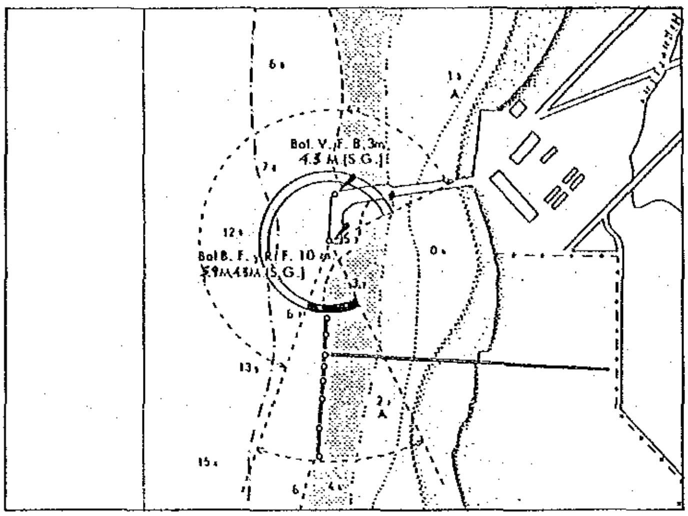
(4) Nueva Palmira



Port of Nueva Palmira

The port of Nueva Palmira consists of the public jetty and the jetty for grain, as shown in the figure.

The public jetty is equipped with 2 sets of 3 ton and one set of 5 ton electric cranes. This public jetty is 100m length and the water depth is approx. 7m to 10m.

The jetty for grain is about 230m length, but it is not available for other cargo vessel.

Moreover this jetty is not furnished the railway because Nueva Palmira has no railway network. The pavement of the national road 21 is not so good, though the road condition is same as to the other area.

Electric power will be available, but industrial water should be taken from the Rio Uruguay.

3-2-3 Future Plan

Regarding as industrial complex, there are no special future plan in Uruguay at this moment. However, during the site survey, in Fray Bentos, there is an interest plan which is natural gas project connecting pipe line between Uruguay and Argentine through the San Martín bridge.

As for this future plan, industrial site development will be provided around ANGLO factory. The sanitary water treatment system in Montevideo will be reportedly also planned.

3-3 Decision of Plant Site

Plant site should be decided taking account of sufficient conditions which are required for not only a general factory but also a paper pulp factory. The requirements mentioned above are as follows:

(1) The location shall be at a river side in order to provide for the products loading system at the paper pulp plant which will be operated mainly for export.

(2) Sufficient area for plant construction including future expansion shall be obtained.

(3) The location shall have suitable topographical features and sufficient land bearing capacity so that the cost for civil work can be cheaper.

(4) To avoid the area where will occur a natural disaster such as a flood.

(5) To be able to mobilize a sufficient manpower with good skill around the area.

(6) The land-expropriation shall be carried out easily.

(7) A lot of investment for infrastructure shall not be required.

(8) Environmental control, the circumstances of the inhabitants shall also be considered.

(9) To meet with the policy for area development and plant planning.

(10) In view point of the collection raw wood, the area shall be near to the afforestation area.

Considering the above mentioned requirements, the site evaluation is conducted as follows:

a) Juan Lacaze, there is no planning of site development and not a sufficient marine facilities, because water depth is too shallow. Therefore, this site is not applicable.

b) Casa Blanca, this site is not applicable by the following reason.

- Difficult condition for site-preparation because the area is very high from the elevation of river water.

- Insufficient river condition because flooding often occurs and shallow places are found around there.

- The nominated location for the site is not faced on the river side.

c) Fray Bentos has been planned industrial zone. In addition, the river and the port conditions are good and the conditions such as electric power, water, railway and road have an advantage compared with other candidate site. Therefore this is applicable.

d) Nueva Palmira has good conditions both of a river and a port, however the area will not be planned for the plant site. Therefore, this is not applicable.

The result of comparison, mentioned above is prepared in Table IV-8.

3-4 Further Study Items for the Plant Site, Fray Bentos

After various site conditions are considered, Fray Bentos is selected as applicable site among four candidate sites. When this project is realized, there are some further study items as follows:

3-4-1 Port Facilities

As mentioned in paragraph 3-2 Infrastructure, large cargo vessel (approx. 10,000 DWT) for paper pulp export is able to be anchored at the public wharf in Fray Bentos. However, there are many existing structures as obstacles on the wharf, such as warehouse, belt conveyor and etc. Therefore it is not easy for stevedoring. As one of case study, the concept of ship loading for the project are as follows:

(1)	Pulp daily production	BKP	750 ton
(2)	Pulp monthly production	BKP approx.	20,000 ton

(3)	Cargo vessel capacity	10,000 ton DWT
(4)	Shipping schedule	2 times/month
(5)	Loading hour	4 day/time
(6)	Loading quantities	2,500 ton/day
(7)	Working hour	20 hr/day
(8)	Loading quantities per hour	125 ton/hour
(9)	Truck loading capacity	20 ton/truck
(10)	Required trucks for loading	6 nos/hour

According to the case study, it is necessary to provide 6 trucks per hour. This stevedoring is seemed to be possible but not to be easy.

3-4-2 Road and Transportation

From the case study, 6-trucks per hour is required for stevedoring.

Therefore, 480 trucks will be required during 4 days. (6 nos x 20 hours x 4 days = 480 nos). Concerning environmental conditions, the traffic route from the plant site to the public wharf should be planned the detouring housing area. (Refer to attached Figure IV-8).

It takes one hour to go and return around housing area. (turnaround distance = 30km, average speed = 30km/hour)

According to the case study for the stevedoring and traffic conditions, it is better to plan a new jetty for paper pulp export near the site. (Refer to attached Figure IV-9, Figure IV-10)

The relation between case-1 and case-2 is only the difference of location and water depth. If ANGLO jetty will be applied for paper pulp export, it should be necessary to be reconstructed as same grade of new one and required the site development for new access road.

3-4-3 Site Condition

The plant site in Fray Bentos is pasturage now and as to the geological condition of the site, the ground level is approx. 10m higher than water surface of the river and its topography seems to be terrace.

There is enough land bearing capacity (approx. 60 ton/m^2) and no problem for construction of paper pulp plant by the conventional construction method.

However, if barge-mounted method is applied for the construction, it seems to be difficult because of the plant site elevation problem. Detail comparison between conventional method and barge-mounted method is mentioned in Chapter 5.

Chapter 4 Plant Facilities

4-1 Basic Design Condition

4-1-1 Code and Standard

The plant facilities are to be designed based on the internationally accepted codes and standards in U.S.A., Europe and Japan shown in Annex IV-2.

According to the investigation on governmental regulation of Uruguay, so far, it is expected that there might be no codes and standards which could make a significant impact on cost and schedule of the plant.

Design of the plant facilities such as boilers, buildings, structures, pressure vessels, plumbing, sanitary facilities, storage tanks, electrical installations, safety and fire protection, etc., are regarded as being easily met with the relevant Uruguay regulations.

4-1-2 Consideration for Energy Conservation

In the paper pulp plant, a large amount of energy in the form of thermal energy or electrical energy, is required in each process unit for heating up, evaporation, rotating purposes and so on. Therefore, the reduction of energy consumption is one of important keys giving economic advantage to the project.

For this study, the basic design of each unit adopts modern techniques which take newer approaches for energy conservation as described below:

(1) Saving large amount of steam by the adoption of Kamyr's continuous digester for cooking process in the place of batch system.

(2) Saving steam and decreasing waste effluent by the introduction of diffuser wahser and displacement bleaching instead of conventional processes.

(3) Adoption of centrifugal cleaner of low pressure drop type in screening process.

(4) Saving steam by the adoption of efficient sextuple-effect evaporators.

(5) Heat recovery from warm water from bleaching and evaporating unit.

(6) Heat recovery from CaO of lime kiln.

4-1-3 Environmental Consideration

Since paper pulp industry usually consumes large amount of raw materials and energy, and hundles poisonous chemicals, the misusage and loose control of them might cause the destroy the irrevocable environment. The regulation for environmental protection in Uruguay is not so severe upto now as other industry countries such as European countries, U.S.A., Japan and so on.

However in future pollution in the country is considered as an important issue along with world-wide emphases for environmental conservation.

In this plan, the plant are to be designed taking the Uruguay, Japanese and also international acceptable environmental controls into consideration.

Table IV-9 shows pollutant sources and their measures in paper pulp mill. The planned approaches for pollution abatement are described in Section 4-5 of this part.

(1) Environmental problem of paper pulp mill

a) As paper pulp mill is energy and material intensive industry, pollutants might be generated there if not provided with measures.

b) As pollutants themselves are diluted into large amount of waste water, it is difficult to catch and separate them distinctly.

c) As consuming much of steam and electricity, air pollutants might be emitted from boilers.

d) As generally equipped large machines and equipments, they possibly generate noise and vibration.

(2) Pollutants generated in pulp manufacturing process

a) Generally pollutants are derived from the residue of unreacted materials such as lignin, hemicellulose, resin etc. Their amounts depend on pulp quality, yield and process of BKP plant. However most of these materials are recovered and utilized as energy sources.

b) Air pollutants from the boiler, recovery boiler and lime kiln, and waste and sludge from pulping process and environmental control facilities.

(3) Measures for air pollution

a) Dust reduction facilities

Steam for pulping process is generated in the recovery boiler and bark boiler. These boilers and lime kiln emit air pollutants by burning. The dust of salt cake and lime stone are discharged from recovery boiler and lime kiln respectively. In this study, in order to catch them, are installed electrostatic precipitators and cyclones/scrubber in the recovery boiler and lime kiln respectively.

b) Reduction of soots

The reduction of soots requires efficient burning operation, good quality fuel and good maintenance. Furthermore, it is necessary to promote the standardization of burning control and to improve instrumentations.

(4) Measures for water pollution

As paper pulp industry is also water-intensive (amount, characteristics, concentration, etc.), it is necessary to provide enough measures for the preservation of environment.

In general, the facility for waste water treatment is composed of clarifier, coagulation and activated sludge treatment. Furthermore some factories have the adsorption process by activated carbon in order to meet severe environmental control.

(5) Measures for vibration and noise

Pulp factories generally equip with large and heavy machine such as drum barker, chipper, grinder, refiner, pulp machine, screen, soot blower of recovery boiler and so on. Since these machines have possibility to generate noise and vibration, it is necessary to consider enough foundation at a design stage and some devices (soundproofing fence and block) not to leak them out of the fence.

(6) Measures for stink (odor)

As the source of stink (malodorous gas), there are several materials such as Hydrogen sulfide (H_2S), Methyl mercaptan (CH_2SH), Di-methyl-sulfide ($(CH_3)_2S$), Di-methyl-disulfide ($(CH_3)_2S_2$). These are generally caused from the pulping process of kraft pulp. To prevent releasing stink, it is important to select appropriate processes and to keep a careful operation besides firing of dense odor gas in boilers.

4-2 Major Equipment of Process Units

This section describes about the major and special equipments of process units adopted by the project. In Annex IV-3 are tabulated the major equipments for onsite, offsite and utility facility as Equipment List.

4-2-1 Kamyr Steam/Liquid Phase Digester

This continuous digester has inverted top separator to be operated with a steam filled zone at the top of separator. It is pressurized with steam added directly the top and cooking starts immediately. This means that compared with the Liquid Phase digester start-up time is short and trouble for strainer is decreased.

The main features of the steam/liquid phase digester are:

(1) Metering and Steaming of the chips
(2) Inverted type top separator
(3) Impregnation in the top circulation line and the top separator
(4) Cooking steam added directly to the top of the digester
(5) Cooking
(6) Hi-heat in digester washing

This system is shown in Figure IV-11.

4-2-2 Kamyr Continuous Diffuser Washer

Inside the casing there are concentric double-sided screen rings. Each screen ring is fastened to radial drainage arms with vertical lifting bars at the ends, which in turn are connected to hydraulic cylinders. The pulp enters in the bottom of the conical part of the casing and moves upwards. The automatically regulated hydraulic cylinders are lifting the screen unit with approximately same speed as the pulp suspension is moving upwards. At the end of the lift the extraction is momentarily shut off whereafter the screen unit makes a rapid downward movement, clearing the screen surface. Above the screen unit rotates a set of scraper-arms, on which the nozzles for distribution of wash liquor are fastened.

The wash liquid displaces the liquor in the pulp, which in turn is extracted through the concave and the convex side of the screen rings. The displacement liquor, thus collected by the screens, is flowing down to the drainage arms and to a collecting pipe or header outside the shell. This system is shown in Figure IV-12.

4-2-3 Displacement Bleaching Plant

Displacement Bleaching is essentially the same principle used in diffuser washer, it was a natural step to mount a number of diffusers in a single tower to accomplish almost any bleaching sequence.

Each stage can be divided in two dynamic stages and one static stage. During the first dynamic stage the new bleach chemicals are displaced into the pulp. The term dynamic refers to the relative movement between fibers and liquor which is accomplished by the displacement and also to the fact that fibers and liquor move in different directions. After the first dynamic stage follows a static stage in which fibers and liquor move in the same direction, upwards, and with the same velocity. In the second dynamic stage the partly used bleach chemicals are displaced by displacement liquor containing bleach chemicals of the following bleach stage or by wash water. This system is shown in Figure IV-13.

4-2-4 Bleaching Chemical Production Facility

(1) Chlor-Alkali-Plant

The electolysis section consists of a number of electrolyzers and their auxiliary equipments. The electrolyzer is partitioned into the anode and cathode compartments by the membrane. The purified brine is fed to the anode compartment where chlorine gas is generated and depleted brine are produced. While in the cathode compartment, deionized water is fed existing in Na^+ ions which is through the membrane. Caustic soda and hydrogen gas are produced these.

35wt% caustic soda is obtained from the electrolyzers. The chlorine gas produced from the electrolyzers is cooled and delivered to the drying process, where it is dehydrated through gas-liquid contact with concentrated sulfuric acid and is sent to users after compression. Principle of the electrolyzer in their plant is shown in Figure IV-14.

(2) Chlorine Dioxide Plant

Chlorate cell liquor containing sodium chlorate and sodium chloride, and separate stream of sulfuric acid are fed into the single vessel generator-evaporator-crystallizer. Chlorine dioxide and chlorine gas mixture diluted with steam are generated and enter the gas cooler where most of the water vapor is condensed.

The gas mixture with condensed water is transferred to the ClO_2 absorber. Here chlorine dioxide gas is absorbed in chilled water to form the ClO_2 water. The unabsorbed chlorine gas is treated same as the chlorine gas produced from Chlor-Alkali-Plant, and is snet to user after compressor.

A stream of salt cake slurry from the generator is continuously filtrated and washed. Then it is returned to the generator except the crystalline salt cake which is used in making up for cooking liquor.

4-3 Offsite Facilities

4-3-1 Building

Table IV-10 shows the building plan of this project. In this plan, the maintenance shop has relatively larger space than conventional factories such as in Japan, Europe and America. All of repair and maintenance in the country are done by themselves because of almost impossible application by outer shops.

In the same table, buildings plan of infrastructure are also tabulated. They are hospital having 10 beds and employees' apartment having 350 houses. Employees' apartment is attached with tennis courts, a pool, a ground, a clubhouse as a community.

4-3-2 Waste Water Treatment

Waste water treatment is described in Chapter 4-5.

4-3-3 Hydrant Facilities

As fire extinguish facilities, there are hydrants, water guns and sprinklers. Water for hydrant is in-taken from the Rio Uruguay by 2 set of pumps. The capacity of pump is approximately $500m^3/H$ and 100m head, and their driver are one electric and the other Diesel. Beside these, the factory has two fire engines and necessary numbers of fire extinguisher.

4-3-4 Raw Material Receiving and Product Shipping Facilities

(1) Logs receiving

Logs are carried into the plant by trucks. Outline of facilities are shown on the table below.

There are two log treating lines, and main equipments in the line are connected each other by belt conveyors. Pneumatic conveyors are used for the long distance conveying of chip and bark. They are considered as lower cost than belt conveyors for long distance transportation.

There is one building for the chipper and screens for dust protection, and the soundproofing building for five sets of blowers of the pneumatic conveyors. The operation of those mahcines are controlled from a local control room placed in the building for the chippers and the screens.

Raw Materials Receiving Facility

Equipment	Description
Log supply	By mobils
Log treating	2 lines, 1,000 t/h. line
Chip conveying	Pneumatic conveyors, 5 lines (include Bark conveying line)
Chip Yard	Concrete floor holding chip $10,000M^3$x2
Chip Silo	$2,000M^3$x3 pieces discharge capacity 70 t/h

(2) Product shipping

The product shipping facilities are shown on the table below. There is each one product packing line for two pulp machines. Electric power supply and control of the lines are done from a local control room. The pulp machine room and warehouse are combined together as one building and above control room is placed in it. The product, unitized pulp, is stacked by two stages (approx. 3.4M height). Area of the warehouse is approximately $14,100M^2$.

Product Shipping Facilities

Equipment	Description
Packing line	2 lines, 400 t/h. line
Storage House	Attachment: shipping mobiles (12 Bale cramps, 6 Trucks)
Berth	Applicable ship size 10,000 ton or under attachment: 3 truck cranes (lifting capa. 10 ton)

The local control rooms of log treating area and pulp machines are connected with a center control room for the production capacity control.

4-4 Utility Facilities

To operate the paper pulp mill smoothly, reliable and stable utilities are inevitable. The utility system and facilities are installed taking accoung of plant site conditions.

4-4-1 Utilities Sources

The table below shows utilities sources:

Utility	Source
- Electricity	Self-generation
- Water	Rio Uruguay
- Natural Gas for kiln fuel	Natural gas from Argentina
- Steam	Self-generation
- Fuel wood	Self-supply

In this plan, all of electricity is self-generated by the generator with the steam turbine. Steam is supplied from the bark boiler and the recovery boiler. Sometimes when starting up of plant or shutting down, electricity is introduced from UTE.

Water for BKP plant is in-taken from the Rio Uruguay and processed in the water treatment unit.

Natural gas pipeline is presently under negotiation between the Argentina and Uruguay governments. Until the realization of the plan, natural gas produced in Argentina is supposed to introduce to the country via the San Martìn bridge.

4-4-2 Boiler and Generator

Steam is generated in the bark boiler and recovery boiler, and their capacity is tabulated in Table IV-11. Steam from these two boilers generates electricity and then it is used widely in the pulp factory. The capacity of the generator is also shown in Table IV-11.

4-4-3 Electrical Facilities

In principle, electricity is supplied by self generation but at the shortage period when the starting up or shutting down, it is bought from UTE. Electrical facilities are considered as follows:

(1) Electrical main station (Transformer, Distribution Panel etc.)
(2) Unit's substation
(3) Power wiring
(4) Lighting
(5) Earthing
(6) Communication (Telephone, Paging etc.)

4-4-4 Water Treatment Facility

Paper pulp mill consumes much of water and usually about 100 ton of water per 1 ADton of pulp is required. Figure IV-15 shows water treatment system and Table IV-12 shows the capacity of the unit and quality of raw water and treated water.

4-5 Environmental Conservation and Safety Facility

4-5-1 Facilities for Prevention of Air Pollution

Pollutants from paper pulp mill are as follows:

(1) Dust .... Salt cake dust from the recovery boiler and lime dust from lime kiln

(2) Sulfur oxide (SOx) .... From the recovery boiler

The installation of electrostatic precipitator with the recovery and bark boiler prevents releasing dust, and lime dust is caught by the water scrubber installed at the outlet of kiln flue gas. Sulfur oxide is recovered in the form of Na_2SO_3 by the NaOH scrubber and then it is used as supplementary cooking chemicals.

4-5-2 Facility for Prevention of Water Pollution

Table IV-3 shows the capacity of waste water treatment unit, and quality of raw effluent and processed effluent. The waste water treatment unit is designed so as to meet controlled figure, BOD less than 120 mg/l, COD 300 -440 mg/l and SS less than 100 mg/l.

As shown Figure VI-16, the system contains physical, chemical, and biological treatments. The waste sludge from the unit is dewatered by the belt filter press as shown in Table IV-14 and finally it is abandoned to landfill or used as fertilizer.

4-5-3 Safety Device and Measures for Labor Safety

(1) Fire protection facilities

a) Position of Hydrants

Several hydrants are necessarily installed in each process. Especially in wood and chip handling processes, fire protection is paid enough attention.

- Enough hydrant system in chip yard
- Connection part of a conveyor to another conveyor
- High quality bearings for chip conveyors
- Hydrants nearby chip silos

b) Protection of Ignition for non-condensable gas

It is necessary to pay attention to the maintenance and repair around cooking and evaporator system in which handle inflammable gas.

- Turpentine line
- Stripping line
- Condensate line
- Flashing tank line
- Evaporator and Barometric condenser

c) Inside dryer of pulp machine

Inside the dryer of pulp machine, paper powder is filled and there is a possibility to ignite it. Therefore near dryer, hydrants are necessarily installed and high quality bearings are used not for the emission of spark.

(2) Measures for shortage oxygen

In the inspection of following places, enough attention is paid for the prevention of oxygen shortage troubles using blower(s) and portable wind tube and opening manholes of the equipments.

- Chip silos
- Chemicals tanks
- Chests

(3) Safety measures for Cl_2 line

For safety, Cl_2 and ClO_2 (Chloric dioxide) system requires hazard removal facilities and emergency shut down valves.

(4) Measures for chemicals and high temperature disaster

a) Bleaching chemicals production facilities, digester, causticizer, boiler etc. handle high concentration chemicals, and high temperature fluid. Therefore at the very near place eye washers are certainly installed.

b) For the safe maintenance and inspection, valves of dangerous fluid lines are set as one remote and one manual in the same line.

(5) Safety of high place works

In following places and works, safety floor(s) and handrail(s) are furnished for labors safety.

a) Chip handling (Replacement of conveyor's belt and deceleration gear, and replacement of bucket and belt for bucket conveyors)

b) Cleaning of heat exchangers for cooking unit

c) Cleaning of evaporation unit

d) Repairing and replacement of thickner's wires

(6) Protection against rotating machines

Covers around dangerous rotating machines are furnished not to be rolled up for the labor's safety.

a) Covers around pumps couplings

b) Protection devices for rolling up by the conveyor belt

c) Protection devices for pulp machine rolls.

d) Protection devices for all of belts and chains of the machines and equipments.

4-6 General Plot Plan

4-6-1 Principles on Layout Plan for Paper Pulp Plant

The general plot plan for paper pulp plant in Fray Bentos is made taking into following consideration:

(1) Major processing plants and utility/offsite facilities are efficiently positioned to exhibit sufficiently their performance. Consequently plant cost and operation cost possibly reduce.

(2) Materials flow from raw material receipt to product pulp loading is simple, regularly and not intricate.

(3) Maintenance and repairing are easily executed for all of facilities.

(4) The sufficient space for plant construction is also considered.

(5) Future expansion space is taken into consideration.

4-6-2 The Gist of the Plant Location

In Figure IV-17 to 19, the layout plans are shown and in Table IV-15 the necessary area for the plant is shown. To prepare this layout plan following basis and consideration are taken:

(1) Logs and products inventory

- Log yard .... Approximate 1 month
- Product pulp storage ..... Approximate 1 month
- Chip yard .... Approximate 3 days
- Bark yard .... Approximate 3 days

(2) Materials flow

Log yard - Chipping - Chip yard - Pulping process

Pulp machine - Storage - Wharf

Materials as processed from logs to pulp product flow toward to the Rio Uruguay as shown above.

(3) Position of utility facilities

In the almost center of the plant site, are located the recovery boiler, bark boiler, steam turbine, generator and electrical receiving station.

(4) The high stack about 100m is located nearby boilers.

As shown in Table IV-15, total required area for the paper pulp plant is about 820,000m^2 (82 ha).

Chapter 5 Comparison of Construction Method

5-1 Considerations on Construction Method

5-1-1 Outline of Construction Method

When a plant is constructed at a certain place, selecting construction method is one of the most important considerations because it influences the construction cost and the schedule. The construction method is basically divided into two. One is the conventional method that equipment and materials are delivered to the construction site, then assembled and erected at the site.

The other is the construction method that equipments and materials are assembled at the remote shop from the construction site. Among these ideas, the method that equipment and materials are assembled onto the barge is called as the barge mounted plant (BMP) method.

5-1-2 Site Conditions for Selecting Construction Method

The construction method to be adopted is decided based on the result of comparison study for cost, schedule and manpower mobilization in consideration with type of the plant, site conditions, etc. At this stage, the most important consideration is given to the site condition. The general site conditions of the selected construction site, Fray Bentos, is described in Chapter 3. The site conditions from viewpoints of selecting the construction method are as follows;

(1) The construction site faces the Rio Uruguay.

(2) Ground level at the construction site is 7m to 30m in height measuring from the mean water level of Rio Uruguay with a gentle slope of degree which is able to plane.

(3) In case of the BMP Method, the BMP has to be raised about 10 meters in order to make the same level to the facilities which are constructed by the conventional method.

(4) An existing unloading wharf is available at Fray Bentos, however, it is recognized that the wharf is unsuitable to unload extra-heavy equipments. Therefore, it is necessary to construct a unloading jetty for construction, or to utilize the new wharf which is to be constructed for product export.

(5) Climatic conditions around the site does not affect construction work.

(6) Construction labor is able to be mobilized in Uruguay and from neighbor countries, however, heavy construction equipments and some construction materials have to be imported from Brazil, USA and so on.

5-2 Comparison of Construction Method

5-2-1 Concept of BMP Method

A basic concept of the BMP method is established to compare with the conventional method considering the above mentioned site conditions.

(1) Plant layout

The plant layout for the BMP method is shown on Figure IV-20. This layout is developed based on the conventional layout, however, the layout differs slightly from the conventionals because the BMP method has a special feature to concentrate the facilities to be installed on the barge. The water way for the barge is backfilled after completing installation.

(2) Facilities on barge

It is reasonable to build two barges in consideration of the plant capacity. If facilities are installed on one barge, it is obviously economical disadvantageous by the reason of assembly, transportation and site installation. For dividing into two barges in consideration of the type of plant, it is preferable to build the process plant barge on which major process units are installed, and the power plant barge on which power plants and various chemcial plants are installed.

The facilities to be installed on the two barges are planned as follows.

a) Process Plant Barge

- Cooking unit
- Washing unit
- First screening unit
- Bleaching unit

- Second screening unit
- Pulp machine

b) Power Plant Barge

- Recovery boiler and bark boiler
- Chemicals producing and recovery unit

The digester with the top separator in the cooking unit is divided into two blocks. The bottom half is installed on the process plant barge, however, the top side is erected at the construction site in consideration of excess stress caused by ship's rolling and pitching during ocean transportation. Further, the center stack which is around 100 meters height is erected in the plant site by the conventional method.

(3) Dimension and weight of barge

Description	Process plant barge	Power plant barge
Overall length (m)	230	220
Overall width (m)	45	40
Depth(m)	14	14
Draft(m)	5	5
Height from deck (m)	app. 30	app. 30
Total weight (tons)	app. 30,000	app. 29,000

The general assembly plans of the two barges are shown in Figure IV-21 and Figure IV-22.

(4) Assembly and transportation for BMP

The BMPs' are built and assembled in Japan, therefore, equipment and materials to be installed on barges are procured, as much as possible, in Japan though equipments and materials for the conventional method are procured in Brazil, USA, etc. The facilities to be installed on the barges are preassembled, as much as possible, at the fabricator's shop, then installed on the barges considering assembling efficiency.

The assembled barges are ocean-transported towed by the tug boat after the completion of necessary inspections and tests. The mechanical tests of assembled BMP is performed at the barge assembly shop, and the test-run is performed at the construction site after completion of the necessary hook-up work.

(5) Installation of BMP

The BMP delivered to the construction site is installed by means of Lock Gate Method. The installation procedure by the lock gate method is sketched in Figure IV-23. At this stage, special consideration has to be given for the ground level where BMPs' are installed. The ground level is higher by around 10 meters than the mean water level of the Rio Uruguay, therefore, the BMPs' have to raised around 10 meters using the lock gate method. This results increase the volume of civil work.

5-2-2 Result of Comparison Study

(1) Construction schedule

The construction schedule for the BMP method comparing with conventional method is shown in Figure IV-24. As shown in Figure IV-24, the field construction periods for the BMP method is shortened about 7 months comparing with the conventional method. On the other hand, the overall project schedule from the contract award to the mechanical completion for the BMP method is shorter 2 months than the conventional method.

