PROPOSED CENTRAL COAL PREPARATION

PLANT AT CALI, COLOMBIA

By

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Bogotá, Enero 1.951

PROPOSED CENTRAL COAL PREPARATION PLANT

AT CALI, COLOMBIA

The Corporacion Carbonera Colombiana of Bogota - Cali, Colombia, proposes to erect a central coal preparation plant at Cali, Colombia. This plant is to be capable of handling all the coal produced in the Cauca Valley coal mining field, and preparing a fuel - suitable for the industries of the Valley that now consume a total of approximately 20,000 tons a month. It is proposed also to produce a coking coal adapted to meet the requirements of the export market, especially for low-volatile blending coal. It is anticipated - that 10,000 tons per month can be exported through the Pacific coast port of Buenaventura. It will be transported form Cali to this port over the line of the Ferrocarril del Pacifico.

1. THE CAUCA VALLEY COAL FIELD:

The coal mines to be served by this central preparation plant are located in the Cauca Valley and in the western mountain range along the west side of the Cauca Valley near the City of Cali, Colombia. The location of the principal mines served is shown on the accompanying map, figure 1. This map shows also the location of the lines of the Ferrocarril del Pacifico that serve the mines and the consuming industries. It shows also the proposed plant site in the environs of Cali, and the location of the principal local industries that will consume the product of the preparation plant.

Table 1 is a listing of the Cauca Valley producer mines to accompany the map of figure 1. This listing names the principal coal mines and gives salient data on the production, reserves of coal, and - transportation facilities. Reference numbers in the table correspond to the same numbers showing mine locations on the map.

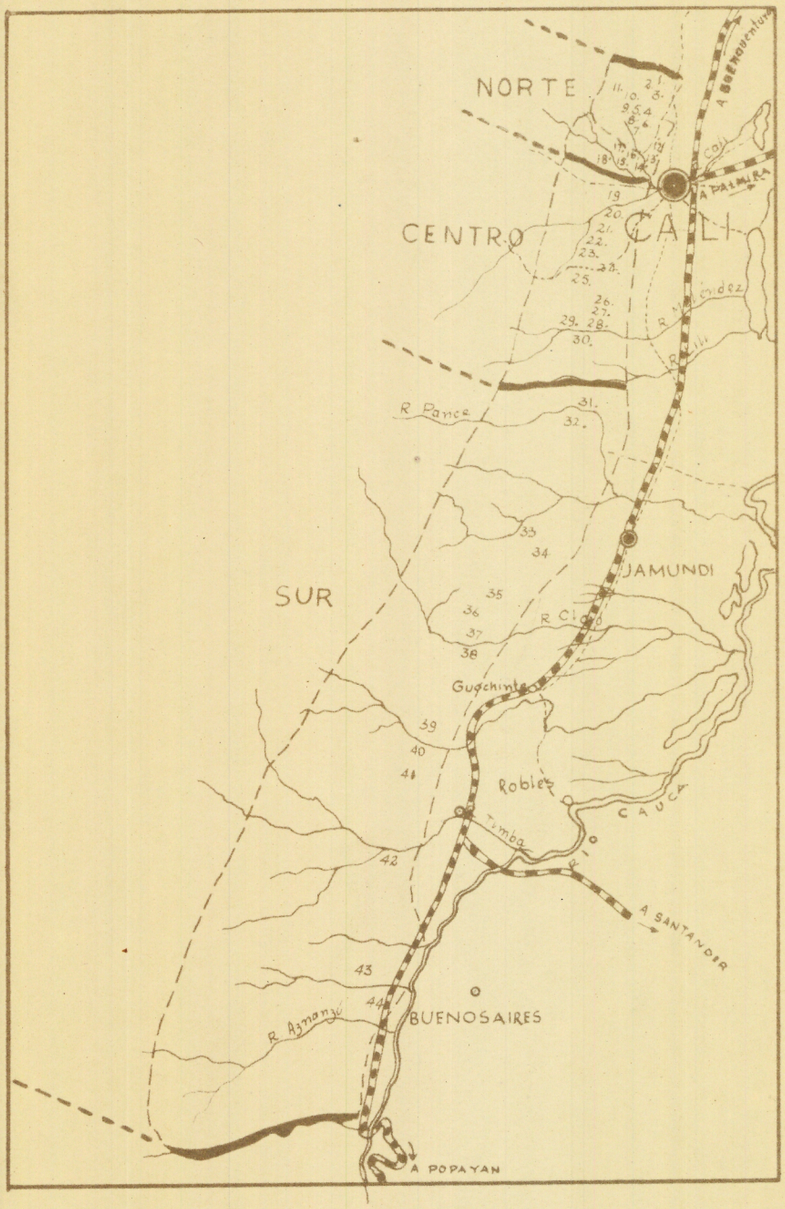
2. THE PROPOSED PLANT:

It is proposed to erect a central preparation plant capable of handling the entire production of the Cali field in one shift of operation each day, with an average of 23 operating days per month. It is - anticipated that within the next five years the production of the coal field may increase by 100%. During this time, the length of the operating shift will be increased to 10 hours to take care of the first two years expansion of production, and when necessary, the plant will operate two shifts a day - the first shift to be from 6 A.M. to 2 P.M., - and the second shift from 2 P.M. to 10 P.M. The third shift from 10 P.M. to 6 A.M. will then be available for maintenance and repair work.

