pen.
All pen will be of the capillary type with reservoirs in generally.
- 9) Local Mount Type Controller.
Displacement type level, capillary type pressure and temperature, etc. will be included.
- 10) Annunciator.
Annunciator will be suitable for 110 V, 60 Hz, single phase service and to be supplied with an acknowledge and test pushbutton.
- 11) Air Supply Regulator (Air Set).
All such regulator will be of the reducing-relief type with integral filter.

Process Control Panel

- 1) Panel Type.
Control panel will generally by of the free-standing type located in locally.
- 2) Panel Design.
Instrument arrangement on panel will be in accordance with department planning drawings.
- 3) Piping and Ducting.
Air supply header mounted within panel will be of copper tubing. Necessary air regulating system consisting of filter, reducing valve and pressure gauge with stop valve should be included.
- 4) Electric Equipment.
All electric equipment including materials, wiring and panel-itself.

Process Control Valve

- 1) Globe and Angle Valve.
Double-seated valve will be top and bottom guided.
Single-seated valve will be top and bottom or cage guide.

- 2) **Batterfly Valve.**
All batterfly valve will be of "Wafer" type.
- 3) **Ball Valve.**
Ball valve will be suitable for the throttling of pulp flow from full open to shut-off and such valve will have flow characteristics closely approximately that of "equal percentage".
- 4) **Valve Positioner and Transducer.**
Pneumatic valve positioner will be considered.
- 5) **Air Supply Regulator (Air Set).**
All such regulator will be of the reducing-relief type with integral filter.
- 6) **Accessories, Piping and Tubing.**
All accessories normally mounted on valve will be included.
All tubing connection will be made using copper tubing and tube fittings.

Instrument Piping

The major materials for instrument piping will be as follows:

- 1) **Vinyle covered multi-control copper tube.**
- 2) **Copper tube.**
- 3) **SGP (W) pipe.**
- 4) **Half-union.**
- 5) **Nipple.**
- 6) **Miniature stop valve.**

Department 67. Water Supply -- On Shore

Item No.	Quantity	Equipment	Specification
67101	1	Clarifier	Slurry circulation type
67102	1 set	Chemical Addition Unit	
67103	1 set	Filter	
67104	1 set	Demineralizing System	
67105	1 set	Potable Water System	
67201	1 set	Pumps	
67301	1 set	Agitator	
67401	1 set	Tanks and Towers	
67510	1 set	Electric Equipment	
67520	1 set	Instrument	
67600	1 set	Scaffolding	
67700	1 set	Piping and Valves	

Department 68. Compressed Air Supply – On Platform

Item No.	Quantity	Equipment	Specification
68101	2	Instrument Air Compressor	Oil free, water cooling double acting type
68102	1	Air Dryer	Automatic, electric heating
68103	1	Prefilter	
68104	1	After-filter	
68105	2	Mill Air Compressor	Water cooling, double acting lubricated tyep
68510	1 set	Electric Equipment	
68520	1 set	Instrument	
68600	1 set	Scaffolding	
68700	1 set	Piping	

Department 69. Mill Inter-connecting Piping

One complete set of mill inter-connecting piping system, i.e., process lines, chemicals lines, steam lines, water lines, potable water lines, fuel lines, all waste and effluent lines, etc., should be included for mill operation.

Department 71. Maintenance Shop – On Shore

Item No.	Quantity	Equipment	Specification
71101	2	Center Lathe	
71102	1	Universal type Milling Machine	
71103	1	Cutter Knife Grinder	
71104	1	Sliter Knife Grinder	
71105	1	Roll Grinder	
71106	1	Double Column type Plane and Milling Machine	
71107	1	Upright Drilling Machine	
71108	1	Floor type Bench Drill Machine	
71109	1	Overhead Crane	
71110	1	Trolley type Hoist with Beam	
71111	1	Marking Off Tools	
71112	1	Electric Hydraulical type Pipe Bender	
71113	5	Disc type Tube Cutter	
71114	2	Pipe Threading Machine	
71115	10	AC Arc Welder with Remote Control	
71116	1	Auto Single Surface Planer	
71117	1	Circular Saw on Frame	

Item No.	Quantity	Equipment	Specification
71118	1	Double Column type Hydraulic Press for Shop	
71119	1	Shaper	
71120	5	Acetylene Cutting and Welding Outfil	
71121	5 sets	Miscellaneous Hand Tool Kits	

Department 72. Laboratory – On Platform

Item No.	Quantity	Equipment	Specification
72101	1	Wood Chip Classification Unit	
72102	1	Laboratory Digester	
72103	1	Laboratory Flat Screen	
72104	1	Laboratory Disintegrator	
72105	1	Laboratory Beater	Niagara type
72106	1	Sheet Forming Machine	TAPPI standard type
72107	4	Freeness Tester	Canadian type
72108	1	Brightness Tester	
72109	1	Tensile Strength Tester	Schopper type
72110	1	Folding Endurance Tester	
72111	1	Bursting Strength Tester	Mullen type
72112	1	Treating Tester	Elemendorf type
721113	1	Stiffness Tester	
72114	1	Ring-crush Tester	
72115	2	Sample Cutter	
72116	2	Thickness Gauge	
72117	1	Gurley Tester for Smoothness, Porosity and Softness	
72118	1	Centrifuge	

Item No.	Quantity	Equipment	Specification
72119	2	Microscope	
72120	1	Projector	
72121	1	Drying Oven	
72122	1	Water Bath	
72123	2	Stopwatch	
72124	1	Electric Muffle Furnace	
72125	3	Basis Weight Balance	
72126	2	Direct Reading Balance	
72127	1	Platform Scale	
72128	2	Analytical Balance	
72129	2	ph Meter	
72130	8	Baume Scale	
72131	2	Turbidometer	
72132	2	Color Comparator	
72133	2	Hand Tachometer	
72134	1	Surface Pyrometer	
72135	10	Thermometer	
72136	1	Psychrometer	
72137	2	Stone Ware Sink Unit	
72138	2	Center Table	
72139	2	Balance Table	
72140	2	Water Still	

Item No.	Quantity	Equipment	Specification
72141	5	Jar Tester for Water	.
72142	10 sets	Glass Wear	

Department 73. Fire Protection System -- On Platform

One complete set of water hydrant system consisting automatic water sprinkler system and automatic water fog spray system, and set of portable chemical powder fire extinguishers for Platform and On-shore buildings should be included for the mill.

Complete sets of necessary piping, and electrical equipment and controls also should be considered.

Department 74. Vehicles

Item No.	Quantity	Equipment	Specification
74101	5	Front-end Loader	Tire skidder, 250 hp Logs offloading use
74102	5	Front-end Loader	Tire skidder, 280 hp Logs sorting in wood yard use
74103	2	Crawler Dozer	200 hp Wood yard use
74104	4	Fork-lift Truck	
74105	4	Shop Truck	3/4 ton
74106	2	4 x 4 Vehicle	
74107	10	Power-saw	Wood yard use

Department 75. Communication Equipment – On Shore

Item No.	Quantity	Equipment	Specification
75220	1 set	Telephone equipment	
75221	1 set	Telex Equipment	
75222	1 set	Office equipment	

Department 76. Mill Effluent Treatment – On Shore

Item No.	Quantity	Equipment	Specification
76101	1	Neutralization Mixer	Vertical type with bar screen
76102	1 set	Chemical Addition Unit	
76103	1	Clarifier	Slurry circulation type
76104	1	Sludge Thickener	
76105	1	Sludge Vacuum Filter	
76106	1 set	Lagoon with Mechanical Aerator	
76201	1 set	Pumps	
76301	1 set	Agitators	
76401	1 set	Tanks and Towers	
76510	1 set	Electric Equipment	
76520	1 set	Instrument	
76600	1 set	Scaffolding	
76700	1 set	Piping	

Department 90. Platform

General Particulars

The platforms will be designed, constructed, equipped, inspected, tested and delivered to the Plant site, and will be operated immediately after the installation by the Builder in accordance with these Specifications.

Dimensions of Platform

Length	Approx. 100 m
Breadth	Approx. 30 m
Depth	Approx. 12.5 m

Platform and House Structure

1) General

The platform will be designed to suit installation and operation of plant equipment and will be of all welded construction. The platform will be strengthened locally for the foundation of equipment where necessary.

2) Bottom Construction

Cellular double bottom will be constructed under the first floor. Bottom frame and inner bottom stiffeners will be arranged longitudinally. Transverse floors and longitudinal girders under double bottom tank top will be also arranged.

Carling or girder will be provided under machinery of other concentrated load wherever necessary. Vibratory characteristics of machinery, operating loads, equipment and fittings will be considered.

3) Framing

Framing system of main structure will be generally longitudinal.

4) Floors

All floors will be of steel fabrication and beams of main floor will be of longitudinal system, supported by deck transverses.

Beams on other floors will be either transverse or longitudinal system, whichever

suits the construction of the structure and operating requirement of the equipment. Carling, girder or suitable stiffening will be provided under the concentrated load wherever necessary.

5) Walls

Transverse walls will be plane type with vertical stiffeners. Boundart walls of the rooms such as operation room, laboratories, control rooms, transformer rooms, disconnection panel rooms, switch gear rooms, turbo generator room, etc. will be of steel fabrication.

6) Foundations

All welded foundation will be fitted for the equipment arranged on floors and walls. Suitable reinforcement by means of pillars, krackets and stays will be provided to prevent excessive concentrated load.

7) Construction of Houses

The side wall and roof of the house will be generally constructed of weathertight asbesto sheet supported with steel framing.

Laddars, Handrails and Elevators

1) Ladders and Steps

Access ladders to machinery and equipment will be of 800 mm wide and 45° to 60° inclined. Step interval will be 220 mm for inclined ladders and 300 mm for vertical ladders.

2) Handrails for Weather Exposed Part

Steel handrails will be fitted on decks except where breakwater will be provided. Handrail will be 1,050 mm high from deck.

3) Gratings

Gratings will be provided around equipment, pipes etc. for proper access and operation.

4) Elevators

Electric elevators for cargo use will be provided. Safety device for overloading, over speed trip, etc. will be also provided.

Ventilation and Air Conditioning System

1) Air Conditioning

Air conditioning system will be installed in dry end test room, operation room and laboratories, and central control room and kiln & recausticizer control room. The system will consist of refrigerating compressor(s), chilled water circulating pump(s) and fan unit(s). Provisions also will be made for supplying cooled air to disconnection panel rooms and switch gear rooms to maintain the inside temperature at 38°C.

Cooler(s) for men will be installed on the floors personnel use.

2) Mechanical Ventilation System

Main compartments of the platform will be served by mechanical supply and/or exhaust ventilation system.

Turbo generator room, air compressor room and refrigerating compressor room will be mechanically ventilated with supply of outside air.

The mechanical ventilation will utilize electric motor driven fans of low pressure type.

3) Natural Ventilation

The side walls of the platform will be opened at site, but insect screen will be supplied for every 5 m of side walls of paper machine area and products finishing area.

The insect screen to have stainless steel screen, frame and fittings.

Hull Piping

1) General

Piping system required for fuel oil, fresh water, compressed air, drainage, etc. will be provided.

2) Firefighting System

Water hydrant system will be served for fire extinguishing the platform main compartments. Water will be supplied from shore side. Automatic water sprinkler system will be provided for products finishing areas, and turbo generator bearings and fuel oil pump area. Automatic water fog spray system will be provided for transformer rooms.

Portable chemical extinguishers will be provided where necessary in accordance with Japanese regulation.

3) Fresh Water System

Fresh water line will be piped for cold water fountains, laboratories, emergency showers and eye washers and toilets.