(2) Construction Cost

The comparison study results on the construction cost between two methods are shown below. The construction cost for the BMP method increases around 6.5% comparing with the conventionals.

(Unit : %)

Items	BMP method	Conventional method
(a) Land acquisition & site prepartion	2.7	2.7
(b) Equipment, materials & spare parts	65.3	56.3
(c) Construction & erection labor	19.8	15.0
(d) Construction equip. & temp. facilities	3.9	7.0
(e) Transport, insurance & duty	2.6	5.0
(f) Indirect field expense, engineering service, H/O expense, etc.	12.2	14.0
Total	106.5	100.0

5-2-3 Summary of Comparison Study

(1) The construction schedule for the BMP method is shorter than the conventionals by about 7 months and 2 months for the field construction and the overall project respectively.

(2) By adopting the BMP Method, the field construction manpower is reduced around 33% comparing with the conventionals.

(3) In spite of shortening the construction schedule and reducing the field construction manpower, the construction cost for the BMP mehtod increases 6.5% comparing with the conventionals. The major reasons on this fact are considered as follows.

a) The increase of cost caused by BMP assembly exceeds the cost reduction caused by reducing work volume at the site.

b) For this project, the BMPs' have to be installed by the lock gate method which is required excessive civil work. Further, since the BMPs' have to be raised around 10 meters, the excess civil work for filling and backfilling the water way is required increasingly.

(4) The result of overall comparison for two methods is shown in Table IV-16.

5-3 Recommendable Construction Method

As mentioned in the previous section, the conventional method for this project has an economical advantage though the construction sheedule is slightly longer than the BMP method.

The BMP method, in general, is suitable when the site conditions are too severe to carry out the field construction by the conventional method. For this project, the site conditions have no special restriction to carry out by the construction of the conventional method. From the result of the comparison study, it is recommendable to adopt the conventional method for this project.

Chapter 6 Construction Execution Plan

6-1 Execution Principle

Execution principle is to be satisfied the quality required for paper pulp mill, proceeding with the most economical engineering, procurement and field construction.

Construction of paper pulp mill in Uruguay is done according to the following policies:

(1) Satisfy the Client's requirement
(2) Minimize the cost
(3) Execute the technology transfer
(4) Maximum utilize the local resource
(5) Cooperate the local development

6-2 Engineering

Basic engineerig and detail engineering are executed based on the licenser's data, the past paper pulp mill's experienced data and the applicable codes and standards. The design of the equipment is based on the basic engineering and the detail engineering and also is based on commercially-proven equipment and experience.

6-3 Procurement

Procurement is done basically on a worldwide basis, however purchasing from neighbor countries (Brazil, etc.) is preferentially carried out to minimize transportation cost. Indigenous materials such as sand, gravel, cement, and some products are procured locally. Equipment and materials are procured from qualified vendors. The vendors are selected from qualified vendor list. The list is based on the following qualifications:

(1) Being a regular supplier to the paper pulp mill or having an international reputation.

(2) Experience with identical equipment.

(3) Meeting delivery schedules.

6-4 Transportation

6-4-1 Shipping

Total shipping volume required for construction of the paper pulp mill is approximately 100,000 Freight Ton. The equipment and materials are mainly imported from Brazil and other neighbor countries including European countries. Shipping is done according to the following policies:

(1) Make timely shipments of the cargo to meet the overall construction schedule.

(2) Maintain close coordination with vendors, forwarders, and shipping companies to ensure timely shipments.

(3) Keep costs and expenditures for forwarding, ocean and air freight, and associated services to a minimum.

(4) Instruct and supervise vendors and forwarders to ensure durable packing that can withstand long-distance ocean transportation, theft, and rough handling.

(5) Arrange shipments of cargo by freight conference vessels, however national flag vessels of the country of export will be given first priority to load the cargo to the extent compatible with the shipping schedule, their capability, and freight cost.

(6) Arrange suitable vessels having ample lifting capacity for heavy equipment and also roll-on and roll-off vessels may be employed.

6-4-2 Unloading

With careful consideration of port facilities and inland transportation, the unloading port is selected basically Fray Bentos Port, however small cargos like approx. 30 Tons and under, approx. 4 x 4 meters, may be unloaded at the Montevideo Port. Such cargos unloaded at the Montevideo Port are carried by way of the route No.1 and No.2.

The route of inland transportation from Fray Bentos Port is selected after further investigation. The derrick of ocean vessel is used for unloading work at the both ports.

6-5 Construction

6-5-1 General

Considering the execution principle described in para. 6-1, construction is done by the conventional method recommended by the former Chapter 5. In principle, work for which experienced, capable contractors are available has been classified as work to be done by contractors as follows:

(1) Civil Work
(2) Building Work
(3) Mechanical Work (Installation, Piping, etc.)
(4) Electrical Work
(5) Instrument Work
(6) Painting and Insulation
(7) Transportation

6-5-2 Labor Sources

Construction is done by a combination of contractors and directly-hired labor forces. Local workers will be used to the maximum extent possible by conducting on-the-job training. Skilled workers from abroad will mainly be recruited from Japan and/or neighbor countries of Uruguay.

6-5-3 Construction Equipment

Local available construction equipments as used for the construction and others such as big cranes and heavy transprtation carriers, etc. are mobilized from outside of Uruguay. The major construction equipments are classified and shown in Table IV-17.

6-5-4 Utility and Consumable Materials

In principle, potable water and electrical power are introduced from Fray Bentos. Consumable gas, fuel and other consumable materials are locally purchased and the shortage consumable materials, if any, are brought from abroad.

6-5-5 Temporary Facilities

Basically, temporary camp accommodation facilities are provided near the *construction site. Commuting service is provided between the construction site* and the temporary camp. The following temporary facilities are provided in the construction site:

(1) Offices
(2) Warehouses
(3) Prefabrication Shops
(4) Training Shops
(5) Maintenance Shops for Construction Equipment
(6) Water Supply System and Sanitary Sewer System
(7) Power Supply System
(8) Tele-Communication System
(9) Access Roads
(10) Other Temporary Facilities
(Fence, Gate House, Scrap Yard, Toilet, etc.)

6-5-6 *Prefabrication Plan*

Construction techniques, such as barge mounted plant method or module construction method are not employed. However skid mounted package type unit may be adopted for the cost reduction. To assure high quality and keep the construction schedule, equipments and materials are delivered in the maximum prefabricated conditions so that field work is minimized.

6-6 Construction Schedule

The overall construction period of paper pulp mill from the feasibility study start mill is about 78 months. The project master schedule and project construction schedule are shown in the form of a bar chart as Figure IV-25 and Figure IV-26.

The key milestone of the schedule and expected periods to achieve are tabulated as follows:

KEY MILESTONES	MONTHS FROM START OF THE PROJECT
(1) Start of Feasibility Study	1
(2) Start of Basic Engineering	7
(3) Start of Detail Engineering	25
(4) Start of Procurement	34
(5) Start of Field Construction	31
(6) Start of Mechanical Test	70
(7) Start of Test Run & Commisioning	73
(8) Commercial Operation Start	79

6-7 Engineering Organization

6-7-1 Engineering Office Organization

The outline of engineering office organization is prepared and shown in Figure IV-27.

Key persons are assigned full time at the engineering office as a project core. They are construction project manager, engineering manager, control manager, administration manager, procurement manager, and their assistants.

General construction manager and his assistants will work at the engineerig office as construction planning manager during the initial stage of the construction project.

6-7-2 Field Construction Office Organization

The outline of field construction office organization is prepared and shown in Figure IV-28. In this organization, construction quality and safety has been emphasized.

Table IV-1 CHARACTERISTICS OF RAW WOOD

	SOFT WOOD (N)		HARD WOOD (L)			
NAME OF WOOD	PINUS TAEDE	PINUS ELLIOTTII	EUCALYPTUS GLOBULUS	EUCALYPTUS GRANDIS	EUCALIPTUS MAIDENNII	POPULUS (ALAMO HIBRIDO)
BASIC DENSITY (kg/m^3)	375	355	555	410	567	361
				511		
AVERAGE BASIC DENSITY (kg/m^3)	365			481		

Table IV-2 PRODUCTION RATE

	REQUIRED WOOD		PRODUCT PULP		OPERATION PERIOD PER ANNUM DAYS	ANNUAL PRODUCTION ADton/Y
	VOL. (M^3/D)	WT. (BDton/D)	BKP (BDton/D)	BKP (ADton/D)		
SOFT WOOD (N)	4,581	1,672	635	705	181	127,500
HARD WOOL (L)	3,341	1,607	725	805	159	127,500
				(NOMINAL: 750)	340	255,000

Table IV-3 CHARACTERISITCS OF PRODUCT PULP
(N and L BKP)

BRIGHTNESS	MORE THAN 90 GE (CAN : 90.5, ISO : 88) AVERAGE 91 ± 1
RELATIVE VISCOSITY (JIS)	6 - 7
DUST	LESS THAN 0.5 MM^2/100 GRAM
PULP SHEET SIZE 1 BALE	600 MM x 800 MM 200 kg
BASIC WEIGHT	650 - 1,000 g/M^2 A.D.
WATER CONTENT	10%

Table IV-4 CHEMICAL REQUIREMENT

(unit: kg/H)

	N-OPERATION	L-OPERATION
BLEACHING		
CAUSTIC SODA (NaOH)*1	1,104	763
SULFUR DIOXIDE (SO_2)	113	79
CHLORINE (Cl_2)*2	1,600	1,075
CHLORIC DIOXIDE (ClO_2)	579	483
COOKING LIQUOR MAKE UP SALT CAKE (Na_2SO_4)	725	746
CAUSTICIZING LIME STONE ($CaCO_3$)	913	771

Table IV-5 MAJOR PURCHASING CHEMICALS

	N-OPERATION (Ton/Day)	L-OPERATION (Ton/Day)	ANNUAL REQUIREMENT (Ton/Year)
SALT (NaCl)	78.9	55.2	23,060
SALT CAKE (Na_2SO_4)*1	0	0	0
SULFURIC ACID (H_2SO_4)*2	22.3	18.6	6,990
LIME STONE ($CaCO_3$)*3	21.9	18.5	6,910
SUBLIMATED SULFUR (S)	1.4	1.0	410

*1: Supplied from R-3 chlorine dioxide generating plant

*2: 98% concentration

*3: Indigenous products

*4: Excluding boiler chemicals and water treatment chemicals

Table IV-6 UTILITY REQUIREMENTS

	Unit	N-Operation	L-Operation
Electricity	kW	27,610	26,500
Steam	Ton/H	256	231
Boiler Feed Water	Ton/H	128	116
River Water	Ton/H	2,940	3,350
Bark Boiler Fuel	BDt/H	5.3	13.0
Kiln Fuel (Natural Gas)	Nm^3/H	2,010	1,720

Table IV-7 COMPARISON TABLE FOR PLANT SITE

ITEMS \ SITE		JUAN LACAZE	FRAY BENTOS	CASA BLANCA	NUEVA PALMIRA
1.	Site Location (from MONTEVIDEO)	120km, W	290km, NW	350km, NW	270km, W
2.	Climate Condition				
•	Annual average temperature	16°C - 17°C	17°C - 18°C	18°C	17°C - 18°C
•	Annual average rainfall	900mm	1,000mm	1,100mm	1,000mm
•	Annual average relative humidity	75%	70%	70%	75%
•	Wind direction & velocity	S or SE, 20km/hr	SE, 15km/hr	SE, 10km/hr	SE, 20km/hr
3.	River Condition				
•	Water depth	2m - 3m	5m - 8m	6m-15m, Shallow points are found.	10m - 15m
•	Velocity	almost none	0 - 1.0knot	almost none	almost none
•	Soil condition	Muddy	Sandy	-	-
•	Flood	None, displacement of water level is less than 1.0m.	None, displacement of water level is less than 1.0m.	Yes. past records shows 8m from normal water level.	None, displacement of water level is few.
4.	Wharf & Facility				
•	Berth (L:Length, W:Width)	L=100m, W=20m	L=125m, W=50m	PAY SANDU L=360m	L=100m, W=20m
•	Past arrival records of large cargo vessel	approximate 3,000DWT	52,000DWT (EUTHALIA), loading 18,350 Ton	PAY SANDU approx. 6,000 - 10,000DWT	not exactly information, available for 5,000 - 10,000DWT
•	Loading/unloading facility	1 - 2 Ton Crane	1-5 Ton, 3-3 Ton Crane	PAY SANDU 3 - 5 Ton Crane	3-5 Ton, 2-3 Ton Crane
•	Draft	5.0m	7.5m	FRICASA Jetty 10.0m, PAY SANDU 7.0m - 10.0m	7.0m - 10.0m
5.	Site Condition				
•	Outline of condition	Site is not provided.	Site is provided and space is approx. 140ha. Ground level is approx. 10m higher than water level and surface has undulation covered with grass. Bearing Capacity seems to be approx. 60t/m².	Site is provided, but separated two (2) area and not located along the river side. Ground level is approx. 15m higher than water level and surface has undulation covered with grass. Bearing capacity is almost same to Fray Bentos.	Site is not provided. Free zone area located near Wharf is approx. 100ha, but occupied by grain factory.
6.	Distance from afforestation area	So far	Not so far	Not so far	So far
7.	Railway Condition	Railway is located near F.N.P. but not used now.	Railway is located near Wharf. In future, branch line will be constructed until industrial area.	Railway is located near PAY SANDU Wharf, but not located CASABLANCA.	No railway.
8.	Road Condition	Route No.1 is connected and condition is good.	Route No.1,2 are connected and condition is good.	Route No.1,3 are connected, but condition around CASABLANCA is not so good.	Route No.1,21 are connected and and condition is good.
9.	Electric Power	Available for Supply.	Available for supply.	Available for supply.	Available for supply.
10.	Water intake	It is possible to take water from Rio de LA Plata.	It is possible to take water from Rio Uruguay.	It is possible to take water from Rio Uruguay.	It is possible to take water from Rio Uruguay.

Table IV-8 COMPARISON TABLE FOR SITE SELECTION

ITEMS \ SITE	JUAN LACAZE	FRAY BENTOS	CASA BLANCA	NUEVA PALMIRA
1. Plant Site				
• Site plan	None	Yes	Yes	None
• Site condition		River site and terraced land. Surface is undulating and covered with grass. Ground level is approximate 10m higher than water level.	Terraced land. Site is separated two (2) area and not located along river side. Ground level is approximate 15m higher than water level.	
• Site space	-	Approximate 140ha	Approximate 150ha	-
• Bearing capacity	-	Approximate 60 t/m^2	Same to Fray Bentos.	-
2. River Condition				
• Water depth	Shallow (2m - 3m)	5m - 8m	CASABLANCA 10m, PAY SANDU 7m-10m	7m - 10m
• Flood	None	None	Yes Shallow points are found.	None
3. Infrastructure				
• Wharf or Jetty	Located	Located	CASABLANCA : Located, but not available PAY SANDU : Located	Located
• Railway	Located	Located	PAY SANDU : Located	None
• Road	Good	Good	CASABLANCA : Not so good	Good
4. Electric Power and Water Intake				
• Electric power supply	Available	Available	Available	Available
• Water supply	Possible	Possible	Possible	Possible
5. Labor Supply				
• For construction	Possible	Possible	Possible	Possible
• For Operation	ditto	ditto	ditto	ditto
6. Transportation for Raw Woods	So far from afforestation area.	Not so far from afforestation area.	Not so far from afforestation area.	So far from afforestation area.
7. Policy of the site development for industrial complex	None	Reliable	Not so reliable	None
Site Selection	Not applicable	Applicable	Not applicable	Not applicable

Table IV-9 SOURCE AND CONTROL OF WASTE FROM PULP PLANT

	Sources	Control Measure	Remarks
1. Air Emission			
1) Sulfur oxides	Recovery Boiler	Flue gas desulfurization unit	(NaOH method)
2) Lime dust	Lime kiln	Cyclone and Water Scrubber	
3) Na_2SO_4 dust	Recovery Boiler	Electrostatic Precipitator	
4) Soot	Bark and Recovery boiler	Improvement burning technique	
2. Liquid Wastes			
1) Foul water from - Process unit (incld. sanitary water)	Evaporator condensate, Bleaching effluent etc. (Buildings)	Waste water treatment (Coagulation, activated sludge biological process. etc.)	Reduction of COD, BOD, SS and PH adjustment
2) Rainy water	Rainy water pit	Directly to the river	
3. Solid Waste			
1) Effluent treatment sludge	Waste water treatment unit	Landfill or fertilizer	
2) Ash from bark boiler	bark boiler	Landfill or (potassium) fertilizer	
3) Na_2SO_4 dust /Lime dust	Electric Precipitator	Re-use	

Table IV - 10 BUILDING PLAN

BLDG. NO.	BUILDING NAME	REQ'D NO.	TOTAL FLOOR AREA (m^2)	STORY
A: Plant Site				
1.	Chip Handling Room	1	910	1
2.	First Screening Room	1	5,600	2
3.	2nd Screening Room	1	4,400	2
4.	Pulp Machine & Pulp Warehouse	1	22,600	1
5.	Causticizing Room	1	600	1
6.	Kiln Room	1	100	1
7.	Electrolysis Room	1	1,040	2
8.	Electrolysis Filter Press. Room	1	510	2
9.	Chlorine Compressor Room	1	60	1
10.	Water Treatment. Dehydration Room	1	1,200	2
11.	Chemical Injection Room	1	250	1
12.	Turbine/Generator Room	1	960	2
13.	Electric Main Station	1	420	1
14.	Electric Sub-station	6	1,060	1
15.	Waste Water Treatment Room	1	50	1
16.	Sludge Dehydration Room	1	770	1
17.	Canteen	1	1,000	1
18.	Laboratory	1	150	1
19.	Maintenance Shop	1	3,000	2
20.	Material Warehouse	1	2,400	1
21.	Chemicals Warehouse	1	7,700	1
22.	Administrating Building	1	4,800	2
B: Infrastructure				
1.	Employees Apartment	10	3,600	5
2.	Hospital	1	500	2

Table IV - 11 BOILER AND GENERATOR

Facility	Capacity	Note
1. Recovery Boiler	5,516 Ton/Day Steam	65 Kg/cm^2G, 450℃
2. Bark Boiler	1,285 Ton/Day Steam	65 Kg/cm^2G, 450℃ Fuel : Bark and Wood
3. Generator	30 MW	15 KV

Table IV-12 WATER TREATMENT

Treating Capacity	:	Service Water	80,500 m^3/day
		Boiler make-up Water	3,070 m^3/day
River Water	:	pH	7.9
		Suspended Solids	38 mg/ℓ
		Color	250
		Conductivity	122 micro S/cm
Service Water	:	pH	6.5 ∿ 7.5
		Suspended Solids	5 ∿ 10 mg/ℓ
		Color	< 25
Boiler make-up water	:	pH	6 ∿ 8
		Suspended Solids	< 1 mg/ℓ
		Color	< 2
		Conductivity	< 2 micro S/cm

Table IV-13 WASTE WATER TREATMENT

Treating Capacity	:	80,500 ton/day	
Effluent Water	:	BOD 450 mg/ℓ	
		COD 730 mg/ℓ	
		Suspended Solids 180 mg/ℓ	
Treaded Water	:	BOD	< 120 mg/ℓ
	:	COD	300 ∿ 440 mg/ℓ
	:	Suspended Solids	< 100 mg/ℓ

Table IV-14 SLUDGE DEWATERING FACILITIES

Capacity	:	65 m^3/hr
Dewatered Cake	:	30.9 ton/day as dry S.S
		154.5 ton/day as wet S.S
Water content	:	80%
Dewatering facility	:	Belt filter press(4 Set)
Sludge from	:	Thickners of Waste water treatment unit
Sludge to	:	Landfill or fertilizer
Effluent from Dewatering facility	:	To Waste water treatmemt unit

Table IV - 15 REQUIRED AREA FOR BKP PLANT

Unit: m^2

1. On Site	12,000
2. Off Site	493,000
3. Utilities	82,000
4. Administration(Inc.Parking area)	55,000
5. Workshop	46,000
6. Future Area	132,000
Total Area	820,000

Table IV-16 OVERALL COMPARISON TABLE
CONVENTIONAL METHOD VS BMP METHOD

Considerations	Conventional Method	Barge Mounted Plant (BMP) Method
1. Site Condition		
- Geographical Conditions	Suitable	Unsuitable
- Climatic Condition	No restriction	No restriction
- Availability of local resources	Suitable	Suitable
2. Construction Schedule *		
- Field construction	100	87
- Overall project schedule	100	95
3. Construction Cost *		
- Equipment & materials	100	117
- Constr. & erection labor	100	133
- Transportatation	100	52
4. Operation & Maintenance	No problem	Necessary special consideration
5. Others		
- Utilization of local resources	Effective	Not effective
- Technical transfer	Suitable	Not so suitable

Note: *; Conventional = 100

Table IV-17

LIST OF MAJOR CONSTRUCTION EQUIPMENT

The following construction equipment will be used for construction of paper pulp mill in Uruguay:

(1) Gin Pole (1,200 Ton Type)

(2) Mobile Cranes (Capacity-400 Ton, 150 Ton, 127 Ton, 80 Ton, 50 Ton, 35 Ton, 20 Ton, etc.)

(3) Portable Generators for Temporary Power

(4) Welding Machines

(5) Air Compressors

(6) Water Pumps

(7) Heavy Transportation Equipment (Dolly, Trailer)

(8) Auto-mobiles (Truck, Bus, Sedan, Jeep, etc.)

(9) Fork Lift

(10) Civil Construction Equipment (Excavator, Bulldozer, Truck Mixer, Truck Shovel, Road Roller, Vibrating Roller, Tire Roller, Grader, Asphalt Finisher, Asphalt Distributor, Concrete Pump Car, Dump Car, Concrete Batcher Plant, etc.)

(11) Machines (Lathe, Drilling Machine, etc.)