It is proposed also that the central preparation plant shall have storage facilities for three shifts production of raw coal (3600

REGION CARBONIFERA
COAL FIELD

VALLE CAUCA
COLOMBIA



PRODUCCION DE CARBON EN EL VALLE DEL CAUCA
VALLE AND CAUCA COAL FIELDS PRODUCCION

Region	N	Clase de Carbón	transperte de la Mina a la Planta Lavadora en: Camiones...Cam. Gondolas...Gon. Cable.....Cab.	Distancia en Kilometros de la Mina a la Planta Lavadora	Nombre de la Mina. Dueño	Produccion Mensual M	Estimacion de que Cantidad sera Lavada M	Estimacion de la Produccion en cinco años M	Reserva de Carbón M	Observacion
Region	N	Class of the Coal	Delivery from Mine to the Coal Cleaning Plant Truck.....Cam. Gondolas..Gon. Cable.....Cab.	Distance in Kilometers from the Mine to the Coal	Name of the Mine	Production Month M	Estimated the quantity to be Washed M	Estimated the Production in five years. M	Coal Reserve M	Observation
Norte	1	A	Cam 6 Cab	9	Arroyondo/Altamira	50	0	0		
"	2	A	"	8	Pedregal/Bautista	600	600	0	4.000000	Seccion Pedregal
"	3	A	"	8	" /Chacon	200	200	0		
"	4	A	"	7	Golondrinas/Romero	2000	2000	5000		
"	5	A	"	7	" /Arbelaez	800	800	0		
"	6	A	"	6	" /Barberena	400		400		Seccion
"	7	A	"	6	" /Hullera	1500	1	5000	8.400000	Golondrinas
"	8	A	"	6	" /Sinisterra	400	400	0		
"	9	A	"	6	" /Murille	100	0	0		
"	10	A	"	6	" /Soto	250	0	0		
"	11	A	"	6	" /Varios	100	0	0		
					TOTAL.....	6400	5500	[illegible]	12.400000	
"	12	A	Cam.	0	Mina Chipichape	300	300	1500		
"	13	A	"	1	Mina S [illegible]	400	0	600		Seccion
"	14	A	"	1	[illegible]ucas/Santamaria	0	0	0		Chipichape
"	15	A	"	1	B. Lopéz	200	0	200	6.000000	[illegible] Cruces
"	16	A	"	2	L. Isaza	600	0	0		
"	17	A	"	2	P. Lopez	1000	1000	1000	2000	
"	18	A	"	2	Varios	500	0	0		
					TOTAL.....	3000	1300	4300	6.500000	
					SUBTOTAL.....	9400	6800	14700	18.900000	
Centro	19	A	Cam.	3	Calderón	350	0	0		
"	20	A	"	4	Tejar S. Fernande	600	0	1050		Seccion
"	21	A	"	4	Antonio Peña	100	0	0		S/ Fernande
"	22	A	"	4	Varios	150	0	150	3.450000	Silee
					TOTAL.....	1300	0	1200		
"	23	A	Cam.	5	Francisco Quesada	400	0	0		
"	24	A	"	5	Tebón	300	0	0		
"	25	A	"	5	Varios	300	0	0		
					TOTAL.....	1000			3.450000	
"	26	A	Cam.	6	Varios	100	0	0		
					TOTAL.....	100	0	0		Seccion
"	27	A	Cam.	7	Cascada	500	500	500	0	Cascada
					TOTAL.....	500	500	0	13.700000	Chorros
"	28	A- B	Cam.	8	Los Chorros	500	500	1500		Melendez
"	29	A	"	10	Melendez	0	0	0		
"	30	A- B	"	12	Los Pesos	0	0	0		
					TOTAL.....	500	500.	1500	13.700000	
					SUBTOTAL.....	3400	1000	2750	17. 15000	
Sur	31	B- C	Cam ó Gon.	20	La Riverita	1000	1000	0	10.600000	Seccion R.
"					TOTAL.....	1000	1000	0	10.600000	Lili-Pance
"	32	B- C	"	30	Rio Jamundi Pance	0	0	0		
					TOTAL.....	0	0	0		Seccion
"	33	A- B	"	40	Carbónera Jamundi	2500	2500	6000		Rio Pance
"	34	A- B	"	40	Pable Lopez- Sur	500	500	4000	58.600000	
					TOTAL.....	3000	3000	10000		Rio Claro
"	35	A- B	Cam ó Gon.	40	J. Gualtero M. A.	1000	1000	0		
"	36	A- B	"	45	Salustio Victoria	500	500	0		
"	37	A- B	"	40	J. Gualtero R. C.	1500	1500	0		
					TOTAL.....	3000	3000	0	58.600000	
"	38	A- B	Cam ó Gon.	45	Carbón y Derivado-	1500	1500	0	18.000000	Seccion R.
"	39	A- B	"	45	Las Cañas	250	250	0		Claro Guachinte
					TOTAL.....	1750	1750		14.000000	
"	40	A-B-C	Cam ó Gon.	45	La Perrera/Mira	1500	1500	10000	17.700000	Seccion Guachinte
"	41	A-B-C	"	50	" /Hullera	1500	1500			
					TOTAL.....	3000	3000	10000	17.700000	Timba
"	42	A-B-C	Cam ó Gon.	50	Timba a Palmar	100	0	1000		Seccion
"	43	A-B-C	"	52	Palmar a S. Ernco	100	0	0	43.000000	Timba Suarez
"	44	B-C	"	56	S. Ernco. Aznanzu	200	0	0		
					TOTAL.....	400	0	1000	43.000000	
					SUBTOTAL.....	12150	11750	21000	147.900000	
					SUMA TOTAL.....	24950	19950	38450	183.950000	

NOTA: De la seccion Pedregal hasta la seccion Timba inclusive se han tomado las reservas en los estudios del ingeniero Germany
En la sección Timba Suarez se han tomado las reservas en los estudios Hubach-Alvarado

cubic meters of live storage capacity), and a corresponding storage capacity to hold the clean product of three shifts of operation, with mechanical facilities to handle this material into and out of storage, - and to load the washed product into railroad cars and trucks for delivery. In addition, suitable patios for ground storage of raw coal and ground storage of washed coal shall be provided with capacity to store at least 8,000 metric tons of each of these two grades of coal. The - ground storage area is to be serviced by efficient mechanical equipment to deliver the product into the storage area. The material will be reclaimed from ground storage by "carry-all" trucks to be supplied by the purchaser.