4) Scupper and Drainage System

Scupper and drain pipes will be provided for the main floors, roof of houses, sanitary spaces and other enclosed spaces wherever necessary.

Joiner Works, Deck covering, Insulation, etc.

1) Joiner Work

Asbestos cement board Joiner lining will be fitted on inside steel walls of operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

Asbestos cement board ceiling will be fitted in operation rooms, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

2) Deck Covering

Synthetic rubber composite deck will be furnished in operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room. Floor in other rooms will be furnished only with paint.

3) Insulation

Glass wool insulation will be provided for interior surface of operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

Glass wool insulation will be also provided for interior surface of weather exposed ceilings and walls of disconnection panel rooms, switch gear rooms, turbo-generator rooms, air compressor rooms, machine room, elevator machine rooms and battery rooms.

Electric Installation

1) General

This Section explains the following features of the overall electrical installation:

1) Electric lighting throughout the areas within the platform.

- 2) Communication system
 - 3) Fire alarm system
 - 4) Warning lights for airplane
 - 5) Lighting conductors
-
- 2) Electric Lighting
Lighting fixtures will be applied to obtain adequate illumination to levels prevailing in corresponding spaces in the pulp industry.
 - 3) Telephone System
To communicate with the platform and shore facilities, telephone system will be applied.
 - 4) Communication System
To communicate with the platform and shore facilities, transceiver system will be applied as well as telephone system.
 - 5) Calling Horn System
Motor horns and push buttons will be installed to call work-men within the platform.
 - 6) Fire Alarm System
One (1) set of fire alarm system with detectors will be installed.
 - 7) Obstruction Warning Light for Airplane
Sets of obstruction light on the platform will be installed.
 - 8) Lighting Conductor
Sets of lightning conductor will be installed on the platform.

Department 91. Civil Works

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
91101	1	Topographic survey work	
91102	1	Soil testing work	
91103	1	Clearing and grubbing work	
91104	1	Grading and ditching work	
91105	1	Graveling work	
91106	1	Revetment work	
91107	1	Road work	
91108	1	Process effluent disposal work	
91109	1	Sanitary effluent disposal work	
91110	1	Water supply work	
91111	1	Underground fire protection work	
91112	1	Foundation work for equipment	
91113	1	Dedging and piling work for platform	

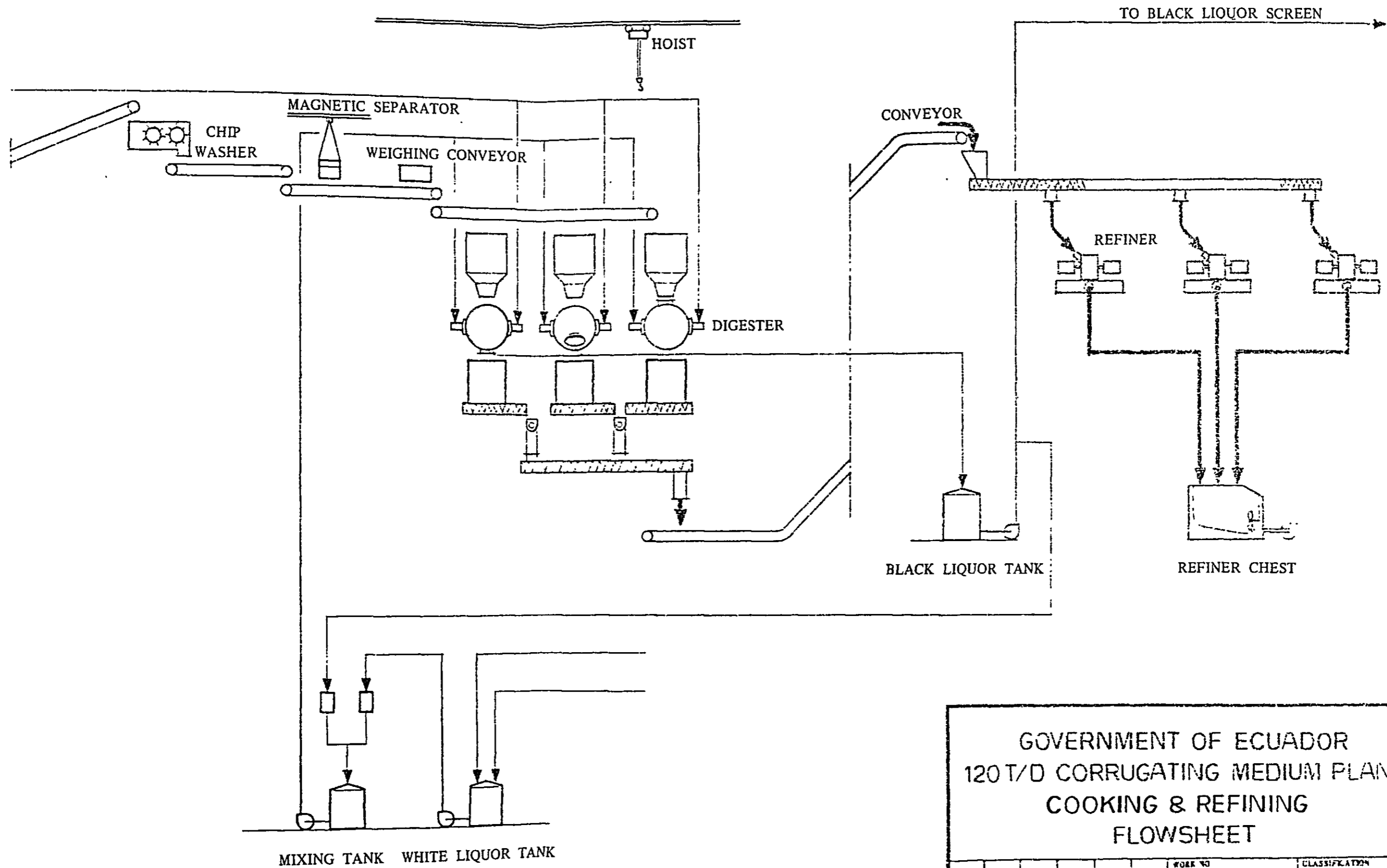
Department 92. Buildings and Structures

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
92201	1	Administration building including laboratory	One story-building 20 x 50 m Structure: Block and brick structure with steel reinforcements Wall: Brick Roof: Asbesto slate
92202	1	Gate house and fire station	One story 5 x 5 m Structure: Block and structure with steel reinforcements Wall: Asbesto slate and brick Roof: Asbesto slate
92203	1	Maintenance shop and Locker house	One story 20 x 30 m Structure: Block and structure with steel reinforcements Wall: Asbesto slate and brick Roof: Asbesto slate
92204	1	Chipper and chip screen	One story 6 x 12 m Structure: Pipe truss structure Roof: Asbesto slate
92205	1	Warehouse	One story 30 x 170 m Structure: Pipe truss structure Wall: Asbesto slate and brick Roof: Asbesto slate

付録 5 - 2 フローシート

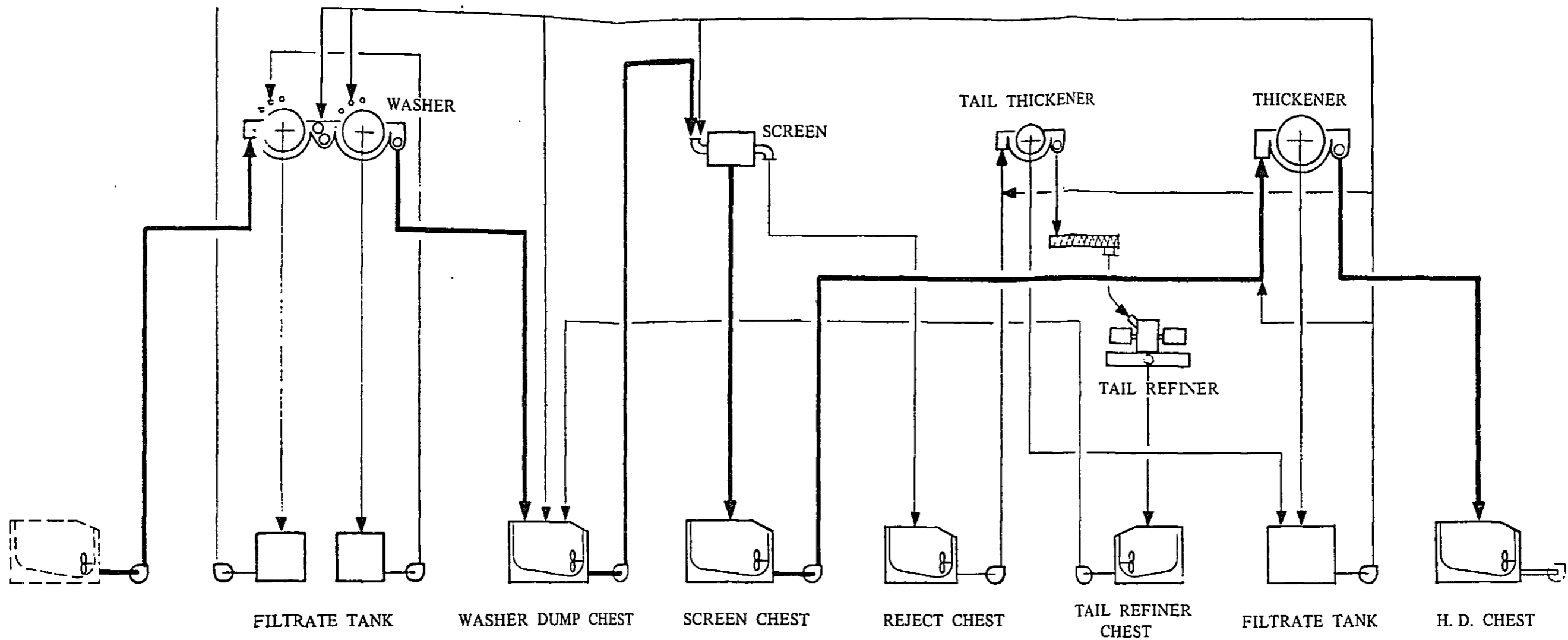
中芯原紙製造プラント, フローシート

Department	21	Log Handling and Chipping
Department	31	Cooking and Refining
Department	32	Brown Stock Washing and Screening
Department	41	Stock Preparation
Department	42	Paper Machine and Finishing
Department	50	Auxiliary Plants for Corrugating Medium Plant