Figure IV - 1 PULPING PROCESS BLOCK FLOW DIAGRAM

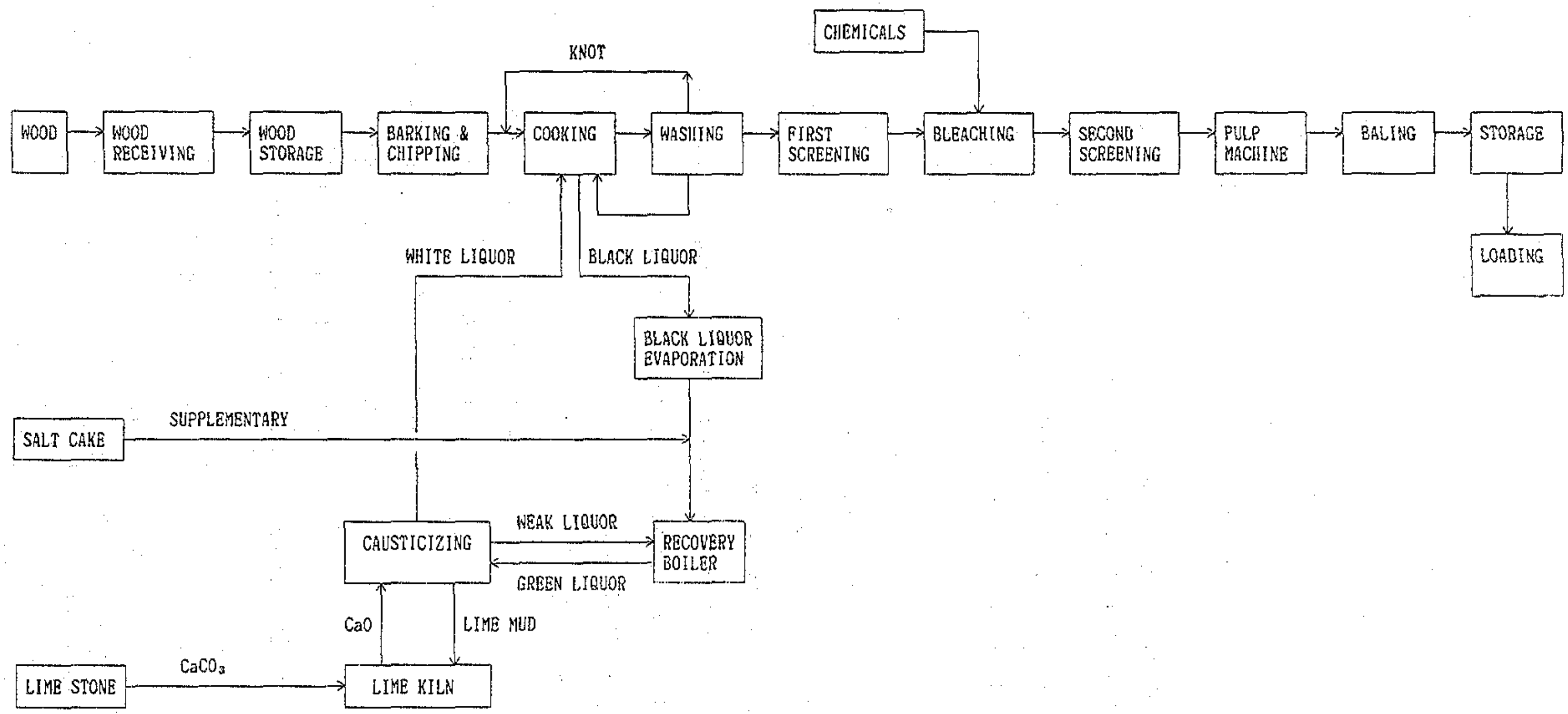


Figure IV-2 MATERIAL BALANCE OF PULPING PROCESS

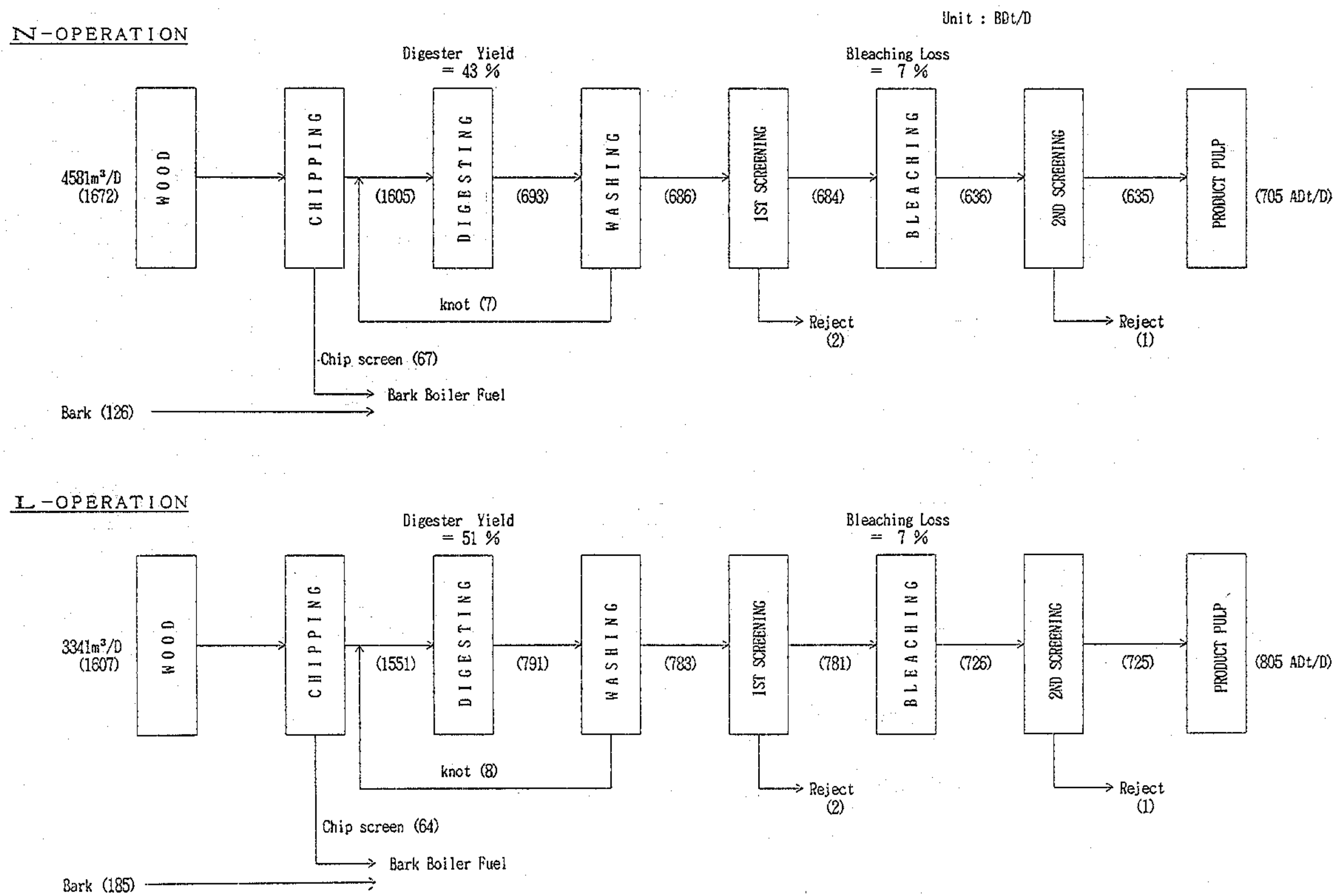


Figure IV - 3 CHEMICALS PRODUCTION UNITS FOR BLEACHING

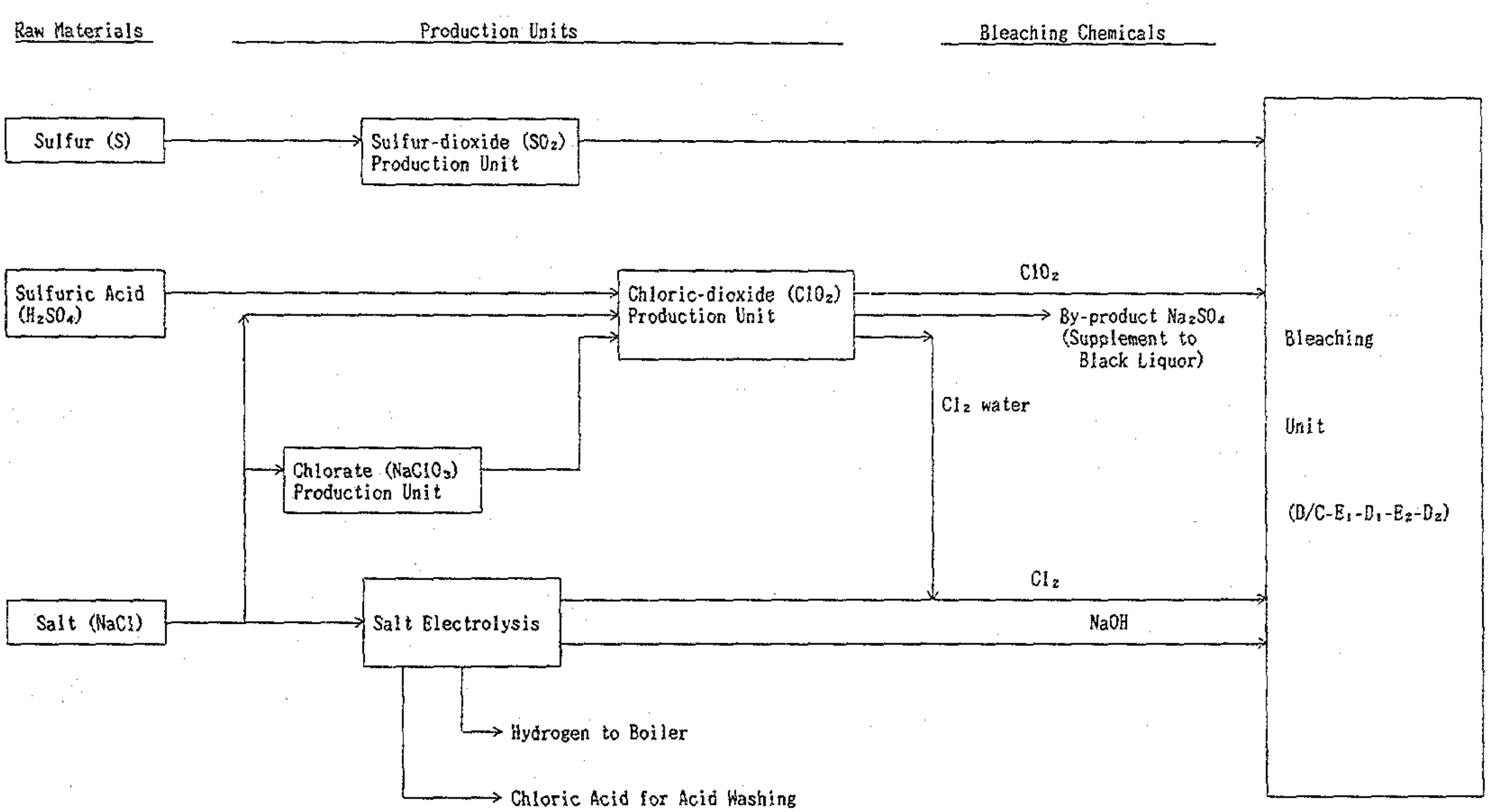


Figure IV - 4 UTILITY BLOCK FLOW DIAGRAM

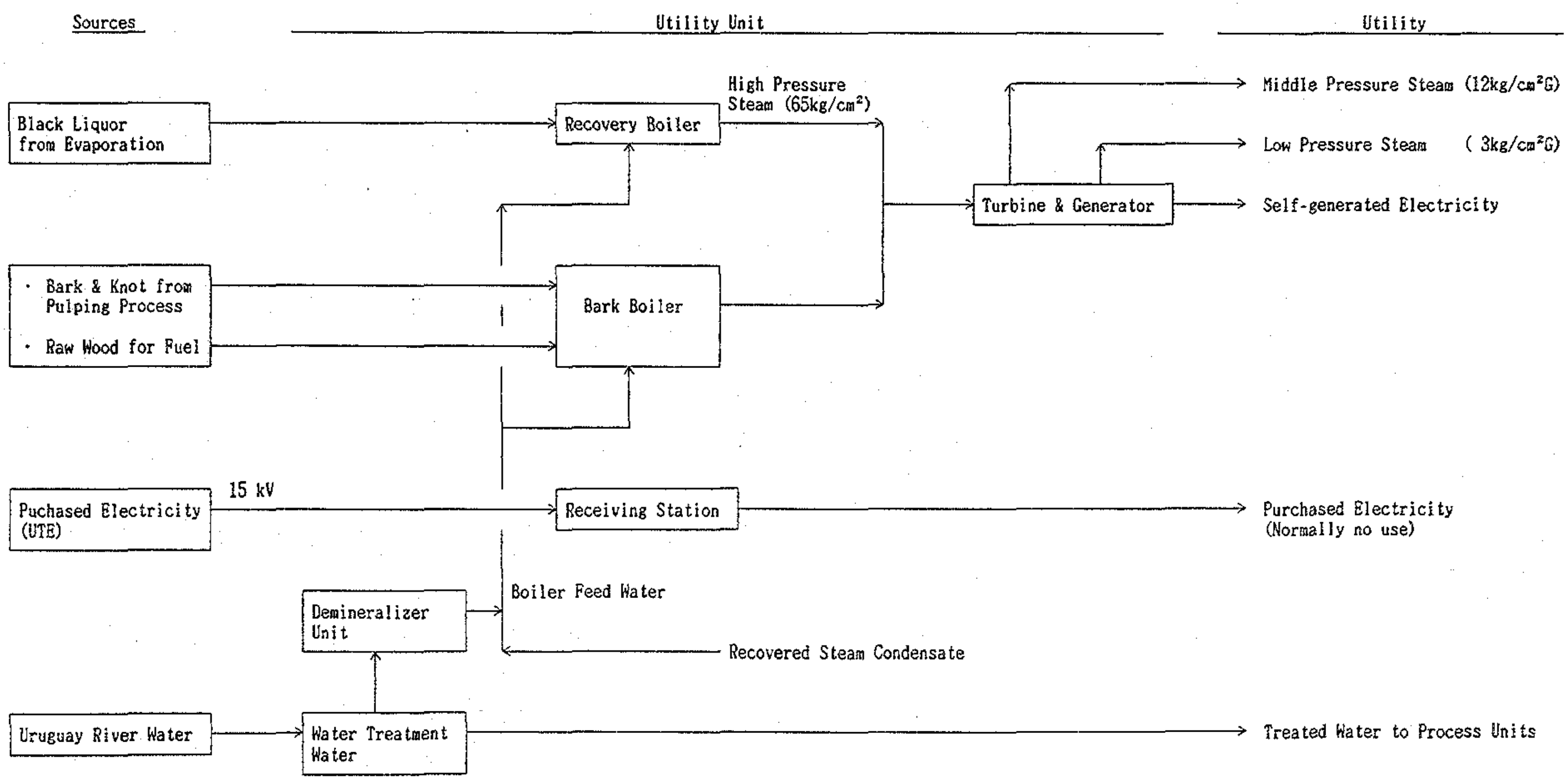
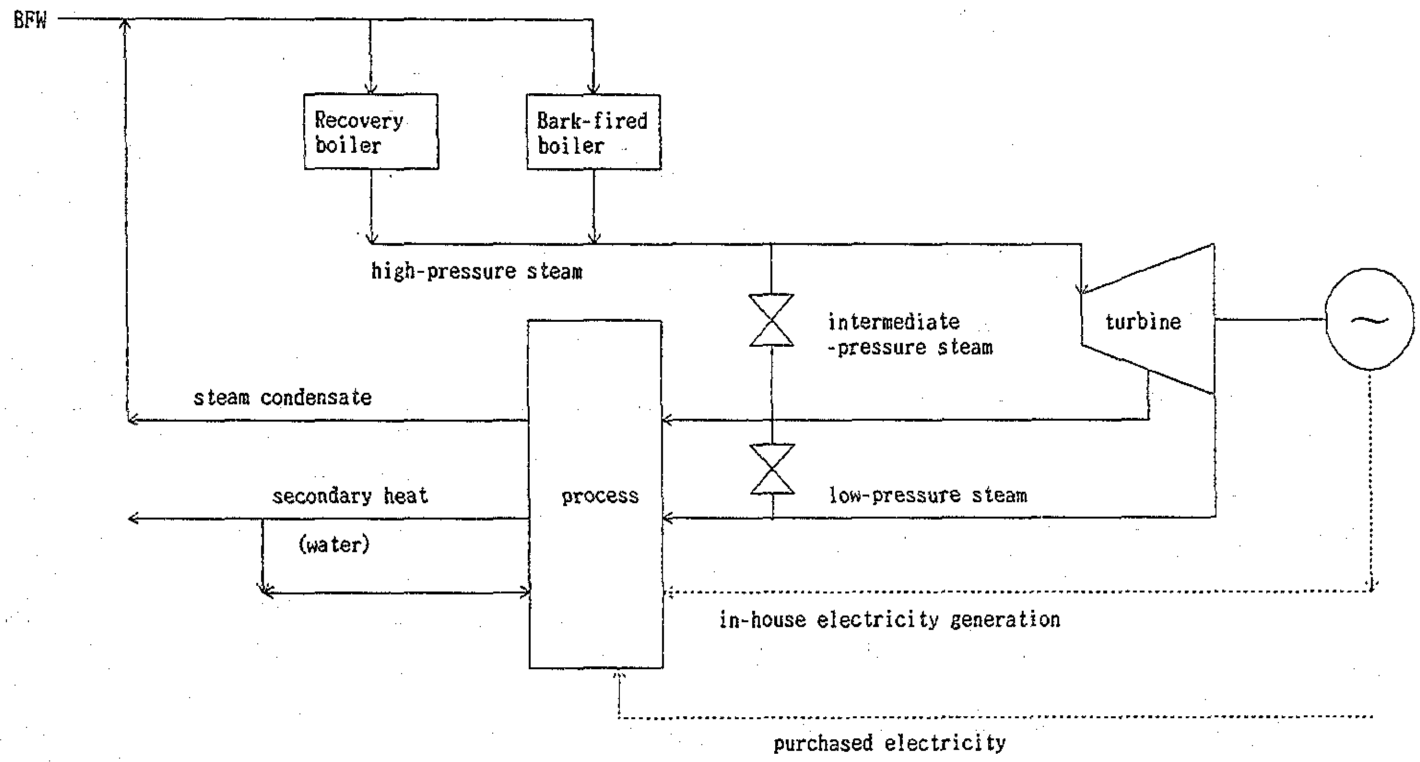


Figure IV - 5 ENERGY SYSTEM OF BKP MILL



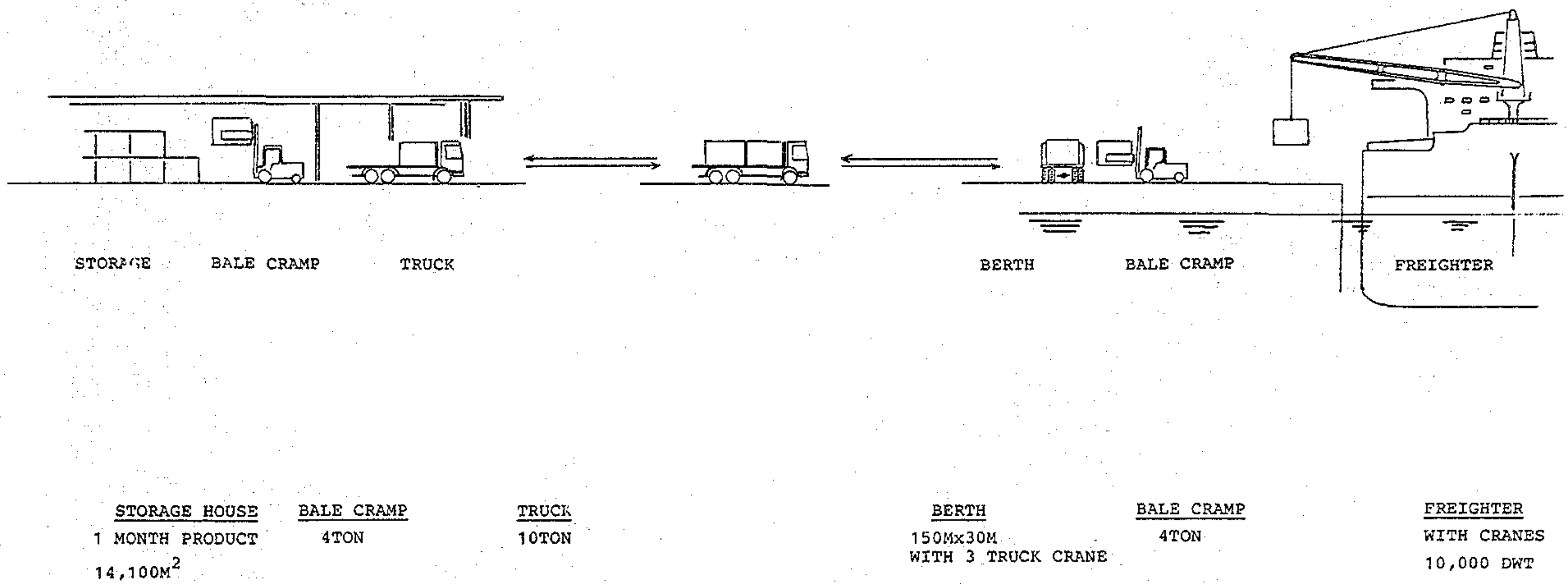


Figure IV-6 SHIPPING SYSTEM

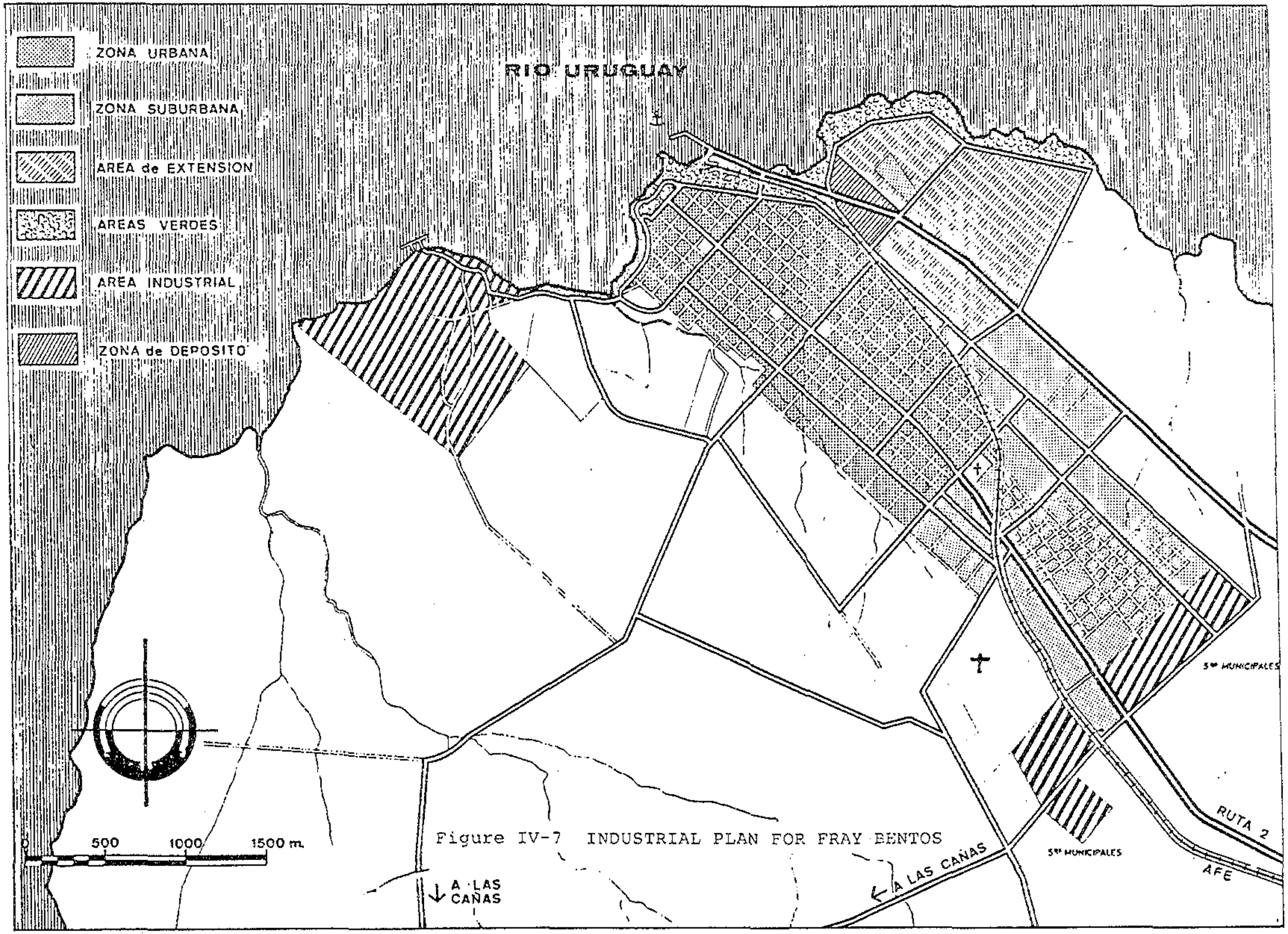


Figure IV-7 INDUSTRIAL PLAN FOR FRAY BENTOS

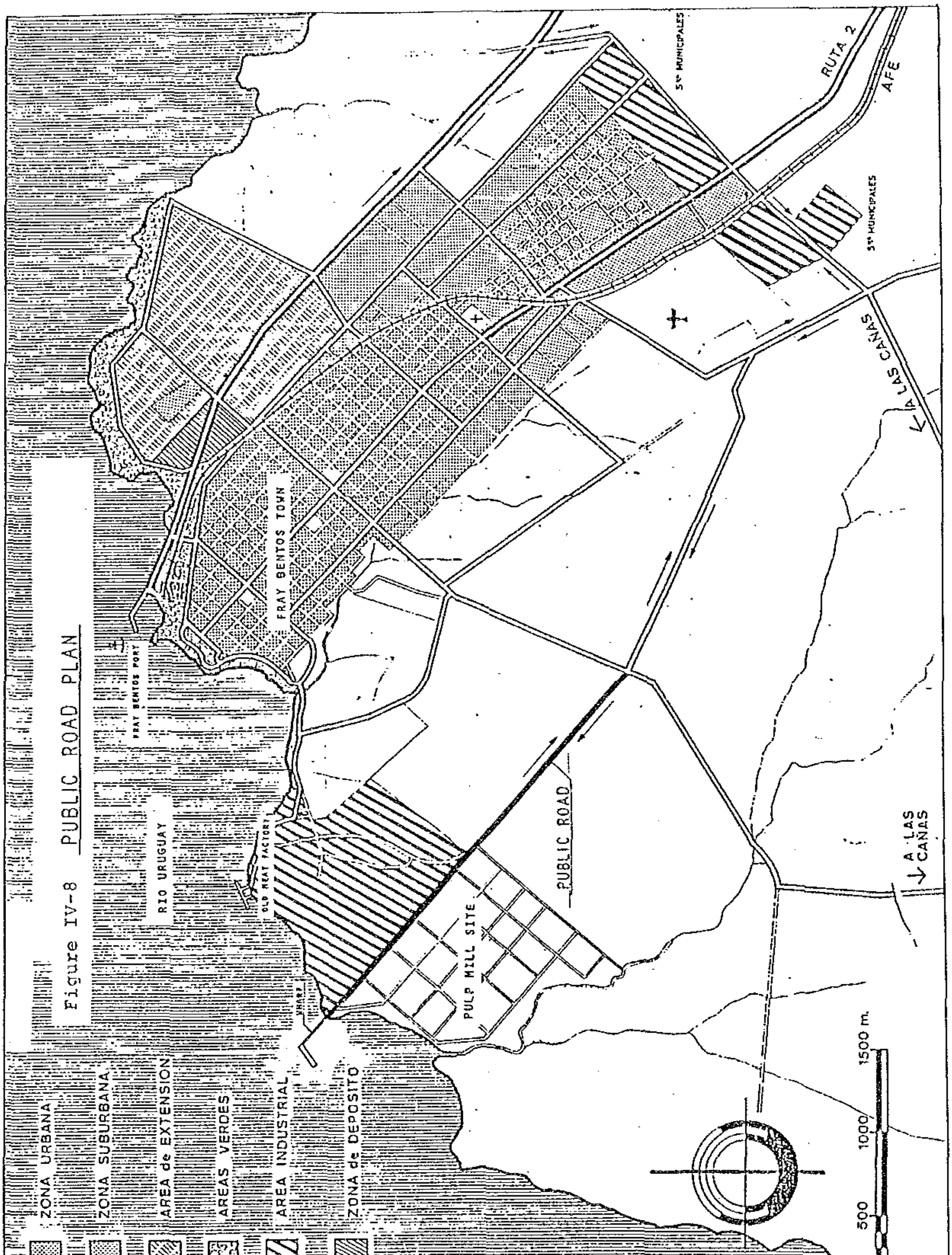


Figure IV-8 PUBLIC ROAD PLAN
ZONA URBANA
ZONA SUBURBANA
AREA de EXTENSION
AREAS VERDES
AREA INDUSTRIAL
ZONA de DEPOSITO
RIO URUGUAY
FRAY BENTOS PORT
FRAY BENTOS TOWN
OLD MEAT FACTORY
WHARF
PULP MILL SITE
PUBLIC ROAD
RUTA 2
AFE
A LAS CAÑAS
A LAS CAÑAS
500
1000
1500 m.

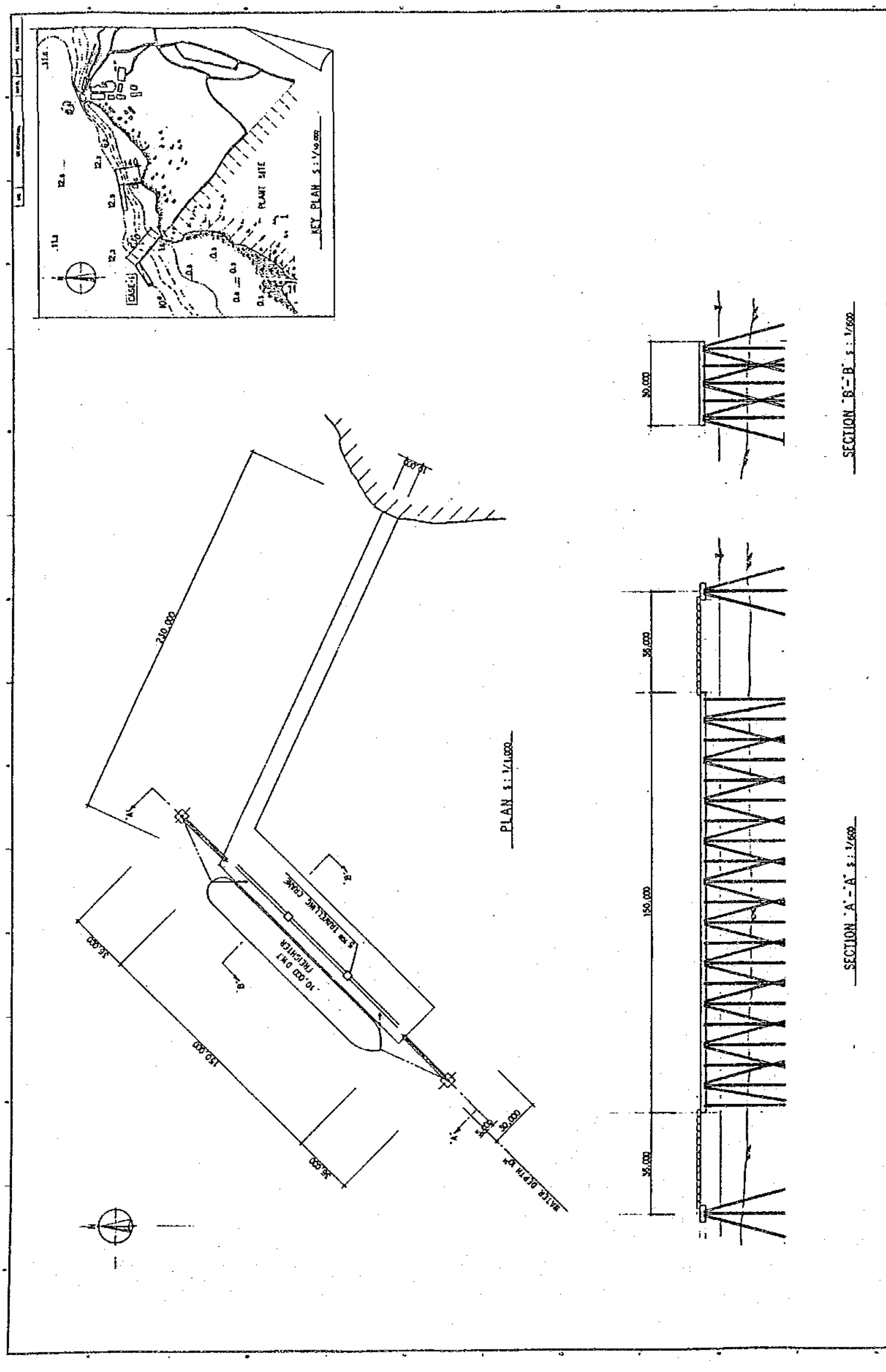


Figure IV-9 WHARF FOR PULP MILL (CASE-1)