3. THE PROPOSED PLANT SITE:

It is proposed to erect this plant on a suitable tract of land near the railroad yards al Chipichape in the environs of Cali. Figure 2 is a plot of the terraine to be used for the plant site, showing the available railway and highway connections. Figure 3 and Figure 4 are photographs of this site.

There are two possible sites shown in Figure 2. That designated as "Terreno No.2" is the site to be used for the plant. The area to the west and shouth of the shaded area is sloping (upward) mountain side that may be used for office buildings, laboratory, etc., if needed. Proposed refuse dumping area is in the ravene extending upward in a northwesterly direction from the northwest extremity of the site. The plant site (shaded area) can be leveled or it can be prepared with a rising gradient toward the northwest (higher at northwest), as desired. Railway and truck road will enter the tract at southeast corner as shown in Figure 2. This feature cannot be changed.

The purchaser (Corporacion Carbonera Colombiana) will prepare this site to suit the design furnished by the successful bidder, and will install necessary railway connections and sidings and highway extensions to serve the proposed plant in accordance with the contractor's design.

4. GENERAL OPERATING CONDITIONS:

The proposed plant will handle the production from a great number of relatively small producers scattered over the coal fields and extending for a distance of some 40 miles along the railway. The coal varies in rank from a high-volatile in the north, to semi-anthracite in the south, generally decreasing in volatile matter from north to south, but not uniformly. The coal generally is more friable in the south than in the north.

Thus there are many kinds of coal to be handled; but for convenience in the operation of the plant, the coal available in the region has been classified into three distinct groups. Deliveries of raw

coal will be separated into three groups only for separate treatment. These three groups are designated as: Class A, - high-volatile non-coking coals; Class B, high-volatile coking coals; Class C, low-volatile coals. For the purpose of this grouping for preparatory treatment, the A and B classification commonly designated as high-volatile will include all the coals of 25% or more in volatile matter, and thus will include medium-volatile as well as high-volatile coals. As received, coal coming into the plant will be kept in separate storage lots of these three classes. It is planned to accumulate raw coal until a full shift of operation can be applied to one class of coal. For this reason, it is specified that the raw coal storage bins shall be separated into three equal compartments, to have a live storage capacity of 1200 cubic meters each.

Raw coal will be delivered to the preparation plant in three different types of transportation facilities: (1) railroad cars, (2) trucks, (3) aerial tram buckets. Railway deliveries will be in solid-bottom side-dump gondolas on 36" gauge railway track. The common type of gondola has three to six hinged doors on each side, hinged at the bottom. Overall length of car, bumper to bumper, is 41'9", the maximum width 8'11". Maximum size of truck now being used is 5 tons, but it is planned to use trucks as large as 12 ton dump trucks. Aerial tram deliveries will be in 1/2 cubic meter tram buckets. The aerial tram will be supplied by the purchaser and will be installed to deliver coal to the terminal station over the receiving bin, in accordance with the contractor's design.

Detailed information about the classification of coal from each producer is given in Table 1, which lists the principal producing mines. This table shows also the type of transportation equipment in which the product of each mine will be delivered to the preparation plant. These data are summarized in Table 2 which shows the estimated monthly deliveries of each class of coal broken down by types of transportation equipment. These figures are in cubic meters because the accounting for raw coal will be made on the basis of cubic meters. It is the current practice here to sell coal by cubic meters measured in the delivery equipment. It is proposed to continue that method of measurement and accounting so far as the deliveries of raw coal are concerned. This accounting will be for the purpose of settling the accounts of the producers of raw coal.

Table 3 gives a final summary of expected deliveries of raw coal by the three classes of coal, and by the three types of delivery equipment reduced to a daily basis. This table shows the number of cars or buckets of each class of coal to be delivered daily, and the corresponding average dumping time. In tables 2 and 3 these are two sets of data: For each item, the first figure shows the current rate of delivery, and the second figure (underlined) shows the estimated rate of delivery to be reached in five years when the total production of the region will be doubled.

In the operation of the proposed plant, it is planned to wash separately each of the three classes of coal. It is planned

137

AREA DISPONIBLE
25000 M²
PARA PLANTA DE LAVADO
DE CARBON

376,50

POSIBLE ENSANCHE 8000 M²

70

TALLERES DEL F.C.
EN CHIPICHAPE

ESTADIO
DE
CHIPICHAPE

CARRETERA CALI - YUMBO

CARRETERA

BALASTERA DEL F.C.

280 MT.

120 MT

AREA APROVECHABLE PARA
LA PLANTA DE LAVADO
33000 M²
PROPIEDAD F.C. NAL.

Q DE MENGA

N

TERRENOS DE LOS TALLERES
DEL F.C. EN CHIPICHAPE
Y POSIBLES AREAS PARA
LA PLANTA DE LAVADO
DE CARBON

ESCALA = 1/2000

COPIA Y ADICIONES R. LONDOÑO G.
DICIEMBRE/50

Fig. 3 - Photograph of proposed plant site looking east from point A shown on figure 2.

Fig. 4 - Photograph of plant site looking westward across terrain toward mountainside and Quarry.