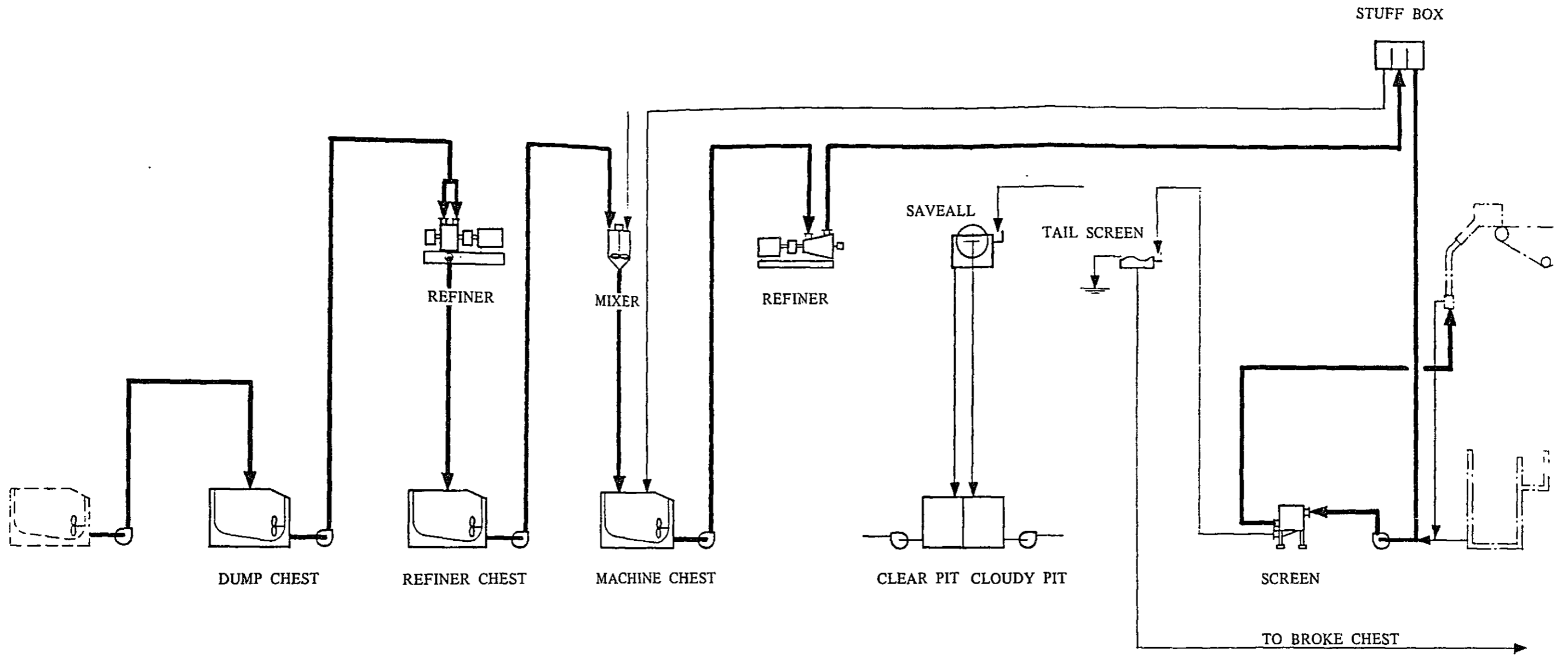
GOVERNMENT OF ECUADOR
 120 T/D CORRUGATING MEDIUM PLANT
 COOKING & REFINING
 FLOWSHEET

						WORK NO	CLASSIFICATION
						DRAWING NO	
DATE	DRAWN BY	ENG. CHAR.	CHEF	DEPT. MANAG.	MANAG.		
JAPAN INTERNATIONAL COOPERATION AGENCY							



GOVERNMENT OF ECUADOR
 120 T/D CORRUGATING MEDIUM PLANT
 BROWN STOCK WASHING & SCREENING
 FLOWSHEET

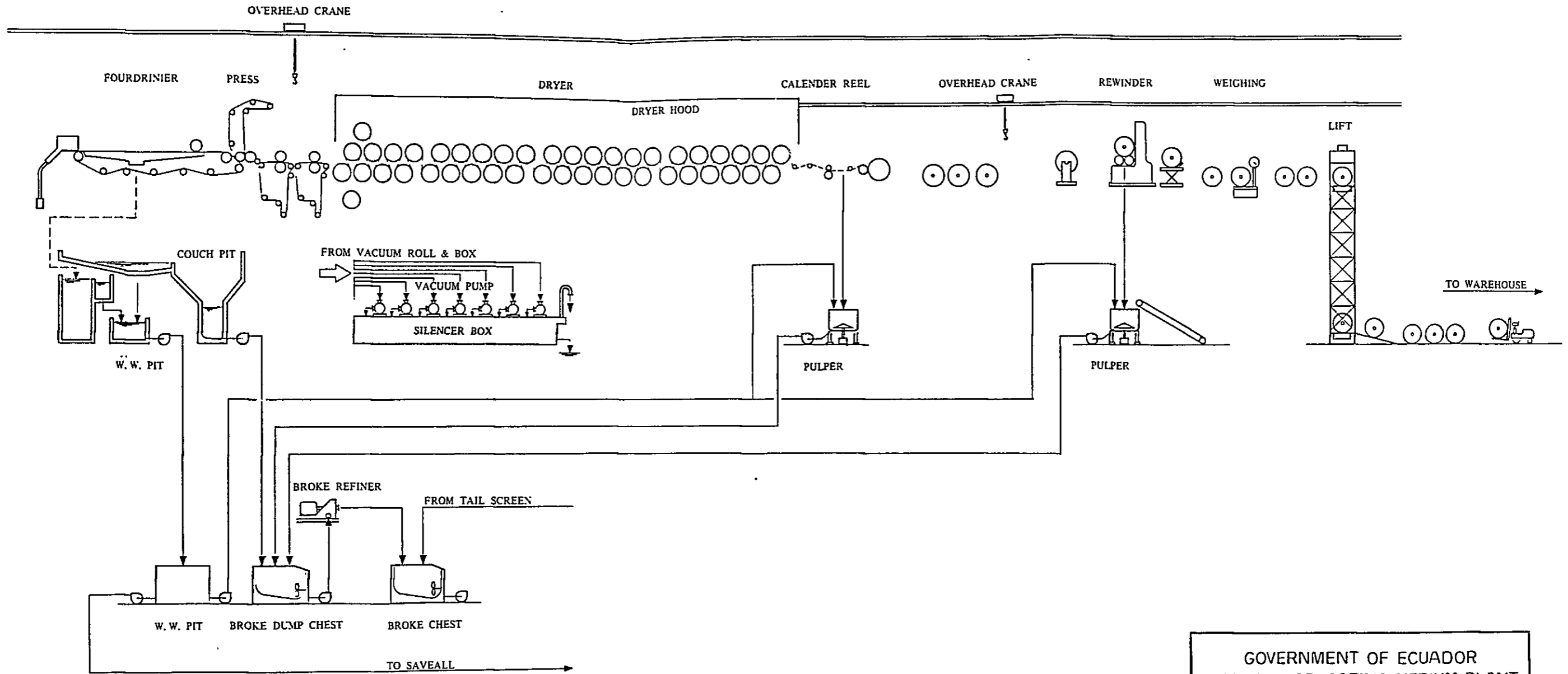
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DATE	DRAWN BY	ENG CHAR	CHIEF	DEPT. MANAG	MANAG.		
JAPAN INTERNATIONAL COOPERATION AGENCY							



GOVERNMENT OF ECUADOR
 120 T/D CORRUGATING MEDIUM PLANT
 STOCK PREPARATION
 FLOWSHEET

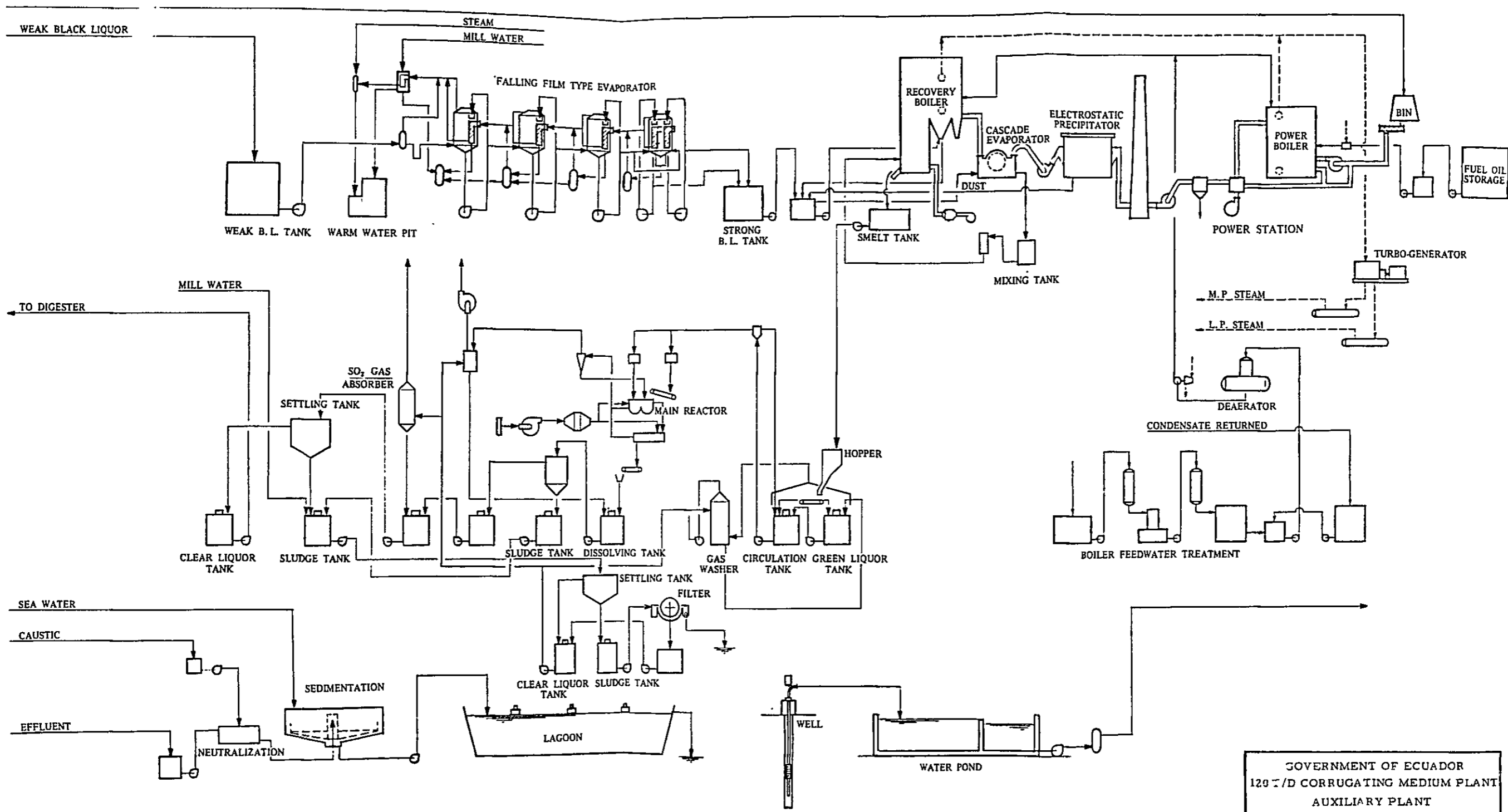
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						DRAWING NO	
DATE	DRAWN BY	ENG. CHECK	CHEF	DEPL. MANAG.	MANAG.		