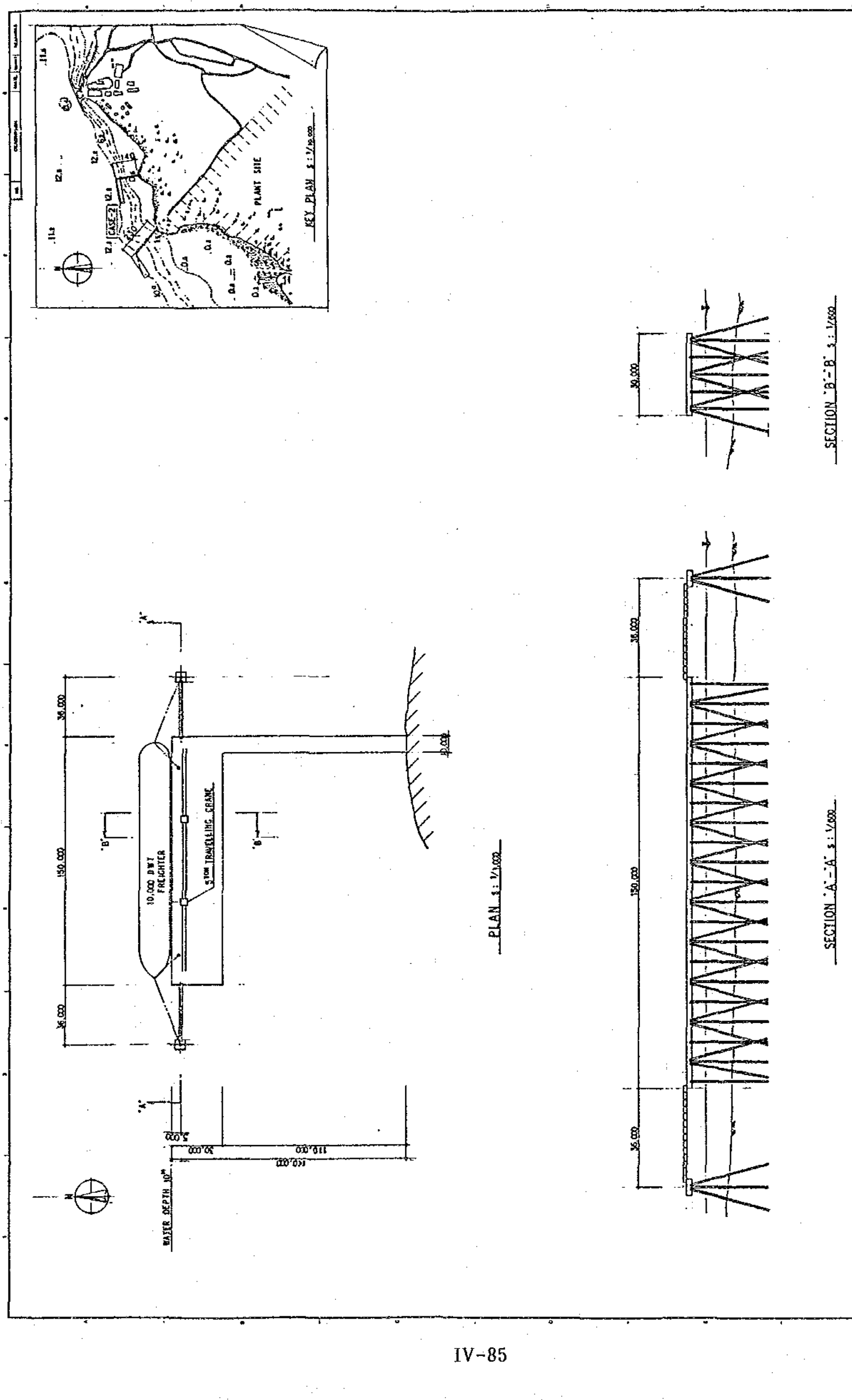


Figure IV-10 WHARF FOR PULP MILL (CASE-2)

Figure IV - 11 TYPICAL KAMYR CONTINUOUS DIGESTER

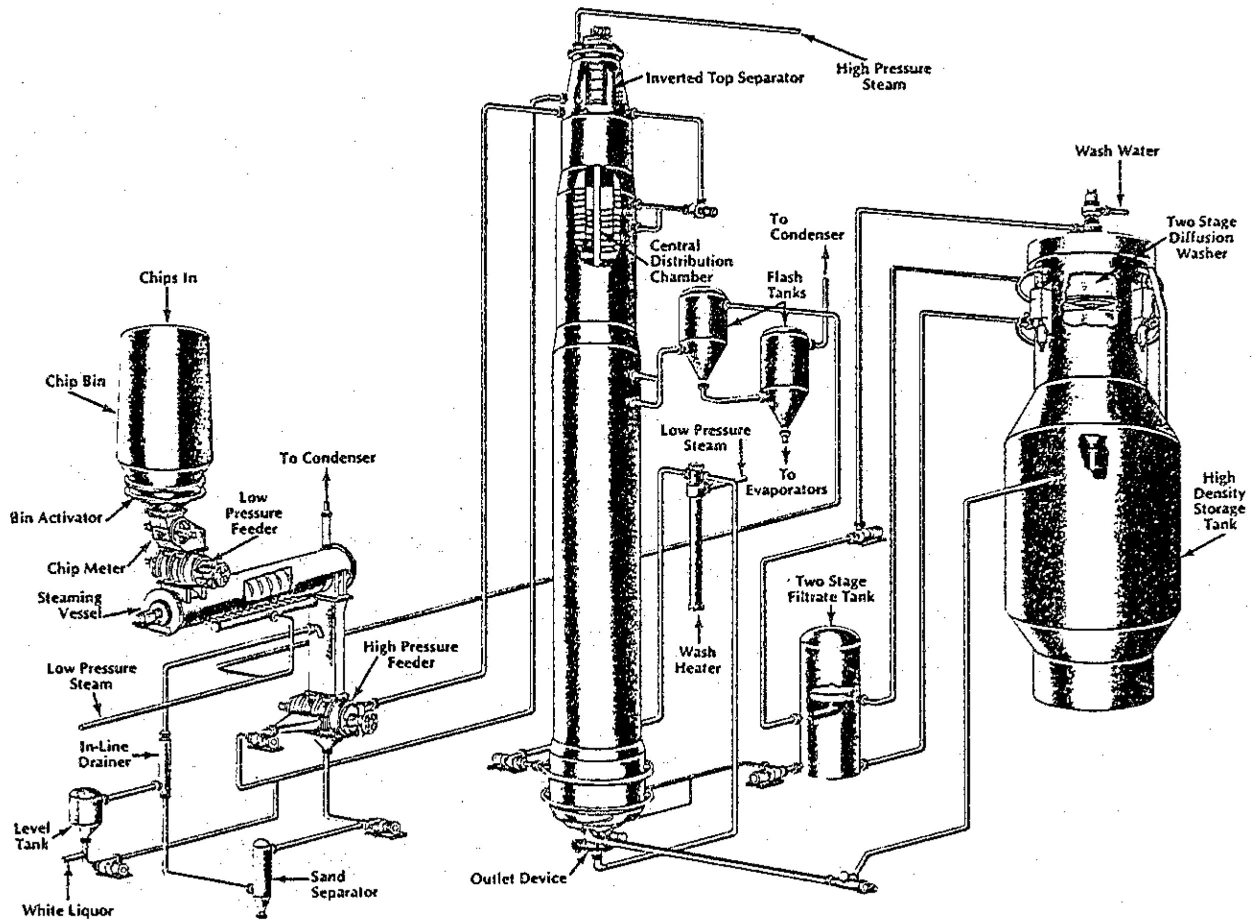


Figure IV - 12 TYPICAL KAMYR CONTINUOUS DIFFUSER WASHER

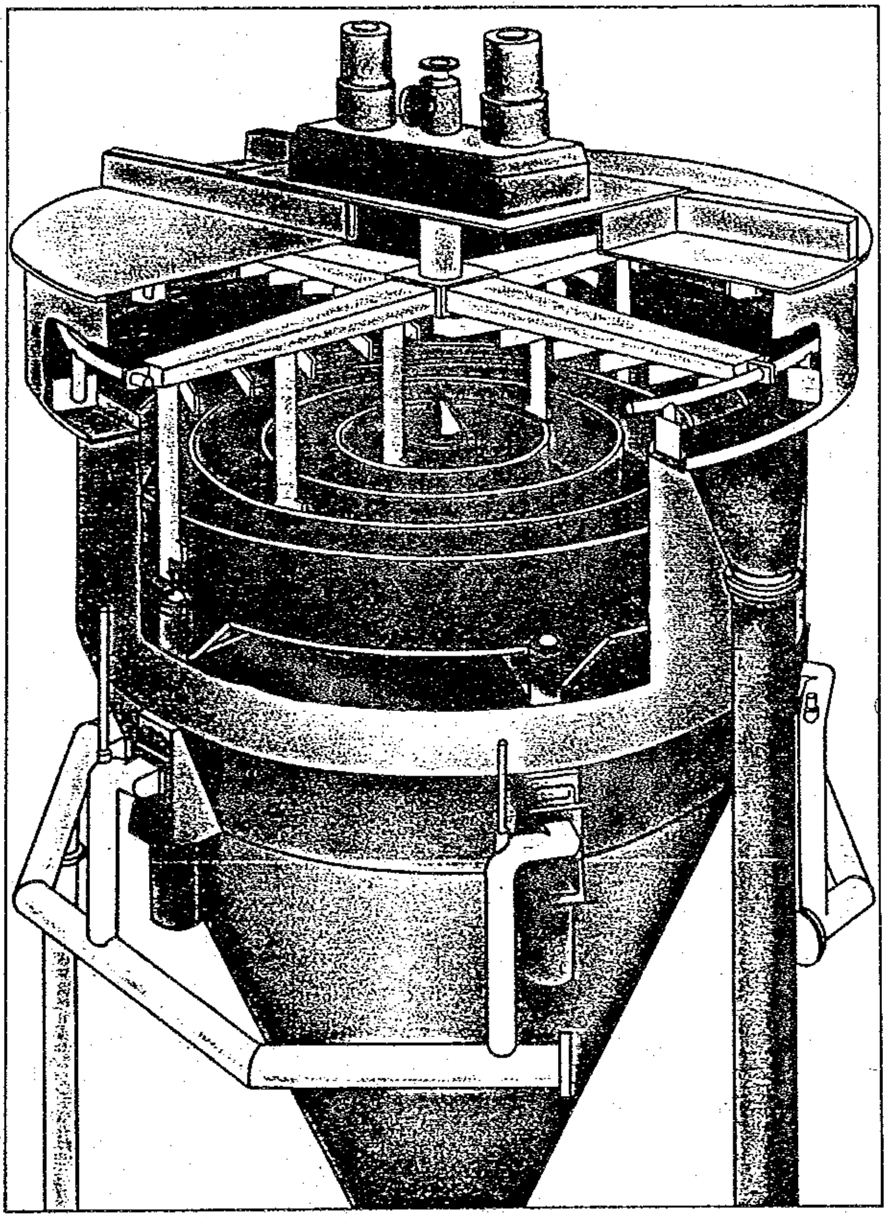


Figure IV - 13 TYPICAL KAMYR DISPLACEMENT BLEACH PLANT

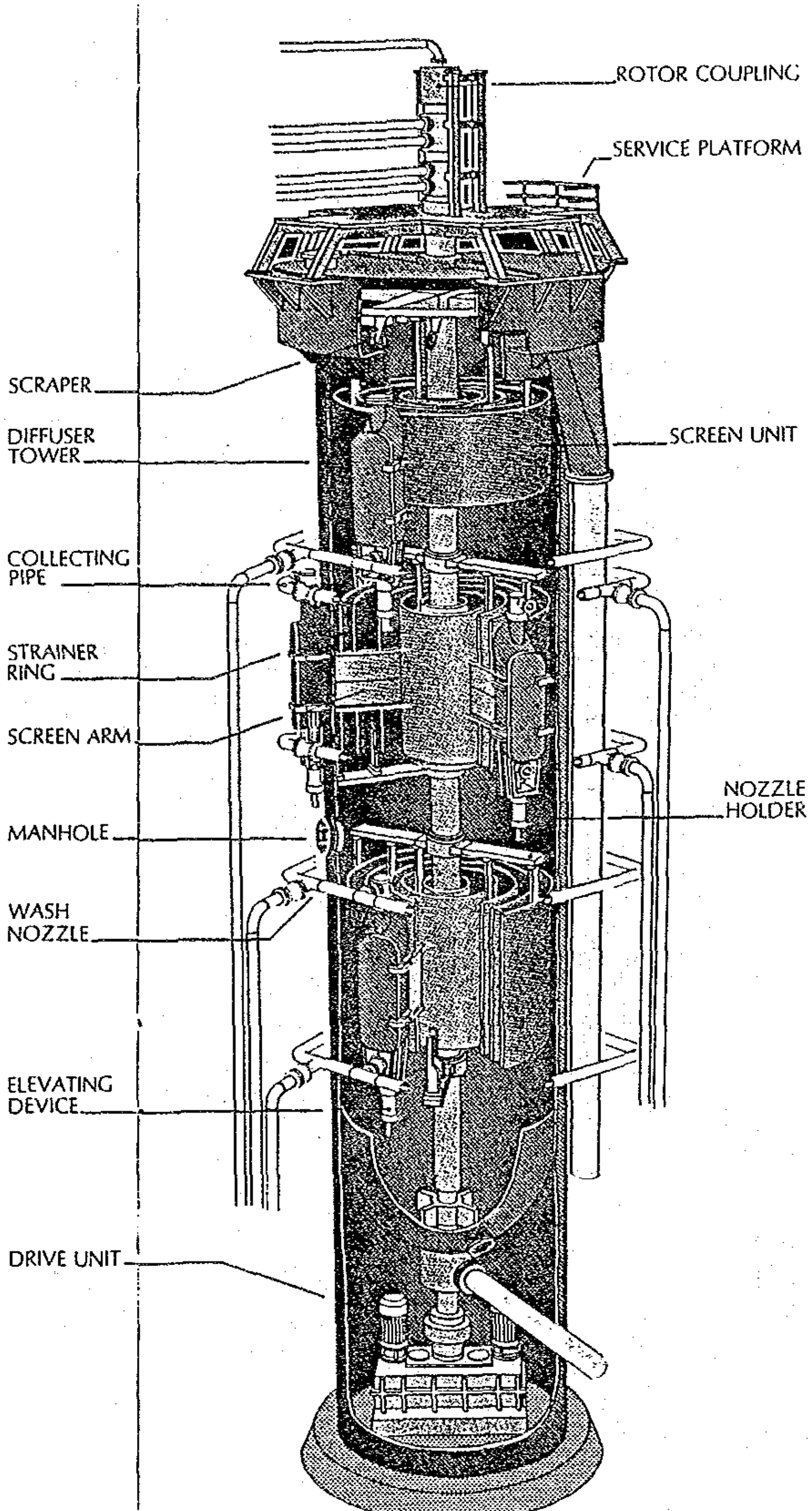


Figure IV - 14 PRINCIPLE OF THE ELECTROLYZER IN CHLOR-ALKALI PLANT

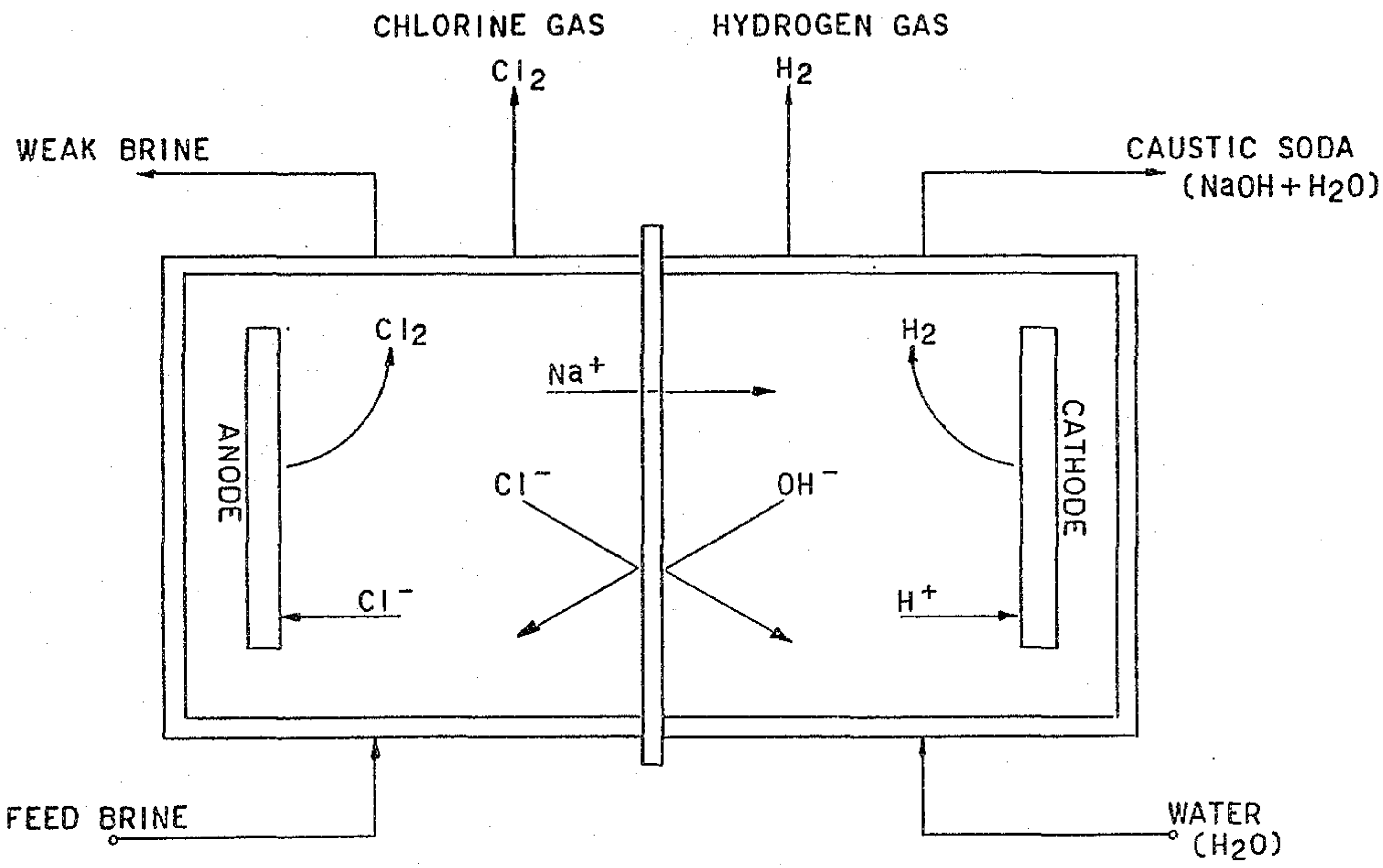


Figure IV - 15 BLOCK FLOW DIAGRAM OF WATER TREATMENT

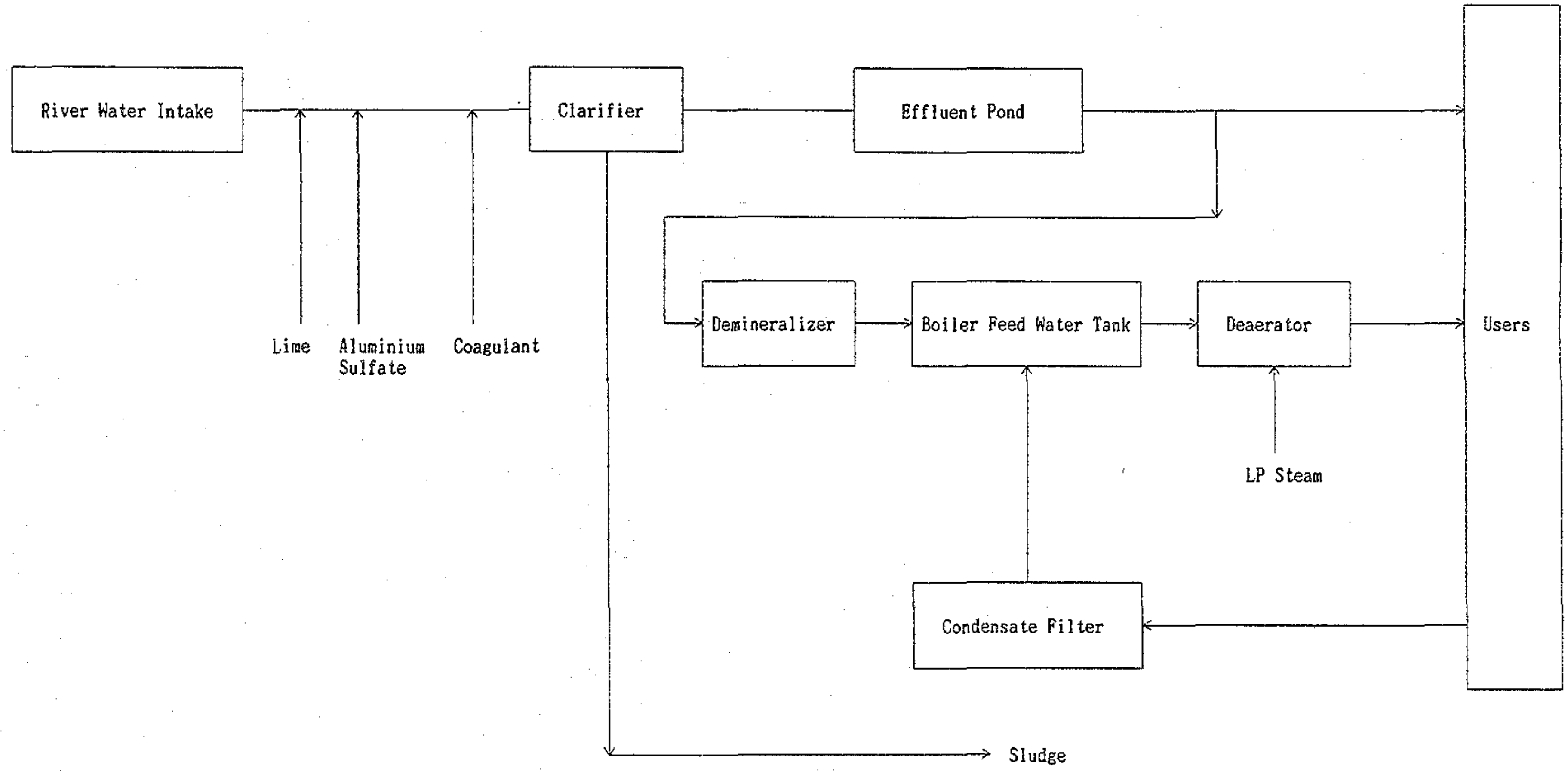
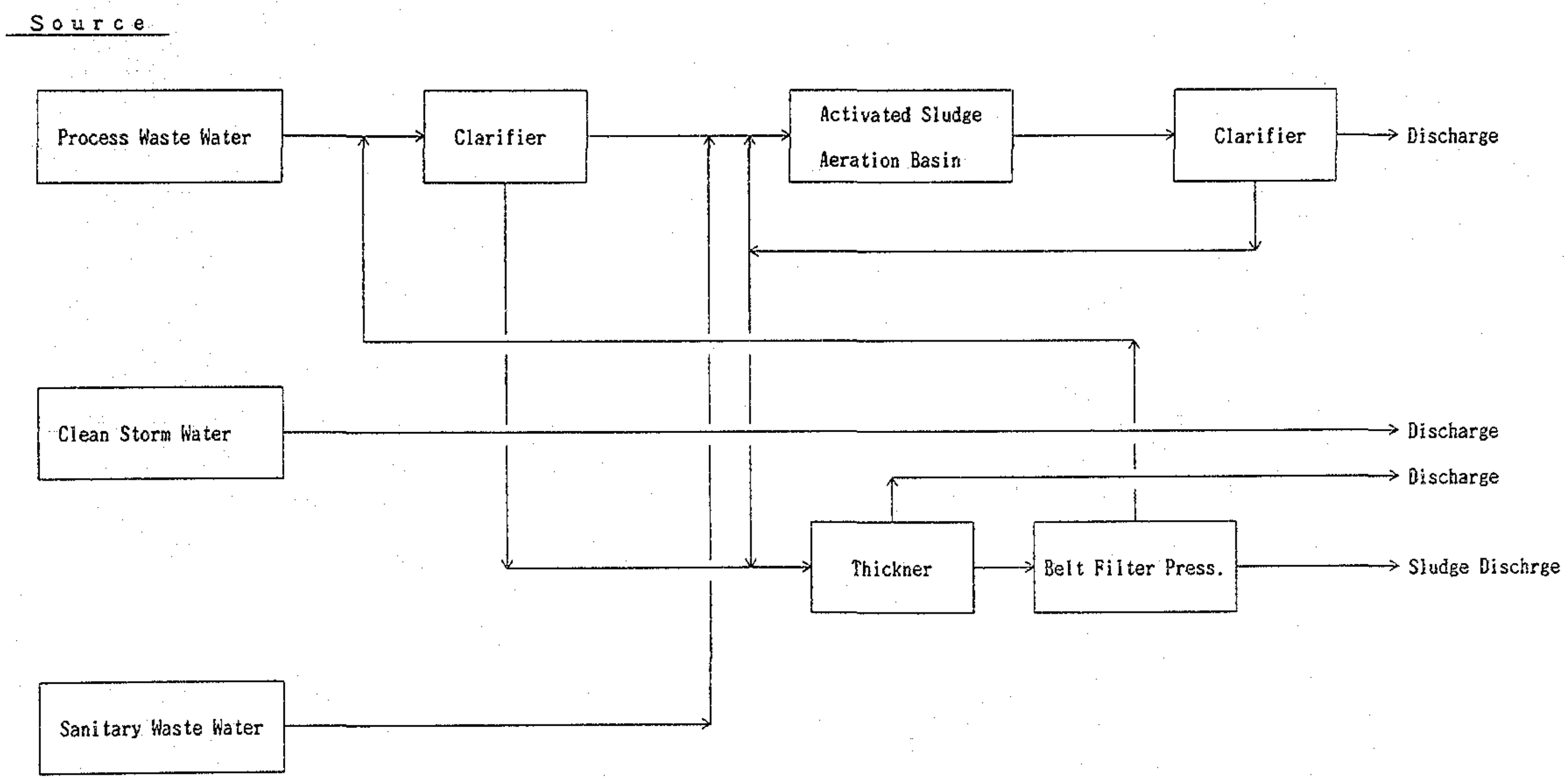


