FOURTH FIVE YEAR PLAN

REPORT OF THE WORKING GROUP ON
INDUSTRIAL MACHINERY

DECEMBER 1964

NG GROUP ON MACHINERY INDUSTRIES

THE REPORT OF THE WORKING GROUP FOR INDUSTRIAL MACHINERY: RE. CEMENT MACHINERY; SUGAR MACHINERY; PAPER MACHINERY; PRINTING MACHINERY; TEA PROCESSING MACHINERY AND INDUSTRIAL BOILER

1. The Ministry of Steel & Heavy Industries under their O.M. No. ME. Ind. 9(16)/63, dated 30-9-1963, constituted the Working Group No. VII comprising of the following:—

Chairman

1. J. P. Mukherji,
   Chief Engineer,
   M/s. Walchandnagar Industries[Dhananjay]
   Walchandnagar.

2. Shri G. R. Tongaonkar,
   M/s. Associated Cement, Vickers & Babcock Ltd., Durgapur.

3. Mr. E. B. Mogensen,
   M/s. F. L. Smidth (Pvt.) Ltd.,
   Bombay.

4. Mr. B. Hedborg,
   M/s. Tata-Johnsons Ltd.,
   Jamsedpore.

5. Shri K. P. Jain,
   Chief Director,
   Sugar & Vanaspati Directorate,
   Ministry of Food & Agriculture.

6. Dr. B. N. Bhargava,
   O.S.D.
   Department of Heavy Engineering.

Convenor

7. Shri S. K. Sinha,
   Industrial Adviser (Engineering),
   Directorate General of Technical Development.

2. The terms of reference given to this Working Group together with further advice in the matter are reproduced in Appendices 1, 2 and 3 of this report.

3. The Working Group held three meetings in this connection in New Delhi and Bombay and the Committee's findings and recommendations are as under:

3(a). The Working Group would like to mention in this connection that the assessment of machinery requirements arrived at by them is solely on the basis of the tentative figures of production of sugar, cement, paper etc. indicated by the Perspective Planning Division of the Planning Commission. In case these figures are ultimately changed the Working Group's assessment of machinery requirement will also need to be modified to that extent.

3(b). The Working Group will like to state further that—

(i) While it is feasible for the Working Group to make an estimate of the present installed capacity; the capacity likely to materialise by 1965-66 based on steps already taken by different entrepreneurs, the likely production from now till say 1967-68 and the total foreign exchange required for maintenance (components and raw materials required for manufacture) purpose during each of these years—it is well nigh impossible to make a realistic estimate of the capacity and production beyond this, due to the fact that these are dependant on very important factors, which are completely unknown at this stage *e.g.*, the availability of rupee resources, the ability of the country to provide the foreign exchange required for Capital goods in respect of new units and substantial expansions and also the foreign exchange required for maintenance purpose. It has, therefore, not been possible for the Working Group to report in respect of paras 4, 5 and 6 of the Appendix 3.

(ii) Similarly, whilst the Working Group has been in a position to estimate the additional capacity required to be created during the Fourth Plan, *vis-a-vis* the targets of requirements by the user industries as given to the Working Group by the Planning Commission, also how much of this could be achieved by substantial expansions and how much by new units, and the total investment required for this purpose and the foreign exchange element thereof—the Working Group could not possibly break this up again under specific schemes, since that would mainly depend upon the actual schemes of different entrepreneurs and their respective resources.

(iii) As regards transport, fuel and power requirements *vis-a-vis* the additional machine building capacity to be created—these are *not* of any significant order.

SUGAR MACHINERY INDUSTRY.

4 (a). Based on a rise of capacity for sugar production starting from 3.5 million tons per year by end of 1965-66 and rising up to 5.5 million tons per year at the end of 1970-71, the Working Group has assumed the average rise of capacity in sugar production at the rate of approx. 400,000 tons per year, during the Fourth Plan period. On this basis and also taking into consideration the replacements required and the desirability of export, the average demand for sugar machinery during the Fourth Plan period has been assessed at approx. Rs. 294 million per year or say Rs. 300 million per year.

As against this the anticipated *installed capacity* of machine building by 1965-66 has been assessed at Rs. 172 million/year.

Installed Capacity as on 1-4-1964 . . .	Rs. 1,200 lakhs per year
Anticipated installed Capacity as on 1965-66 .	Rs. 1,719 lakhs per year

	1963-64	1964-65	1965-66	1966-67	1967-68
	(Rs./ lakhs)	(Rs./ lakhs)	(Rs./ lakhs)	(Rs./ lakhs)	(Rs./ lakhs)
Production	600	750	900	1050	1200
Total Foreign Exchange . .	98	125	150	175	200

The *additional capacity* required will be to the extent of Rs. 122 million/year.

The Working Group considers that this may be achieved both by substantial expansions and by new units, more or less on a 50:50 basis. The total investment that may be required is estimated to be of the order of Rs. 125 million of which the foreign exchange element for Capital goods will be approximately Rs. 70 million. The above figures of investment and foreign exchange do not include the expenditures on establishment of additional boiler capacity required for the expansion of sugar industry. Such figures are included separately under industrial boilers.

The break-up by nomenclature of the imported element (Rs. 14 lakhs) per standard sugar plant is indicated in Appendix 4.

Similarly complete item-wise break-up of a Sugar plant of capacity 1000—1200 tons of crushing per day with broad specification of each item, is indicated in Appendix 5 of this report. The break-up of such a plant by percentage value *vis-a-vis* each broad category will be as under:—

(*i*)	Equipments specific to the industry	45.06%
(*ii*)	Prime movers	2.43%
(*iii*)	Motors and Electrical Equipments	6.50%
(*iv*)	Pumps	2.02%
(*v*)	Compressors	0.35%
(*vi*)	Blowers and fans	0.52%
(*vii*)	Machine tools and equipments for maintenance	Nil
(*viii*)	Boilers	13.14%
(*ix*)	Power plants	6.52%
(*x*)	Tanks and Ordinary vessels	1.00%
(*xi*)	Pipes, Valves and fittings	7.62%
(*xii*)	Gears and gear boxes and other drives	6.60%
(*xiii*)	Material Conveying and handling equipments	4.50%
(*xiv*)	Instruments	0.45%
(*xv*)	Miscellaneous	3.29%
	TOTAL	100.00%

CEMENT-MAKING MACHINERY

4(b). In the light of the proposed rise in the Cement production capacity of 12 million tons/yr. required during the Fourth Plan period *i.e.*, from 14 million tons/yr. in 1965-66 to 26 million tons/yr. in 1970-71, and taking into consideration the replacement requirements of Cement Machinery, the average annual demand for Cement making machinery during the Fourth Five Year Plan period will come to approximately Rs. 207 million. As against this, the anticipated *installed capacity* by 1965-66 has been assessed at Rs. 178 *million/yr.*

Installed Capacity as on 1-4-1964	6 Plants/yr. valued at Rs. lakh/yr.	945
Anticipated installed capacity as on 1965/66	11 Plants/yr. valued at Rs. lakh/yr.	1780

	1963-64	1964-65	1965-66	1966-67	1967-68
Anticipated Production	Rs. 96 lakhs	Rs. 450 lakhs *i.e.* 3 Plants/ yr.	Rs. 600 lakhs *i.e.* 4 Plants/ yr.	Rs. 750 lakhs *i.e.* 5 Plants/ yr.	Rs. 900 lakhs *i.e* 6 Plants/ yr.
Total Foreign Exchange	5+ 90 from CG Committee	Rs. 135 lakhs	Rs. 180 lakhs	Rs. 225 lakhs	Rs. 270 lakhs

The break-up by nomenclature of the imported element of a typical wet process standard cement plant (Rs. 45 lakh approx.) is indicated in Appendix "6". The imported items will be different with wet process plants of different designs and also different in the case of dry process plants.

The *additional capacity* required will be to the extent of Rs. 29 million/yr. only. This gap can be easily achieved by the licensed entrepreneurs by the installation of additional balancing equipments.

The total investment required and the foreign exchange element thereof will be approximately Rs. 30 million and Rs. 20 million respectively.