Table 2 - Estimate of Monthly Deliveries of Raw Coal to Preparation Plant

Raw Coal Incoming

Class # of coal	In Gondolas M³	Cars	In trucks M³	Cars	By acrial Tram M³	Buckets	Total M³
	---	---	3,800	760	4,000	8,000	7,800
A	---	---	6,000	1,200	9,000	18,000	15,000
B	10,000	333	500	100	---	---	10,500
	12,500	418	---	---	---	---	12,500
C	1,750	58	---	---	---	---	1,750
	12,500	418	---	---	---	---	12,500
Total	11,750	392	4,300	860	4,000	8,000	20,050
	25,000	833	6,000	1,200	9,000	18,000	40,000

Notes: The three classes of coal are:
"A" high-volatile coal non-caking;
"B" high-volatile caking coal;
"C" low-volatile 25.0 percent or lower.
Estimates of number of gondolas and trucks are based on average capacity of 30 cubic meters in gondolas and 5 cubic meters in trucks, and 0.5 cubic meters in aerial tram buckets.

Table 3 - Estimate of daily rate of arrival of raw Coal at Preparation Plant.

Class of coal	GONDOLAS Dumps per day	Dumping Time. Min.	T R U C K S Dumps per day	Dumping Time. Min.	CABIE BUCKETS Dumps per day	Dumping Time, Min.
A	---	---	32		333	
	---	---	50		750	
B	13		4		---	
	17		-		---	
C	3		-		---	
	17		-		---	
Total	16	30.	36	14.	333	1.4
	34	14.	50	10.	750	0.64

Table 4 - Estimate of Shipments of Washed Coal

Class of Coal	In Gondolas M³	In Gondolas Cars	In Trucks M³	In Trucks Cars	Total Shipments
	5,000	167	2,500	500	7,500
A	7,500	250	5,000	1,000	12,500
B	8,000	267	1,000	200	9,000
	11,500	384	2,000	400	13,500
	1,500	50	--	--	1,500
C	10,000	334	--	--	10,000
Total	14,500	484	3,500	700	18,000
	29,000	968	7,000	1,400	36,000

Table 5 - Estimate of rate of loading out of shipments of washed coal.

	GONDOLAS		TRUCKS	
Class of Coal	Cars per day	Loading time per car	Trucks per day	Loading time per truck
	7	-	21	
A	11	-	42	
	11	-	8	
B	16	-	16	
	2	-	-	
C	18	-	-	
	20	24	29	16
Total	45	11	58	8

to operate for at least one continuous 8-hour shift on one class of coal. The changes from one class of coal to another will be scheduled to suit the comparative rate of deliveries of the three classes of coal. It will not be necessary normally to keep all the Class A and Class B coal separate, but facilities must be provided to separate these two classes when preparing Class A coal for certain consumers who prefer free-burning non-coking coal for use on chain-grate stokers. It is specially necessary to keep the Class C coal separate because it is planned to try to develop an export market for this class.

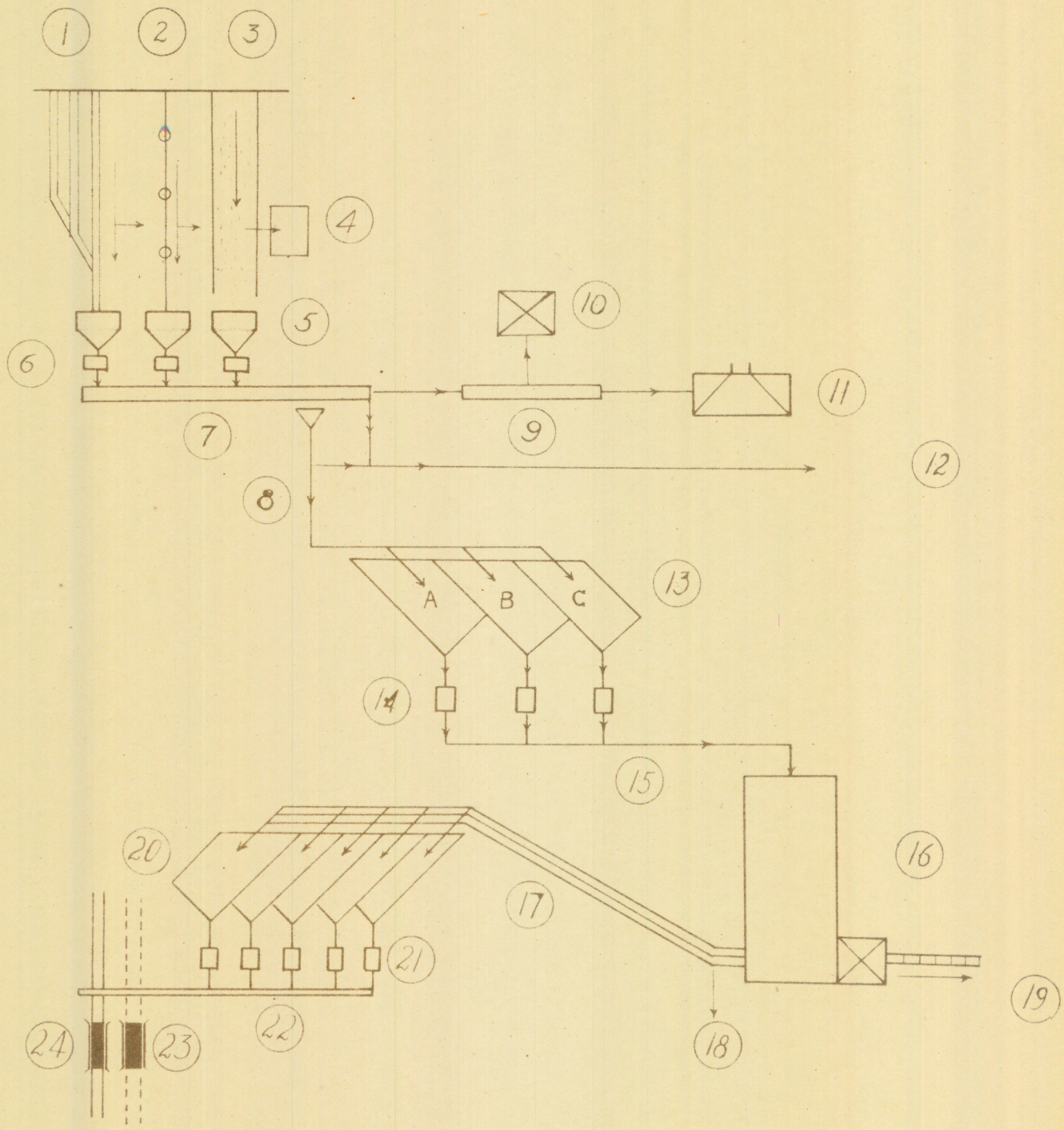
Deliveries of washed coal will be dispatched in railway cars and in trucks. Generally the trucks that deliver raw coal to the plant will not be the same trucks that are loaded with washed coal for delivery to consumers; but facilities shall be provided for the raw coal trucks to have easy access to the washed coal loading bins. Table 4 gives an estimate of the shipments of washed coal by classes and by types of transportation equipment. These data may be used as a basis for estimating the out-loading facilities required. This table, like table 3, has two sets of data; the first figure in each item gives the current rate, and the second figure (underlined) gives an estimate of the expected rate after five years.