Figure IV - 16 BLOCK FLOW DIAGRAM OF WATER EFFLUENT SYSTEM



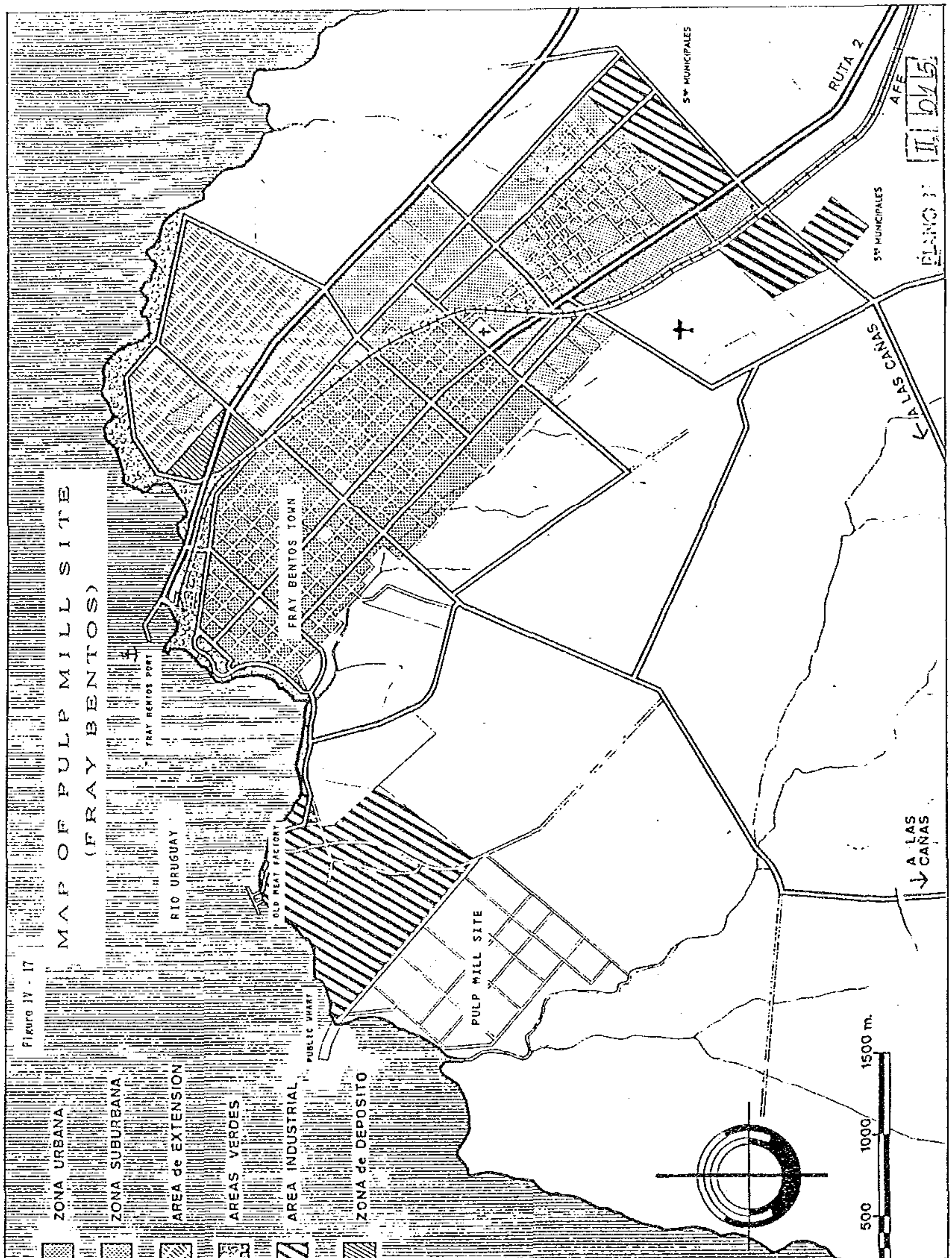
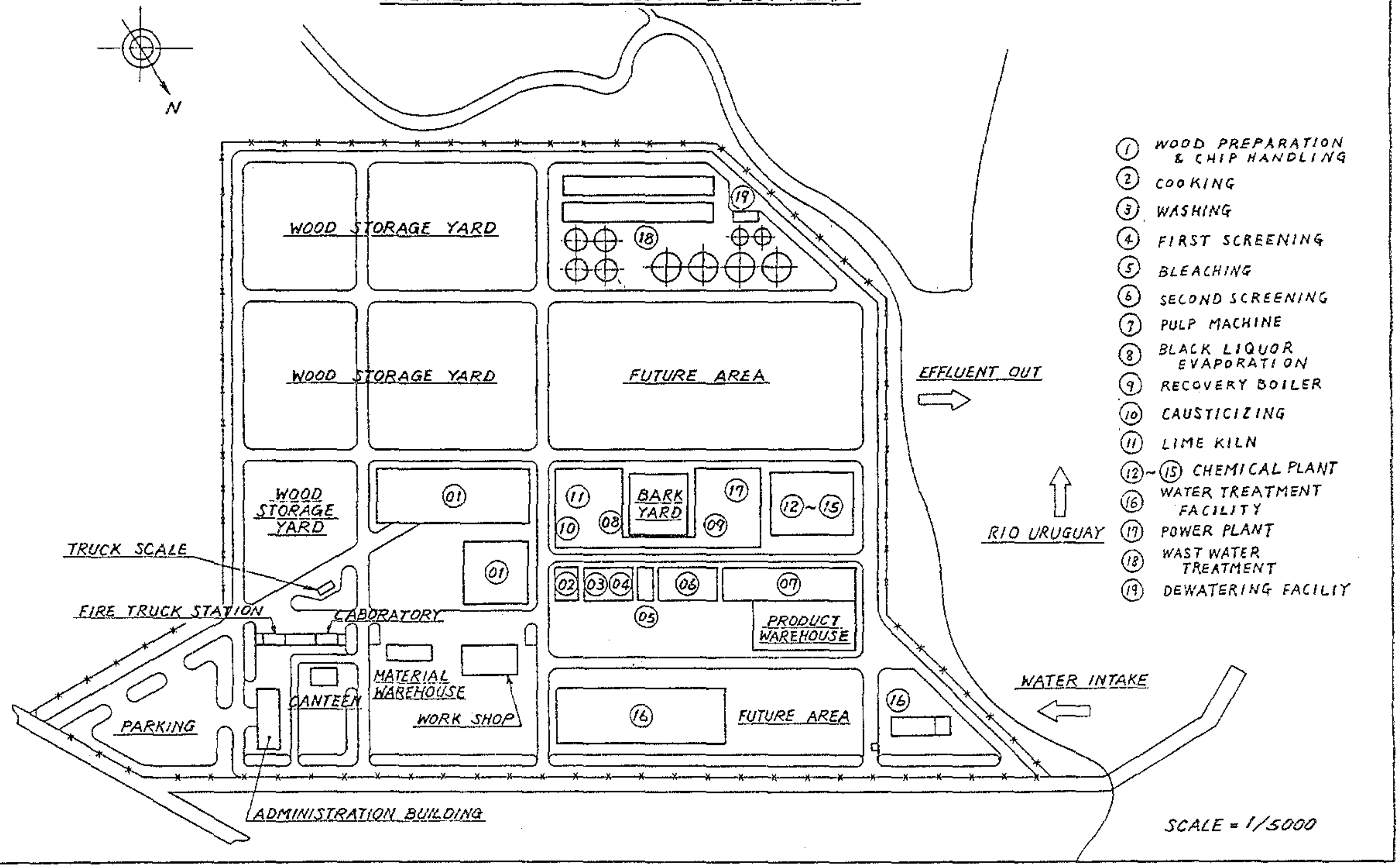


Figure IV - 17
MAP OF PULP MILL SITE
(FRAY BENTOS)

FIGURE IV-18 GENERAL PLOT PLAN



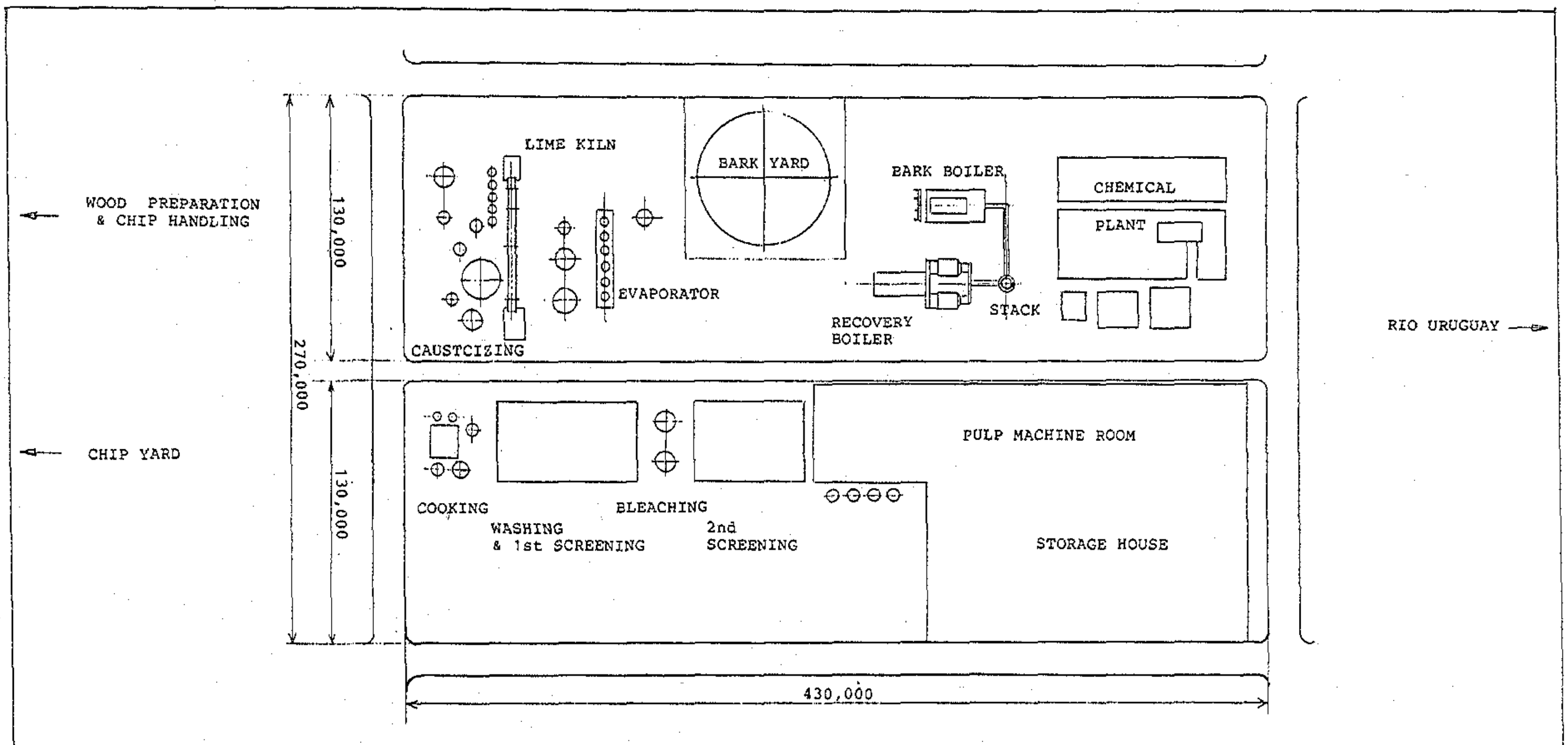


Figure IV-19 PLOT PLAN FOR PROCESS AREA

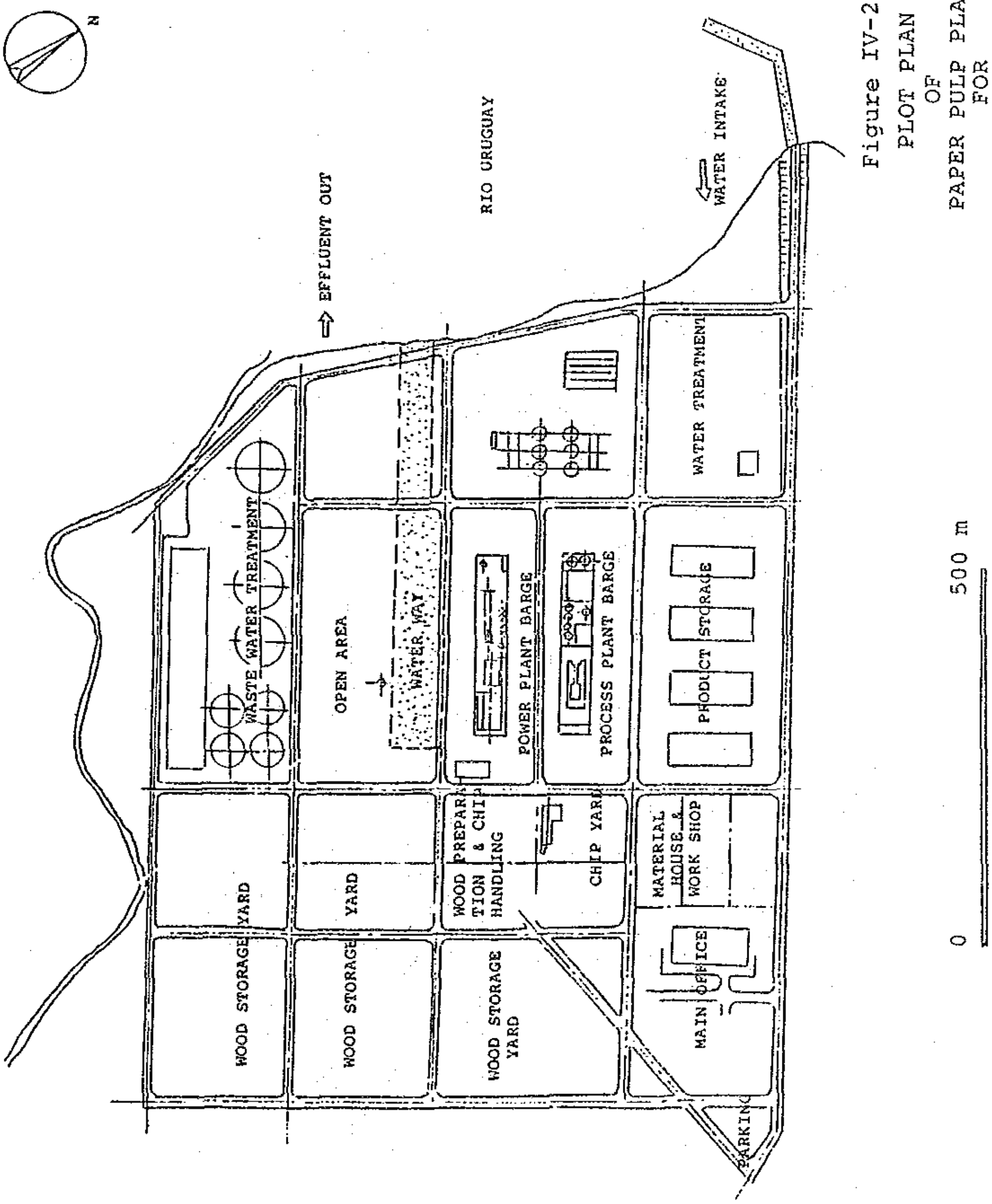


Figure IV-20
PLOT PLAN
OF
PAPER PULP PLANT
FOR
BARGE MOUNTED METHOD

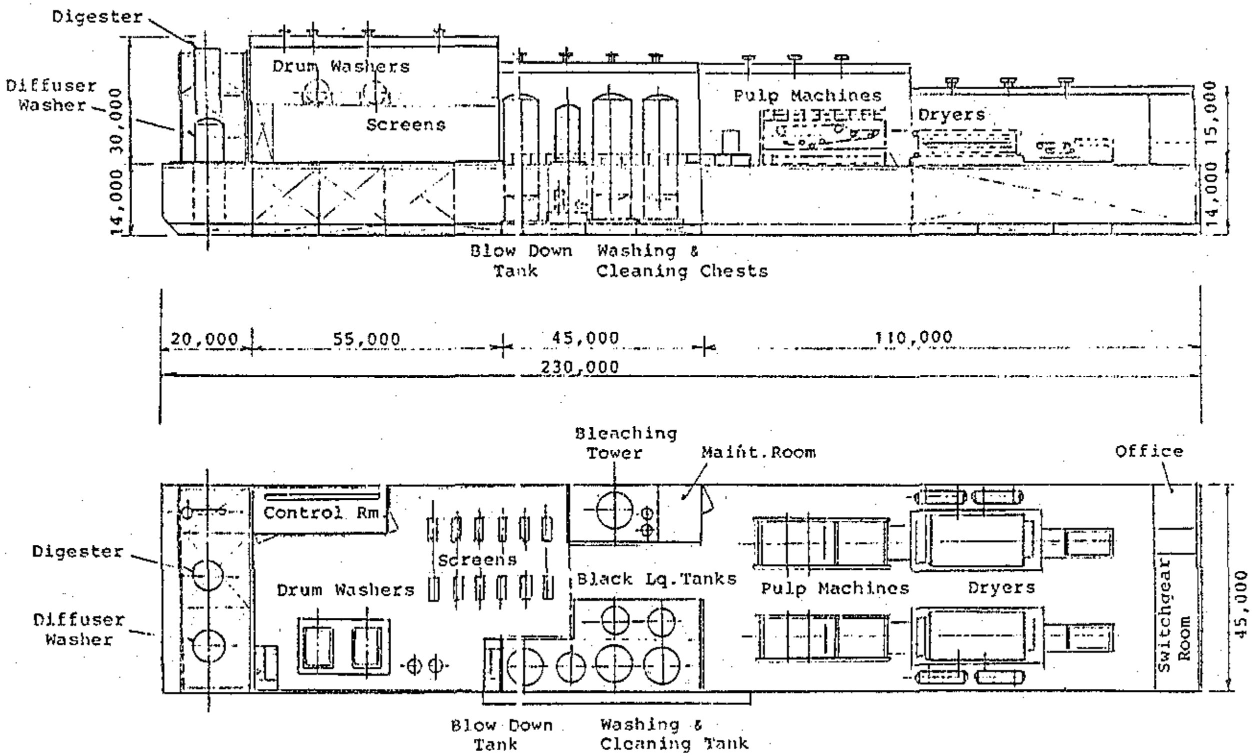


Figure IV-21
GENERAL ASSEMBLY
OF
PROCESS PLANT BARGE

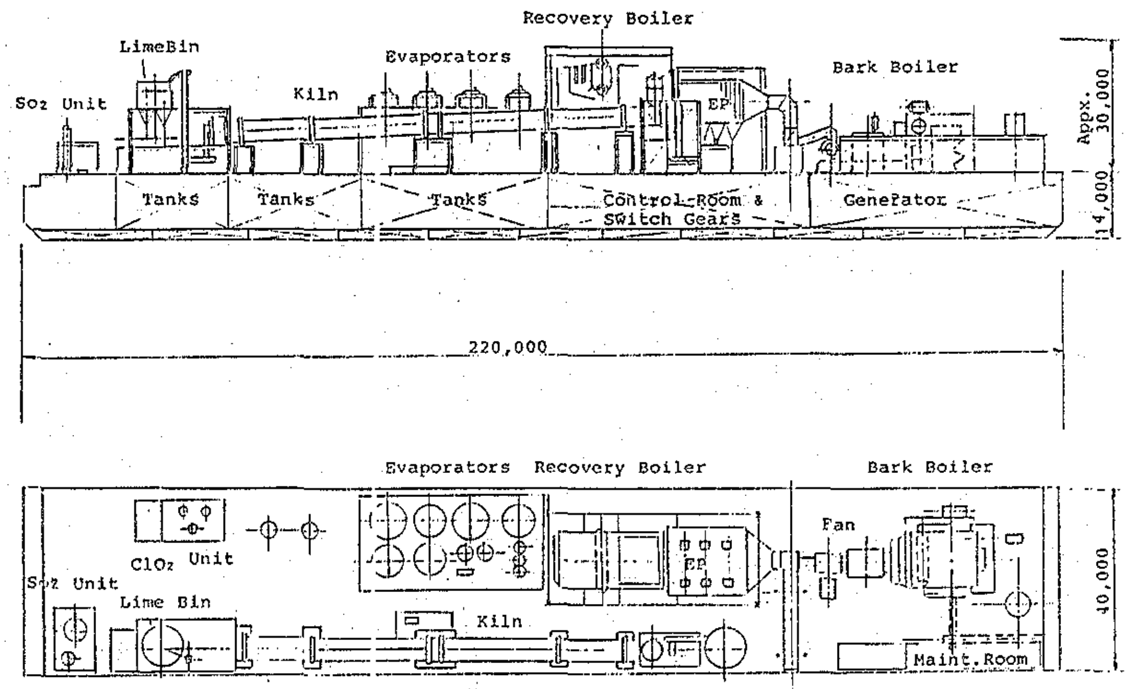


Figure IV-22
GENERAL ASSEMBLY
OF
POWER PLANT BARGE

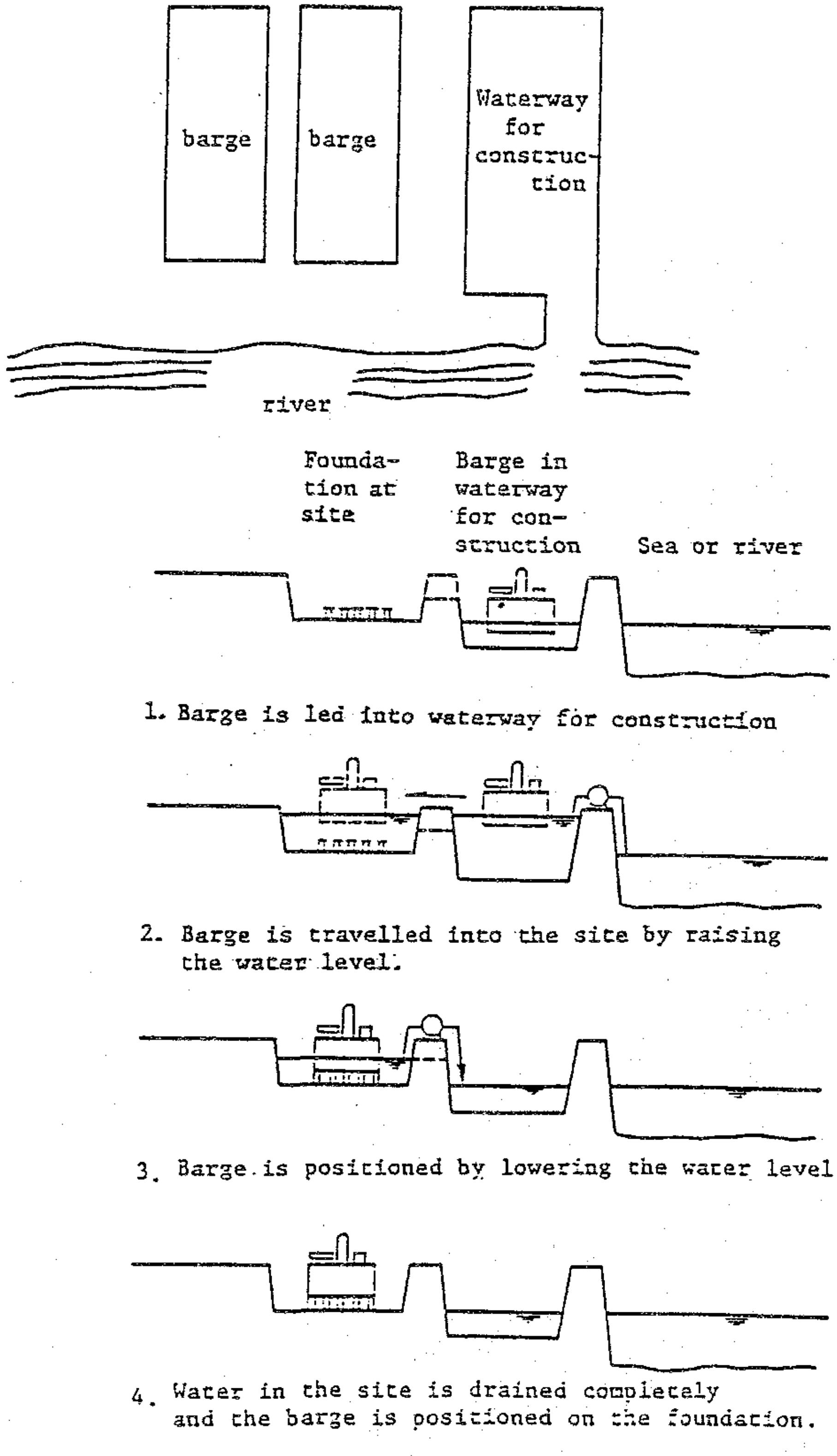


Figure IV-23 LOCK GATE METHOD

Figure IV-24

COMPARISON OF
PROJECT CONSTRUCTION SCHEDULE FOR 750 T/D PAPER PULP MILL
IN THE ORIENTAL REPUBLIC OF URUGUAY

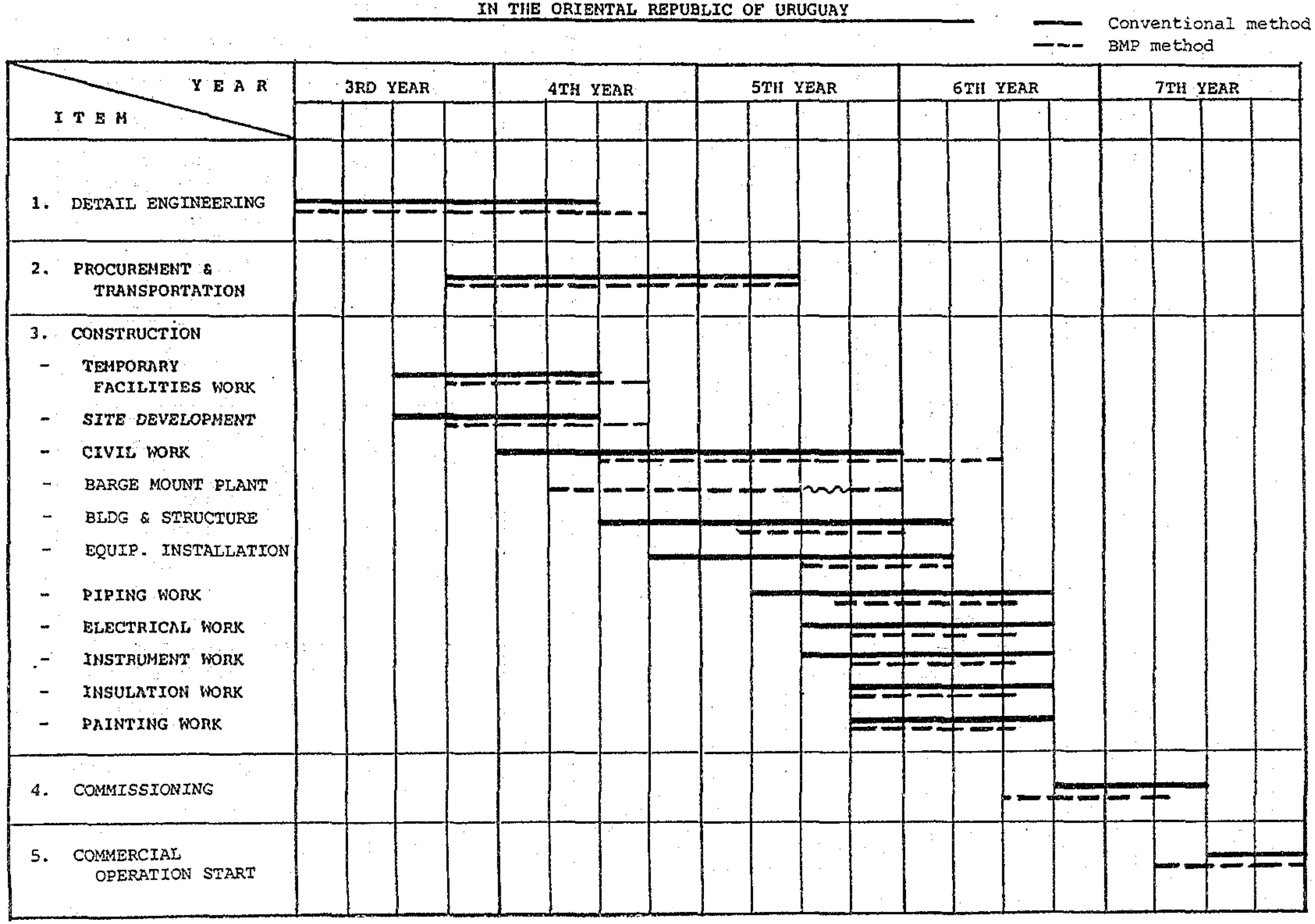


Figure IV-25 Project Master Schedule for Plantation and Construction

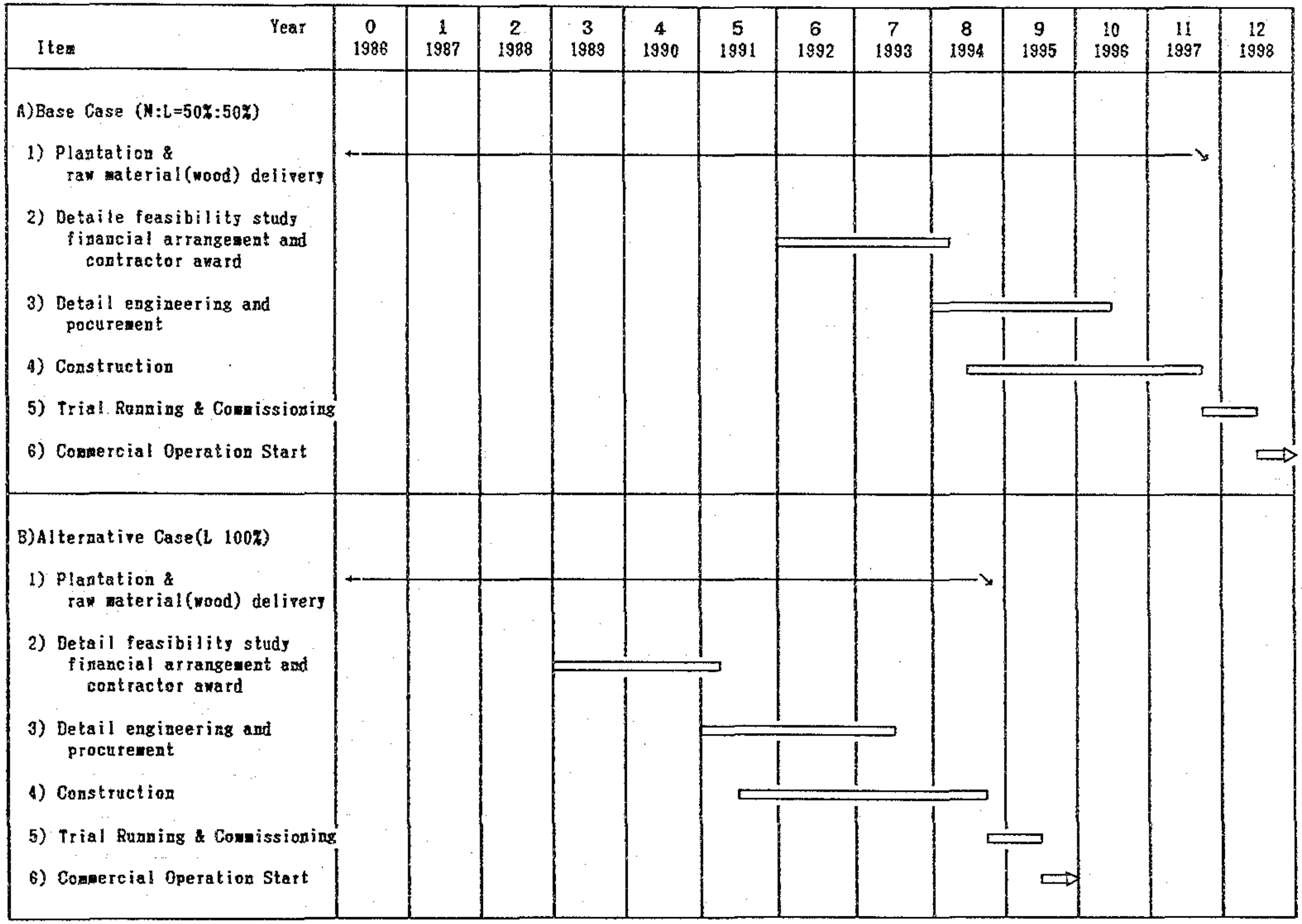


Figure IV-26 PROJECT CONSTRUCTION SCHEDULE FOR 750 T/D PAPER PULP MILL IN THE ORIENTAL REPUBLIC OF URUGUAY (CONVENTIONAL METHOD)