The complete item-wise break-up of a 600 tons per day wet process Cement plant is indicated in Appendix "7" and the break-up of such a plant by percentage value *vis-a-vis* each broad category will be as under:—

(*i*)	Equipment specific to the industry	60.00%
(*ii*)	Prime movers	0.20%
(*iii*)	Motors and Electrical equipments	15.00%
(*iv*)	Pumps	0.60%
(*v*)	Compressors	0.50%
(*vi*)	Blowers and fans	2.00%
(*vii*)	Machine tools and equipments for maintenance	3.00%
(*viii*)	Boilers	..
(*ix*)	Power Plants	..
(*x*)	Tanks and ordinary vessels	..
(*xi*)	Pipes, valves and fittings	0.30%
(*xii*)	Gears and gear boxes and other drives	10.00%
(*xiii*)	Material Conveying and handling equipments	6.00%
(*xiv*)	Instruments	1.00%
(*xv*)	Miscellaneous	1.40%
	TOTAL	100.00%

PULP AND PAPER-MAKING MACHINERY

4(c). It has been indicated by the Planning Commission (Perspective Division) that the production capacity of writing and printing paper is to rise from 7.7 lakh tons/yr. in 1965-66 to 15 lakhs ton/yr. in 1970-71 and that of the newsprint from 30,000 tons/yr. to 330,000 tons/yr. during the same period. Taking this into consideration the Working Group has assessed the average annual *demand* for Pulp and Paper Machinery during the Fourth Plan period at Rs. 342 million. The only additional requirements will be for replacement purpose, since the question of any appreciable export of paper machinery at this stage of its early inception hardly arises. However, taking into consideration that some portion of the additional capacity required will be for small-scale pulp and paper plant and paperboard plant, where the cost of machinery per ton of capacity would be appreciably less than that of the large-scale plant—the Working Group considers that this will be offset against the additional replacement requirement. Hence the total average annual demand during the Fourth Plan period is taken at Rs. 342 million. The anticipated installed machine building capacity lby 1965-66 has been assessed by the Working Group at Rs. 73 million/yr.

Industry: PULP & PAPER-MAKING MACHINERY

Installed Capacity as on 1-4-1964 . . Rs. 550 lakhs per year.

Anticipated installed capacity as on 1965-66 Rs. 730 lakhs per year.

	1963-64	1964-65	1965-66	1966-67	1967-68
Production .	Rs. 134 lakhs	Rs. 200 lakhs	Rs. 300 lakhs	Rs. 400 lakhs	Rs. 500 lakhs
Total Foreign Exchange	Rs. 72 lakhs	Rs. 80 lakhs	Rs. 120 lakhs	Rs. 160 lakhs	Rs. 200 lakhs

In case of the Pulp and Paper-making machinery industry, it is not practicable in most cases to lay down the break-up of the imported element per plant by specific nomenclature of items, due to the fact that unlike the Sugar Machinery or the Cement Machinery where machinery could be standardised to a considerable extent in case the pulp and paper industry the capacity of the plant varies from 2 T/day to as high as 300 T/day and furthermore the raw materials to be processed by such plants are of a very wide variety.

Hence the gap required to be bridged or the additional annual capacity required will be Rs. 269 million. This may

be done by new units and also by substantial expansions on a 50:50 basis.

To achieve the above, the Working Group estimate that the total investment required and the foreign exchange element thereof will be approximately Rs. 250 million and Rs. 180 million respectively.

The complete itemwise break-up of a 50 ton per day pulp and papermaking plant is indicated in Appendix "8" of this report and the break-up of such a plant by percentage value *vis-a-vis* each broad category will be as under:—

(*i*)	Equipments specific to the industry	52.50%
(*ii*)	Prime movers	1.70%
(*iii*)	Motors and electrical equipments	4.75%
(*iv*)	Pumps	3.50%
(*v*)	Compressors	1.00%
(*vi*)	Blowers and fans	2.00%
(*vii*)	Machine tools and equipments for maintenance	2.75%
(*viii*)	Boilers	7.00%
(*ix*)	Power Plants	2.75%
(*x*)	Tanks and Ordinary vessels	2.75%
(*xi*)	Pipes, Valves and Fittings	7.00%
(*xii*)	Gears and gear boxes and other drives	2.40%
(*xiii*)	Material Conveying and handling equipments	2.30%
(*xiv*)	Instruments	2.30%
(*xv*)	Miscellaneous	5.30%
	TOTAL	100.00%

PRINTING MACHINERY

4(d). This industry is not covered under the Industries (Development and Regulation) Act, nor is it prescribed under the Third Five Year Plan. This industry is at present in its infancy and the present installed capacity as well as production is negligible.

Sometime back Government had appointed a Panel comprising specialists from manufacturers, trade, office of the

Controller of Stationery and Printing and Directorate General of Technical Development. The Panel has assessed the annual demand of Printing machinery of various types by 1965/66 and 1970/71 at Rs. 73 million and Rs. 120 million respectively.

The Panel has also indicated the nomenclature as well as quantity required of each type of machines. It will be observed that for this Working Group to re-examine the whole aspect, it will be necessary to carry out a large-scale survey of the type that had already been done by the panel. This will be a long time-consuming process and further the Working Group will also need the benefit of advice of specialists from manufacturers, trade, Office of Stationery and Printing etc. Hence the Working Group is of the opinion that, for all practical purposes, the Panel's report on this industry that has already been submitted to the Government should serve the purpose. The Working Group however considers that to achieve the target capacity of Printing machinery worth Rs. 120 million/yr. by 1970/71 almost from scratch, the total investment required for establishing this capacity and the foreign exchange element thereof will be of the order of Rs. 150 million and Rs. 100 million respectively.

Installed Capcity as on 1-4-1964 . . Rs. 23 lakhs per year.

Anticipated installed Capacity as on 1965/66 Rs. 60 lakhs per year.

	1963/64	1964/65	1965/66	1966/67	1967/68
	Rs. lakhs	Rs. lakhs	Rs. lakhs	Rs. lakhs	Rs. lakhs
Anticipated Production	4.5	6	30	50	100
Total Foreign Exchange.	None of the existing firms applied. Hence no release of foreign exchange.	2.5	7.5	12.5	25

TEA PROCESSING MACHINERY

4(e). This industry has been well-established inasmuch as there are about a dozen factories producing tea-processing machinery of diverse types over a number of years.

Between these different factories they produce the entire range of tea-processing machinery as required by the tea-gardens. The demand as well as production is more or less

steady for several years and is ranging between Rs. 160 lakh and Rs. 175 lakh per year. The import of Tea machinery has been on the banned list for several years and the industry has also commenced to export its product. One of these factories has exported Rs. 26 lakh worth of Rotorvane Tea rollers during 1963. The export of tea machinery during 1964 is expected to go up still further to about Rs. 30 lakh.

The Working Group considers that the industry can take full care of the requirements of machinery during the 4th Plan period. If at all, the manufacturers may require only some balancing equipments.

Installed capacity as on 1-4-1964 . . Rs. 200 lakhs per year.

Anticipated installed capacity as on 1965/66 . Rs. 212 lakhs per year.

	1963/64	1964/65	1965/66	1966/67	1967/68
	Rs. lakhs	Rs. lakhs	Rs. lakhs	Rs. lakhs	Rs. lakhs
Anticipated Production	166	175	180	190	20
Total foreign exchange	25	26	27	28	3

INDUSTRIAL BOILERS

4(f). The present position of the Boiler manufacturing industry, *i.e.,* in respect of both industrial boilers and Power boilers is shown in detail in appendix "9". It will be seen therefrom that the projected installed capacity by 1965/66 in respect of industrial boilers will be approximately for Rs. 832 lakh/yr. This is of course on the assumption that ISG, AVB and Thaper Steinmuller will utilize their installed capacity both in respect of industrial boilers and power boilers. It will be noted in this connection that a manufacturer equipped to produce power boilers can always divert part of its capacity for industrial boilers (which have lower pressures and lower steam-raising capacity), but the reverse is not true. In the light of above, it will be apparent that the available installed capacity for industrial boilers will widely fluctuate, depending upon to what extent firms like ISG, AVB, Thaper Steinmuller and the public sector plant at Tiruchi engage themselves in the manufacture of power boilers. Assuming that the Tiruchi plant will go in almost wholly for power boilers and the other plants both for power and industrial boilers, more or less in the ratio indicated in Appendix "9" we may assume the annual capacity for industrial boilers by 1965/66 at Rs. 832 lakhs.

For determination of demand for industrial boilers by 1970/1971 we may base our calculation on an "equated" boiler with a steamraising capacity of 35,000 lbs./hour costing approximately Rs. 6 lakhs each.

The demand for industrial boilers will come broadly under the following fields:—

(1) Sugar industry.
(2) Paper industry.
(3) Nitrogenous fertilisers.
(4) Other industries like Iron and Steel, textiles, soda ash, alkalies, Oil mills, Solvent Extraction etc.
(5) Spares for the above boilers per year.

Re: Sugar Industry

Average number of new plants per year during the 4th Plan period 26.

Hence No. of equated additional boilers per year $=26\times2=52$.

Total value of additional boilers per year @ Rs. 6 lakhs $=6\times52=312$ lakhs.