JAPAN INTERNATIONAL COOPERATION AGENCY



GOVERNMENT OF ECUADOR
 120 T/D CORRUGATING MEDIUM PLANT
 PAPER MACHINE
 FLOWSHEET

						WORK NO.	CLASSIFICATION
						DRAWING NO.	
DATE	DRAWN BY	CHKD BY	CHKD	DEPT.	PLANT	NAME	
JAPAN INTERNATIONAL COOPERATION AGENCY							



GOVERNMENT OF ECUADOR
 120 T/D CORRUGATING MEDIUM PLANT
 AUXILIARY PLANT
 FLOWSHEET

DATE	BY	CHECKED	DATE

JAPAN INTERNATIONAL COOPERATION AGENCY

付録 5 - 3 仕 様 書

印刷, 筆記用紙製造プラント, 主要機器, 土木, 建築工事仕様書
for Printing/Writing Paper Plant

FOREST WORKS

Department 11 Logging Equipment

LOG HANDLING

Department 21 Log Handling and Chipping

PULP MAKING

Department 31 Cooking
Department 32 Brown Stock Washing and Screening
Department 33 Bleaching
Department 34 Auxiliary Equipment for Pulp Making

PAPER MAKING

Department 41 Stock Preparation
Department 42 Paper Machine
Department 43 Finishing
Department 44 Auxiliary Equipment for Paper Machine

CHEMICAL RECOVERY AND MAKING

Department 51 Black Liquor Evaporation
Department 52 Chemical Recovery Boiler
Department 53 Reausticizing
Department 54 Lime Recovery
Department 56 Bleach Chemical Preparation

UTILITIES

Department	61	Fuel Supply
Department	62	Power Boiler
Department	63	Electrical Power generation
Department	64	Substation and Electrical power Distribution
Department	65	Electrical Equipment
Department	66	Instrumentation
Department	67	Water Supply
Department	68	Compressed Air Supply
Department	69	Mill Inter-connecting Piping

MILL SERVICE

Department	71	Maintenance Shop
Department	72	Laboratory
Department	73	Fire Protection System
Department	74	Vehicles
Department	75	Communication Equipment
Department	76	Mill Effluent Treatment

PLANT CONSTRUCTION

Department	90	Platform
Department	91	Civil Works
Department	92	Buildings and Structures

Department 11. Logging Equipment – On Shore

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
<u>Logging and Log Transportation Equipment</u>			
11101	22	Chain Saws	24 inch
11102	14	Angledozer	Equipped with towing winch
11103	4	Skid Loaders	
11104	26	Road Trucks	Capacity; 13 – 14 m ³
<u>Road Construction Equipment</u>			
11105	3	Angledozer	
11106	1	Angledozer	
11107	1	Bucket Loader	
11108	1	Back Hoe Shovel	
11109	1	Mobile Crane	Capacity; 16 tons
11110	1	Chain Saw	24 inch
11111	1	Tire Roller	Capacity; 8.5 tons
11112	1	Road Roller	McAdam-type, Capacity; 16 tons
11113	1	Motorized Piledriver	
11114	6	Dump Trucks	Capacity; 5 m ³
11115	1	Truck	Capacity; 8 tons
<u>Maintenance and Repair Equipment</u>			
11116	2	Trucks	

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
11117	1 set	Machine Tools	
11118	1	Generating Set	
11119	1	Air Compressor	
<u>Construction Material Transportation Equipment</u>			
11120	3	Trucks	Capacity; 8 tons
<u>Fuel Distribution Equipment</u>			
11121	2	Tank Trucks	Capacity; 10 tons
<u>Lighting Equipment at Logging Camp Site</u>			
11122	2	Generating Sets	
<u>Administrative Equipment</u>			
11123	2	Passenger Buses	Capacity; 40 passengers
11124	5	Patrolling Cars	
11125	2	Generating Sets	

Department 21. Log Handling and Chipping – On Shore

Item No.	Quantity	Equipment	Specification
<u>Pulpwood Handling and Chipping</u>			
21101	1	Truck Scale	
21102	1	No. 1 Log Deck	Chain live deck
21103	1	No. 2 Log Deck	Chain live deck with log kicker
21104	1	No. 1 Log Conveyors	Chain conveyor
21105	1	No. 2 Log Conveyors	Chain conveyor
21106	1	Chipper	Gravity Feed, top discharge chipper
<u>Large Pulpwood Handling</u>			
21107	1	Splitter	
<u>Chip Handling</u>			
21108	1	Chip Cyclone	Centrifugal cyclone
21109	1	Chip Feeder	Star type with chip bin
21110	1	Chip Screen	Rotary type
21111	1 set	Fines Conveyors	Belt conveyor
21112	1 set	Overs Conveyors	Belt conveyor
21113	1	Rechipper	Knife type rechipper with cyclone
21114	1 set	Chip Screen Outlet Conveyors	Belt conveyor
21115	1	Chip Stacker	Belt conveyor. for outside chip storage use

Item No.	Quantity	Equipment	Specification
21116	1	Chip Reclaimer	Chain conveyor
<u>Refuse Handling</u>			
21117	1 set	Bark and Dust Conveyors	Belt conveyor
<u>Auxiliary Equipment</u>			
21201	1 set	Pumps for Log Handling and Chipping Department	
21510	1 set	Electric Equipment	
21600	1 set	Scaffolding	
21700	1 set	Piping and Valves	

Department 31. Cooking -- On Platform

Item No.	Quantity	Equipment	Specification
31101	1	Chip Washer	Horizontal type chip washer
31102	1	Chip Feeding Conveyor	Inclined trough belt conveyor
31103	1	Chip Weighing Conveyor	Horizontal trough belt conveyor with weight meter and magnetic separator
31104	1 set	Chip Distribution Conveyors	Trough belt conveyors
31105	3	Chip Bins	Vertical cylindrical type chip bin
31106	3	Digesters	Vertical stationary type batch digester, 65 m ³
31107	3	Liquor Heaters	
31108	1	Blow Tank	Vertical cylindrical tank
31109	1	Direct Contact Condenser	
31110	1	Accumulator	
31111	1	Heat Exchanger	
31201	1 set	Pumps	
31301	1 set	Agitators	
31402	1 set	Tanks	
31510	1 set	Electric Equipment	
31520	1 set	Instrument	

Item No.	Quantity	Equipment	Specification
31600	1 set	Scaffolding	
31700	1 set	Piping and Valves	
31800	1 set	Insulation	

Department 32. Brown Stock Washing and Screening – On Platform

Item No.	Quantity	Equipment	Specification
32101	1	Metal Trap	
32102	1	Knotter	
32103	1	Three-stage Brown Stock Washer	Drum washer 2,500 mm diameter, 2,000 mm length
32104	1	Pulp Conveyor	Screw conveyor
32105	1	Black Liquor Screen	Inclined type
32106	1	Pulp Screen	Cowan type or equivalent
32107	1	Thickener	Valveless type
32108	1	Pulp Conveyor	Horizontal screw conveyor
32109	1	Rejects Screen	Cowan type or equivalent
32110	1	Rejects Screen	Vibrating screen
32111	1	Rejects Cleaner	Centrifugal screen
32401	1	H.D. Chest	High density chest for pulp storage
32201	1 set	Pumps	
32301	1 set	Agitators	
32402	1 set	Chests and Tanks	
32510	1 set	Electric Equipment	
32520	1 set	Instrument	
32600	1 set	Scaffolding	

Item No.	Quantity	Equipment	Specification
32700	1 set	Piping and Valves	
32800	1 set	Insulation	

Department 33. Bleaching – On Platform

Item No.	Quantity	Equipment	Specification
33101	1	Chlorine Mixer	Inline type
33102	1	Chlorine Washer	Vacuum type
33103	1	No. 1 Caustic Mixer	Screw type
33104	1	No. 1 Caustic Washer	Vacuum type
33105	1	No. 1 Hypo Mixer	Screw type
33106	1	No. 1 Hypo Washer	Vacuum type
33107	1	No. 2 Caustic Mixer	Screw type
33108	1	No. 2 Caustic Washer	Vacuum type
33109	1	No. 2 Hypo Mixer	Screw type
33110	1	No. 2 Hypo Washer	Vacuum type
33111	1	Pulp Cleaner	Centrifugal type
33112	1	Two-stage Pulp Thickener	Extractor and vacuum type
33401	1	Chlorination Tower	Vertical cylindrical type, 62 m ³
33402	1	No. 1 Caustic Extraction Tower	Vertical cylindrical type, 40 m ³
33403	1	No. 1 Hypo Tower	Vertical cylindrical type, 65 m ³
33404	1	No. 2 Caustic Extraction Tower	Vertical cylindrical type, 40 m ³
33405	1	No. 2 Hypo Tower	Vertical cylindrical type, 65 m ³
33406	1	H.D. chest	High density chest for pulp storage

Item No.	Quantity	Equipment	Specification
33201	1 set	Pumps	
33301	1 set	Agitators	
33407	1 set	Chests and Tanks	
33510	1 set	Electric Equipment	
33520	1 set	Instrument	
33700	1 set	Piping and Valves	
33600	1 set	Scaffolding	
33800	1 set	Insulation	

Department 41. Stock Preparation – On Platform

Item No.	Quantity	Equipment	Specification
41101	1	Pulp Refiner	Disc refiner
41102	1	Pulper Feed Converyor	Steel slat conveyor
41103	1	Hydrapulper	Continuous pulper
41104	1	No. 1 Stock Refiner	Disc refiner
41105	1	No. 2 Stock Refiner	Disc refiner
41106	1	No. 1 Stock Mixer	Vertical cylindrical mixing tank with agitator
41107	1	No. 2 Stock Mixer	Vertical cylindrical mixing tank with agitator
41108	1	Machine Refiner	Conical refiner
41109	1	Stuff Box	
41110	1	Machine Screen	Pressure type
41111	1	Machine Cleaner	Centrifugal cleaner
41112	1	Tail Screen	Vibrating type
41113	1 set	Additive Chemicals Preparation Equipment	
41201	1 set	Pumps	
41301	1 set	Agitators	
41402	1 set	Chests and Tanks	
41510	1 set	Electric Equipment	
41520	1 set	Instrument	
41700	1 set	Piping and Valves	

Item No.	Quantity	Equipment	Specification
41600	1 set	Scaffolding	
41800	1 set	Insulation	

Department 42. Paper Machine – On Platform

Item No.	Quantity	Equipment	Specification
42101	1	Head Box	Totally enclosed air cushion type with multi-tube flow distributor
42102	1	Fourdrinier	Cantilever quick wire changing type, no shaking. Wire width: Approx. 2,980 mm
42103	1 set	Press Part	Primary and secondary press. – comprising one suction pick up press roll, one grooved press roll and one fixed center roll installed between these two press rolls. Tertiary press. – straight-through grooved roll. Wringer press.
42104	1 set	Pre-dryer Part	Double deck multi-cylinder type with vapour removal roll system. Gearing - closed gearing. Paper dryers - Approx. 1,520 mm diameter. Cooling cylinder - Approx. 1,520 mm diameter.
42105	1 set	Size Press	
42106	1 set	After-dryer Part	Double deck multi-cylinder type with vapour removal roll system. Gearing - closed gearing. Paper dryers - Approx. 1,520 mm diameter.

Item No.	Quantity	Equipment	Specification
			Cooling cylinder - Approx. 1,520 mm diameter.
42107	1 set	Calender	Six rolls, two stacks with open type frame
42108	1 set	Reel	Horizontal surface reel, autoflyte type
42109	1 set	Dryer Hood Exhaust Fans	Centrifugal fan
42110	1	Size Preparation Screen	
42401	1	Machine Pit	
42402	1	Couch Pit	
42403	1	White Water Pit	
42404	1	Calender Broke Pit	

Department 43. Finishing – On Platform

Item No.	Quantity	Equipment	Specification
43101	1	Sheets Cutter	
43102	1	Sheets Wrapper	
43103	1	Rewinder	
43104	1	Roll Weight Meter	
43105	1	Roll Packing Machine	
43106	1 set	Pneumatic Conveying System for Sheets Cutter	
43107	1 set	Pneumatic Conveying System for Rewinder	

Department 44. Auxiliary Equipment for Paper Machine – On Platform

Item No.	Quantity	Equipment	Specification
44101	1 set	Paper Machine Drive	Sectional driving system by DC motors
44102	1 set	Hood and Air System	Total enclosed type with motorized sliding doors
44103	1 set	Hot Air Supply System for Vapour Removal Rolls	
44104	1 set	Fourdrinier Air Exhaust System	
44105	1 set	Machine Room Ventilation System	
44106	1 set	Steam and Condensate System	Cascade flush-blow through type
44107	1 set	Vacuum System	NASH type
44108	1 set	Calender Cooling System	
44109	1 set	Lubrication System	Forced circulation central oil supply type
44110	1	Pulper Feed Conveyor	Steel slat conveyor
44111	1	Dry Broke Pulper for Reel and Cutter	Continuous pulper
44112	1	Save-all	
44113	1	Broke Thickener	Drum filter
44114	1	Broke Breaker	
44115	1	Over-head Crane	Load capacity-25 tons. Two crabs three Hooks with operating console