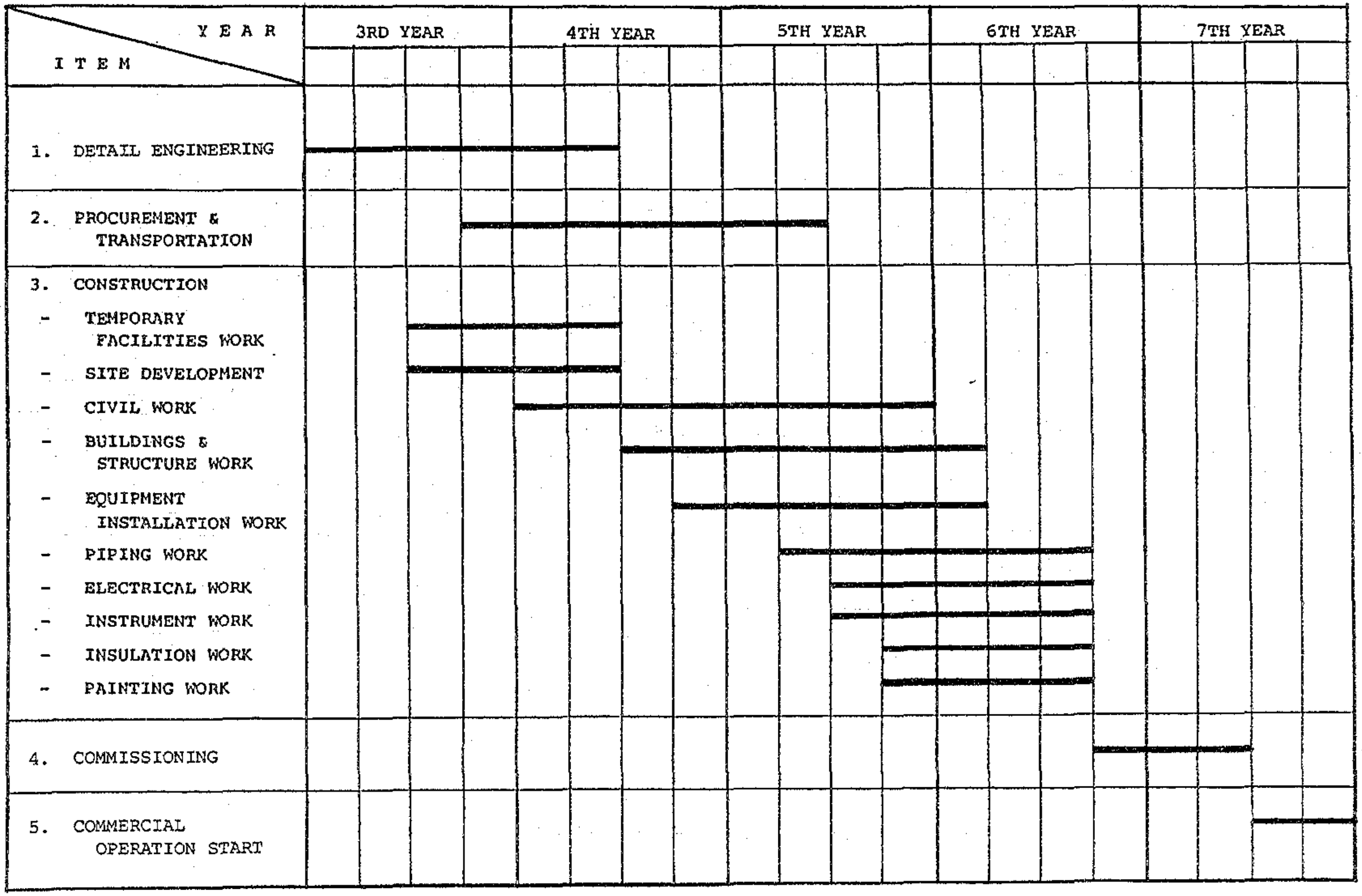


Figure IV-27 ENGINEERING OFFICE ORGANIZATION CHART

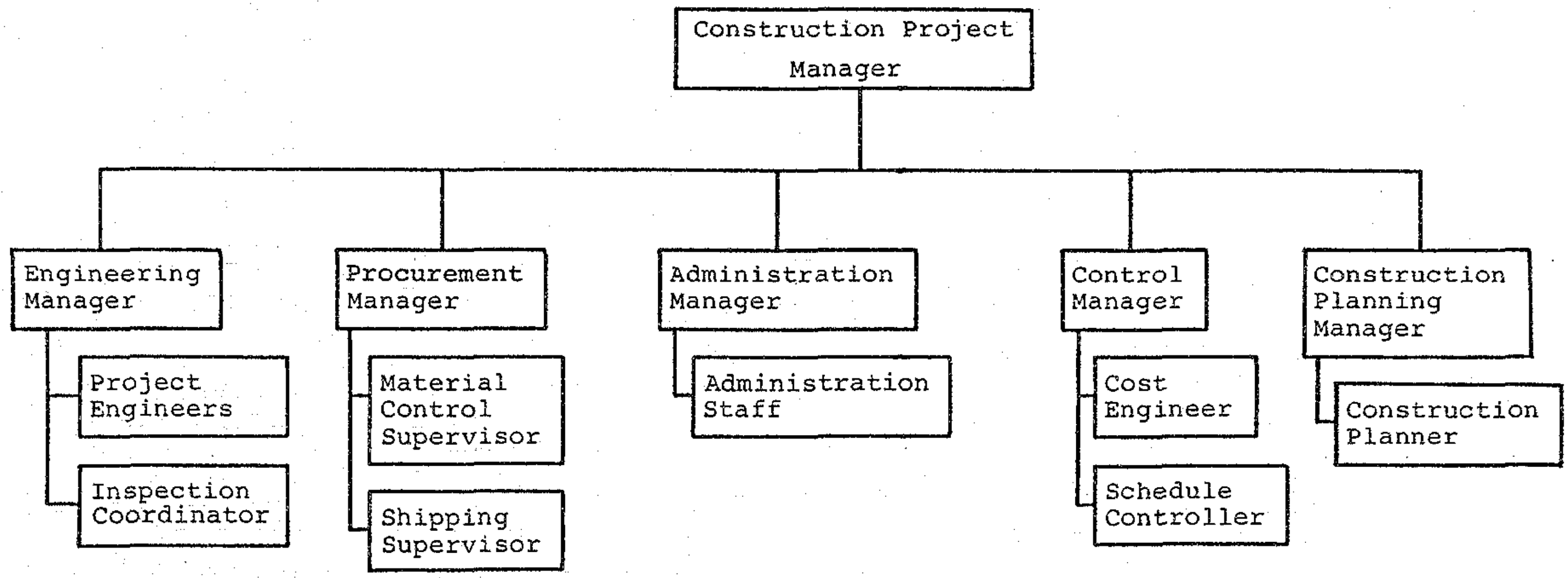
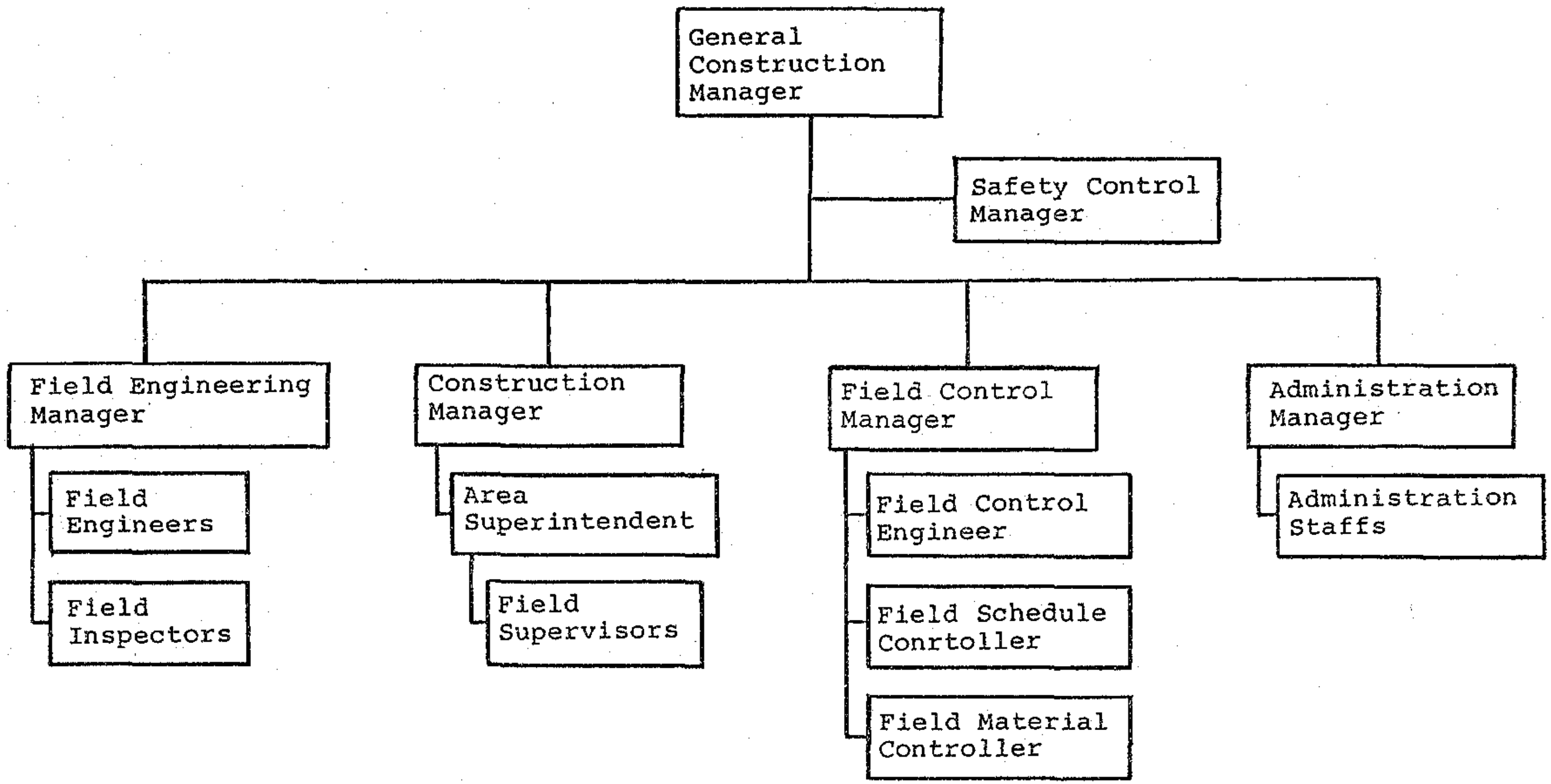


Figure IV-28 FIELD CONSTRUCTION OFFICE ORGANIZATION CHART



PART V

PROJECT COST ESTIMATE AND FINANCING PLAN

Part V PROJECT COST ESTIMATE AND FINANCING PLAN

Chapter 1 Project Cost Estimate

1-1 Major Assumptions for the Estimate

On the basis of the technical requirements, conceptual design of the facilities, and implementation plans defined or formulated for the Project in Part IV, the major assumptions for the project cost estimate was set as summarized below.

1-1-1 Project Scope for the Estimate

The scope of the Project which is the basis for the project cost estimate consists of a BKP manufacturing plant having a capacity of 750 T/D, and storage facilities for pulp wood, but afforestation and infrastructure such as public port and railroad were excluded.

For the economic evaluation, however, the project cost includes the expenses for infrastructure to some extent.

1-1-2 Project Implementation Schedule

Based on the implementation schedule (ref. Figure IV-25) and construction schedule as shown in Figures V-1 and V-2, for the project cost estimate, it is assumed that six and a half years is required from the commencement of detailed feasibility study, through plant construction, to the start of commercial operation.

1-1-3 Currency and Exchange Rates

In accordance with the agreement made with Uruguayan counterpart for the study, the estimate is made in terms of U.S. Dolalrs for all charges, costs and prices and also by applying a foreign exchange rate of US$1.00 for New Uruguayan P75.

1-1-4 Escalation Rate

(1) Price escalation for foreign exchange components

Enumerated below are the escalation rates used for projecting future increases in the costs for imported equipment and materials which may be effected due to inflation. These rates are used not only for the project cost estimate but also for the estimate of costs for spare-parts, chemicals and other materials which will be imported for operation.

The escalation rates have been projected on the basis of the past trends for consumer price increases in the United States, Japan and other seven industrial countries, as well as statistics showing the past trends of average export prices in the developed industrial countries.

Inflation rate in the developed countries, as is evident from the figures shown in Table V-1, has currently been tending in static. Nevertheless it is commonly predicted that the inflation would tend at a rather higher rate in the future. In this context the escalation rates are assumed as follows:

1985	3.0%
1986	3.5
1987	4.0
1988	4.5
1989 and onward	5.0

(2) Price escalation for local currency components

The price increases in Uruguay have been tending at significantly higher rates compared to those in the developed industrial countries, although they are moderate as compared to other Latin American countries. Such increases, however, have been offset by devaluations of the Uruguay currency so that the increases in terms of U.S. Dollars can be assessed as being identical to the international inflation. In this context the price escalation for the local currency in terms of U.S. Dollars is set at the same rate as that for the foreign exchange components.

1-1-5 Mode of Contract Assumed for the Construction of Plant Facilities

Since the implementation agency for the Project is not decided yet, it is early to define the appropriate mode of contract applicable to the Project, although the Project may presumably be implemented with assistances extended from the developed countries as can be seen in Brazil. Nevertheless, for the project cost estimate, it is assumed that the construction of plant facilities will be commissioned to an engineering contractor selected through competitive bids and under a lump-sum contract.

1-1-6 Tax and Duties

As agreed with the Uruguayan counterpart, the estimate is made on the assumption that equipment, machinery and materials imported for the Project are exempted from import duty, although local contractors employed should be subject to a 30% corporate tax.

1-2 Base for the Estimate

1-2-1 Project Cost

The project cost including spareparts estimated for each case, is summarized below.

(Unit: Million US$)

	Foreign	Local	Total
Base Case	548.00	161.52	709.92
Case 1	547.80	162.72	709.52
Case 2	473.10	138.42	611.52
Case 3	473.10	137.92	611.02

Description of the Project has been defined for each case in Chapter 1-4, Part VI, and breakdown of the estimated cost is given in Tables V-2 to V-5.

1-2-2 Base for the Estimates of Major Cost Components

(1) Land Acquisition Cost

Land areas for the plant, receiving and storing of pulp wood, product storage, and utility facilities are estimated as 82 ha., and the land cost is estimated at US$225/ha.

(2) Site Preparation Cost

It is assumed that the site preparation works will be undertaken by a local or foreign contractor under a lump-sum contract, separately made from the construction of plant facilities, and also assumed that the preparation works will be supervised by consulting engineers in accordance with an optimum site preparation plan formulated by them.

(3) Cost for Equipment and Materials

Assuming that all equipment and materials for the 750 t.p.d. BKP plant, except cement and sand are required by imports, the costs for those items are estimated on the basis of FOB prices.

(4) Costs for Spare-parts & Chemicals

Assuming that spare-parts required for 2-years operation will be procured at the stage of plant construction, the cost for the spare-parts is estimated at 4% of the above plant costs. The cost for chemicals to be purchased at the construction stage is estimated on the basis of their requirements for 3 months operation.

(5) Costs for Construction & Erection Labor

Costs for foreign technicians and local laborers required for the construction are estimated. The estimates are made at US$75/man-day for foreign technicians and US$22/man-day for Uruguayan laborers. The above unit cost includes all necessary costs for extra works, allowances and fringe benefits.

(6) Costs for Construction Equipment & Consumables

The cost of these items includes those for special machines and tools to be used for fabricating large-size construction machines such as cranes etc. as well as electrical and instrument tools which are required for the plant construction, and also those for consumables such as oxygen and acetylene. Costs for construction equipment were estimated on the assumption that they are rented on a lease basis.

(7) Costs for Temporary Facilities

The cost of these items includes those for temporary facilities such as a temporary site office, warehouses, lodgings for workers, power generation and receiving facilities for the construction.

(8) Costs for Transportation, Insurance & Portcharges

Assuming that all plant equipment will be procured in abroad, cost of this item includes those for ocean freight, land transportation, insurance premium during such transportations up to the site, and port charges at the importing ports in Uruguay (9.5%). It must be noted, however, that the costs for transporting via the ports account for only 4% of total weight, since it is assumed that majority of the equipment will be purchased in Brazil.

(9) Indirect Field Expenses

The cost of this item is for field indirect personnel at the site, expenditures of site office, travel expenses both of overseas and inland, and communication charges incurred for the contractors.

(10) Engineering Fee

This item includes the engineering contractor's fees for process design, project management and other services, as well as royalty for process license.

(11) Home Office Expenses

This item includes the expenses incurred to the main contractor at the home office for the management of the project, including communication charges, travel expenses and printing charges etc.

(12) Pre-operational Expenses

This item includes the costs for foreign engineers employed as technical advisors (600 man-month), the costs for pulp wood consumed during start-up and test-run (for 1.5 months), chemicals (for 1.5 months operation), fuels, as well as salaries and wages of employees for 6 months (estimated as 40% of those incurred for commercial operation) etc.

(13) Initial Working Capital

Initial working capital is the funds required for initial inventories and operation prior to the generation of cash effected by sales. It is estimated in the following manner.

Cash in Hand	:	One month of the production cost
Inventory of raw materials	:	Pulp wood required for one month operation and fuel wood required for one month operation
Inventory of chemicals	:	Chemicals required for three months operation
Inventory of products	:	Equivalent to the production costs incurred for one month operation
Accounts receivable	:	Equivalent to the revenue for three months' sales
Accounts payable	:	Equivalent to the variable costs for 3 months operation

This initial working capital excludes the costs for spareparts, because these costs is included in the base project cost.

(14) Price Contingency

The price contingency reflects expected increases in the base cost estimate due to changes in unit prices for the various project components beyond the date of the base cost estimate. The increase rates are estimated on the basis of annual compound of annual inflation rate.

(15) *Physical Contingency*

The physical contingency reflects expected increases in the estimated capital cost, due to changes in quantities and methods of implementation judged necessary to take into account, as being caused by uncertainties related to site conditions and other design bases, as well as degree of precision with which quantity of materials, equipment, laborers and services were estimated. In this estimate physical contingency allowances are assumed to be 10% of the base cost estimate.

(16) Interest During Construction

Interest During Construction is estimated on the basis of the conditions stated in Chapter 2 (Financing Plan); Debt/Equity Ratio of 70:30, interest rate at 12% per annum, and disbursement schedule for loans as enumerated below.

Borrowing schedule	%
1st year	24.50
2nd "	37.50
3rd "	24.00
4th "	6.60
5th "	5.40

The detailed calculation method and actual result are mentioned in Table V-6 - Table V-17.

Chapter 2 Financing Plan

At the present, the source of funds as well as terms and conditions for loans are unknown yet. Nevertheless, for the estimate, the financing plan for the Project is assumed as follows according to the discussion made with the Uruguayan counterpart.

2-1 Debt/Equity Ratio

Assuming a Debt/Equity Ratio of 70:30, it is projected that 70% of the project cost be financed with long-term loans and 30% be financed with equity capital, and the long-term loan be borrowed from a foreign country(s).

2-1-1 Terms and Conditions of Long-Term Loan

(1) *Terms of Repayment*

The principal of the loan is to be repaid, with 14 semi-annual installments for 7 years starting 4th year (3 years grace period) from the commencement year of commercial operation.

(2) Interest

Libor + 2% or 2.5% = 12% per annum

2-1-2 Short-Term Loan

Any deficiency in fund flow which has accrued during the operation will be financed with short-term loans.

The terms and conditions of the short-term loans are assumed as follows:

(1) Interest: Libor + 3 or 3.5% = 13% per annum
(2) Terms of Repayment: Within 12 months

Table V-1 PROJECTED ANNUAL INFLATION RATE

(Unit: %)

	1984	1985
U.S.A.	4.00	5.25
Japan	2.25	3.00
W. Germany	3.00	3.25
U.K.	5.00	5.25
France	7.50	5.75
OECD Total (24 countries)	5.25	5.25
Average	4.50	4.625

Source: OECD

Table V-2 BASE PROJECT COST (Base Case)

(Unit: Million US$)

Item	Foreign	Local	Total
1. Land Acquisition	0.00	0.02	0.02
2. Site Preparation	5.60	2.50	8.10
3. Equipment & Materials	134.50	17.30	151.80
4. Spare Parts & Chemicals	6.40	3.40	9.80
5. Construction & Erection Labor	13.80	26.30	40.10
6. Const. Equipment & Consumable	12.00	2.90	14.90
7. Temporaty Facilities	2.10	3.90	6.00
8. Transport, Insurance & Portcharge	13.80	1.10	14.90
9. Indirect Field Expenses	8.40	3.50	11.90
10. Engineering Fee	14.20	0.80	15.00
11. Home Office Expenses	5.90	0.00	5.90
12. Pre-operational Expenses	3.50	6.40	9.90
Base Project cost (in 1985)	220.20	68.12	288.32
13. Physical Contingency (in 1985)	22.10	6.80	28.90
14. Price Contingency (in 1991)	144.30	48.10	192.40
15. Initial Working Capital (in 1991)	0.00	38.90	38.90
16. Interest During Construction	161.40	0.00	161.40
Total Financing Required	548.00	161.92	709.92

Table V-3 BASE PROJECT COST (Case 1)

(Unit: Million US$)

Item	Foreign	Local	Total
1. Land Acquisition	0.00	0.02	0.02
2. Site Preparation	5.60	2.50	8.10
3. Equipment & Materials	134.50	17.30	151.80
4. Spare Parts & Chemicals	6.40	3.40	9.80
5. Construction & Erection Labor	13.80	26.30	40.10
6. Const. Equipment & Consumable	12.00	2.90	14.90
7. Temporaty Facilities	2.10	3.90	6.00
8. Transport, Insurance & Portcharge	13.80	1.10	14.90
9. Indirect Field Expenses	8.40	3.50	11.90
10. Engineering Fee	14.20	0.80	15.00
11. Home Office Expenses	5.90	0.00	5.90
12. Pre-operational Expenses	3.50	6.30	9.80
Base Project cost (in 1985)	220.20	68.02	288.22
13. Physical Contingency (in 1985)	22.10	6.80	28.90
14. Price Contingency (in 1991)	144.30	48.00	192.30
15. Initial Working Capital (in 1991)	0.00	38.90	38.90
16. Interest During Construction	161.20	0.00	161.20
Total Financing Required	547.80	161.72	709.52

Table V-4 BASE PROJECT COST (Case 2)

(Unit: Million US$)

Item	Foreign	Local	Total
1. Land Acquisition	0.00	0.02	0.02
2. Site Preparation	5.60	2.50	8.10
3. Equipment & Materials	134.50	17.30	151.80
4. Spare Parts & Chemicals	6.40	3.40	9.80
5. Construction & Erection Labor	13.80	26.30	40.10
6. Const. Equipment & Consumable	12.00	2.90	14.90
7. Temporaty Facilities	2.10	3.90	6.00
8. Transport, Insurance & Portcharge	13.80	1.10	14.90
9. Indirect Field Expenses	8.40	3.50	11.90
10. Engineering Fee	14.20	0.80	15.00
11. Home Office Expenses	5.90	0.00	5.90
12. Pre-operational Expenses	3.50	5.50	9.00
Base Project cost (in 1985)	220.20	67.22	287.42
13. Physical Contingency (in 1985)	22.10	6.80	28.90
14. Price Contingency (in 1991)	91.90	30.90	122.80
15. Initial Working Capital (in 1991)	0.00	33.50	33.50
16. Interest During Construction	138.90	0.00	138.90
Total Financing Required	473.10	138.42	611.52

Table V-5 BASE PROJECT COST (Case 3)

(Unit: Million US$)

Item	Foreign	Local	Total
1. Land Acquisition	0.00	0.02	0.02
2. Site Preparation	5.60	2.50	8.10
3. Equipment & Materials	134.50	17.30	151.80
4. Spare Parts & Chemicals	6.40	3.40	9.80
5. Construction & Erection Labor	13.80	26.30	40.10
6. Const. Equipment & Consumable	12.00	2.90	14.90
7. Temporaty Facilities	2.10	3.90	6.00
8. Transport, Insurance & Portcharge	13.80	1.10	14.90
9. Indirect Field Expenses	8.40	3.50	11.90
10. Engineering Fee	14.20	0.80	15.00
11. Home Office Expenses	5.90	0.00	5.90
12. Pre-operational Expenses	3.50	5.20	8.70
Base Project cost (in 1985)	220.20	66.92	287.12
13. Physical Contingency (in 1985)	22.10	6.70	28.80
14. Price Contingency (in 1991)	91.90	30.80	122.70
15. Initial Working Capital (in 1991)	0.00	33.50	33.50
16. Interest During Construction	138.90	0.00	138.90
Total Financing Required	473.10	137.92	611.02

Table V-6. DISBURSEMENT AND INTEREST DURING CONSTRUCTION (BASE CASE)

TOTAL FINANCING REQUIRED:

DEBT (70.00%)	496.80
EQUITY (30.00%)	213.12
TOTAL	709.92

INTEREST RATE: 12.00% PER YEAR

DISBURSEMENT:

YEAR	%	DISBURSEMENT
1 YEAR	24.50	121.70
2 YEAR	37.50	186.30
3 YEAR	26.00	129.20
4 YEAR	6.60	32.80
5 YEAR	5.40	26.80
		496.80

INTEREST DURING CONSTRUCTION; AT THE END OF YEAR:

	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR
A. ALREADY DRAWN	0.0	121.70	308.00	437.20	470.00
B. PREVIOUS YEARS INTEREST	0.0	0.0	0.0	0.0	0.0
C. OPENING DEBT (A+B)	0.0	121.70	308.00	437.20	470.00
D. INTEREST ON OPENING DEBT	0.0	14.60	37.00	52.50	28.20
E. DRAWN DURING YEAR	121.70	186.30	129.20	32.80	26.80
F. INTEREST ON CURRENT DRAW G	7.30	11.20	7.80	2.00	0.80
G. TOTAL INTEREST FOR YEAR(D+F)	7.30	25.80	44.80	54.50	29.00
H. INTEREST PAYMENT	7.30	25.80	44.80	54.50	29.00

INTEREST DURING CONSTRUCTION:

1 YEAR	7.30
2 YEAR	25.80
3 YEAR	44.80
4 YEAR	54.50
5 YEAR	29.00
TOTAL	161.40

Table V-7 CONTINGENCY SCHEDULE BY COST GROUP

*** PULP PROJECT IN URUGUAY (BASE CASE) *** (USD MIL)

	MONTHS TO EXPEND DATE (MONTHS)		PHYSICAL CONTINGENCY(PCT)		PRICE CONTINGENCY(PCT)		COMBINED CONTINGENCY(PCT)	
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL
A. LAND ACQUISITION	0.0	107.00	0.0	10.00	0.0	48.01	0.0	62.82
B. SITE PREPARATION	118.00	118.00	10.00	10.00	54.77	54.77	70.25	70.25
C. EQUIPMENT & MATERIALS	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
D. SPARE PARTS & CHEMICALS	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
E. CONST. ERECTION LABOR	136.00	136.00	10.00	10.00	66.56	66.56	83.21	83.21
F. CONST. EQUIP. & CONSUMERBLES	118.00	118.00	10.00	10.00	54.77	54.77	70.25	70.25
G. TEMPORARY FACILITIES	119.00	119.00	10.00	10.00	55.42	55.42	70.96	70.96
H. TRANSPORT, INSURANCE	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
I. INDIRECT FIELD EXPENSES	136.00	136.00	10.00	10.00	66.56	66.56	83.21	83.21
J. ENGINEERING SERVICES	112.00	112.00	10.00	10.00	51.07	51.07	66.18	66.18
K. HOME OFFICE EXPENSENS	107.00	0.0	10.00	0.0	48.01	0.0	62.82	0.0
L. PRE-OPERATION	160.00	160.00	10.00	10.00	83.63	83.63	101.99	101.99
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table V-8 ESCALATED CAPITAL COST ESTIMATE