Re: Paper Industry

Average number of new plants required (in terms of 50 tons/day plants) per year during the 4th plan $=14$

Hence number of equated additional boilers per year $= 14\times 2 = 28$

Total value of additional boilers per year . . $= 62\times 8 =$ Rs. 168 lakhs

Re: Nitrogenous Fertiliser.
Additional Fertiliser production during 4th Plan.

1965/66 640,000 Tons of fertiliser (in terms of N_2)
1970/71 2,000,000 Tons of fertiliser (in terms of N_2)

∴ Additional annual production capacity by end of 4th Plan. $=1.4$ million tons of N

Addl. Steam required for above $=1.4\times 15 = 21$ million tons

Addl. hourly steam required $=21{,}000{,}000\times$

$$\therefore \text{Average number of additional Std. boilers required/yr. per hour} = \frac{\text{300 days} \times 24 \text{ lbs. per hour}}{5\times 35{,}000} = \frac{6{,}500{,}000 \text{ lbs.}}{5\times 35{,}000} = 37 \text{ Nos.}$$

∴ Total value of above Boilers per year $=37\times 6 =$ Rs. 222 lakhs

Re: Order Industries

To.al number of equated additional boilers = 125 per year (assumed).
Hence total value = 125 × 6 lakhs = Rs. 750 lakhs.

Re: Annual Replacement requirement of existing

Industrial boilers/..... = Rs. 400 lakhs (assumed).

∴Total estimated annual average demand for industrial boilers during 4th Plan is..... = Rs. 1852 lakhs/year

The average additional annual capacity required during 4th Plan = (1852—832) = Rs. 1020 lakhs/year or Rs. 102 million/year.

The above additional capacity may be achieved both by substantial expansions and by new units on a 50:50 basis. The total investment required and the foreign exchange element thereof will be approximately Rs. 120 million and Rs. 70 million respectively.

OBSERVATIONS OF THE WORKING GROUP RE: TARGETS FOR SUGAR, CEMENT AND PAPER

5. Although the Working Group has based their assessment regarding the requirements of machinery for Sugar, Cement and Pulp and Paper Industry, as per the targets mentioned in respect of these in the note from the Perspective Division of the Planning Commission, they would like to mention hereunder that in the opinion of the Working Group, these targets are rather on the high side and it may not be possible to reach these high targets. The broad reasons in respect of the difficulties in reaching the targets are indicated below:—

(i) Sugar Industry

The sugar manufacturing target as suggested is radically different from the present rate of growth of the industry. It will be very difficult to convince the sugar plant manufacturers to enlarge their facilities to manufacture machinery at this high rate. The slump in this industry about two years ago forced them to diversify their products and they would continue to have more than one product to avoid recurrence of past difficulties.

The Working Group has also serious doubts in regard to the adequate availability of Sugarcane for vacuum pan sugar factories in the country to meet the high target of manufacture of sugar envisaged in the note of the Perspective Division of the Planning Commission.

(ii) Cement Industry

According to the Perspective Division of the Planning Commission, the Cement production capacity in the country will reach 14 million tons/yr. by the end of the 3rd Plan period. The Working Group has doubts if this target will be achieved and is inclined to the view that the actual achievement may be of the order of 12.5 million tons/yr. Further, the Perspective Division of the Planning Commission has set a target of 26 million tons/yr. at the end of the 4th Plan period, which would mean the establishment of additional capacity to the extent of 12 to 13.5 million tons of cement per year, during the 4th Plan period.

There are considerable difficulties in achieving the above high targets. According to the information available at present, there are not numerous proved deposits available near the rail-heads and by and large good deposits are available only in certain regions of the country. To tap these deposits, the Railway transport system will have to be extended. The poorer deposits may have to be enriched where possible by floatation which would mean higher capital cost and higher production cost. The establishment of Cement Capacity requires heavy investment these days. Apart from the foreign exchange needed for import of special raw materials and components, it is doubtful whether the necessary Rupee finance would be forthcoming.

The Cement Industry is a controlled Industry with prices fixed by Government and today there are not enough private entrepreneurs coming forward to establish the additional capacity.

As regards the Cement Machinery Manufacturing Industry itself the progress would also depend to a considerable extent on the increase in the availability from indigenous sources of the components and ancillary equipments required for the complete cement plants, particularly large size Gears and Gear Boxes, large size Electrical Motors and Special Motors and large size steel castings, for which the capacity in the country today is grossly inadequate.

(iii) Pulp & Papermaking Machinery Industry

Although it is recognised that the targets set by the Perspective Division of the Planning Commission for the production of Paper are desirable in order to support the educational and industrial activities of the country, it seems that one has to recognize the considerable difficulties in fulfilling such targets.

The envisaged increase in the production of Paper from 70,000 tons/yr. to 1,500,000 tons/yr. requires availability of further quantity of raw materials equal to the ones now being consumed. It is, however, a fact that the Bamboo resources are virtually utilised to the limit of their capacity with the exception for Assam. Utilisation of hard wood for pulp and papermaking is not yet started on the large scale. Availability of sugarcane bagasse for pulp and papermaking is, at present, practically nil due to the difficulty of making suitable substitute fuel available. In view of what has been stated above of the Development of sugar industry, considerable deficiencies will have to be expected also in future. Therefore, the raw material availability must on whole be considered as far below the required level.

Increase in production in the Newsprint from 30,000 tons/yr. to 330,000 tons/yr. requires development of completely new raw material resources, mainly sugarcane bagasse and Himalayan forest timber. The bagasse situation has been already commented upon. The development of the Himalayan forest regions from virgin to industrial resource for the purpose of supplying large quantity required by the programme must be considered as very onerous. Sufficient raw material for newsprint can therefore not be expected to be available until late in the plan period.

Pulp and Paper Industry being capital intensive it must be recognised that the availability of capital, both foreign and national, will be heavily strained, even for a considerable smaller expansion programme, than the one envisaged. The present day rate of development of the Industry underlines this fact. Particularly it is now observed that Pulp and Paper Industry finds it difficult to attract capital due to the lack of adequate profit in this business.

SPECIAL RECOMMENDATIONS OF THE WORKING GROUP

6. (i) The Working group considers that for the satisfactory and speedier development of the machinery industry and in accordance with the procedure that had been successfully adopted for the development of the sugar machinery industry, Government should give blanket buffer licence to manufacturers wherever this is possible, for a specific value per plant, leaving it open to each of the manufacturers to import whatever items they deem necessary (except banned items) within the aforesaid value. They should also have the freedom to import their requirements from any country of their choice as far as practicable.

(ii) The working group also considers that whereas the capacity in the country for the manufacture of light equipment is adequate—there are certain components, *viz.*, Steel Castings and Forgings and certain types of heavy equipments for which the existing capacity is inadequate.

While the supply position of gray iron castings in the country is not unsatisfactory, the position regarding the supply of steel castings is very difficult. Although steel castings up to 2 tons per piece and manganese steel castings are manufactured indigenously—the extent of the present capacity for their production is grossly inadequate to meet the growing needs of the industry and urgent steps should be taken by the Government to augment this capacity. Large size castings and forgings are not at all available indigenously at the moment. For indigenous delivery of complete cement plants, it is necessary to import at present large size steel castings which cost between Rs. 13 lakhs and Rs. 18 lakhs per plant; large size electric motors and motors of special designs up to Rs. 7 lakhs; large size Helical Gear Boxes approximately Rs. 13 lakhs. Besides the above items, other miscellaneous special items like packing machine, boiler quality steel plates and plates of special thickness and components of special design or material, etc., etc., are also required to be imported at present.

7. Finally, the Working Group has also pleasure in appending herewith a note prepared jointly by Shri E. B. Mogensen and Shri G. R. Tongaonkar, highlighting some of the problems facing the indigenous Cement machinery manufacturers as Appendix "10" to this report.

J. N. MUKHERJI,
(*Chairman*)

Dated 9th July, 1964.

S. K. SINHA,
(*Convenor*)

APPENDIX I

Terms of Reference to the Working Group No. VII

(i) To make an estimate of the requirements of equipment falling within the scope of the Working Group, having regard to the production programmes and investment in the sectors requiring such equipment envisaged during the Fourth and Fifth Plans, insofar as they are relevant to the establishment of capacity for the manufacture of such equipment during the Fourth Plan. In making this estimate, the requirements of replacements and possibility of exports should be taken into account.

(ii) To make an analysis of these requirements, in terms of category of equipment and value.

(iii) To work out in detail the requirements of each category of equipment, by type and by range, during each of the years of the Fourth Plan.

(iv) To recommend the capacity and production targets for 1970-71, for each category of equipment, by type and by range, to the extent indigenous manufacture is considered feasible and desirable.

(v) To make an assessment of the production capacity of existing and projected manufacturing facilities and to work out the gaps for each category of equipment.