5. PROPOSED FLOW-SHEET

Figure 5 is a tentative flow-sheet of the proposed plant, and figure 6 is a preliminary sketch (not to scale) showing one general plant arrangement that would be suitable. This schematic drawing was prepared before the plant site was finally decided upon, and it is included in the specifications only to make more definite and specific the details of physical conditions and functional requirements of the proposed plant. The bidders are invited to offer their own designs that they best consider adapted to these conditions.

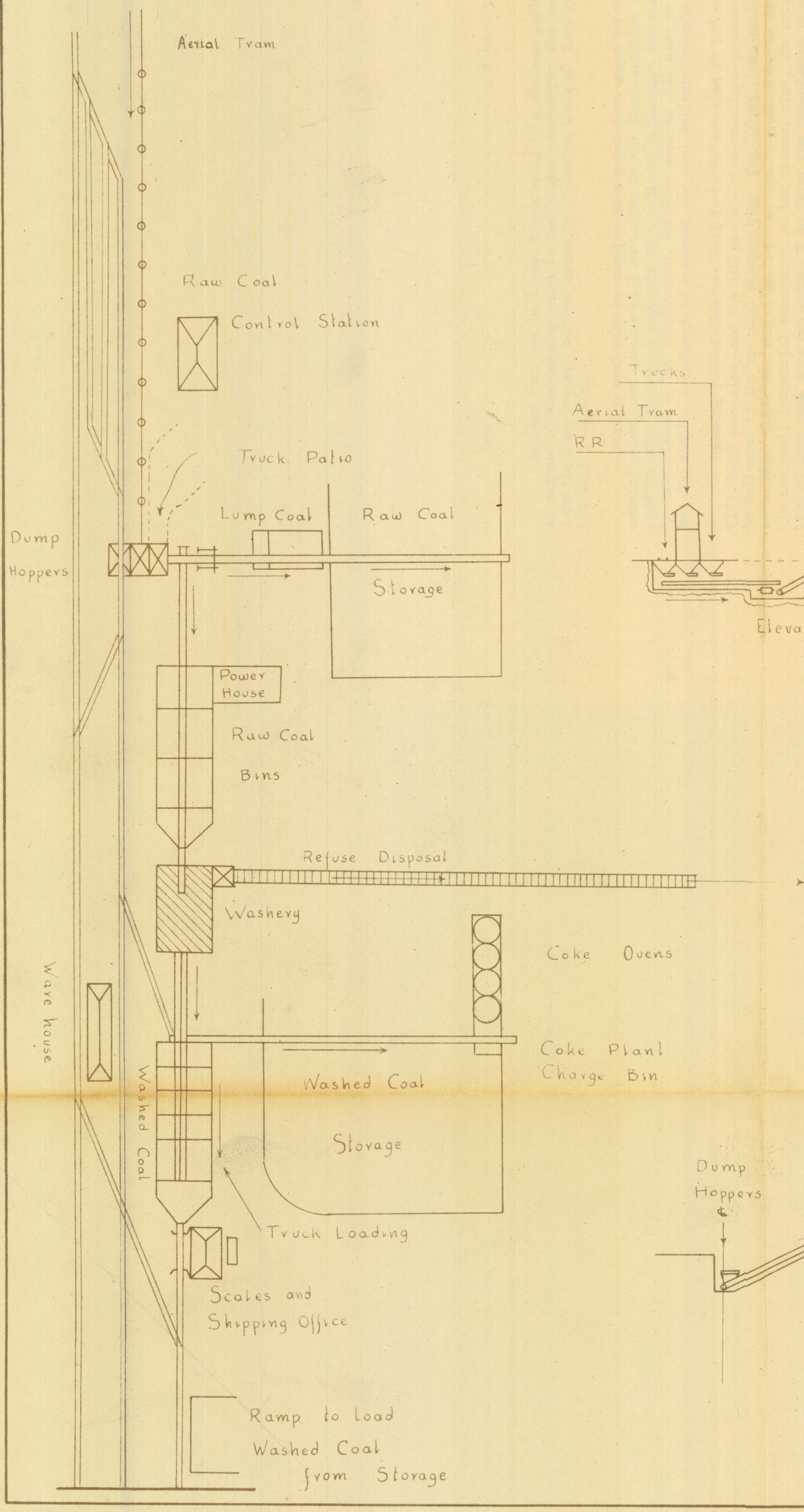
The raw coal that is transported to the preparation plant by rail will generally arrive in the early morning and will come to the plant in mixed trains of all classes of coal. It is proposed to provide three sidings for storage of raw coal cars and the train crews will spot cars on the three sidings classified according to the three classifications already described.