Item No.	Quantity	Equipment	Specification
44116	1	Reel Crane	Load capacity-20 tons. Low speed two-hooks with pendant push button switch box
44201	1 set	Pumps	
44301	1 set	Agitators	
44402	1 set	Chests and Tanks	
44510	1 set	Electric Equipment	
44520	1 set	Instrument	
44600	1 set	Scaffolding	
44700	1 set	Piping and Valves	
44800	1 set	Insulation	

Department 51. Black Liquor Evaporation – On Platform

Item No.	Quantity	Equipment	Specification
51101	1	First Effect Evaporator	Falling film type
51102	1	Second Effect Evaporator	Falling film type
51103	1	Third Effect Evaporator	Falling film type
51104	1	Fourth Effect Evaporator	Falling film type
51105	1	Surface Condenser	Shell and tube type
51106	1	Pre-cooler	Barometric type
51107	1	Steam Ejector	Two stage ejector
51201	1 set	Pumps	
51301	1 set	Agitators	
51401	1 set	Tanks and Towers	
51510	1 set	Electric Equipment	
51520	1 set	Instrument	
51600	1 set	Scaffolding	
51700	1 set	Piping and Valves	
51800	1 set	Insulation	

Department 52. Chemical Recovery Boiler – On Platform

Item No.	Quantity	Equipment	Specification
52101	1 set	Recovery Boiler Proper	Outside installation
52102	1 set	Boiler Furnace	Water cooled membrane wall construction
52103	1 set	Superheater	Pendant platen type
52104	1 set	Attemperature	Spray type
52105	1 set	Economizer	Bare tube vertical type
52106	1	Steam Airheater	
52107	1 set	Steel Framework for Boiler Support	
52108	1 set	Steel Casing for Boiler enclose	
52109	1 set	Soot Blower	Long retracting rack soot blower, steam blowing type
52110	1 set	Black Liquor Spray Apparatus	Hoseless type
52111	1	Cascade Evaporator	
52112	1 set	Electrostatic Precipitator	Horizontal flow, dry bottom
52113	1 set	Oil Burner	Y-jet steam atomizer with ignitor
52114	1	Smelt Spout	Water cooled
52115	1	Saltcake Screw Feedre	
52116	1	Saltcake Rotary Feeder	
52117	1	Saltcake Conveyor	Bucket conveyor

Item No.	Quantity	Equipment	Specification
52118	1	Forced Draft Fan	Backward bladed fan
52119	1	Induced Draft Fan	Radial bladed fan
52120	1	Sampling Apparatus	Sampling for water and steam
52121	1	Boiler Stack	
52201	1 set	Pumps	
52301	1 set	Agitators	
52401	1 set	Tanks and Towers	
52510	1 set	Electric Equipment	
52520	1 set	Instrument	
52600	1 set	Scaffolding	
52700	1 set	Piping and Valves	
52800	1 set	Insulation	

Department 53. Reausticizing – On Platform

Item No.	Quantity	Equipment	Specification
53101	1	Green Liquor Clarifier	Unit type thickener
53102	1	Green Liquor Heater	Inline type steam direct injection
53103	1	Lime Slaker	Combined type with mixer tank and classifier
53104	1 set	Causticizer	Turbine mixer
53105	1 set	White Liquor Classifier	
53106	1	Dregs Mixer	Turbine type
53107	1	Dregs Washer	Unit type thickener
53108	1	Dregs Filter	Drum filter
53109	1	Lime Mud Washer	Unit type thickener
53110	1	Lime Mud Filter	Drum filter
53111	1	Slaker Discharge Conveyor	Belt conveyor
53201	1 set	Pumps	
53301	1 set	Agitators	
53401	1 set	Tanks	
53510	1 set	Electric Equipment	
53520	1 set	Instrument	
53600	1 set	Scaffolding	
53700	1 set	Piping and Valves	
53800	1 set	Insulation	

Department 54. Lime Recovery – On Platform

Item No.	Quantity	Equipment	Specification
54101	1	Feed End Hood	
54102	1	Lime Kiln	Short type
54103	1 set	Satellite Cooler	
54104	1	Firing Hood	
54105	1	Discharge Housing	
54106	1 set	Driving Unit	
54107	1 set	Supporting Unit	Three tires one thrust roller
54108	1	Rotary Valve	
54109	1	Cyclone	
54110	1	Discharge Divider	
54111	1	Venturi-scrubber	
54112	1	Table Feeder	
54113	1	Lime Stone Crusher	Hammer type
54114	1	Lime Stone Crusher	Roll type
54115	1	Cage Mill	
54116	2	Belt Conveyor	
54117	1	Paddle Mixer	
54118	3	Screw Conveyor	
54120	1	Bucket Elevator	
54121	1	Bucket Elevator	

Item No.	Quantity	Equipment	Specification
54122	1	Feed Hopper	
54123	1 set	Oil Pump Unit	
54124	1 set	Oil Burner	
54125	1 set	Diesel Oil Pump Unit	
54126	1	Exhaust Fan	
54127	1	Primary Fan	
53201	1 set	Pumps	
53301	1 set	Agitators	
53401	1 set	Tanks	
54510	1 set	Electric Equipment	
54520	1 set	Instrument	
54600	1 set	Scaffolding	
54700	1 set	Piping and Valves	
54800	1 set	Bricks and Insulation	

Department 56. Bleach Chemical Preparation – On Platform

Item No.	Quantity	Equipment	Specification
56101	1 set	Salt Handling	Comprising: 3-Salt conveyors 1-Salt dissolving tank 1-Slurry receiver
56102	1 set	Brine Purification	Comprising: 1-Raw brine receiver 1-Reactor 1-Settler 1-Brine receiver 1-Filter 1-Chemical dosing equipment 1-Filter press 1-Filtrate liquor receiver 1-Mud conveyor 1-Mud receiver
56103	1 set	Electlysis and NaOH Line	Comprising: 3-Cells of membrane apparatus 1-Rectifier
56104	1 set	Cl ₂ Line	Comprising: 2-Cl ₂ gas washing and cooling towers 1-Cooling water tank 4-Cooling water pumps 2-Water coolers 3-Cl ₂ gas drying towers 3-H ₂ SO ₄ Coolers 1-Cl ₂ Gas cooler 2-Cl ₂ Gas Liquefiers 1-Refriator 2-Cl ₂ Gasifiers 1-Cl ₂ Gas receiver 1-Air compressor 1-Air dryer 1-Air receiver

Item No.	Quantity	Equipment	Specification
56105	1 set	Brine Recovery	Comprising: 1-Weak brine receiver 1-Dechlorination tower 1-Air blower 1-Weak brine receiver 1-Desulphated tank 3-Brine pumps 1-CaCl ₂ Dissolving tank 1-CaCl ₂ Pump
56106	1 set	Na-Hypo Preparation	Comprising: 1-NaOH Cooler 2-Absorption towers
56107	1 set	Exhaust Cl ₂ Absorption	Comprising: 1-Mixer 2-NaOH Circulation tank 2-NaOH Circulation pumps 1-Na-hypo Cooler 1-Exhaust Cl ₂ gas absorption tower 3-No. 1 Exhaust Cl ₂ gas blowers
56108	1 set	Na-Hypo Preparation	Comprising: 1-Reaction tube 1-Cooler
56201	1 set	Pumps	
56301	1 set	Agitators	
56401	1 set	Tanks and Towers	
56510	1 set	Electrical Equipment and Controls	
56520	1 set	Instrumentation	
56600	1 set	Scaffolding	
56700	1 set	Piping and Valves	

Department 61. Fuel Supply – On Shore

Item No.	Quantity	Equipment	Specification
61202	1 set	Heavy Oil Receiving Pumps	
61202	1 set	Diesel Oil Receiving Pumps	
61203	1 set	Gasoline Receiving Pumps	
61204	1 set	Heavy Oil Feed Pumps	
61205	1 set	Diesel Oil Feed Pumps	
61206	1 set	Gasoline Feed Pumps	
61401	1	Heavy Oil Storage Tank	
61402	1	Diesel Oil Storage Tank	
61403	1	Gasoline Storage Tank	
61510	1 set	Electric Equipment and Controls	
61600	1 set	Scaffolding	
61700	1 set	Piping and Valves	

Department 62. Power Boiler – On Platform

Item No.	Quantity	Equipment	Specification
62101	1 set	Boiler Proper	Outdoor installation type comprises: Boiler furnace Water tube Headers, Downcomers, Feeders Drums Boiler bank tube Boiler bank skin casing
62102	1	Superheater	Pendant convection type
62103	1	Economizer	Bare tube convection type
62104	1	Air Heater	Tubular type
62105	1	Steam Air Heater	
62106	1	Boiler Casing	Ribbed aluminum cold sheet
62107	1 set	Steel Framework	
62108	1 set	Soot Blower	Long retractable or rotary type blower, steam blowing type
62109	1	Forced Draught Fan	Turbo fan
62110	1	Induced Draught Fan	Turbo fan
62111	1	Secondary Air Fan	Turbo fan
62112	1 set	Chemical Dosing Equipment	Comprises: tanks, pumps and agitator for dosing chemicals of ammonia, hydrazine, disodium phosphate and trisodium phosphate.

Item No.	Quantity	Equipment	Specification
62113	1 set	Sampling Equipment	
62114	1 set	Boiler Feed Pump	Multi-staged turbine pump
62115	1	Fuel Oil Heater	
62116	1 set	Fuel Oil Burner	Steam atomizing type
62117	1 set	Pilot Oil Burner	Air atomizing type
62118	1 set	Make-up Water Treatment Equipment	Mixed bed, pilisher type
62119	1	Ion Exchanger	
62120	1 set	Process Return Water Treatment Equipment	
62121	1	Stack	
62122	1	Main Condenser	Divided water box type surface condenser
62123	1	Main Steam Jet Air Ejector	Twin element two stage steam jet ejector
62124	1	Starting Air Ejector	Single stage steam jet type
62520	1 set	Instrument	
62600	1 set	Scaffolding and Support	
62700	1 set	Piping and Valves	
62800	1 set	Insulation	
<u>Boiler Feed Water System</u>			
62125	1 set	Feed Water Heater	Shell and tube type heater
62126	1	Deaerator	Spray type
62202	1 set	Pumps	

Item No.	Quantity	Equipment	Specification
62402	1 set	Tanks	
62510	1 set	Electric Equipment	
62520	1 set	Instrument	
62600	1 set	Scaffolding	
62700	1 set	Piping and Valves	
62800	1 set	Insulation	

Department 63. Electrical Power Generation – On Platform

Item No.	Quantity	Equipment	Specification
63101	1	Steam Turbine	9,000 kVA. Single cylinder, Impules type double extraction condensing turbine
63102	1	Generator	9,000 kVA. Three phase synchronuous generator, open type forced air cooled, horizontal and gear coupled to steam turbine
63103	1 set	Protective Device	
63104	1 set	Lubrication System	
63105	1 set	Steam Seal System	
63106	1 set	Turning Gear Device	
63107	1 set	Air Cooler for Generator	
63108	1	Power Generator for Emergency	500 kVA. Diesel engine driven power generator
63401	1 set	Tanks	
63510	1 set	Control System	Speed and pressure control
	1 set	Excitation System	Three phase full-wave bridge, self cooled rectifier utilizing silicon diodes
63520	1 set	Instrument	
63700	1 set	Piping and Valves	
63800	1 set	Insulation	