(vi) To investigate the best manner in which the gaps could be covered to the extent feasible and desirable by the end of the Fourth Plan; and to make specific proposals to this end, by way of expansion or new projects, etc.

(vii) To make an estimate of the investment and foreign exchange on capital and maintenance account required for implementing the production programme as recommended.

(viii) To make an estimate of power, fuel, transport and other requirements of a significant order.

(ix) To make an estimate of raw materials, components, etc., required for the manufacture of such equipment and to suggest measures for the indigenous manufacture of such items.

(x) To recommend measures by which utilisation of manufacturing capacity and programmes of production in the consuming sectors are co-ordinated to the fullest extent.

(xi) To make such other recommendations as may be relevant.

APPENDIX 2

GOVERNMENT OF INDIA

DIRECTORATE GENERAL OF TECHNICAL DEVELOPMENT
UDYOG BHAVAN, MAULANA AZAD ROAD,
NEW DELHI.

No. IA (SK)/WKGP No. VII No. VII/63 Dated, 22-5-1964.

To

The Chairman & Members of Working Gp. No. VII

Dear Sir,

1. In the meeting taken by the Additional Secretary (Heavy Engg.) on 20-5-1964 at 3-30 p.m., our Working Group was requested to probe into and report further, *inter alia,* on the following:—

(a) In respect of *Printing Machinery,* its present stage of development, likely prospect by 1965-66, demand estimate by 1970-71, types of equipments required by number and value, the gap to be filled in, the total investment required and the foreign exchange element in it.

(b) Same as above in respect of *Tea Processing Machinery.*

(c) Same as above in respect of *Industrial Boiler.*

(d) Revised estimate of demand for *Sugar Machinery* together with gap to be filled in, total investment required and foreign exchange element in it—on the assumption that production target of Sugar may be raised from 3.5 million tons in 1965-66 to 5.5 million tons in 1970-71.

(e) Break up of present per plant value of imported element by nomenclature of different items in respect of Sugar Machinery and Cement Machinery and if possible also for Paper Machinery.

(f) Opinion of the Working Group whether by and large the demand target by 1970-71 would rise steadily by approx. 20% each year from 1965-66 or whether substantial fluctuations is envisaged and if so details thereof.

(g) A second look on the level of installed capacity and likely production, which may be achieved by 1965-66.

(h) Requirements of transport, fuel and power, if of any significant order and need for special type of wagons, if required for any of these industries.

It is requested that your views, if any, on the above aspects may please be circulated simultaneously to the Chairman and all Members of the Working Group on or before the 15th June, 1964.

Thereafter a two-day meeting of the Working Group is proposed to be convened in Bombay in consultation with the Chairman when the considered opinion of the Committee as a whole will be drawn up on each of these aspects.

Yours faithfully,

(S. K. SINHA),
Industrial Adviser & Convenor,
Working Group No. VII.

Copy to:

Shri P. R. Nayak, Dy. Secretary,
Ministry of Steel, Mines & Heavy Engg.

APPENDIX 3

GOVERNMENT OF INDIA

MINISTRY OF STEEL, MINES & HEAVY ENGINEERING

New Dehi, the 21st May, 1964.

Planning Commission desire that the Working Groups under the Planning Group on Machinery Industries may include the following information also in their final reports:—

1. Based on schemes already licensed/approved till now,

(a) indigenous capacity/production expected to be reached by 1965-66;

(b) additional capacity and production expected during each year of the Fourth Plan.

For the purpose of (a) and (b) above, only schemes on which definite decisions have been taken in regard to investment and issue of import licences should be taken into account.

2. Capacity that has to be set up in addition to 1(a) and (b) above to achieve the capacity and production targets recommended for 1970-71. This additional capacity may be divided into two groups:

(a) by expansion of existing schemes;

(b) by establishing new units both in the Public and Private sector.

3. An analysis of total capacity under 1 and 2 above, with specific schemes, so far as may be possible, with reference to unit size, product mix, total investment, value of capital goods and its indigenous content, foreign exchange (capital goods) already arranged and still required.

4. On the basis of recommendations made, the likely total capacity/production and its value during each year of the Fourth Plan.

5. For the production at 4 above, the foreign exchange requirements of raw materials, spares, components, etc., with their quantities during each year.

6. On a reasonable estimate of machinery available during each year of the Fourth Plan from indigenous sources, the extent to which machinery needs to be imported in order to fulfil the production programmes of user industries.

The Group may also examine the problems that might militate against the phased achievement of the targets recommended and suggest measures for overcoming them.

It will be recalled that the Working Groups had undertaken the study of the Fourth Plan programmes with reference to certain tentative targets of capacity and production furnished by the Planning Commission last year. The Planning Commission have now transmitted a revised set of tables prepared on the basis of a recent reappraisal of industrial programmes. Copies of these tables have already been forwarded to the Working Groups.

(Sd.) P. R. NAYAK,

Deputy Secretary to the Govt. of India.

APPENDIX 4

Broad list of imported elements required for a standard SUGAR PLANT of 1000/1250 tons Crushing Capacity per day

(Approx. Rs. 14 lakh)

(a) Components for Boiler Plants.

(b) For mill drive and power generation:

(i) Steam Engine 45 BHP for cane carrier or motor with reduction gears.

(ii) Steam Engine 650 IHP of two Steam Turbine of 500 H.P. each.

(iii) Turbo Generator for power generation 1,000/1,250 K.W.

(iv) Diesel generating set of 150 K.W. for off season lightening.

(c) Components and raw material for other machines:

(i) Centrifugal components.

(ii) Steel casting for mill plants.

(iii) Roller shafts for milling plants.

(iv) Reduction Gears.

(v) Chains.

(vi) Vacuum & Pressure gauges.

(vii) Bearings.

(viii) Brass Tubes (sizes which are not manufactured indigenously).

(ix) Miscellaneous.

APPENDIX 5

Standard Sugar Pant of a Crushing Capacity of 1000/1250 tons of canes per day

I. *MILLING PLANT*

(a) *Cane Carrier.*—56″ wide × 160 ft. long with overlapping steel slats 3/16″ thick, Horizontal loading length 80 ft. fitted with 2 strands of heavy steel roller type chain, 6″ pitch and tensile strength of 60,000 lbs./sq. in. Grease lubrication arrangement for carrier chain.

(b) *Cane Carrier Drive.*—Twin cylinder steam engine capable of developing 40/45 H.P. and running the cane carrier at 33 ft. per minute.

OR

An electric motor of 45 B.H.P. directly coupled to Hydraulic variable speed gear and reduction gear with speed regulation from 0 to maximum, with an output of 20/25 H.P. Interlocking arrangement to be provided.

(c) *Cane Cutting Knives—*

(i) Leveller.

(ii) Cutter.

Two sets of knives—leveller and cutter each driven through flexible coupling by 150 B.H.P. continuously rated slipring drip proof motor running at about 585 R.P.M. and oil immersed stator rotor starters. Flywheel at the outer end and coupling of the flywheel type.

(d) *Mills.*—12 Roller Milling Tandem of 28″ dia. × 56″ long with journals about 14″ dia. × 17″ long. The first unit is to work as a crusher mill.

Mills to be high set so that no juice tanks are situated underground. Kingboltless or short Kingbolt type. Top Scraper moving up and down with the roller, or of the rigid type Trash plate adjustment from outside, quick lift type inter-carriers, water cooled metal bearings with water discharging into a tundish near mill platform, continuous 'V' troughs for juice and with partition, troughs made of stainless steel or copper lined mild steel plate 1/4″ thick. Edwards Accumulators, Masschaert grooves, scrappers for feed rollers of mills and mechanical lubrication system.

(e) Gears and pinions of cast steel with machine cut teech both for the first motion and the second motion. Provision for installation of the 5th and 6th units.

(f) *Mill Drive.*—One drop valve or piston valve with rider valve, steam engine capable of developing 650 I.H.P. running at 60/120 R.P.M. giving roller surface speed of 20/40 ft. per minute, with cut off not more than 30% of stroke and supplied with steam of 160 lbs./sq. inch, 100°F superheat and exhausting against a pressure of ten pounds per sq. inch. Governing

arrangement by oil pressure or other suitable type. Heavy fly wheel, reversing arrangement, mechanical lubrication, tail rod and other fittings to be provided. Remote control arrangement for engine speed control to be provided.

(g) *Imbibition System.*—Compound imbibition system with chokeless pumps, vibrating or rotary juice strainer, chokeless pump of about 90 gallons per minute capacity against 50 ft. head, juice pipes of copper and of 4" bore with larger radius bends. Juice pumps capacity 12,000 gallons per hour and pipe size 5".

Water meter preferably venturi recording type for hot water imbibition. Pump capacity 75 gallons per minute at 25/30 ft. head.