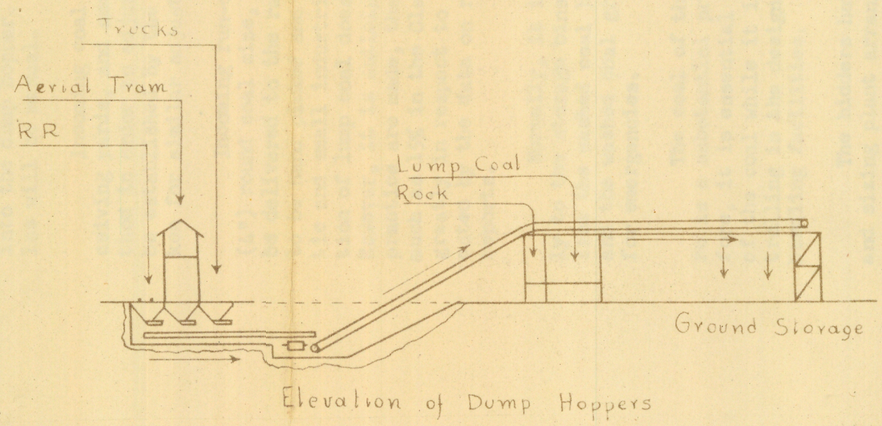
The coal to be transported by aerial tram will come from mines almost entirely of the A classification located in the Golondrinas Mountain, and the aerial tram delivery terminal will be located directly on the raw coal receiving hopper of the plant. Truck deliveries of raw coal will arrive at irregular intervals from 7 A.M. to 7 P.M., and it is proposed to provide a separate dump hopper for incoming truck coal. Truck coal will be of Class A and Class B. The bidder must provide the design and equipment adapted to handle these separate deliveries of the different classes of coal, to discharge the coal from transport facilities, and transfer the separate classes of coal to their proper compartments in the raw coal storage bin structure (No. 13 of the flow-sheet).



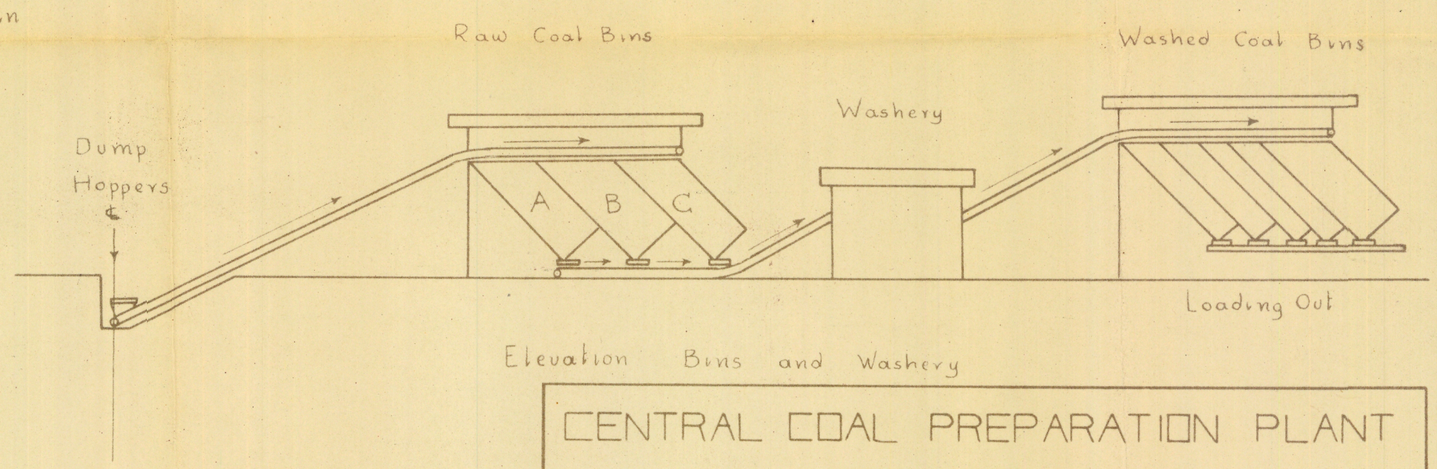
Explanation of Flow Sheet

1. Three RR Storage Trucks for ABC Coal
2. Aerial Tram from Golondrinas
3. Truck Road
4. Raw Coal Control Station
5. 3 Dump Hoppers
6. 3 Raw Coal Feeders
7. Raw Coal Shaking Convergor Screen (100 m.m Φ)
8. Raw Coal Conveyor To Storage Bins
9. Lump Coal Picking Table (100 m.m x 0)
10. Refuse Bin
11. Lump Coal Bin for Truck Delivery Service (200T)
12. Conveyor to Ground Storage for Raw Coal
13. 3 Raw Coal Bins each 1200 M^3
14. 3 Raw Coal Feeders
15. Washery Feed Conveyor
16. Washery
17. 3 Compt Washed Coal Conveyor
18. Washed Coal Conveyor to Ground Storage
19. Washery Refuse Disposal Track
20. 5 Washed Coal Bins 4-600 M^3 1-1200 M^3
21. 5 Washed Coal Feeders
22. Washed Coal Blending and Loading Conveyor
23. Truck Scale
24. RR Scale





Elevation of Dump Hoppers



Elevation Bins and Washery

CENTRAL COAL PREPARATION PLANT

Proposed

Corporación Carbonera Colombiana Cali Colombia	Dec. 5-1950 T. Fraser Not to Scale

Railway cars may be tipped transversly to a maximum angle of 15 degrees at the dumping point to facilitate discharging the contents into the dump hopper. Further means to discharge the coal from gondolas will be manual.