Department 64. Substation and Electric Power Distribution – On Platform

Classification of Electric power Distribution System

	Voltage	Frequency	Phases	Wires	Grounding system
High Voltage	3,300 V	60	3	3	Resister neutral
Low Voltage	440 V	60	3	3	Non-grounded
90 kW and above AC motor	3,300 V	60	3	3	Non-grounded
75 kW and below AC motor	440 V	60	3	3	Non-grounded
DC motor	440 V	–	–	2	Non-grounded
Control Circuit and Instrument	110 V	60	1	2	Non-grounded
Lighting	220 V	60	1	2	Non-grounded
Battery Lighting (D.C)	110 V	–	–	2	Non-grounded

Item No.	Quantity	Equipment	Specification
64501	1 set	3.3 kV High Voltage Sheet-steel Cubicle Switchgear	
64502	1 set	Electrical Cable	
		3.3 kV Class Power Cable	Cross-linked polyethylene insulated, polyvyniyle chloride sheated cable
		600 V Class Power Cable	Cross-linked polyethylene insulated, polyvinyle chloride sheated cable

Item No.	Quantity	Equipment	Specification
		600 V Class Control Cable	Polyvinyle chlorided insulated and sheathed control cable
		600 V Class Control Shield Cable	Polyvinyle chloride insulated and sheathed control cable with copper tape shield

Department 65. Electrical Equipment – On Platform

Item No.	Quantity	Equipment	Specification
65501	1 set	High Voltage sheet-steel Cubicle Switchgear	Draw-out type
65502	1 set	High Voltage Motor Control Center	Draw-out type
65503	1 set	Low Voltage Load Center	Fixed type
65504	1 set	Low Voltage Motor Control Center	Draw-out type
65505	1 set	Operation Panel for Motors	
65506	1 set	Local Push Button Switch Box	
65507	1 set	Electrical Motor	

Department 66. Instrumentation – On Platform

Supply Characteristics

Electric power for instrument operation will be made available at 110 V, 60 Hz, single phase.

General Specification

- 1) Control System Type
Control system will be mainly pneumatic and to be generally insulated on locally.
- 2) Transmission and Control Signal
Electronic transmission and control signal range will be 4 to 20 mA. Pneumatic signal will be of 0.2 to 1.0 kg.f/cm² G.
- 3) Transmitter
Transmitter will be of the force-balance type or, where specified, of the motion balance indicating type, except in case of electrical measurement or control signal.
- 4) Recorder
Recorder will be of the standard transmitted signal range and contain multiple recording pens. Miniature recorder with folding strip chart will be used for general mill service.
- 5) Control Station
Controller will be mounted on panel with vertical scale for set point and process variable indication.
- 6) Indicator
Indicator will be of the vertical scale type and the standard transmission signal.
- 7) Chart Drive
Recorder chart drive will be of 110 V, 60 Hz, single phase.
- 8) Pen
All pen will be of the capillary type with reservoirs in generally.

- 9) **Local Mount Type Controller**
Displacement type level, capillary type pressure and temperature, etc. will be included.
- 10) **Annunciator**
Annunciator will be suitable for 110 V, 60 Hz, single phase service and to be supplied with an acknowledge and test pushbutton.
- 11) **Air Supply Regulator (Air Set)**
All such regulator will be of the reducing-relief type with integral filter.

Process Control Panel

- 1) **Panel Type**
Control panel will generally be of the free-standing type located in locally.
- 2) **Panel Design**
Instrument arrangement on panel will be in accordance with department planning drawings.
- 3) **Piping and Ducting**
Air supply header mounted within panel will be of copper tubing. Necessary air regulating system consisting of filter, reducing valve and pressure gauge with stop valve should be included.
- 4) **Electric Equipment**
All electric equipment including materials, wiring and panel-itself.

Process Control Valve

- 1) **Globe and Angle Valve**
Double-seated valve will be top and bottom guided.
Single-seated valve will be top and bottom or cage guide.
- 2) **Batterfly Valve**
All batterfly valve will be of "Wafer" type.

- 3) **Ball Valve**
Ball valve will be suitable for the throttling of pulp flow from full open to shut-off and such valve will have flow characteristics closely approximately that of "equal percentage".
- 4) **Valve Positioner and Transducer**
Pneumatic valve positioner will be considered.
- 5) **Air Supply Regulator (Air Set)**
All such regulator will be of the reducing-relief type with integral filter.
- 6) **Accessories, Piping and Tubing**
All accessories normally mounted on valve will be included.
All tubing connection will be made using copper tubing and tube fittings.

Instrument Piping

The major materials for instrument piping will be as follows:

- 1) Vinyl covered multi-control copper tube
- 2) Copper tube
- 3) SGP (W) pipe
- 4) Half-union
- 5) Nipple
- 6) Miniature stop valve

Department 67. Water Supply – On Shore

Item No.	Quantity	Equipment	Specification
67101	1	Clarifier	Slurry circulation type
67102	1 set	Chemical Addition Unit	
67103	1 set	Filter	
67104	1 set	Demineralizing System	
67105	1 set	Potable Water System	
67201	1 set	Pumps	
67301	1 set	Agitator	
67401	1 set	Tanks and Towers	
67510	1 set	Electric Equipment	
67520	1 set	Instrument	
67600	1 set	Scaffolding	
67700	1 set	Piping and Valves	

Department 68. Compressed Air Supply – On Platform

Item No.	Quantity	Equipment	Specification
68101	2	Instrument Air Compressor	Oil free, water cooling double acting type
68102	1	Air Dryer	Automatic, electric heating
68103	1	Prefilter	
68104	1	After-filter	
68105	2	Mill Air Compressor	Water cooling, double acting lubricated type
68510	1 set	Electric Equipment	
68520	1 set	Instrument	
68600	1 set	Scaffolding	
68700	1 set	Piping	

Department 69. Mill Inter-connecting Piping

One complete set of mill inter-connecting piping system, i.e., process lines, chemicals lines, steam lines, water lines, potable water lines, fuel lines, all waste and effluent lines, etc., should be included for mill operation.

Department 71. Maintenance Shop – On Shore

Item No.	Quantity	Equipment	Specification
71101	2	Center Lathe	
71102	1	Universal type Milling Machine	
71103	1	Cutter Knife Grinder	
71104	1	Sliter Knife Grinder	
71105	1	Roll Grinder	
71106	1	Double Column type Plane and Milling Machine	
71107	1	Upright Drilling Machine	
71108	1	Floor type Bench Drill Machine	
71109	1	Overhead Crane	
71110	1	Trolley type Hoist with Beam	
71111	1	Marking Off Tools	
71112	1	Electric Hydraulical type Pipe Bender	
71113	5	Disc type Tube Cutter	
71114	2	Pipe Threading Machine	
71115	10	AC Arc Welder with Remote Control	
71116	1	Auto Single Surface Planer	
71117	1	Circular Saw on Frame	

Item No.	Quantity	Equipment	Specification
71118	1	Double Column type Hydraulic Press for Shop	
71119	1	Shaper	
71120	5	Acetylene Cutting and Welding Outfil	
71121	5 sets	Miscellaneous Hand Tool Kits	

Department 72. Laboratory – On Platform

Item No.	Quantity	Equipment	Specification
72101	1	Wood Chip Classification Unit	
72102	1	Laboratory Digester	
72103	1	Laboratory Flat Screen	
72104	1	Laboratory Disintegrator	
72105	1	Laboratory Beater	Niagara type
72106	1	Sheet Forming Machine	TAPPI standard tyep
72107	4	Freeness Tester	Canadian type
72108	1	Brightness Tester	
72109	1	Tensile Strength Tester	Schopper type
72110	1	Folding Endulance Tester	
72111	1	Bursting Strength Tester	Mullen type
72112	1	Treaing Tester	Elemendorf type
721113	1	Stiffness Tester	
72114	1	Ring-crush Tester	
72115	2	Sample Cutter	
72116	2	Thickness Gauge	
72117	1	Gurley Tester for Smoothness, Porosity and Softness	
72118	1	Centrifuge	
72119	2	Microscope	

Item No.	Quantity	Equipment	Specification
72120	1	Projector	
72121	1	Drying Oven	
72122	1	Water Bath	
72123	2	Stopwatch	
72124	1	Electric Muffle Furnace	
72125	3	Basis Weight Balance	
72126	2	Direct Reading Balance	
72127	1	Platform Scale	
72128	2	Analytical Balance	
72129	2	ph Meter	
72130	8	Baume Scale	
72131	2	Turbidometer	
72132	2	Color Comparator	
72133	2	Hand Tachometer	
72134	1	Surface Pyrometer	
72135	10	Thermometer	
72136	1	Psychrometer	
72137	2	Stone Ware Sink Unit	
72138	2	Center Table	
72139	2	Balance Table	
72140	2	Water Still	

Item No.	Quantity	Equipment	Specification
72141	5	Jar Tester for Water	
72142	10 sets	Glass Wear	

Department 73. Fire Protection System – On Platform

One complete set of water hydrant system consisting automatic water sprinkler system and automatic water fog spray system, and set of portable chemical powder fire extinguishers for Platform and On-shore buildings should be included for the mill.

Complete sets of necessary piping, and electrical equipment and controls also should be considered.

Department 74. Vehicles

<u>Item No.</u>	<u>Quantity</u>	<u>Equipment</u>	<u>Specification</u>
74101	5	Front-end Loader	Tire skidder, 250 hp Logs offloading use
74102	5	Front-end Loader	Tire skidder, 280 hp Logs sorting in wood yard use
74103	2	Crawler Dozer	200 hp Wood yard use
74104	4	Fork-lift Truck	
74105	4	Shop Truck	3/4 ton
74106	2	4 x 4 Vehicle	
74107	10	Power-saw	Wood yard use

Department 75. Communication Equipment – On Shore

Item No.	Quantity	Equipment	Specification
75220	1 set .	Telephone equipment	
75221	1 set	Telex Equipment	
75222	1 set	Office equipment	

Department 76. Mill Effluent Treatment – On Shore

Item No.	Quantity	Equipment	Specification
76101	1	Neutralization Mixer	Vertical type with bar screen
76102	1 set	Chemical Addition Unit	
76103	1	Clarifier	Slurry circulation type
76104	1	Sludge Thickener	
76105	1	Sludge Filter	
76106	1	Lagoon with Mechanical aerator	
76201	1 set	Pumps	
76301	1 set	Agitators	
76401	1 set	Tanks and Towers	
76510	1 set	Electric Equipment	
76520	1 set	Instrument	
76600	1 set	Scaffolding	
76700	1 set	Piping	

Department 90. Platform

General Particulars

The platforms will be designed, constructed, equipped, inspected, tested and delivered to the Plant site, and will be operated immediately after the installation by the Builder in accordance with these Specifications.

Dimensions of Platform

Length	Approx. 100 m
Breadth	Approx. 30 m
Depth	Approx. 12.5 m

Platform and House Structure

1) General

The platform will be designed to suit installation and operation of plant equipment and will be of all welded construction. The platform will be strengthened locally for the foundation of equipment where necessary.

2) Bottom Construction

Cellular double bottom will be constructed under the first floor. Bottom frame and inner bottom stiffeners will be arranged longitudinally. Transverse floors and longitudinal girders under double bottom tank top will be also arranged.

Carling or girder will be provided under machinery of other concentrated load wherever necessary. Vibratory characteristics of machinery, operating loads, equipment and fittings will be considered.

3) Framing

Framing system of main structure will be generally longitudinal.

4) Floors

All floors will be of steel fabrication and beams of main floor will be of longitudinal system, supported by deck transverses.

Beams on other floors will be either transverse or longitudinal system, whichever

suits the construction of the structure and operating requirement of the equipment. Carling, girder or suitable stiffening will be provided under the concentrated load wherever necessary.