(h) *Mill House Crane Gantry.*—One hand operated over-head mill house travelling crane having two crabs each of 7.5 tons capacity with a total capacity of 15 tons, complete with crane rails and crane gantry to suit mill house span which should not be less than 60 ft.

II. *CLARIFICATION PLANT*

(a) Juice Weighing scale to handle 60 tons of raw juice per hour. The number of charges should not exceed 25/30 per hour. It should be fitted with a counter.

(b) *Juice Heater.*—Three High Velocity multiple circulation vertical juice heaters having 100 sq. ft. heating surface Solid drawn brass tubes of 1½" to 2" O/D (70/50 alloy) × 16 gauge. Length not more than 13 ft. All the three juice heaters provided with double seat juice valves for alternate heating of raw or sulphited juice with inter-connecting pipes.

(c) Continuous Juice Sulphitation arrangement with chemicals proportioning device.

(d) *Continuous Clarifier* of 22 ft. dia. and 4 compartments or 'Rapi-Dorr' of 20 ft. dia. × 4 compartments.

(e) *Sulphur Furnaces.*—Three cast iron water jacketed sulphur furnaces each having 8 sq. ft. tray area complete with hinged doors etc. or a continuous sulphur burner suitable for burning 120 lbs. of sulphur per hour.

(f) *Vacuum Filter.*—One multi-cellular type cane and filter of 8 ft. dia. × 16 ft. long of approximately 400 sq. ft. nominal filtering area complete with condenser and other accessories. Alternatively 7 filter presses each of 800 sq. ft. F.A.

(g) *Two Air Compressors.*—One of 250 cu. ft. per minute and the other 150 cu. ft. per minute compressing and delivering air at 10 lbs. per sq. inch gauge.

III. *EVAPORATION AND BOILING PLANT*

(a) One quadruple effect evaporator having a total heating surface of 16,000 sq. ft. with larger first two vessels for bleeding vapours to the juice heaters. The first body should be 5,000 sq. ft. H.S., second of 4,000 sq. ft. H.S. and the third and fourth body each of 3,500 sq. ft. H.S. The evaporator should be of standard type with vacuum working. There should be space for an additional body. Evaporator with 'sealed-downtake', Syphon and electric pump for condensate extraction, sight glasses in

condensate pipe to indicate flow of condensate. efficient design of save-all, colandria with 2 inch O.D. solid drawn brass tubes not more than 6 ft. in length, separate condenser. Evaporator staging to be about 16 ft. high, proper juice distribution complete with other fittings. Minimum thickness of M.S. Plate for body ½", Tube plate 7/8", and tubes (70/30 alloy) × 16 gauge. Save-all of centrifugal type.

(b) Continuous Sulphitation arrangement for syrup.

(c) Vacuum Pans—

(i) Three rapid boiling calandria type vacuum pans each of 1,500 sq. ft. H.S. and normal strike capacity of 35 tons of Massecuite. Solid drawn brass tubes (70/30 alloy) 4" O.D. × 14 gauge. Minimum thickness of mild steel plate for body ½", tube plate—7/8".

(ii) One graining pan of calandria type having a massecuite capacity of 15 tons and a heating surface 600 sq. ft. 8" dia. cutover piping with valves from Vacuum Pans to seed crystallizers.

(iii) One Seed Crystallizer of 500 cu. ft. gross capacity.

IV. *CONDENSATION PLANT*

(a) Condensers either five multi-jet of Schutte-Koerting type or barometric condensers 2 in number, one for the evaporator and the other for the plans. Mild steel plate for body ½" and tail pipe of cast iron.

(b) *Injection Water Pumps.*—Three multi-jet condensers with individual pumps of 90,000 gallons capacity per hour for each pan. One pump of 1.5 lac gallons per hour or two pumps each of 90,000 gallons per hour for evaporator condenser. The multi-jet condenser with pump of 40,000 gallons per hour for the graining pan.

If Barometric condensers, two injection water pumps each of 2.5 lac gallons per hour capacity against a head of 80 ft. coupled to slipering motors or squirrel cage motors of suitable design. The pumps should have impeller of gun metal and casting of cast iron. Necessary valves should be provided. Injection water piping should preferably be of cast iron.

(c) *Spray Pumps.*—Two centrifugal spray pumps capable of delivering 2.5 lakhs gallons per hour each against a head of 40 ft., directly coupled to slipring induction motor.

(d) *One dry Air Pump.*—Electric driven reciprocating type with 'Hoerbiger' valves of 2,500 cu. ft. air displacement per minute. This is required with barometric condensers only.

(e) Vapour piping of M.S. of minimum thickness of 3/8" with vapour velocity not to exceed 150 ft. per sec. from evaporator and pans to their respective condensers.

(f) One ejector booster capable of removing 1,000 cu, ft. of air in 5 minutes.

(g) 250 Chokeless type G.M. nozzles for spray pond.

V. *COOLING AND CURING PLANT*

(a) *Crystallizers.*

(i) Five 'U' shape mild steel crystallizers for high grade massecuites each with a gross capacity of 1,000 cu. ft. complete with stirring arrangement of helical type. Each crystallizer to be driven by an electric motor and reducing gear.

(ii) Six 'U' shape mild steel crystallizers each of 1,000 cu. ft. gross capacity. Each crystallizer to be driven by electric motors and reduction gears.

Mild steel plate for side plates of the crystallizers should be at least 3/8" thick and end plates 1/2" thick. The shaft carrying the stirrers should be 6" sq. The driving motor should be of 7.5 H.P. giving the stirrer speed of up to one R.P.M.

(b) *Centrifugal Machines.*—15 Centrifugal machines with basket size of 42" × 24" C foreworket machines will run at 1,500 R.P.M. and all other machines to run at 1,000 R.P.M. The machines are to be provided with mechanical discharger and fitted with process controller with a suitable timer. The machines to be provided with hand operated mosalles separation arrangement. All massecuites to be double cured.

3 C Foreworker Machines (4 to 8 charges per hour).

2 C Afterworker Machines (8 to 15 charges per hour).

2 B Foreworker Machines (10 to 15 charges per hour).

3 A Foreworker Machines (15 to 20 charges per hour).

4 A Afterworker Machines (7 to 12 charges per hour).

1 A Afterworker Machine (10 to 15 charges per hour).

The foreworker machines to discharge directly into the corresponding mixers of double paddles.

The motors should be of continuously rated high torque and double squirrel cage type suitable for the various time cycles.

Alternatively, a centrifugal station of equivalent capacity may be supplied.

VI. *POWER PLANT*

(a) *Boilers.*—Two boilers working at a pressure of 200 lbs. per sq. inch with 120°F superheat and feed water-temperature 180°F. The boilers should have the following ratings:—

Maximum continuous rating—35,000 lbs. steam per hour.

Half hour peak rating—40,000 lbs. steam per hour.

Boiler rating should be based on an evaporation of 5 lbs. per sq. ft. per hour.

The boilers to be provided with auxiliary fuel firing equipment—coal or oil. The steam generating plant should include economisers of sectional Header gilded tube type, superheaters and I.D. fan with draft control dampers. The boilers should be with straight tubes preferably of not less than 3" I.D. connected to the steam and the water drum with sufficient water holding capacity to meet fluctuations in load. The furnaces should be designed for firing bagasse with about 50% moisture with preheated air.

(b) *Boiler Feed Pumps.*—Two boiler feed pumps each of 16,000 gallons per hour capacity to work against 200 lbs. per sq. inch pressure. One of these pumps should be electric driven and other one steam driven of the 'Weir' type.

(c) *Electric Generators.*—One Turbo-generator set of 1,000/1,250 K.W. having 0.80 to 0.85 power factor with multi-stage turbine to suit the steam pressures. Corrected power factor should not be less than 0.75.

(d) *Diesel Generating set* of 150 K.W. for lighting of the factory and emergency power supply (to be delivered in the first consignment).

(e) Return type Bagasse Carrier.

VII. *MISCELLANEOUS*

(a) Four dock mechanically vibrated type sugar grader having a capacity of 8 to 10 tons sugar per hour. Screens to be specified on the basis of I.S.S. Grading. Screening area not less than 30 sq. ft.

(b) Rotary Lime Slaked having a dia. of 3 ft. × 12 ft. length.

(c) Two Milk of Lime storage tanks each of 6 ft. dia. × 6 ft. height with conical bottom and accessories.

(d) Two milk of lime pumps of plunger or centrifugal type.

(e) Two pre-determined balance weight type, capacity up to 150 kg. weighing scales for sugar bags.

(f) One surplus valve for exhaust steam between evaporator and vacuum pans of 12" size having 20,000 lbs. per hour capacity.

(g) One Continuous Sugar Melting equipment suitable for treating 2 to 4 tons of melt per hour.