Incoming coal will be sampled at a convinient point in the receiving yards, and samples will be tested by the float-and-sink method in order to adjust payments to a basis of a standard raw coal to be established by the Corporacion. Moisture samples will also be taken for similar adjustment of incoming raw coal delivery weights.

Incoming run-of-mine raw coal is to be screened at 100 mm. (4") round coal size, and the 100 mm. x 0 size resultant product will be delivered to the raw coal storage bins. The 100 mm. lump coal is to be hand picked and stored in the lump coal bin for sale to domestic and small industrial consumers. At the present time, the proportion of lump coal does not exceed 2 to 3% of the run-of-mine product. However, it is anticipated that, after some improvements in mining practice are made, the proportion of lump coal may increase to as much as 15% in the Class A and Class B categories. The mines vary greatly in respect to the percentage of lump coal, as will be indicated by the data on raw coal characteristics in the accompanying reports.

Normally, it is expected that the raw coal will move directly to the storage bins and the washed coal will be shipped directly from the washed coal loading pockets. The raw coal ground storage and the washed coal ground storage facilities are to be used only for emergencies.

The coal of the Cauca Valley region is very friable and there is a substantial price differential with respect to size. Therefore, it is essential to take every precaution to avoid degredation of the coal while it is being processed. This factor should be controlling in the design of the storage bins and general conveying and handling facilities.

The bidders have the option to recommend the type of washing and sizing plant arrangement best adapted to handle this coal, subject only to the specifications hereafter set forth regarding the quality of product and performance requirements of the plant.

When washed coal is placed in ground storage, it is proposed to store unsized washed coal. There are very few experience data available on the storage characteristics of these coals, but it is tentatively estimated that in both ground storage areas the coal may be stocked to a height of 10 meters without prohibitive fire hazzard.

It is planned to erect, in the preparation plant compound, a small behive coke plant to supply locals users of foundry coke. This coke plant will be erected later by the purchaser, and it is planned, in the general preparation plant design, to provide only for delivery of washed coal to the coke plant charging bin.

It is desirable to have facilities to stock separately the following sizes of coal in the washed coal loading hoppers:

Class A Coal (4" x 3/4"; 3/4" x 0; 3/8" x 0
(100 x 18 mm.; 18 x 9; 10 mm. x 0

Class B Coal (4" x 3/4"; 3/4" x 0; 3/8" x 0
(100 x 18 mm.; 18 x 0; 10 mm. x 0

Class C Coal - Run-of-mine.

Class A and B Coal of 4" x 3/4" size will normally be loaded together in bin n. 1; Class A coal 3/4" x 0 size will be loaded in bin n. 2; Class B coal of 3/4" x 0 size will be loaded in bin n. 3; Class A and B coal of 3/8" x 0 size will be loaded together in bin n. 4; and class C run-of-mine coal will be loaded in bin n. 5.

The 3/8" x 0 coal will be obtained by screening as much of this size as is needed out of the 3/4" x 0 size, thus the 3/4" x 0 size will be a modified screening grade.

The washed coal loading out bins, with the appropiate feeders and collecting conveyer, shoudl be adapted to load any desired combination of the above sizes into either railway cars or trucks.

Automatic sampling facilities are to be provided to sample the washed coal and the refuse, but the processing of samples will be handled manually by the purchaser's operating crew.

6. THE CHARACTERISTICS OF THE RAW COAL

The accompanying report entitled "Preparation Characteristics of the Valle y Cauca Coals of Colombia", by Thomas Fraser, prepared by the U. S. Bureau of Mines, gives the analyses and float-and-sink test data of 15 typical samples collected at various mines in the region. These data are supplemented by additional test results obtained in the laboratory of the Ferrocarril del Pacifico at Cali, and reported in the accompanying memorandum entitled "Sizing Tests and Analyses of Cauca Valley Coal Samples".

While these data cannot be designated definitely to represent the average feed to the proposed central preparation plant, they are typical of these coals and they were obtained on tests of a substantial number of samples representing the important mines. These data may be used as a basis for design of the washing plant.

Because of the very friable nature of the coal, the purchaser would be willing to consider a proposal to use dry cleaning methods provided the contractor gives assurances of satisfactory performance. For such a dry cleaning plant, due consideration must be given to the fact that much of the coal will be exposed to varying weather conditions in transit from producers' mine to the central preparation plant. It is expected that most of the coal will be dry

enough for pneumatic treatment during the dry season, but much of the coal will be delivered to the plant in a wet condition during the rainy season of about four months. It is estimated roughly by local operators, that the most severe condition with respect to moisture would cause at least 75% of the raw coal to arrive at the plant too wet for dry cleaning, and with an average moisture content of around 8%. Therefore, predrying of the raw coal would be necessary in a dry cleaning operation.