*** PULP PROJECT IN URUGUAY (BASE CASE) *** (USD MIL)

	BASE PROJECT COST		PHYSICAL CONTINGENCY		PRICE CONTINGENCY		TOTAL PROJECT COST (AS COMPLETED)		
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	TOTAL
A. LAND ACQUISITION	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.02
B. SITE PREPARATION	5.60	2.50	0.60	0.30	3.40	1.50	9.60	4.30	13.90
C. EQUIPMENT & MATERIALS	134.50	17.30	13.50	1.70	88.60	11.40	236.60	30.40	267.00
D. SPARE PARTS & CHEMICALS	6.40	3.40	0.60	0.30	4.20	2.20	11.20	5.90	17.10
E. CONST. ERECTION LABOR	13.80	26.30	1.40	2.60	10.10	19.30	25.30	48.20	73.50
F. CONST. EQUIP. & CONSUMERBLES	12.00	2.90	1.20	0.30	7.20	1.70	20.40	4.90	25.30
G. TEMPORARY FACILITIES	2.10	3.90	0.20	0.40	1.30	2.40	3.60	6.70	10.30
H. TRANSPORT, INSURANCE	13.80	1.10	1.40	0.10	9.10	0.70	24.30	1.90	26.20
I. INDIRECT FIELD EXPENSES	8.40	3.50	0.80	0.40	6.10	2.60	15.30	6.50	21.80
J. ENGINEERING SERVICES	14.20	0.80	1.40	0.10	8.00	0.40	23.60	1.30	24.90
K. HOME OFFICE EXPENSENS	5.90	0.0	0.60	0.0	3.10	0.0	9.60	0.0	9.60
L. PRE-OPERATION	3.50	6.40	0.40	0.60	3.20	5.90	7.10	12.90	20.00
BASE PROJECT COST	220.20	68.12	22.10	6.80	144.30	48.10	386.60	123.02	509.62
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.90	38.90
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	161.40	0.0	161.40
TOTAL FINANCING REQUIRED	220.20	68.12	22.10	6.80	144.30	48.10	548.00	161.92	709.92

Table V-9 DISBURSEMENT AND INTEREST DURING CONSTRUCTION (CASE 1)

TOTAL FINANCING REQUIRED:

DEBT (70.00%)	496.60
EQUITY (30.00%)	212.92
TOTAL	709.52

INTEREST RATE: 12.00% PER YEAR

DISBURSEMENT:

YEAR	%	DISBURSEMENT
1 YEAR	24.50	121.70
2 YEAR	37.50	186.20
3 YEAR	26.00	129.10
4 YEAR	6.60	32.80
5 YEAR	5.40	26.80
		496.60

INTEREST DURING CONSTRUCTION; AT THE END OF YEAR:

	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR
A. ALREADY DRAWN	0.0	121.70	307.90	437.00	469.80
B. PREVIOUS YEARS INTEREST	0.0	0.0	0.0	0.0	0.0
C. OPENING DEBT (A+B)	0.0	121.70	307.90	437.00	469.80
D. INTEREST ON OPENING DEBT	0.0	14.60	37.00	52.40	28.20
E. DRAWN DURING YEAR	121.70	186.20	129.10	32.80	26.80
F. INTEREST ON CURRENT DRAW G	7.30	11.20	7.70	2.00	0.80
G. TOTAL INTEREST FOR YEAR(D+F)	7.30	25.80	44.70	54.40	29.00
H. INTEREST PAYMENT	7.30	25.80	44.70	54.40	29.00

INTEREST DURING CONSTRUCTION:

1 YEAR	7.30
2 YEAR	25.80
3 YEAR	44.70
4 YEAR	54.40
5 YEAR	29.00
TOTAL	161.20

Table V-10 CONTINGENCY SCHEDULE BY COST GROUP

*** PULP PROJECT IN URUGUAY (CASE 1) *** (USD MIL)

	MONTHS TO EXPEND DATE (MONTHS)		PHYSICAL CONTINGENCY(PCT)		PRICE CONTINGENCY(PCT)		COMBINED CONTINGENCY(PCT)	
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL
A. LAND ACQUISITION	0.0	107.00	0.0	10.00	0.0	48.01	0.0	62.82
B. SITE PREPARATION	118.00	118.00	10.00	10.00	54.77	54.77	70.25	70.25
C. EQUIPMENT & MATERIALS	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
D. SPARE PARTS & CHEMICALS	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
E. CONST. ERECTION LABOR	136.00	136.00	10.00	10.00	66.56	66.56	83.21	83.21
F. CONST. EQUIP. & CONSUMERBLES	118.00	118.00	10.00	10.00	54.77	54.77	70.25	70.25
G. TEMPORARY FACILITIES	119.00	119.00	10.00	10.00	55.42	55.42	70.96	70.96
H. TRANSPORT, INSURANCE	126.00	126.00	10.00	10.00	59.91	59.91	75.90	75.90
I. INDIRECT FIELD EXPENSES	136.00	136.00	10.00	10.00	66.56	66.56	83.21	83.21
J. ENGINEERING SERVICES	112.00	112.00	10.00	10.00	51.07	51.07	66.18	66.18
K. HOME OFFICE EXPENSENS	107.00	0.0	10.00	0.0	48.01	0.0	62.82	0.0
L. PRE-OPERATION	160.00	160.00	10.00	10.00	83.63	83.63	101.99	101.99
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table V-11 ESCALATED CAPITAL COST ESTIMATE

**** PULP PROJECT IN URUGUAY (CASE 1) **** (USD MIL)

	BASE PROJECT COST		PHYSICAL CONTINGENCY		PRICE CONTINGENCY		TOTAL PROJECT COST (AS COMPLETED)		
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	TOTAL
A. LAND ACQUISITION	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.02
B. SITE PREPARATION	5.60	2.50	0.60	0.30	3.40	1.50	9.60	4.30	13.90
C. EQUIPMENT & MATERIALS	134.50	17.30	13.50	1.70	88.60	11.40	236.60	30.40	267.00
D. SPARE PARTS & CHEMICALS	6.40	3.40	0.60	0.30	4.20	2.20	11.20	5.90	17.10
E. CONST. ERECTION LABOR	13.80	26.30	1.40	2.60	10.10	19.30	25.30	48.20	73.50
F. CONST. EQUIP. & CONSUMERBLES	12.00	2.90	1.20	0.30	7.20	1.70	20.40	4.90	25.30
G. TEMPORARY FACILITIES	2.10	3.90	0.20	0.40	1.30	2.40	3.60	6.70	10.30
H. TRANSPORT, INSURANCE	13.80	1.10	1.40	0.10	9.10	0.70	24.30	1.90	26.20
I. INDIRECT FIELD EXPENSES	8.40	3.50	0.80	0.40	6.10	2.60	15.30	6.50	21.80
J. ENGINEERING SERVICES	14.20	0.80	1.40	0.10	8.00	0.40	23.60	1.30	24.90
K. HOME OFFICE EXPENSENS	5.90	0.0	0.60	0.0	3.10	0.0	9.60	0.0	9.60
L. PRE-OPERATION	3.50	6.30	0.40	0.60	3.20	5.80	7.10	12.70	19.80
BASE PROJECT COST	220.20	68.02	22.10	6.80	144.30	48.00	386.60	122.82	509.42
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.90	38.90
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	161.20	0.0	161.20
TOTAL FINANCING REQUIRED	220.20	68.02	22.10	6.80	144.30	48.00	547.80	161.72	709.52

Table V-12 DISBURSEMENT AND INTEREST DURING CONSTRUCTION (CASE 2)

TOTAL FINANCING REQUIRED:	
DEBT (70.00%)	428.10
EQUITY (30.00%)	183.42
TOTAL	611.52

INTEREST RATE: 12.00% PER YEAR

DISBURSEMENT:

YEAR	%	DISBURSEMENT
1 YEAR	24.50	104.90
2 YEAR	37.50	160.50
3 YEAR	26.00	111.30
4 YEAR	6.60	28.30
5 YEAR	5.40	23.10
		428.10

INTEREST DURING CONSTRUCTION; AT THE END OF YEAR:

	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR
A. ALREADY DRAWN	0.0	104.90	265.40	376.70	405.00
B. PREVIOUS YEARS INTEREST	0.0	0.0	0.0	0.0	0.0
C. OPENING DEBT (A+B)	0.0	104.90	265.40	376.70	405.00
D. INTEREST ON OPENING DEBT	0.0	12.60	31.80	45.20	24.30
E. DRAWN DURING YEAR	104.90	160.50	111.30	28.30	23.10
F. INTEREST ON CURRENT DRAW G	6.30	9.60	6.70	1.70	0.70
G. TOTAL INTEREST FOR YEAR(D+F)	6.30	22.20	38.50	46.90	25.00
H. INTEREST PAYMENT	6.30	22.20	38.50	46.90	25.00

INTEREST DURING CONSTRUCTION:

1 YEAR	6.30
2 YEAR	22.20
3 YEAR	38.50
4 YEAR	46.90
5 YEAR	25.00
TOTAL	138.90

Table V-13 CONTINGENCY SCHEDULE BY COST GROUP

*** PULP PROJECT IN URUGUAY (CASE 2) *** (USD MIL.)

	MONTHS TO EXPEND DATE (MONTHS)		PHYSICAL CONTINGENCY(PCT)		PRICE CONTINGENCY(PCT)		COMBINED CONTINGENCY(PCT)	
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL
A. LAND ACQUISITION	0.0	71.00	0.0	10.00	0.0	27.86	0.0	40.65
B. SITE PREPARATION	82.00	82.00	10.00	10.00	33.70	33.70	47.07	47.07
C. EQUIPMENT & MATERIALS	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
D. SPARE PARTS & CHEMICALS	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
E. CONST. ERECTION LABOR	100.00	100.00	10.00	10.00	43.88	43.88	58.27	58.27
F. CONST. EQUIP. & CONSUMERBLES	82.00	82.00	10.00	10.00	33.70	33.70	47.07	47.07
G. TEMPORARY FACILITIES	83.00	83.00	10.00	10.00	34.25	34.25	47.68	47.68
H. TRANSPORT, INSURANCE	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
I. INDIRECT FIELD EXPENSES	100.00	100.00	10.00	10.00	43.88	43.88	58.27	58.27
J. ENGINEERING SERVICES	76.00	76.00	10.00	10.00	30.50	30.50	43.55	43.55
K. HOME OFFICE EXPENSENS	71.00	0.0	10.00	0.0	27.86	0.0	40.65	0.0
L. PRE-OPERATION	124.00	124.00	10.00	10.00	58.63	58.63	74.49	74.49
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table V-14 ESCALATED CAPITAL COST ESTIMATE

*** PULP PROJECT IN URUGUAY (CASE 2) *** (USD MIL.)

	BASE PROJECT COST		PHYSICAL CONTINGENCY		PRICE CONTINGENCY		TOTAL PROJECT COST (AS COMPLETED)		
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	TOTAL
A. LAND ACQUISITION	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.02
B. SITE PREPARATION	5.60	2.50	0.60	0.30	2.10	0.90	8.30	3.70	12.00
C. EQUIPMENT & MATERIALS	134.50	17.30	13.50	1.70	56.40	7.30	204.40	26.30	230.70
D. SPARE PARTS & CHEMICALS	6.40	3.40	0.60	0.30	2.70	1.40	9.70	5.10	14.80
E. CONST. ERECTION LABOR	13.80	26.30	1.40	2.60	6.70	12.70	21.90	41.60	63.50
F. CONST. EQUIP. & CONSUMERBLES	12.00	2.90	1.20	0.30	4.40	1.10	17.60	4.30	21.90
G. TEMPORARY FACILITIES	2.10	3.90	0.20	0.40	0.80	1.50	3.10	5.80	8.90
H. TRANSPORT, INSURANCE	13.80	1.10	1.40	0.10	5.80	0.50	21.00	1.70	22.70
I. INDIRECT FIELD EXPENSES	8.40	3.50	0.80	0.40	4.10	1.70	13.30	5.60	18.90
J. ENGINEERING SERVICES	14.20	0.80	1.40	0.10	4.80	0.30	20.40	1.20	21.60
K. HOME OFFICE EXPENSENS	5.90	0.0	0.60	0.0	1.80	0.0	8.30	0.0	8.30
L. PRE-OPERATION	3.50	5.50	0.40	0.60	2.30	3.50	6.20	9.60	15.80
BASE PROJECT COST	220.20	67.22	22.10	6.80	91.90	30.90	334.20	104.92	439.12
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.50	33.50
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	138.90	0.0	138.90
TOTAL FINANCING REQUIRED	220.20	67.22	22.10	6.80	91.90	30.90	473.10	138.42	611.52

Table V-15 DISBURSEMENT AND INTEREST DURING CONSTRUCTION (CASE 3)

TOTAL FINANCING REQUIRED:

DEBT (70.00%)	427.70
EQUITY (30.00%)	183.32
TOTAL	611.02

INTEREST RATE: 12.00% PER YEAR

DISBURSEMENT:

YEAR	%	DISBURSEMENT
1 YEAR	24.50	104.80
2 YEAR	37.50	160.40
3 YEAR	26.00	111.20
4 YEAR	6.60	28.20
5 YEAR	5.40	23.10
		427.70

INTEREST DURING CONSTRUCTION; AT THE END OF YEAR:

	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR
A. ALREADY DRAWN	0.0	104.80	265.20	376.40	404.60
B. PREVIOUS YEARS INTEREST	0.0	0.0	0.0	0.0	0.0
C. OPENING DEBT (A+B)	0.0	104.80	265.20	376.40	404.60
D. INTEREST ON OPENING DEBT	0.0	12.60	31.80	45.20	24.30
E. DRAWN DURING YEAR	104.80	160.40	111.20	28.20	23.10
F. INTEREST ON CURRENT DRAW G	6.30	9.60	6.70	1.70	0.70
G. TOTAL INTEREST FOR YEAR(D+F)	6.30	22.20	38.50	46.90	25.00
H. INTEREST PAYMENT	6.30	22.20	38.50	46.90	25.00

INTEREST DURING CONSTRUCTION:

1 YEAR	6.30
2 YEAR	22.20
3 YEAR	38.50
4 YEAR	46.90
5 YEAR	25.00
TOTAL	138.90

Table V-16 CONTINGENCY SCHEDULE BY COST GROUP

*** PULP PROJECT IN URUGUAY (CASE 3) *** (USD MIL.)

	MONTHS TO EXPEND DATE (MONTHS)		PHYSICAL CONTINGENCY(PCT)		PRICE CONTINGENCY(PCT)		COMBINED CONTINGENCY(PCT)	
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL
A. LAND ACQUISITION	0.0	71.00	0.0	10.00	0.0	27.86	0.0	40.65
B. SITE PREPARATION	82.00	82.00	10.00	10.00	33.70	33.70	47.07	47.07
C. EQUIPMENT & MATERIALS	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
D. SPARE PARTS & CHEMICALS	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
E. CONST. ERECTION LABOR	100.00	100.00	10.00	10.00	43.88	43.88	58.27	58.27
F. CONST. EQUIP. & CONSUMERBLES	82.00	82.00	10.00	10.00	33.70	33.70	47.07	47.07
G. TEMPORARY FACILITIES	83.00	83.00	10.00	10.00	34.25	34.25	47.68	47.68
H. TRANSPORT; INSURANCE	90.00	90.00	10.00	10.00	38.14	38.14	51.95	51.95
I. INDIRECT FIELD EXPENSES	100.00	100.00	10.00	10.00	43.88	43.88	58.27	58.27
J. ENGINEERING SERVICES	76.00	76.00	10.00	10.00	30.50	30.50	43.55	43.55
K. HOME OFFICE EXPENSENS	71.00	0.0	10.00	0.0	27.86	0.0	40.65	0.0
L. PRE-OPERATION	124.00	124.00	10.00	10.00	58.63	58.63	74.49	74.49
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table V-17 ESCALATED CAPITAL COST ESTIMATE

*** PULP PROJECT IN URUGUAY (CASE 3) *** (USD MIL.)

	BASE PROJECT COST		PHYSICAL CONTINGENCY		PRICE CONTINGENCY		TOTAL PROJECT COST (AS COMPLETED)		
	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	FOREIGN	LOCAL	TOTAL
A. LAND ACQUISITION	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.02
B. SITE PREPARATION	5.60	2.50	0.60	0.30	2.10	0.90	8.30	3.70	12.00
C. EQUIPMENT & MATERIALS	134.50	17.30	13.50	1.70	56.40	7.30	204.40	26.30	230.70
D. SPARE PARTS & CHEMICALS	6.40	3.40	0.60	0.30	2.70	1.40	9.70	5.10	14.80
E. CONST. ERECTION LABOR	13.80	26.30	1.40	2.60	6.70	12.70	21.90	41.60	63.50
F. CONST. EQUIP. & CONSUMERBLES	12.00	2.90	1.20	0.30	4.40	1.10	17.60	4.30	21.90
G. TEMPORARY FACILITIES	2.10	3.90	0.20	0.40	0.80	1.50	3.10	5.80	8.90
H. TRANSPORT, INSURANCE	13.80	1.10	1.40	0.10	5.80	0.50	21.00	1.70	22.70
I. INDIRECT FIELD EXPENSES	8.40	3.50	0.80	0.40	4.10	1.70	13.30	5.60	18.90
J. ENGINEERING SERVICES	14.20	0.80	1.40	0.10	4.80	0.30	20.40	1.20	21.60
K. HOME OFFICE EXPENSENS	5.90	0.0	0.60	0.0	1.80	0.0	8.30	0.0	8.30
L. PRE-OPERATION	3.50	5.20	0.40	0.50	2.30	3.40	6.20	9.10	15.30
BASE PROJECT COST	220.20	66.92	22.10	6.70	91.90	30.80	334.20	104.42	438.62
INITIAL WORKING CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.50	33.50
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.0	0.0	138.90	0.0	138.90
TOTAL FINANCING REQUIRED	220.20	66.92	22.10	6.70	91.90	30.80	473.10	137.92	611.02

Figure V-1

EXPECTED CONSTRUCTION SCHEDULE FOR 750 T/D BKP (L50% & N50%)
IN THE ORIENTAL REPUBLIC OF URUGUAY (BASE CASE & CASE 1)
(Includings the Progress Schedule for the Plantation)

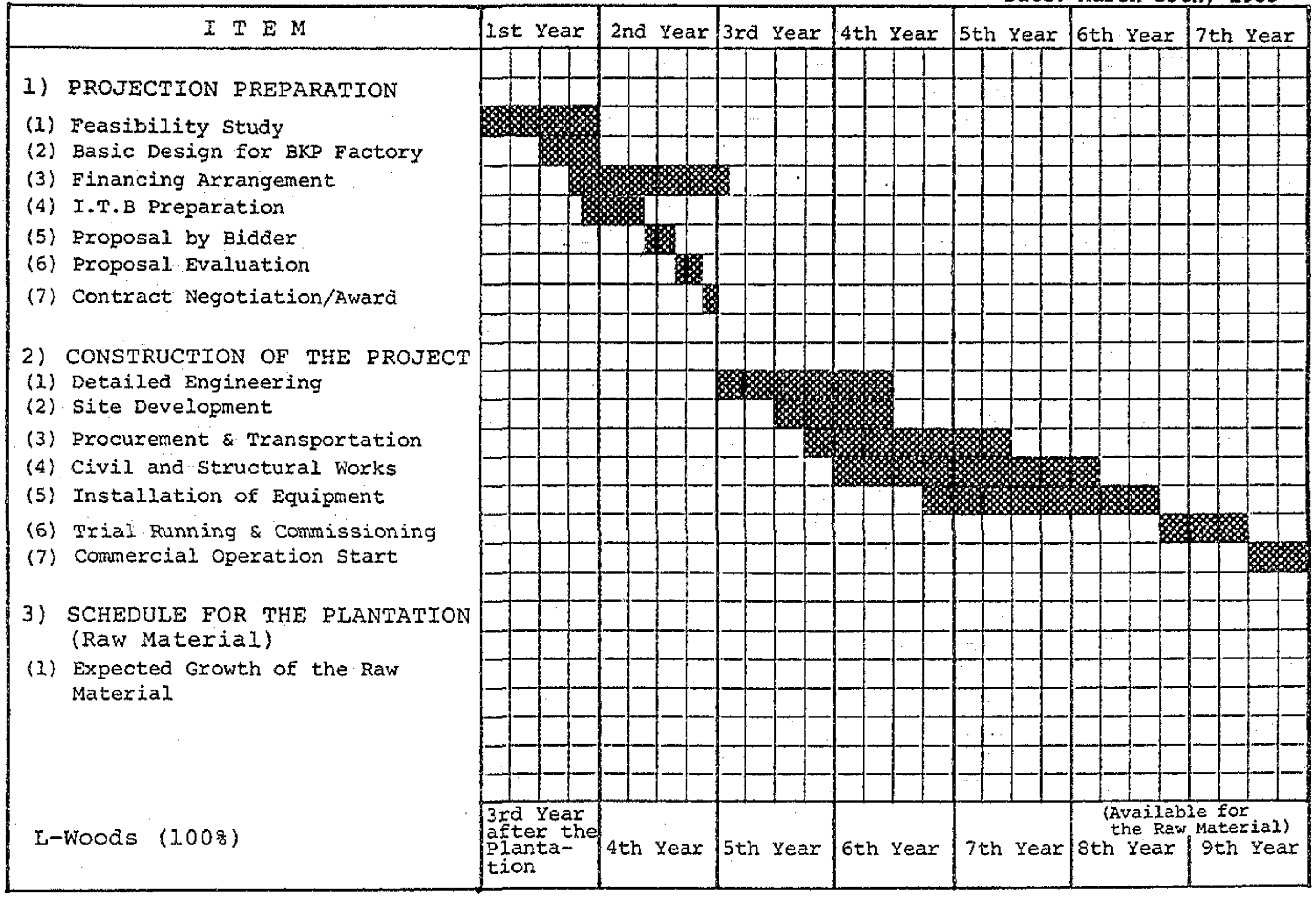
Date: March 25th, 1985

I T E M	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
1) PROJECTION PREPARATION							
(1) Feasibility Study							
(2) Basic Design for BKP Factory							
(3) Financing Arrangement							
(4) I.T.B Preparation							
(5) Proposal by Bidder							
(6) Proposal Evaluation							
(7) Contract Negotiation/Award							
2) CONSTRUCTION OF THE PROJECT							
(1) Detailed Engineering							
(2) Site Development							
(3) Procurement & Transportation							
(4) Civil and Structural Works							
(5) Installation of Equipment							
(6) Trial Running & Commissioning							
(7) Commercial Operation Start							
3) SCHEDULE FOR THE PLANTATION (Raw Material)							
(1) Expected Growth of the Raw Material							
N-Wood (50%)	6th Year after the Planta-tion	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year (Available for the Raw Material)
L-Wood (50%)	3rd Year after the Planta-tion	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year

Remarks: An essential factor for this projects is to assure the sufficient supply of pulpwood to the mill. The construction of the mill shall be started after confirmed that the plantation has been effectively progressed as per the schedule.

Figure V-2 EXPECTED CONSTRUCTION SCHEDULE FOR 750 T/D L-BKP INDUSTRY IN THE ORIENTAL REPUBLIC OF URUGUAY (CASE 2 & CASE 3)
(Includings the Progress Schedule for the Plantation)

Date: March 25th, 1985



Remarks: An essential factor for this projects is to assure the sufficient supply of pulpwood to the mill. The construction of the mill shall be started after confirmed that the plantation has been effectively progressed as per the schedule.

PART VI

FINANCIAL, ECONOMIC ANALYSIS AND EVALUATION

Part VI FINANCIAL, ECONOMIC ANALYSIS AND EVALUATION

Chapter 1 Financial Analysis

The production cost of BKP, produced in accordance with the scheme used for this study, financial plan, financial analysis and suitability of this project are evaluated below.

1-1 Major Assumptions for Financial Analysis

1-1-1 Economic Life Span of the Project

The production cost and financial plan were calculated on the assumptions that:

(1)	Starting time for the base case (N:L=50:50)	:	in 1998
(2)	Starting time for the alternative (L=100)	:	in 1995
(3)	Economical life span of the project	:	15 years from the starting date of commercial operation*1

Note: *1 In Japan, depreciation period of pulp mill is 14 years and residual value is 5%. But considering that the mill will be used for 15-20 years, the depreciation period was set at 15 years and residual value as 5%.

1-1-2 Base Cost of Financial Statements

All financial statements shall be prepared in U.S. Dollars.

The production cost and financial projections were calculated based on market prices as of March 1985 and the escalation rate was applied as specified in Part V to the foreign currency as well as Uruguayan currency components, during the period up to the date of starting of the commercial operation.

In addition, recently the escalation of the Uruguayan currency components is rising rapidly and at the same time exchange rate against the dollar is also declining corresponding to inflation. Because of this, it was decided to use

U.S. dollar equivalents for all of finacial analysis. Because of this, in turn, the same escalation rate as in industrialized countries is applied for the analysis (Part V, Table V-1).

1-1-3 Management System and Organization

The employee requirement for implementation of this project has been estimated, refering to the case of Senibra S.A. of Brazil, as follows. The expected organization chart is shown in Figure VI-1.

General managers	33 persons
Managers	90
1st. class operators	140
Operators	190
Workers	568
Total	1,021 persons

1-1-4 Products Delivery and Payment Terms

The price of the products for export shall be calculated based on the FOB Fray-Bentos. Payment for exports shall be 90 days after shipment.

In case of exports to Europe, the products presumably will be stocked at ports of entry in Europe, but since selling prices are C&F basis, it was decided that payment terms, for financial analysis purposes, would be 90 days after shipment.

1-1-5 Method of Operation and Standard Operating Days per Year

Operation of the mill shall be continuously 24 hours per day, by 3 shifts. The standard number of operation days is 340 per year. Total annual production for the base case (N:L=50:50) and Alternative (L=100) are as under:

Base case N:L = 50%:50%		Alternative L = 100%
N	705 t/d x 181d = 127,605 t/y	
L	805 t/d x 159d = 127,995 t/y	805 t/d x 340d = 273,700 t/y
Total annual production	255,600 t/y	273,700 t/y

1-1-6 *Method of Financial Analysis*

The financial analysis of this project is made from two aspects, profitability and financial stability. As indexes for these analyses, financial internal rate of return (FRR), net present value (NPV), financial ratios, and break even point analysis are used.

FRR is calculated also in constant prices. It is obtained by discounting the current prices by a deflator.

This deflator is deemed the same as the escalation rate determined in Part V Chapter 1-1-4, i.e., 5% per annum from 1991, the year mill construction is to start. For reference, the result of calculation of FRR in current prices is also indicated.

1-2 Production, Stock and Selling Plan

1-2-1 *Annual Operation Plan and Output*

The annual operation plan and output is summarized as follows.

Year of operation	Utilization of capacity	Base Case	Alternative
1st year	60%	153,300 t/y	164,220 t/y
2nd year	90%	230,040 t/y	246,330 t/y
3rd year-	100%	255,600 t/y	273,700 t/y

Note: The actual rate of capacity use in 1995 becomes 30% (*Table VI-1*).

1-2-2 Selling Price of Products

The export price (FOB) of products is as follows. It is escalated at 5% per annum from 1984.

Projected Price of Uruguay BKP Market Pulp (FOB)

	NBKP (US$/t)	LBKP (US$/t)
1984	418	388
1985	439	407
1990	560	520
1995	715	697 (L-100% production start)
1998	828	768 (N.L. 50%: 50% production start)

1-2-3 Stock Planning

In principle the level of stock of imported material shall be the equivalent of three months' requirements, and that of domestic material as well as mill products is to be the equivalent of one month's production (Table VI-2).