(h) Molasses weighing scale of capacity 3 tons per hour.

VIII. *SPARE PARTS TO BE SUPPLIED ALONG WITH THE PLANT*

(a) Knife Bearing—Self aligning—one.

(b) 5% Chains of all types.

(c) 3 Finished roller shafts of interchangeable type.

(d) One set of big end and small end mill engine bearing.

(e) One set of mechanical lubricators for mill engines.

(f) One dozen sight glasses for lubricators.

(g) 5% Boiler Tubes of each size with minimum number of 5 tubes of each type.

(h) 5% tubes for juice heaters, evaporators and pans.

(i) Spare parts for running the turbo set for two seasons.

(j) Spares for Centrifugal machines:—

(i) Two sets of ball bearings for Centrifugal machines.

(ii) Three sets of buffers.

(iii) Brake lining—100 ft.

(iv) Copper liners—15 numbers.

(k) Three sets of tube cleaning equipments for boiler, juice heaters, evaporator and pans.

NOTES.—(1) Factory layout should be for gravity flow of massecuites from pans to crystallizers and centrifugals.

(2) Designs of continuous Sulphitation system for juice and syrup should be furnished.

(3) Lagging quotations should be given separately.

(4) Quote separately for weight bridges for wagons, trucks and bullock carts to be provided according to the arrangements for supply of cane. The bridges are to be steel-yard type and suitable for weighing cane loaded carts with bullocks yoked.

(a) *Sugar Machinery*.—For a typical 1,000-ton per day sugar machinery plant the following quantities of Grey Iron Castings, Steel Castings and Forgings will be required:

Total Steel Castings	120 Tons
Steel castings from 2 to 10 Tons	65 Tons
Total Grey Iron Castings	300 Tons
Total Forgings	70 Tons
Forgings from 1 ton to 5 tons	60 Tons

(N.B.—All weights are finished machined weights.)

APPENDIX 6

Broad list of imported raw materials, Components and finished equipments required for a 600-Ton per day Capacity Cement Plant.

(Approx. Rs. 45 lakhs)

(1) *MACHINED COMPONENTS FOR ONE ROTARY KILN*

(a) 5 Nos. Tyres.

(b) 5 Nos. Supporting Equipment including Bed Plates, with supporting bearing rollers, roller shafts, thrust discs, lubricating devices and thrust stations complete.

(c) 1 No. Gear Wheel.

(d) 1 No. Counter Shaft, bearing with housing and pinion.

(e) 1 No. Nose-ring of refractory steel.

(f) 1 No. 15 H.P. Gear Box for auxiliary drive with clutch.

(g) 1 No. 175 H.P. Triple Reduction Gear Box with coupling.

(h) 1 No. 175 H.P. Motor with starter and controlling and regulating gear.

(i) 1 No. 175 H.P. Motor with starter and control gear for exhaust fan.

(j) 2 Nos. 3.5 H.P. Motor Reducer Variators for Slurry Feeder with remote control with synchronising device.

(k) 1 No. Fluid Coupling for induced draft fan with remote control.

(2) *MACHINED COMPONENTS FOR RAW AND CEMENT MILLS*

(a) 4 Nos. End Castings.

(b) 4 Nos. Supporting bearings complete with lubricating devices.

(c) 2 Nos. Mill Tubes with flanges.

—1 No. — 2.8 m. dia. × 12.75 m. long.

—1 No. — 2.8 m. dia. × 13.5 m. long.

(d) 2 Nos. Girth Gear Wheels.

(e) 2 Nos. Counter Shafts, bearings with housings and pinions.

(f) 2 Nos. 1,500 H.P. Gear Boxes with couplings.

(g) 2 Nos. 1,500 H.P. Motors with starter & control gear.

(3) 4 Nos. Lubricating Pumps for the Seals of the Kilns and bearings for mills.

(4) Oil Firing Equipment with all necessary accessories such as Oil Pumps, Oil heaters, Valves, Burner, Filters, Regulators, Gauges etc. and with spares: 1 Set.

(5) *COMPONENTS FOR KILN CONTROL PANEL*

Including all instruments for indicating and recording temperature, pressure and speed.

(6) *COMPONENTS FOR ROTARY COOLER*

(a) 1 No. 70 HP Gear Box with Coupling.

(b) 1 No. Machined Inlet Ring—refractory steel.

(c) 1 No. Un-machined Girth Gear.

(d) 2 Nos. Tyres rough-machined.

(7) *FORGED STEEL BARS*

(a) 1. No. function 280×2,500 for Jaw Crusher Shaft.

(b) 1. No. function 280×2,050 for Cooler Drive Shafts.

(c) 2. Nos. function 280×2,900 for Roll Crusher shafts.

(8) *GEAR BLANKS*

(a) 2 Nos. 800 × 400 for Cooler Drive pinions.

(9) 1 No. 80 HP Gear Box with Couplings for clay wash mill.

(10) 1 No. 0.7 HP Motor Reducer variator for clay distributor.

(11) 1 No. 7.5 HP Motor Reducer Variator for coal feeder.

(12) 1 No. Cement Bag Packing Machine with four spouts.

(13) 350 Tonnes Boiler quality steel plates for kilns, (excepting hoods and gas chambers & coolers thickness 22 × 25 ×40 — 60 m.).

(14) 1 No. Fluid coupling for Primary Air Fans with remote control.

(15) Components for one 10 Tonne Grabbing Crane, excepting bridge structure but including crane motors, control gears and collectors grab, etc.

(16) Special Chains for bucket elevators.

function 18 mm pitch 63 mm

function 30 mm pitch 105 mm

(17) 2 Sets—Porus Tiles for 1 No. of 4,000 cubic metres capacity cement silo discharge, and silo bottoms and bulk cement discharge.

(18) *BALL AND ROLLER BEARINGS*

(a) Ball Bearings not exceeding 51 millimetre bore diameter for use exclusively with power driven machinery namely Rotary Air Locks, Belt Conveyors, Gypsum and Coal Feeders, Dust Filters and Screw-Conveyors etc., 12,50 Nos.

(b) Ball and Roller Bearings having more than 51 millimetre bore-diameter for use exclusively with power driven machinery namely Limestone Crushers, Counter Shaft Bearings for Mills, Kiln Counter Shaft Bearings, Slurry Basin Machinery, Slurry Feeder, Gypsum, Coal and Clinker Crushers and various Fans, etc..... 175 Nos.

(19) (a) 11 KV. Panel consisting of 5 circuit breakers 400 amps capacity complete with current transformers 3-phase potential transformers busbars, ammeters voltmeters with selector switches, trivector meters, KW meter, induction type overload relays, indicating lamps, etc. Panel completely assembled, wired and with suitable cable boxes.

(b) 2 Cubicles each with 2,500 amps capacity circuit breakers with overload relays, secondary wiring, cable boxes, ammeters, voltmeters with selector switches etc. All the HT & LT cubicles should be of the draw-out type.

APPENDIX 7

600 ton per day/wet process typical cement

I. *LIMESTONE CRUSHING DEPARTMENT*

(1) 1.8 M. × 10 M. Laminated Conveyer (1 No.).
(2) 56" × 42" Jaw Crusher (1 No.).
(3) 900 mm. × 40 M. Belt Conveyer (1 No.).
(4) Secondary Hammer Crusher 1,220 mm. × 2,500 mm. (1 No.).
(5) 800 mm. × 110 M. Belt Conveyer (1 No.).
(6) Throw Off carriage (1 No.).
(7) "Dracco" Dust Collector (1 No.).
(8) 10-ton hand operated crane (1 No.).
(9) 20-ton hand operated crane (1 No.).

II. *RAW MATERIAL GRINDING DEPARTMENT*

(1) 1,700 mm. dia. table feeder (2 Nos.).
(2) 9'—0" × 46'—0" open circuit tube mill (1 No.).
&
Grinding Media.

III. *SLURRY STORAGE AND TRANSPORT DEPARTMENT*

(1) Set of pipes and fittings for air agitation incl. valves for 6 silos. (1).
(2) Reciprocating air compressor 450 cfm. at 100 psi. (1).
(3) Set of mech. parts for 80' dia. slurry mixer (1).
(4) Rotary air compressor, 290 cfm. at 30 lbs. psi. (1).
(5) Centrifugal pumps for slurry (2 Nos.).

IV. *KILN DEPARTMENT*

(1) Rotary slurry scoop feeder (1).
(2) 3.83, 35 × 3, 8 × 148 M Rotary Kiln (1).
&
Auxiliary drive 30 h.p.
1,500 rpm. Diesel Engine (1).
(3) Fabricated dust chamber.
(4) Louvre Damper (1).
(5) Induced draught fan (1).
(6) Ductings (1).
(7) 841 Fuller Cooler (1).
(8) "Dracco" dust collector (1).
(9) 400 mm × 60 m Drag chain conveyer (1).
(10) 4'—6" × 2'—0" × 164 Bucket Elevator (2).
(11) Control panel for rotary kiln. Fuller Cooler and Coal Mill (1).
(12) 5 h.p. Motorised blower (1).