The purchaser proposes to instal a thermal-power plant at the preparation plant capable of supplying the electrical energy needed for the plant operation. Flue gases from this plant would be available for drying the coal, if use of these gases is recommended by the contractor.

7. PRODUCT REQUIREMENTS

It is proposed to wash the coal at a washing gravity of 1.60.

In treatment of the Class A and Class B coals, it is desired to produce a washed coal product of 10% ash content. In the treatment of the Class C coal, it is desired to produce a washed coal product of 6.5% ash content. It is expected that the plant will operate continuously to deliver a product varying by not more than 1% above and below these specified ash contents; that is, the Class A and Class B washed coals may vary from 9% ash to 11% ash, and the washed Class C coal may vary from 5-1/2% ash to 7-1/2% ash.

It is important that the coal as delivered to consumer shall be relatively dry; especially the Class C coal of 3/8 x 0 size, which is to be used for burning in cement kilns. The maximum tolerance for moisture in this grade is 8.0 percent.

The bidder's proposal shall contain a statement of the performance of the plant offered with respect to quality of the washed coal product, and the refuse product, in terms of specific gravity consist. This statement may conform to the method of stating washery performance embodied in the Christian Wolf formula, or it may be set up in the manner normally used in the United States, namely, a statement of the percent float in the refuse, and the percent sink in the washed coal, both to be tested in a float-and-sink test bath of a specific gravity equal to the washing gravity.

8. SLUDGE RECOVERY AND WATER CLARIFICATION

Because of the extremely friable character of the Cauca Valley coals, the design of the sludge recovery facilities must be given special attention. It is expected that the plant will operate substantially in closed circuit with respect to the washing water. Substantially complete recovery of the fine sizes is necessary to avoid prohibitive losses. A small quantity of the dirty water may be discharged to the drainage system without penalty, but this should be kept to a very small quantity.

9. ELECTRICAL ENERGY

Electrical energy will be supplied in 220-440 volts 3-phase 60 cycle AC current. The Corporacion proposes to install a thermal power plant at the washery to furnish power needed for the operation of the coal handling and preparation equipment. This plant will have hand-fired boilers and steam driven generators.

10. USE OF MIDDLINGS

The proposed boiler plant will be adapted to use a secondary fuel of about 35% ash content. Therefore, this plant will furnish a certain limited use for a middling product from the washery. If such a secondary product is involved in the bidder's design, the total quantity of middlings to be disposed of should not exceed the requirements of the hand-fired boiler plant of suitable size to furnish electrical energy for the equipment needed in the plant.

11. REFUSE DISPOSAL

Facilities for disposing of refuse will be supplied by the purchaser. It is proposed to handle this job by installing a track and mine car with rope haul to transport the refuse from a refuse bin in the washery building to the dumping area in a valley near the plant site. This is indicated in the tentative plant layout - drawing, and probable location of the refuse dumping area is shown on the site plot and the photographs. (Figures 2, 3, 4).

However, the refuse bin location shall be such that the refuse can be loaded into trucks and railroad cars for shipment out of the plant area. This requirement will be satisfied if the Contractor's design shows that a truck road and a rail siding can be installed to give access to the refuse bin.

12. PERSONNEL AND LABOR SUPPLY

The operating labor supply is adequate, and labor available in the Cali area has been found apt in learning to handle industrial machinery. The area around the city of Cali (population about 200,000) is an expanding industrial area with railroad shops, cement plants, sugar mills, etc. There is a substantial industrial population.

Table No. 6 shows the type of administrative organization commonly set up to operate enterprises of this kind in Colombia. The data in this table will show the prevailing wage rate and salary scales, in Colombian pesos, applicable to the proposed washing plant organization.

13. CLIMATIC AND WEATHER CONDITIONS

The Cauca Valley is an elevated plain area between the coastal range and the central range of the Andes. Elevation at the railway station in Cali is 3000 feet. The temperature is almost uniform the year round, and the principal seasonal changes are with respect to rainfall.

The accompanying record of the local weather station will be of interest in considering such matters as the housing of equipment and relation of general weather conditions to the problems of handling and preparing the coal.

14. RAILWAY SIDINGS

56 inch gauge: minimum clearance above rail 3.50 meters, minimum curves 70 meters radius, 80 meters preferred. Rail 50 lbs. per yard - main line 70 lbs. Lateral clearance 4.0 meters - center to center.

15. WATER SUPPLY

The purchaser will furnish an adequate supply of water and make the water supply connection to deliver fresh water from the Cauca River pumping station to storage tank or other facility in preparation plant area, in accordance with contractor's design.

SAINT LUIS GONZAGA COLLEGE

METEOROLOGG STATION

Cali Colombia S. A.

AVERAGE OF THE METEOROLOGIG FACTS IN THE YEARS 1949 - 1950.

WINDS	- DOMINANT	N. W.	MAXIMUM POWER M/M		N W	12.	
	DOMINANT	N. W.	MAXIMUM POWER M/M		N.W	14.	
RAINS	DAYS	115	TOTAL 1248,1	MAXIMUM M/M 57,2	DAY 21 DIC.		
	"	141	TOTAL 1067,3	M/M MAXIMUM M/M 50	DAY 15 NOV.		
PSYCHROMETER	MEDIUM RELATIVE MOISTURE		64%	MEDIUM STRAIN OF THE STEAM			
	"	"	"	69%	"	"	M/M 14,8
							M/M 16,0
EVAPORATION	"	M/M	4,8				
	"	M/M	5,3				
TEMPERATURE	HIGH	33,2		17,8	MEDIUM	29,2	
	"	33,4		16,6	"	29,4	
	AVERAGE MONTHLY		1949 - 24,6				
	"	"	1950 - 24,9				