1-3 Operation Cost

1-3-1 Variable Cost

(1) Wood (log)

In accordance with Part III Chapter 5, the ex-factory cost of wood (1985) is as shown below:

a) Eucalyptus, average US$15.23/m^3
b) Eucalyptus (globulus) US$15.39/m^3
c) Pinus, average US$20.15/m^3
d) Populus US$14.59/m^3

(2) Auxiliary materials

Present prices of major imported chemicals for pulp processing (Dec. 1984) are 2-3 times higher than that of internation level. This is simply due to the small purchase quantities. For this financial evaluation the following prices (1985) are adopted, by refering to prices in Argentina and Brazil. But limestone and fuel wood are of domestic origin.

a)	Salt	US$ 34.3/t
b)	Salt Cake	US$173.0/t
c)	Sulfuric acid	US$114.0/t
d)	Limestone	US$ 71.6/t
e)	Sublimated Sulfur	US$130.0/t
f)	Alum $Al_2(SO_4)_3$	US$275.0/t
g)	Fuel Wood	US$ 15.39/m^3

(3) Utility cost

Electric power is to be generated at the mill by steam available as a by-product. The cost of the generator and related equipment is included in the total cost of the mill and cost of fuel wood is included in the cost of auxiliary materials. Water is to be taken from the La Plate River and used to produce industrial and drinking water needed. The escalation of variable cost (logs, auxiliary materials and utilities) is assumed to be 5% per year, the same as the escalation of prices of other imported goods.

1-3-2 Fixed Cost

(1) Labor

Wages for labor, including salary for managers on the basis of rates for different job categories and including social security, insurance premiums, etc. are as shown below. Wage escalation is always higher than that of industrial products by about 1-2%, as reported in UN statistics and therefore the escalation rate for labor costs was decided as 6%, which is 1% higher than the rate for industrial products.

Direct Wage (1985)	Per Month	No. of person	Total per year
General managers	US$2,272	33	US$ 899,712
Managers	1,526	90	1,648,080
1st. class operators	1,018	140	1,710,240
Operators	503	190	1,146,840
Workers	430	568	2,930,880
Total		1,021	US$8,335,752

The social security, insurance premiums, etc. are included at the rate of 150% of above direct wage.

(2) Management and Administration Expenses

The cost of the management and administration was taken to be equal to 40% of direct wage cost. The items included herein are as follows:

a) Remuneration for directors (officers)
b) Travel and communication expenses
c) Consumable items in the office
d) Emergency and medical care expences
e) Others

(3) Maintenance cost

Maintenance cost including periodic maintenance are as follows:

a) 4% of the plant construction cost (per annum)
b) 3% of the building construction cost (-do-)

The cost of periodical maintenance will escalate at 5% per annum. This cost includes the cost of spare parts at the time of maintenance.

Spare parts for 2 years' requirement is included in the initial inventory cost.

(4) Depreciation and amortization

Depreciation of erected equipment (assets) is to be as follows:

a) Amortization : Fixed amount depreciation
b) Residual book value : 5%
c) Depreciation period : Plant equipment ; 15 Buildings and structure ; 25 years

1-3-3 Production Advisors

In accordance with the precedents in Brazil, it shall be necessary to secure advisory services from foreign engineers for 4 years after the start of commercial operation. The schedule of technical assistance is as follows.

	Monthly Salary	1st Year	2nd	3rd	4th	5th
Project engineer	US$10,000	1	1	1	1	0
Process "	8,000	2	2	1	1	0
Chemical "	7,000	1	1	1	0	0
Forest "	7,000	1	1	0	0	0
Mechanical "	7,000	1	1	1	0	0
Electrical "	7,000	1	1	0	0	0
Instrument "	7,000	1	1	0	0	0
Chemical Analyst	7,000	2	1	1	0	0
Inspection & Quality control	7,000	1	1	1	1	0
Operation Supervisor						
- Chipping	6,000	3	2	0	0	0
- Dissolving	6,000	3	2	2	1	0
- Pulping	6,000	3	2	2	1	0
- Bleaching	6,000	3	2	2	1	0
- Maintenance	6,000	3	2	0	0	0
Total		26	20	12	6	0

1-3-4 Other Financial Items

(1) Deferred depreciation assets

Expenses for the before start of operation and interest during construction shall be treated in the Deferred depreciation assets and depreciated over 15 years in equal annual amounts.

(2) Damage insurance premiums

Damage insurance premiums covering risks of plant equipment shall be 0.3% of the construction expense.

(3) Marketing expense

Marketing expense shall be 1% of the gross sales amount.

(4) Dividend

This financial analysis is intended to determine the feasibility of the project, therefore no consideration is to be paid to dividends from profit earned. The financial analysis to be made on the assumption all net profits shall be kept until completion of the project.

1-3-5 Permanent Working Capital

The working capital after starting of commercial operation is called "Permanent Working Capital", which is calculated by deduction of liquid liabilities from liquid assets; the method of calculation is as follows:

(1) Liquid assets

Cash in hand:	Cash requirements for the mill for one month
Receivables:	Sales amount for three months
Stock of products:	Products during one month

Stock of raw materials:	Wood and fuel wood for one month, imported chemicals for three months, chemicals of domestic origin for one month, spare parts for two years

(2) Liquid liabilities

Payables:	Variable expenses for three months

1-3-6 Taxes

By the negotiation with the Uruguayan Government, taxes shall charged for the following items only.

Corporate income tax: 30%

Assets tax: 4.5%
(Charged after 5 years from the starting date of commercial operation, on the book value.)

Building Tax: 1.5%
(Charged after 5 years from the starting date of commercial operation on the book value of the building.)

1-4 Establishment of Various Alternative Plans

The study was carried out on the basis of the Base Case of the recommendation in "Paper and Pulp Industry Development Plan" concerning a pulpmaking mill having capacity of BKP 750 T/D (N=50%, L=50%), performed in 1980 by JICA.

It was found that the required period for growth of soft wood is 3 years longer than hard wood and specific gravity is lower, and as the result it is more expensive than hard wood.

Recently demand for LBKP (Hard wood BKP) is increasing internationally. If production of LBKP is selected as target, production can be started 3 years earlier than in the case of N:L = 50:50.

According to the result of pulping tests, it become clear that globulus has highest specific gravity and also the best economical afforestation effect is expected from it.

Taking the above factors into consideration, financial evaluation were done for each of following cases.

(1) Base case

Annual production of BKP both from N.W (soft wood) and L.W (hard wood) shall be 50% each. For this purpose L-wood plantation (4 kinds) shall be delayed for 3 years in coincide with cutting of N-wood. Accordingly the start of production will become 12 years after the planting of N.W, the standard volumetric quantities both of NW and LW shall be the average value obtained by pulping tests.

(2) Alternative case 1

The same as in the base case, BKP production rate of N.W and L.W shall be 50% each, but for L.W, only globulus shall be used. The volumetric quantity of N.W shall be same as that of the base case. Accordingly, the start of pulp production will be 12 years after planting.

(3) Alternative case 2

Production of BKP is limited to L.W only; production shall be started 9 years after planting. Species shall be 4 H.L. The volumetric quantity shall be average of 4 kinds of L.W according to the pulping tests.

(4) Alternative case 3

The same as in the alternative case (2), BKP shall be produced with L.W only, accordingly production shall start 9 years after starting of afforestation planting. The kind of L.W shall be globulus only. Volumetric quantity shall be the figures from the pulping tests.

1-5 Major Items for Production in Each Case

The summary of production costs is as shown in the following table.

Item \ Case	N:L = 50:50		L = 100	
	Base	1	2	3
1. Species of Tree	L&N in average	N=average L=globulus	L=average	globulus
2. Start of Production after plantation	12 years	12 years	9 years	9 years
3-1 Q'ty of Production Working days				
N	181	181	-	-
L	159	159	340	340
3-2 Q'ty of Production				
N t/d	705	705	-	-
L t/d	805	805	805	805
3-3 Annual Production				
N t/y	127,605	127,605	-	-
L t/y	127,995	127,995	273,700	273,700
Total t/y	255,600	255,600	273,700	273,700
4-1 Consumption of Wood Volumetric average				
N average BDT/m^3	0.365	0.365	-	-
L average BDT/m^3	0.481	-	0.481	-
L globulus BDT/m^3	-	0.555	-	0.555
4-2 Consumption(m^3/D)				
N average	4.581	4.581	-	-
L average	3.341	-	3.341	-
L globulus	-	2.895	-	2.895
5. Material Cost at Factory (US$/m^3)				
N average	20.15	20.15	-	-
L average	15.23	-	15.23	-
L globulus	-	15.39	-	15.39

Chapter 2 Results of Financial Analysis and Case Study

2-1 Comparison of Each Alternative Case and Study

In accordance with prior conditions described in the previous chapter, financial statements were prepared for the following four cases.

Base Case:
N : L ratio of pulp wood = 50:50 (L.W = mixture of 4 kinds)

Case 1:
N : L ratio of pulp wood = 50:50 (L.W = globulus only)

Case 2:
N : L ratio of pulp wood = 0:100 (L.W = mixture of 4 kinds)

Case 3:
N : L ratio of pulp wood = 0:100 (L.W = globulus only)

The financial statements are attached in Annex VI in the form of computer output.

The computer output includes the following reports.

(1) Production and sales plan

(2) Production cost statement

(3) Working capital statement

(4) Income statement (P&L)

(5) Funds flow

(6) Balance sheet

(7) Financial indication (Financial ratio)

(8) Internal rate of return (Current price basis)

(9) Internal rate of return (Constant price basis)

2-1-1 Total Capital Requirement of Each Case (Escalated Capital Cost Estimate)

The total capital requirement of each case is shown in Table VI-3. As shown in Table VI-3 there is not much difference in any case but between the case of N:L = 50%:50% and the case of L=100%, there are big differences in price contingency and in interest during construction, because there is a 3 years difference in the starting time of production.

Escalated Capital Cost Estimate

(Unit: Million US$)

Case / Product	Base Case N:L = 50:50	Case 1 N:L = 50:50	Case 2 L = 100	Case 3 L = 100
1. Base project cost	F 220.2	F 220.2	F 220.2	F 220.2
	L 68.12	L 68.02	L 67.22	L 66.92
	T 288.32	T 288.22	T 287.42	T 287.12
2. Physical contingency	F 22.1	F 22.1	F 22.1	F 22.1
	L 6.8	L 6.8	L 6.8	L 6.7
	T 28.9	T 28.9	T 28.9	T 28.8
3. Price contingency	F 144.3	F 144.3	F 91.9	F 91.9
	L 48.1	L 48.0	L 30.9	L 30.8
	T 192.4	T 192.3	T 122.8	T 122.7
4. Initial working capital	F 0	F 0	F 0	F 0
	L 38.9	L 38.9	L 33.5	L 33.5
	T 38.9	T 38.9	T 33.5	T 33.5
5. Interest during construction	F 161.4	F 161.2	F 138.9	F 138.9
	L 0	L 0	L 0	L 0
	T 161.4	T 161.2	T 138.9	T 138.9
Total	F 548.0	F 547.80	F 473.1	F 473.1
	L 161.92	L 161.72	L 138.42	L 137.92
	T 709.92	T 709.52	T 611.52	T 611.02

Notes: F = Foreign, L = Local, T = Total

2-1-2 Profitability

Usually constant after-tax FRR is used to evaluate of profitability. The results are as follows.

FRR After Tax (Constant Price)

Base Case	in 1994	7.64%
Case 1	in 1994	7.83%
Case 2	in 1991	9.60%
Case 3	in 1991	9.95%

2-2 Production Cost, and Profit and Loss

2-2-1 Production Cost of LBKP

The total production cost and total sales cost, shown in Table VI-4, are divided by tons of produced and sold goods respectively.

Utilization of capacity in the initial year of operation is estimated as 60% but the start is middle of a calender year, and therefore, it is shown as 30%. In the second year it is 90% and from the third year on it is 100%.

The first reduction of production cost appeares in the third year; at that time the number of operation advisors is reduced. The second reduction occurs in the fifth year, when the number of advisors becomes zero. After the eighth year production cost is gradually reduced because loan repayment rapidly decreases. After the loan is refunded, in the twelveth year after starting operation, production cost is increased to the extent of escalation of variable cost and fixed cost.

(1) For example, the composition of production cost in 1997, the first year of 100% operation, is shown below.

Production Cost in 1997

Variable cost	1,000$/Y	$/T	(%)	(%)
Raw material	27,203	99	24.9	16.8
Chemicals	4,677	17	4.3	2.9
Utilities	5,130	19	4.7	3.2
Packing	899	3	0.8	0.6
vehicle fuel	1,077	4	1.0	0.7
Sub. Total	38,986	142	35.7	24.2
Direct fixed cost				
Labor	22,153	81	20.3	13.6
Maintenance	11,219	41	10.3	6.9
Insurance	1,183	4	1.1	0.7
Operation advisor	1,913	7	1.8	1.2
Depreciation and amortization	33,630	123	30.8	20.6
Total Mill Cost	109,084	398	100.0	67.2
Sales cost	1,987	7	-	1.2
Interest	51,326	188	-	31.6
Total Production Cost	162,397	593		100.0

In broad classification, variable cost is 36%, fixed cost (excluding depreciation) is 33%, and depreciation is 31%; these three items are almost equal. During the five years after start of production payment of interest exceeds the depreciation.

(2) For reference, production cost in major LBKP exporting countries, as given in PPW is shown below.

Hard Wood

(unit: US$)

	Brazil	Portugal	Sweden	Finland	US South
Fiber	55	55	146	155	103
Chemicals	20	31	22	27	41
Energy	15	26	15	10	53
Wages/salaries	27	33	33	31	60
Other	40	55	25	27	67
Total	157	200	241	250	324

Note: Excluding interest and depreciation

Source: PPW, quoting August 20, 1984, Mead Pulp Sales Inc.

If production cost of this project is determined for the above year and itemized as above, for comparability with the LBKP exporting countries, the results are as in the following table. To do this, a retrogressive calculation was made, starting with the production of this project in 1997, when use of capacity reaches 100% and stabilized operation is attained, and calculating back to 1984. The discount rate used is the figure adopted for the escalation rate in Part V of this report. But in conformity with the above table, interest and depreciation were excluded.

It is understood that the present Uruguayan case resembles that of Brazil. The cost of chemicals in the former is lower because NaOH, Cl_2, Na_2SO_4, etc. are produced in the Uruguayan mill's own plant. But if depreciation and interest is included, it is understood that the production cost of the Uruguayan, younger mill is higher than that of the Brazil mill.

Production Cost Breakdown

	(Unit US$1,000) in 1997	in 1984	(Unit US$) Unit cost
1. Pulp Wood	27,203	15,138	55.0
2. Chemicals	4,677	2,603	10.0
3. U.T./Energy	5,130		
Fuel Oil	1,077		
Sub Total	6,207	3,454	13.0
4. Labor cost	15,824		
Advisors	1,913		
Sub Total	17,737	9,870	36.0
5. Other			
Packing material	899		
Maintenance	11,219		
Insurance	1,183		
Overhead	6,329		
Sales expenses	1,987		
Sub Total	21,617	12,029	44.0
Grand Total	77,441	43,094	
Unit Cost	283/t		158/t

2-2-2 Profit and Loss

In Table VI-5 the profit of each case is indicated.

As shown in the table, in the Base Case and Case 1 during the first two years after the start of operation a loss is shown but in Cases 3 profits are earned from the first year.

In Base Case and Case 1 repayment of the long term loan exceeds the profit earned and as the result there are losses.

In both Cases 3 it is possible to earn profits from the first year and from the year of 2006, after the final loan repayment, profits will greatly improved. Reference may be made to the income statement Table VI-9 at the end of Part VI.

Table VI-6 FRR AND NPV FOR INCREMENTAL

(Unit: %)

Item	Base Case	Case 1	Case 2	Case 3
(1) FRR in Constant Price	in 1994	in 1994	in 1991	in 1991
After Tax (%)	7.64	7.83	9.60	9.95
Before Tax (%)	9.10	9.33	11.48	11.92
(2) FRR in Current Price				
After Tax (%)	12.57	12.77	14.66	15.04
Before Tax (%)	14.15	14.40	16.68	17.15
(3) NPV in Constant Prices				
10% Discount Rate				
After Tax (US$Million)	-79.02	-72.98	-12.15	-1.41
Before Tax (US$Million)	-32.33	-24.21	48.61	63.76

FRR of Base Case and Case 1 (alternative 1) it is less than 8% after tax. In general, its earnings potential is dangerous due to the existence of many risks. Case 2 (alternative 2) and Case 3 are seen in general as showing a good profit outlook.

The difference in FRR between the cases is considered to be caused by the difference of cost of pulp wood and annual production volume because there are no difference in mill cost at all. The cheapest material per unit specific gravity is globulus of L-wood and next is the mixture of four species of L-woods. The most costly material is N-wood. Those factors are reflected in the above results.

To the extent that it is not necessary to produce pulp from N-woods due to marketing considerations or because of technical reasons concerning afforestation, planting of mixed species is better than a single species, Case 3 (alternative 3), L-wood (globulus) 100%, should be selected as the raw material, on account of its profitability.

The detailed financial analysis are given in the following pages. All of these analysis are made for to Case 3 (alternative 3).

Disbursement and interest during construction of alternative 3 (Table VI-13), Contingency schedule by cost group (Table VI-14) and the escalated capital cost estimate (Table VI-15) are at the end of this Part.

2-3 Analysis of Financial Ratio, and Breakeven Analysis

2-3-1 Financial Ratio

In order to measure the financial stability of this project, hereby prepared the table of debt service ratio, current ratio, and quick ratio were calculated with results as shown below.

Table VI-7 FINANCIAL RATIOS

	D.S.R.	Current Ratio	Quick Ratio
1995	2.53	8.51	5.57
1996	1.76	7.22	5.54
1997	2.16	1.88	1.39
1998	1.42	1.11	0.83
1999	1.12	1.16	0.86
2000	1.11	1.25	0.92
2001	1.22	1.29	0.96
2002	1.38	1.34	1.00

If D.S.R. is below 1.0 then additional borrowing is necessary for repayment of the long term loan principal and interest. As shown in the above table D.S.R. falls from 1.42 in 1998 the starting year of repayment of principal to 1.11 in 2000 but never falls below 1.0, and improves gradually. If the profit earned up to 1999 is reserved in order to reduce the D.S.R. in 1999 and 2000 then repayment of principal could be easily done.

The current ratio reaches bottom in 1998 at 1.11 but still is above 1.0 which is the lowest requirement. The quick ratio (acid test) for the four years 1998 - 2001 is below 1.0.

It is said that a quick ratio above 1.0 is good enough and it can't be said it is dangerous if it is below 1.0. But during these four years the financial position is deemed to be in unstable condition. After 2001 it is improved gradually by inflation and after completion of repayment it will become favorable.

Checking stability in overall terms, this project is above the minimum safety line but during three years period of 1998 - 2001, when the repayment is started, it is in a rather difficult position, therefore up to 2000 current profit should not be used for dividends but should be kept as internal reserves to enhance the financial position.

2-3-2 Breakeven Print Analysis

(1) Profit and loss BEP (Breakeven Point)

In checking the profit and loss breakeven point (BEP) as it varies according to utilization of capacity, the first year it is at 34.7%, which is higher than set rate of 30% but if the cost of increased stock is deducted, profit is obtained even at 30% of capacity and after that the BEP remains lower position than the set rate of capacity use. The BEP falls year by year and in 1999 it become lower than 70% and in 2002 it is forecast that it will go below 60% (Table VI-26).

(2) Sales price BEP

As part of the BEP analysis, mention should be made of the relation between funds supply and unit sales price. The price BEP means the point when the DSR = 1.0 at a certain unit sales price. That is, the sales price BEP is the price(s) at which repayment of principal and interest to the lender is equal to the cash in hand.

Accordingly, if the products can be sold at the sales price BEPs in the following table, then there is no shortage of funds (DSR = 1.0). In the following table, the sales price BEP is always lower than the estimated sales price, but in the year of 2000 the ratio (B)/(A) is 94.1% which means if there is price cut of 5.9% then fund supply become impossible. In order to avoid such risk, it seems necessary to hold back the dividend for several years from the start of operation, and to keep the profit as internal reserves.

(Unit: US$/T)

Year	Unit sales price (A)	Sales price BEP (B)	(B)/(A) %
1995	664.0	532.2	80.2
1996	697.2	523.8	75.1
1997	732.1	474.7	64.8
1998	768.7	593.6	77.2
1999	807.1	740.7	91.8
2000	847.4	797.3	94.1
2001	889.8	782.7	87.9
2002	934.3	769.0	82.3
2003	981.0	756.4	77.1
2004	1,030.1	744.8	72.3
2005	1,081.6	579.8	53.6
2006	1,135.7	479.1	42.1
2007	1,192.4	498.0	41.7
2008	1,252.1	518.2	41.3
2009	1,314.7	539.9	41.0

2-3-3 Sensitivity Analysis

Concerning to Case 3, the change in FFR due to variation of major financial elements was calculated; the result is shown in the following table. The calculation is given in Annex.

Table VI-8 SENSITIVITY ANALYSIS RESULTS

(FRR, %, 1991 Constant Price, After Tax)

	20% up	10% up	10% down	20% down
Construction Cost	7.89	8.88	11.15	12.53
Raw material Cost	9.47	9.71	10.19	10.42
Selling Price	13.03	11.55	8.12	6.05
Capacity Utilization	12.44	11.24	8.51	6.89
Base Value			9.95	

As is clear from Figure VI-2, if raw material cost varies within ±20%, FRR value is almost unchanged. The FRR is most sensitive to selling price, it is next sensitive to the rate of capacity use. If selling price is reduced 10% the base value is reduced 1.33% and if capacity use is reduced 10% the base value is reduced 1.44%.

For instance, if construction cost rises 10% and selling price falls 10% then FRR will come down 2.9% and FRR after tax will become 7.05% (FRR before tax is 9.02%).

Chapter 3 Economic Analysis and Evaluation

3-1 Economic Value

For the financial analysis, market price was used but for economic analysis economic value was used. It shall be done on the Case 3 only.

Determination the economic value is done by the following method.

(1) Tax

Taxation on materials, machinery procurement and contracts etc. belong to the transfer account in the national economy, therefore, is excluded from the project cost. By the same reason corporate profit tax is also excluded from the cost.

(2) Selling price

BKP produced by this project is an international commodity to be exported in its entirety; therefore, sales of BKP shall be at the international price. Because of reason the same price as used financial analysis is applied.

(3) Price of pulp wood

In the event that pulp wood is used for other purposes than pulp making, in large quantity and continuously, it is considered that the use will be make either wood chips or to burn it as fuel.

The trend of international demand for wood chips has been as follows. Imports by the ten countries of EC were approximately 460,000 T in 1983. Imports by Japan were 5,860,000 T, approximately 13 times the former figure.

The main exporters of wood chips are the U.S.A., Canada, Australia, New Zealand and South Africa, and at present there are no export sales from South American countries.

If wood grown for this project is processed into chips for export, the total quantity would be as follows. In case of Eucalyptus-globulus:

2,895 m^3/D x 340 D/Y = 984,300 m^3 x 0.555 BDt/m^3 = 546,300 BDt

If processing loss is 7%, then 546,300 BDt x 0.93 = 508,000 BDt

This quantity exceeds the total imports of the ten EC countries, and therefore if it shall be exported, the destination might be limited to the Japanese market only.

If this is the case, it will compete with Australian-origin chips.
(L = Eucalyptus)

Accordingly, the real price (economic evaluation) of the Urguayan wood shall be estimated as the raw material of chips competitive in the international market. It shall be the same price as Australian origin chips on the basis of C&F Yokohama.

Usually wood chips are transported by specially built ships, which are 50,000 DWT and loaded with approximately 30,000 - 35,000 m^3.

Transportation charges from the west coast of the U.S.A. (Coos Boy) and from Australia to Japan is approximately US$45 - 55/BDU. There is considerable difference in the charge depending on year the chip carrer was built and cost to built it but if it is calculated on the above base the result is as follows:

Sydney (Australia) - Yokohama (Japan)

$$\frac{\$45 + 55}{2} \times \frac{1}{5,680 \text{ Miles}} = \text{US\$0.00957/Miles BDU}$$

Montevideo - Yokohama
12,525 Miles (Via Punta Arenas)
12,525 x $0.00957 = 119.86/BDU approx. $108/BDt

Namely, if Uruguayan chips are exported to Japan twice the transportation charges are required in comparison with transport from Australia.

The price of wood chips exported to Japan, made from North American L-wood at FOB west coast of the U.S.A. is US$90/BDU, or approximately $81/BDt. The price of Australian L-wood chips is approximately US$65 - 70/BDU, or $59 - 63/BDt.

If only the wood processing facilities planned for this project are constructed and chips are produce at the same terms and condition for capital investment as set forth for this study, the cost of manufacturing chips from would be US$12.4/BDt. Converted to a C&F Yokohama basis for comparison with chips of Australian origin, the result is as follows:

	Uruguayan (US$)	Australian (US$)
1. Cost of Wood	-8.20/BDt	
2. Processing Charges	12.40	63.00/BDt
3. Shipping Charges (1+2x2%)	0.80	
FOB	5.00	63.00
4. Ocean Freight	108.00	50.00
C&F Yokohama	113.00/BDt	113.00/BDt

As understood from the above calculation, if the wood grown for this project is exported as chips it must be sold at minus US$8.20/BDt F.O.B. As the result, it has no economic value as an export item (Economic value = 0).

From another viewpoint, the wood for this project may be defined as not being an item to be exported. If it is not worthy for export and the wood is not used to make pulp, the most practical use would as domestic fuel. At present the price of fuel wood is lower by $10 - 15 than the set price as the material for pulp making, i.e., US$27.73/BDt.

In this study the economic value of the price of wood is deemed as the same as that of domestic fuel wood and assumed as US$15/BDt.

(4) Chemicals and utilities

Almost all of chemicals are to be imported. Among of utilities natural gas is imported from Argentina through a pipeline. Fuel wood is not exported; therefore, its economic value is deemed costs the same as the market price.

(5) Personnel Costs

Since the wages for skilled workmen is seen as a fair value, the actual personnel expenses are taken as economic value. On the other hand, unskilled workmen can be easily replaced by workers from countries which have high unemployment or high hidden unemployment such as high semi-employment (e.g., workers who depend on agriculture as a last resort). Therefore, the real value of labor can be deemed to be lower than the present wages.

The number of ordinary employees of the mill is 568 persons (total employees, 1,021 persons) half of whom shall be deemed as unskilled workmen. Half of wages paid shall be used as shadow wages; then the reduction will correspond to 10% of total personnel expenses.

Accordingly, economic amount of the personnel expenses is 90% of paid wages. Welfare and fringe benefit expenses, etc. are also discounted by the same method.

(6) Exchange Rate of Foreign Currency

In accordance to the discussions with the Uruguayan Authorities, it was decided that shadow prices shall not be used in this study, therefore the same exchange rate used in the financial study was applied for economic evaluation.

(7) Total Capital Requirement

Among the total capital requirement, the foreign currency portion is acquired as goods in trade, which are procured by strict international competition and therefore are deemed as economic price in principle.

Among the total capital requirement, the foreign currency portion is acquired as goods in trade, which are procured by strict international competition and therefore are deemed as economic price in principle. Among the local currency portion, of the Construction Labor Cost, 30% of the workmen are unskilled workers and could be easily replaced by underemployed persons.

The real labor value of unskilled workers is evaluated as 50% of estimated cost in the project cost and this 50% value is taken as the economic price.

Concerning to the other local currency components the major parts are not international trade items; therefore, the market price of those are deemed the same as the economic prices.

Table VI-10 ESCALATED TOTAL CAPITAL REQUIREMENT (Economic)

(Unit: Million US$)

Item	Foreign	Local	Total
1. Land	0.00	0.02	0.02
2. Site Preparation	5.60	2.50	8.10
3. Equipment & Materials	134.50	17.30	151.80
4. Spareparts & Chemicals	6.40	3.40	9.80
5. Construction & Erection Labor	13.80	23.60 1)	37.40 1)
6. Construction Equipment & Consumables	12.00	2.90	14.90
7. Temporary Facilities	2.10	3.90	6.00
8. Transport, Insurance & Port Charges	13.80	1.10	14.90
9. Indirect Field Expenses	8.40	3.50	11.90
10. Engineering Services	14.20	0.80	15.00
11. Home Office Expenses	5.90	0.00	5.90
12. Pre-operational Expenses	3.50	4.00 1)	7.50 1)
Total	220.20	63.02	283.22

Note: 1) means altered figure from that used for financial project cost

Adding the above total capital requirement, the following social base preparation expenses are obtained.