V. *COAL GRINDING DEPARTMENT*

(1) Reciprocating feeder (1).
(2) Coal Hammer Crusher (1 No.).
(3) 600 mm x 68 M. Belt Conveyer (1 No.).
(4) 1,500 mm dia. table feeder (1 No.).
(5) 9'—3" dia. air swept coal mill (1 No.) and grinding media.
(6) Grit Separator (1 No.).
(7) Multicone Cyclones with dampers (1 No.).
(8) Fine coal hopper (1 No.).
(9) Hopper level indicators (1 set).
(10) 400 mm x 7 M. Screw conveyer (1 No.).
(11) Circulating fan (1 No.).
(12) H.P. Fan for coal firing (1 No.).
(13) Rotary disc feeder (2 Nos.).
(14) Nominal length ducts, and chutes (1 set).

V. *OIL BURNING EQUIPMENT*

VI. *CEMENT GRINDING DEPARTMENT*

(a) *Gypsum Crushing & Handling Section.*
(1) Reciprocating feeder (1 No.).
(2) Gypsum Hammer Crusher (1 No.).
(3) 600 mm—18 M. Belt Conveyer (1 No.).
(4) 4'—0" x 1'—6" x 18 M. Bucket Elevator (1 No.).
(5) 600 mm x 123 M. Belt Conveyer (1 No.).

(b) *Cement Grinding Section.*
(1) 1,700 mm dia. table feeder (1 No.).
(2) 800 mm dia. Table feeder (1 No.).
(3) 9' x 46' open circuit tube mill (1 No.) and Grinding media.
(4) "Dracco" dust collector (1 No.).
(5) Fuller vane type feeder (1 No).
(6) Nominal length ducts & chute (1 set).

(c) *Cement Transport Section.*
(1) 7" type F.K. Pump (1 No.).
and Rotary Air Compressor.
(2) 2-Way Valve (Motor operated) (1 No.).

VII. *CEMENT STORAGE & PACKING PLANT DEPARTMENT*

(1) F.H. Fluidification system for silos (inclusive of blower).
(2) 300 mm x 26 M. Air Slide Conveyor (2 Nos).
(3) 2,000 x 800 mm x 20 M. Bucket Elevators (2 Nos.).
(4) 1,000 x 2,000 mm. vibrating screen (2 Nos.).
(5) "Dracco" dust collector (2 Nos.).
(6) 4-spout packing machine (2 Nos.).
(7) 700 mm Grate bar conveyor (2 Nos.).
(8) Bag Printing & Stitching Machine (1 each).
(9) M.S. Hopper and Chutes.

VIII. *GRAB CRANE*

(10) Tonnes 25 M. Grab Crane.

IX. *OTHER EQUIPMENTS*

(1) Gear Boxes & Couplings.

(2) Motors & Control Gears.

(3) Quarry equipments.

(a) 2½ cu. yd. diesel shovel—1 No.

Or.

1½ cu. yd. diesel shovel—2 Nos.

(b) 15 cy. yd. Rear during trucks —4 Nos.

(c) Halco Stonuick drills—2 Nos.

(d) Air Compressors (250 cfm at 100 psi)—3 Nos.

(e) Jack hammers—6 Nos.

(f) D-8 diesel caterpillar—1 No.

(g) 150 H.P. diesel shunting loco—1 No.

(4) Transformers (from 1 KVA to 6,000 KVA).

(5) Switchgear & sub-distribution boards.

(6) Cables.

(7) Labortary equipments.

NOTE.—For a typical 600 ton per day Cement Machinery Plant, the following quantities of Grey Iron Castings, Steel Castings and Forgings will be required:—

1. *Gray Iron Castings*:

Total approx. requirements: 225 Tons (Finished weight).

(a) Individual weights from 2 to 10 tons—25/30 tons.

2. *Steel Castings*:

(a) Carbon Steel Castings—300 tons (finished weight).

(i) Steel castings up to 2 tons—50 tons.

(ii) Steel castings from 2 to 10 tons—75 tons.

(iii) Steel castings from 10 to 25"—125 tons.

(iv) Girth Gears (max. weight/sector 7 tons).

(b) *Manganese Steel Castings (required unmachined)*.
Normal weight up to 1/4—150 tons.

(c) Alloy Steel Castings—1,015 tons.
Max. weight not exceeding 200 kgs.

3. Forgings (unmachined).

(a) Total requirement—25 tons.

(b) Up to 1/2 ton max. weight—10 tons.

(c) From 1/2 ton to 5 tons—15 tons.

APPENDIX 8

50 T/D Pulp and Paper Plant

Sl. No.	Particulars	Quantities	Specifications	Motors
	A. Bamboo Handling			
	(1) Raw bamboo treating Lines			
1.	Bamboo Conveyor	3	Horizontal belt conveyor 10 T/H cap. 500 mm width × 50 m length × 2 sets 500 mm width × 80 m. length	2-3 KW × 33 rpm. 1-5 KW × 33 rpm.
2.	Bamboo Conveyor	3	Inclined belt conveyor 10 T/H cap. 500 mm width × 25m length.	3-3 KW × 33 rpm.
3.	Bamboo Washer	3	Stationery friction type, 10 T/H cap.	3-3 KW × 50 rpm.
4.	Bamboo Conveyor	3	Horizontal belt conveyor 10 T/H cap. 500 mm width × 15 m length.	3-2 KW × 33 rpm.
5.	Bamboo Conveyor	3	Inclined belt conveyor 10 T/H cap. 500 mm width × 15 m length.	3-3 KW × 33 rpm.
6.	Chipper	6	Multiknife chipper, 5 T/H cap.	6-25 KW × 8 p.
7.	Cyclone	6	800 mm dia. × 1.4 m. height.	
	(2) Chip preparing and storing line			
1.	Chip Conveyor	1	Horizontal belt conveyor 150 m^3/H cap. 750 mm width × 40 m length.	1-5 KW × 100 rpm.

Sl. No.	Particulars	Quantities	Specifications	Motors
2.	Chip Screen . . .	2	Two deck vibrating Screen 75 m^3/H cap. × 2 screen size 1,530 mm width × 4,900 mm length.	2-7.5 KW × 4 p.
3.	Chip Conveyor . . .	1	Horizontal belt conveyor 150 m^3/H cap. 500 mm width × 10 m length.	1-2 KW × 100 rpm.
4.	Chip Conveyor . . .	1	Rodler type conveyor 150 m^3/H cap.	1-25 KW × 50 rpm.
5.	Chip Conveyor . . .	1	Horizontal belt conveyor 150 m^3/H cap. 500 mm . width × 13.5 m length.	1-2 KW × 100 rpm.
6.	Chip Sile	2	Vertical cylindrical type; made of concrete and reinforced plates.	
7.	Sliver Conveyor . . .	1	Horizontal belt conveyor, 45 m^3/H cap. 400 mm width × 8 m length.	1-1 KW × 100 rpm.
8.	Rechipper	2	Rotary cutter type 5 T/H × 2 cap.	2-30 KW × 8 p.
9.	Sliver conveyor . . .	1	Inclined belt conveyor, 45 m^3/H cap. 400 mm width × 9 m length.	1-2 KW × 100 rpm.
10.	Silver conveyor . . .	1	Inclined belt conveyor 45 m^3/H cap. 400 mm width × 15 m length.	1-2 KW × 100 rpm.
11.	Magnetic Separator . .	1	Conveyor pulley type, 400 mm dia. × 500 mm width 1.0 KW cap. with selenium rectifier.	

Sl. No.	Particulars	Quantities	Specifications	Motors
12.	Dust Collecting Device	1 set	Consists of: 1-Induced Fan 200 m^3/min. cap. × 200 mm W.C. head. 1 set—Duct and Dust Hopper 1 Dust cyclone 1.5 m dia. × 5.5 m height 1-Dust storage made of concrete. 2m × 2m 2m height.	1-15 KW × 6 p.
13.	Knife Grinder	1	Max. grinding length 2,040 mm grinding stone, 200 mm dia. × 100 mm width.	1-1.5 KW × 4 p. 1-2 KW × 4 p.
	(3) Chip Charging Line			
1.	Chip Feeder	2	270 m^3/H cap. table dia. 2.1m × 8 rpm.	2-5 KW × 33 rpm.
2.	Chip Conveyor	1	Horizontal belt conveyor, 270 m^3/H cap. 750 mm width × 18 m length.	1-3 KW × 100 rpm.
3.	Chip Conveyor	1	Inclined belt conveyor 270 m^3/H cap. 750 mm width × 48 m length.	1-7.5 KW × 100 rpm.
4.	Chip Conveyor	1	Horizontal belt conveyor 270 m^3/H cap. 750 mm width 7 m length.	1-2 KW × 100 rpm.
5.	Chip Conveyor	1	Horizontal belt conveyor; 270 m^3/H cap.	1-3 KW × 100 rpm.
6.	Magnetic Separator	1	Conveyor Pulley type, 1.5 KW cap. 500 mm dia. × 850 mm width.	
7.	Weighing Scale	1 set	Automatic continuous type Chip weighing and integrating meter cap. max. 80T/H.	