5) Walls

Transverse walls will be plane type with vertical stiffeners. Boundart walls of the rooms such as operation room, laboratories, control rooms, transformer rooms, disconnection panel rooms, switch gear rooms, turbo generator room, etc. will be of steel fabrication.

6) Foundations

All welded foundation will be fitted for the equipment arranged on floors and walls. Suitable reinforcement by means of pillars, krackets and stays will be provided to prevent excessive concentrated load.

7) Construction of Houses

The side wall and roof of the house will be generally constructed of weathertight asbesto sheet supported with steel framing.

Laddars, Handrails and Elevators

1) Ladders and Steps

Access ladders to machinery and equipment will be of 800 mm wide and 45° to 60° inclined. Step interval will be 220 mm for inclined ladders and 300 mm for vertical ladders.

2) Handrails for Weather Exposed Part

Steel handrails will be fitted on decks except where breakwater will be provided. Handrail will be 1,050 mm high from deck.

3) Gratings

Gratings will be provided around equipment, pipes etc. for proper access and operation.

4) Elevators

Electric elevators for cargo use will be provided. Safety device for overloading, over speed trip, etc. will be also provided.

Ventilation and Air Conditioning System

1) Air Conditioning

Air conditioning system will be installed in dry end test room, operation room and laboratories, and central control room and kiln & recausticizer control room. The system will consist of refrigerating compressor(s), chilled water circulating pump(s) and fan unit(s).

Provisions also will be made for supplying cooled air to disconnection panel rooms and switch gear rooms to maintain the inside temperature at 38°C.

Cooler(s) for men will be installed on the floors personnel use.

2) Mechanical Ventilation System

Main compartments of the platform will be served by mechanical supply and/or exhaust ventilation system.

Turbo generator room, air compressor room and refrigerating compressor room will be mechanically ventilated with supply of outside air.

The mechanical ventilation will utilize electric motor driven fans of low pressure type.

3) Natural Ventilation

The side walls of the platform will be opened at site, but insect screen will be supplied for every 5 m of side walls of paper machine area and products finishing area.

The insect screen to have stainless steel screen, frame and fittings.

Hull Piping

1) General

Piping system required for fuel oil, fresh water, compressed air, drainage, etc. will be provided.

2) Firefighting System

Water hydrant system will be served for fire extinguishing the platform main compartments. Water will be supplied from shore side. Automatic water sprinkler system will be provided for products finishing areas, and turbo generator bearings and fuel oil pump area. Automatic water fog spray system will be provided for transformer rooms.

Portable chemical extinguishers will be provided where necessary in accordance with Japanese regulation.

3) Fresh Water System

Fresh water line will be piped for cold water fountains, laboratories, emergency showers and eye washers and toilets.

4) Scupper and Drainage System

Scupper and drain pipes will be provided for the main floors, roof of houses, sanitary spaces and other enclosed spaces wherever necessary.

Joiner Works, Deck Covering, Insulation, etc.

1) Joiner Work

Asbestos cement board Joiner lining will be fitted on inside steel walls of operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

Asbestos cement board ceiling will be fitted in operation rooms, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

2) Deck Covering

Synthetic rubber composite deck will be furnished in operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room. Floor in other rooms will be furnished only with paint.

3) Insulation

Glass wool insulation will be provided for interior surface of operation room, control rooms, kiln and recausticizer control room, laboratory and dry end test room.

Glass wool insulation will be also provided for interior surface of weather exposed ceilings and walls of disconnection panel rooms, switch gear rooms, turbo-generator rooms, air compressor rooms, machine room, elevator machine rooms and battery rooms.

Electric Installation

1) General

This Section explains the following features of the overall electrical installation:

- 1) Electric lighting throughout the areas within the platform.
- 2) Communication system
- 3) Fire alarm system
- 4) Warning lights for airplane
- 5) Lighting conductors

2) Electric Lighting

Lighting fixtures will be applied to obtain adequate illumination to levels prevailing in corresponding spaces in the pulp industry.

3) Telephone System

To communicate with the platform and shore facilities, telephone system will be applied.

4) Communication system

To communicate with the platform and shore facilities, transceiver system will be applied as well as telephone system.

5) Calling Horn System

Motor horns and push buttons will be installed to call work-men within the platform.

6) Fire Alarm System

One (1) set of fire alarm system with detectors will be installed.

7) Obstruction Warning Light for Airplane

Sets of obstruction light on the platform will be installed.

8) Lighting Conductor

Sets of lighting conductor will be installed on the platform.

Department 91. Civil Works

Item No.	Quantity	Equipment	Specification
91101	1	Topographic Survey Work	
91102	1	Soil testing work	
91103	1	Clearing and grubbing work	
91104	1	Grading and ditching work	
91105	1	Graveling work	
91106	1	Revetment work	
91107	1	Road work	
91108	1	Process effluent disposal work	
91109	1	Sanitary effluent disposal work	
91110	1	Water supply work	
91111	1	Underground fire protection work	
91112	1	Foundation work for equipment	
91113	1	Dedging and piling work for platform	

Department 92. Buildings and Structures

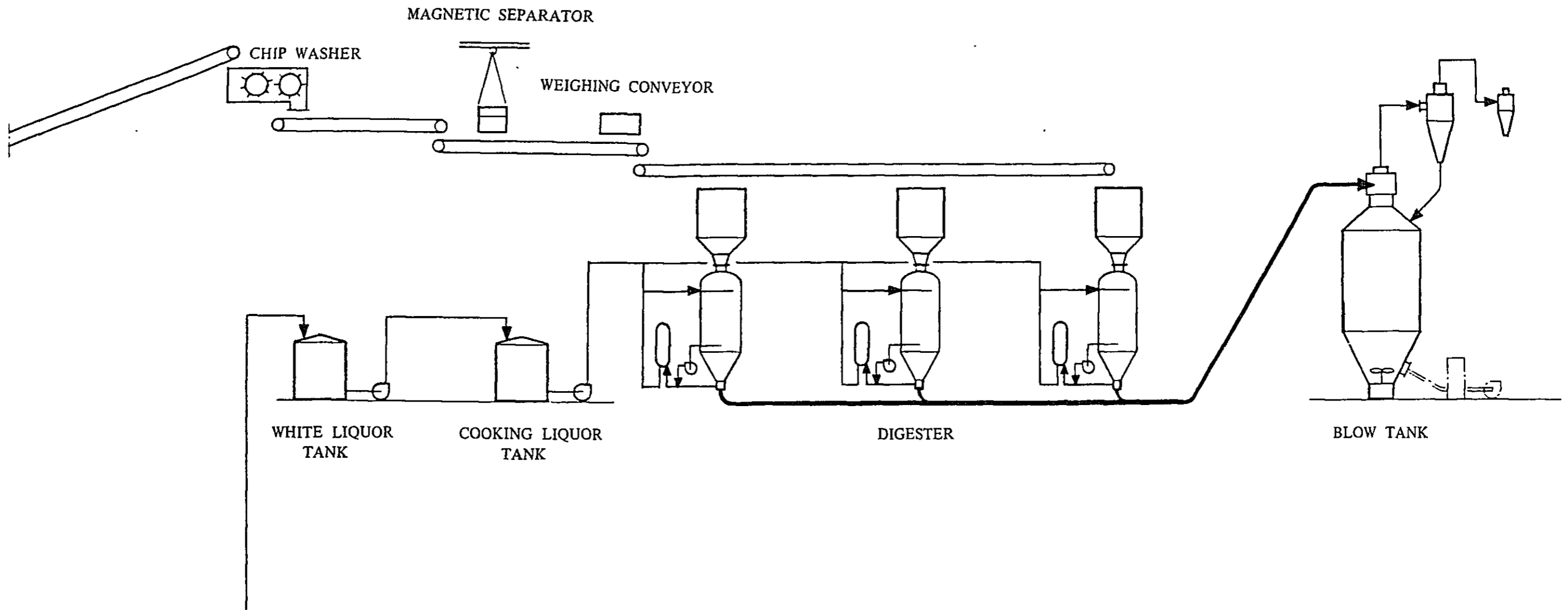
Item No.	Quantity	Equipment	Specification
92201	1	Administration building including laboratory	One story-building 20 x 50 m Structure: Block and brick structure with steel reinforcements Wall: Brick Roof: Asbesto slate
92202	1	Gate house and fire station	One story 5 x 5 m Structure: Block and structure with steel reinforcements Wall: Asbesto slate and brick Roof: Asbesto slate
92203	1	Maintenance shop and Locker house	One story 20 x 30 m Structure: Block and structure with steel reinforcements Wall: Asbesto slate and brick Roof: Asbesto slate
92204	1	Chipper and chip screen room	One story 6 x 12 m Structure: Pipe truss structure Roof: Asbesto slate

Item No.	Quantity	Equipment	Specification
92205	1	Warehouse	One story 30 x 170 m Structure: Pipe truss structure Wall: Asbesto slate and brick Roof: Asbesto slate

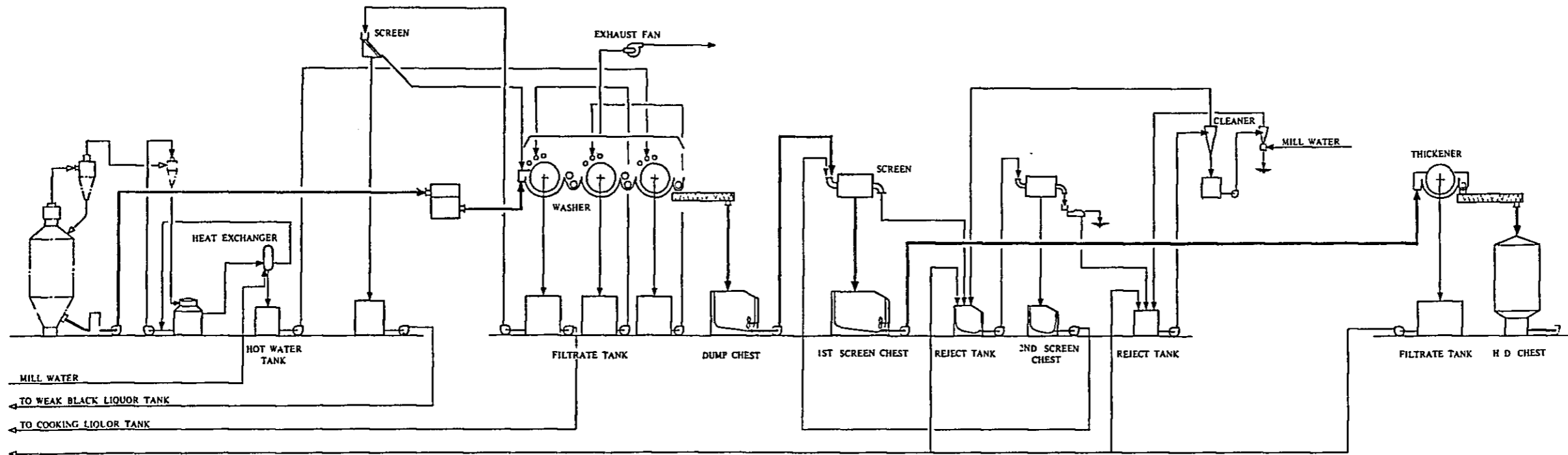
付録5-4 フローシート

印刷、筆記用紙製造プラント、フローシート

Department	21	Log Handling and Chipping
Department	31	Cooking
Department	32	Brown Stock Washing and Screening
Department	33	Bleaching
Department	41	Stock Preparation
Department	42	Paper Machine and Finishing
Department	50	Auxiliary Plants for Printing/writing Paper Plant



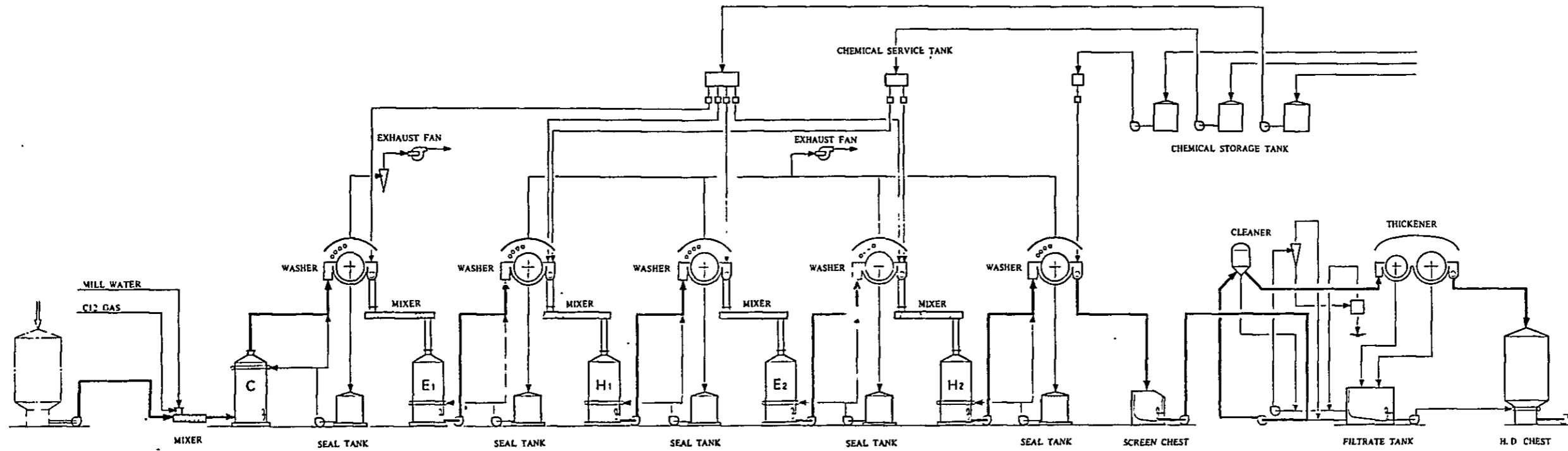
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					DRAWING NO			
DATE	DRAWN BY	ENG. CHIEF	CHIEF	TECH. MANAGER	MANAG.			
<p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>								



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 BROWN STOCK WASHING & SCREENING
 FLOWSHEET

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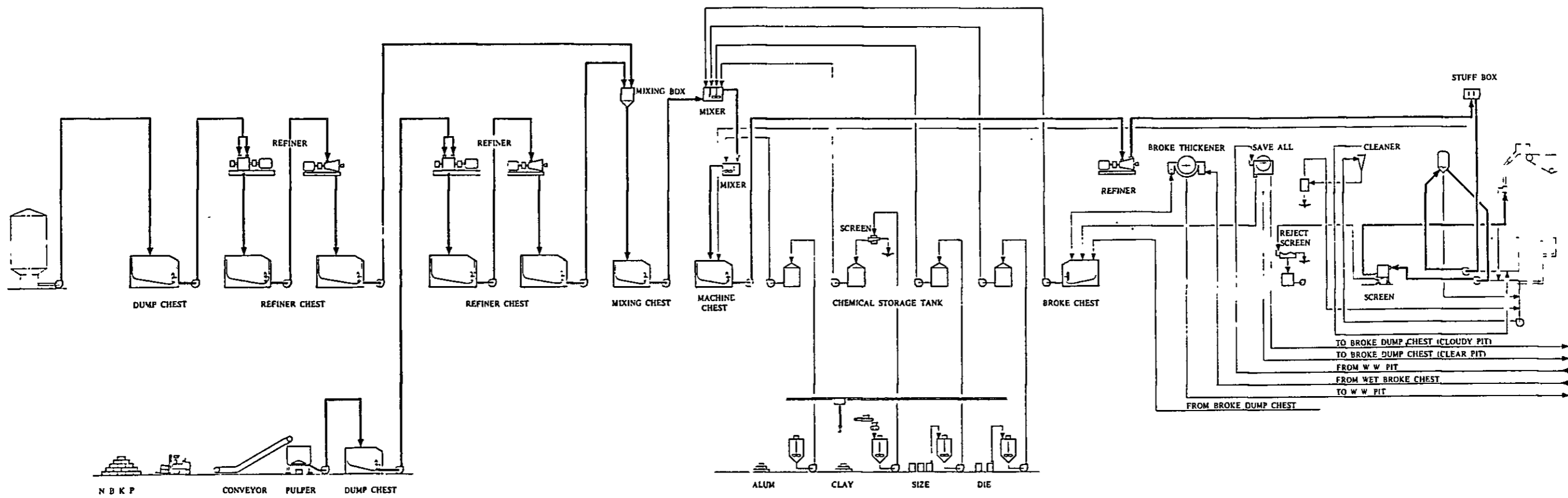
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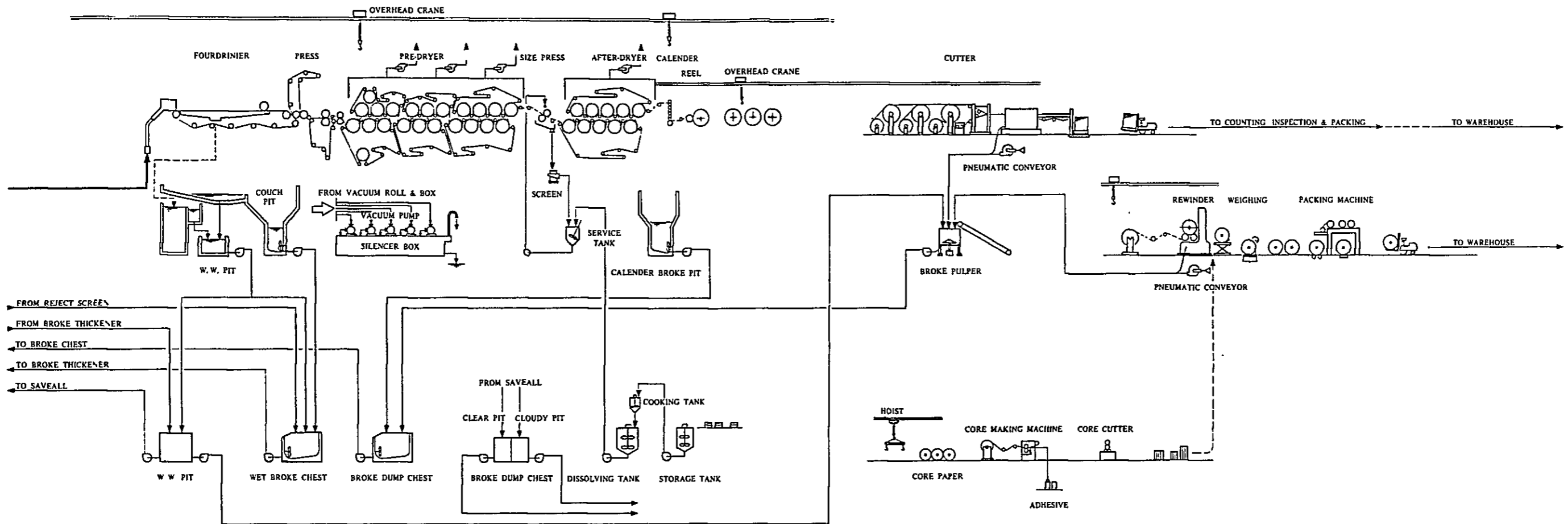
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 STOCK PREPARATION
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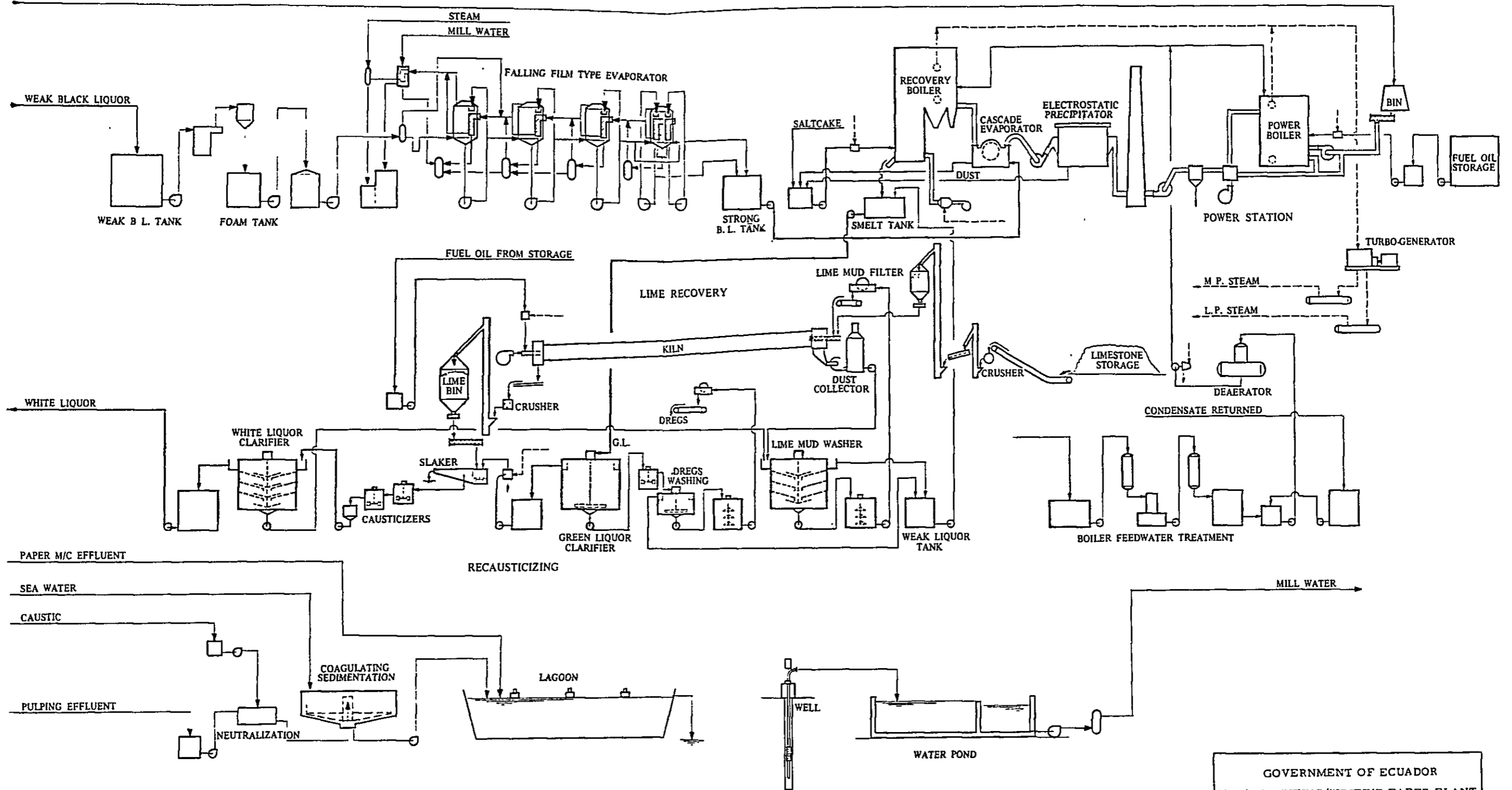
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 PAPER MACHINE & FINISHING
 FLOWSHEET

DATE	PLANT	STEP	CLASSIFICATION

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GOVERNMENT OF ECUADOR
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 AUXILIARY PLANT
 FLOWSHEET

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