Sl. No.	Particulars	Quantities	Specifications	Motors
	(4) Auxiliary equipments			
1.	Fresh Water Pump . .	1	3.0 m³/min. cap. ×30 m head for bamboo washer & others.	1-25 KW×4 p.
2.	Pipes and Valves . .	1 set	..	
3.	Conveyor Frames . .	1 set	..	
4.	Chutes	1 set	Made of steel plate and reinforced shape steel.	
	B. COOKING			
1.	Digestor	3	Vertical stationary type, 75 m³/cap. 3.6 m dia. ×10.5 m height.	
2.	Tube Heater . . .	3	Vertical tubular type indirect heater. Heat transfer area. 85 m² 930 mm dia. ×4.8 m height (body).	
3.	Blow valve . . .	3	Hydraulic operating type ball valve 200 mm bore.	
4.	Blow Pipe	2 sets	200 mm bore.	
5.	White liquor tank . .	1	80 m³ cap. 4.45 m dia. ×.6 m height.	
6.	Black liquor tank . .	1	60 m³ cap. 4.45 m dia. × 4.5 m height.	
7.	Mixing Tank	1	70 . m³ . cap. 4.45 m dia ×5m height.	1-5 KW×33 rpm.
8.	Relief gas cyclone . .	1	950 mm dia. ×1.65 m height.	
9.	Relief gas condenser . .	1	Spiral plate type, 50 m² surface area.	
10.	Turpentine Separator . .	1	1.2 m dia. ×3.0 m height, with decanter.	

Sl. No.	Particulars	Quantities	Specfications	Motors
11.	Turpentine Storage Tank	1	2 m^3 cap. 1.4 m dia. × 1.5m height	
12.	Liquor Pit	1	1.2m × 2.0 m × 1.5 m height.	
13.	Blow Tank	1	Cylindrical barrel and conical bottom type storing cap. 390 m^3 6.6 m dia × 21.6 m total height.	1-20 KW × 6 p.
14.	Iron Trap	1	0.9 m dia. × 1.5 m height.	
15.	Blow gas cyclone	1	3.1 m dia. × 6.3 m height.	
16.	Blow Condenser	1	Vertical tubular type, 500 m^2 heat transfer area.	
17.	Hot Water Tank	1	250 m^3 cap. 6.6 m dia. × 7.5 m height.	
18.	Fresh Water Tank	1	Made of concrete 250 m^3 cap. 10 m × 5 m × 6 m height.	
19.	Pumps			
	(1) Black Liquor circulation pumps.	3	7.5 m^3/min. cap. × 25m head.	3-60 KW × 6 p.
	(2) Black Liquor Charging Pump.	1	2.5 m^3/min. cap. × 25 m head.	1-20 KW × 4 p.
	(3) Black Liquor Pump	1	0.3 m^3/min. cap. × 10 m head.	1-2 KW × 4 p.
	(4) High Press Pump	1	0.3 m^3/min. cap. × 130 m head.	1-20 KW × 2 p.
	(5) Cooling Water Pump	1	1.5 m^3/min. cap. × 20 m head.	1-10 KW × 4 p.
	(6) Cooling Water Pump	1	18 m^3/min. cap. × 23 m head.	1-110 KW × 6 p.
	(7) Hot Water Pump	1	1.4 m^3/min. cap. × 18 m head.	1-7.5 KW × 4 p.
	(8) Pulp Pump	2 (1 spare)	1.8 m^3/min. cap. × 18 m head.	2-15 KW × 4 p.
	(9) Fresh Water Pump	1	2.0 m^3/min. cap. × 20 m head.	1-12 KW × 4 p.

Sl. No. Particulars	Quantities	Specifications	Motors
20. Pipes and Valves:			
(1) Steam piping . . .	1 set	..	
(2) Liquor circulation piping .	1 set	..	
(3) Black liquor piping . .	1 set	..	
(4) Other piping . . .	1 set	..	
21. Instruments:			
(1) Program controller of cooking temperature	3 sets	..	
(2) Program controller of cooking pressure.	3 sets	..	
(3) Flow recorder of circulation Liquor.	3 sets	..	
(4) Flow recording integrator of steam.	3 sets	..	
(5) Pressure recorder of steam	1 set	..	
(6) Recording thermometer .	3 sets	..	
(7) Indicating Salt Meter .	1 set	..	
(8) Level indicating controller	2 sets	..	
(9) Pneumatic operating valve	2 sets	..	
(10) Temperature indicating controller.	2 sets	..	
(11) Level indicator of blow tank	1 set	..	
(12) Open Panel . . .	1 set	..	
(13) Air Compressor . .	1 set	Common use with washing plant 5.0 m^3/min. cap. × 7kg/cm^2/g press.	1-15 KW × 4 p.
C. WASHING			
1. Head Box	1	Opensquare type 1.5 m×0.6 m× 1.0 m height.	
2. Knot Screen . . .	2	1.0 m width × 1.5 m height.	2-5 KW × 4 p.

Sl. No.	Particulars	Quantities	Specifications	Motors
3.	Washer	1 set	3 (three) stage 3 (three) drum vacuum filter, 2.2 m dia. × 2.5 m width filter	3-7.5 KW × 6 p 2-12 KW × 150 rpm. 1-3 KW × 100 rpm.
4.	Filtrate Tank . . .	3	Made of Steel Plate 100 m^3 cap. 4.75 m dia. × 6 m. height.	
5.	Foam Tank . . .	1	Made of steel plate, 70 m^3 cap. 3.15 m dia. × 9 m height.	1-5 KW × 6 p.
6.	Pulp Conveyor . . .	1	Horizontal belt conveyor, 25 T/H cap. 600 mm width × 5.0 m length.	1-1 KW × 33 rpm.
7.	High density Chest . .	1	Vertical cylindrical type, 100 m^3 cap.	1-20 KW × 6 p.
8.	Ventilator	1	Natural draft type, 3.6 m width × 16 m length × 1 m height.	1-1 KW × 9 rpm.
9.	Knot Conveyor . . .	2	Screw type, 200 mm. dia. × 3.5 m length.	2-1 KW × 60 rpm.
10.	Knot Storage Tank . .	2	Made of wood, 1.5 m × 1.5 m × 1.5 m h. of filtrating type.	
11.	Pumps:			
	(1) Black Liquor Pump . .	1	0.8 m^3/min. cap. × 15 m. head.	1-5 KW × 4 p.
	(2) Black Liquor Pump . .	1	0.9 m^3/min. cap. × 35 m. head.	1-12 KW × 4 p.
	(3) Black Liquor Pump . .	1	3 m^3/min. cap. × 18 m head.	1-20 KW × 4 p.
	(4) Black Liquor Pump . .	2	4.5 m^3/min. cap. × 20 m head.	2-30 KW × 4 p.
	(5) Pulp Pump . . .		1.8 m^3/min. cap. × 15 m head.	1-10 KW × 4 p.

Sl. No.	Particulars	Quantities	Specifications	Motors
12.	Pipes and Valves:			
	(1) Black Liquor Piping	1 set	..	
	(2) Pulp Liquor Piping	1 set	..	
	(3) Pulp Water Piping and others	1 set	..	
13.	Instruments:			
	(1) Pulp Consistency Controller	1 set	..	1-0.4 KW×4 p.
	(2) Flow recording Integrator	3 sets	..	
	(3) Recording Thermometer	1 set	..	
	(4) Level Indicator	4 sets	..	
	(5) Level Indicator	1 set	..	
	(6) Open Panel	1 set	..	
	(7) Air Compressor	1 set	Common use with cooking plant.	
	D. Screening			
1.	Head Box	1	Made of wood 1.5 m.×1 m.×1.2m head.	
2.	Vibrating Rotary Screen	1	1.0 m. dia.×1.0 m width of drum, 0.35 mm. slit width of screen plate.	1-7.5 KW×4 p. 1-1.5 KW×4 p.
3.	Flow Box	1	Made of wood 1.5 m ×1m ×1.2 m height.	
4.	Flat Screen	4	Diaphragm type, screen plate, 305 mm width×1,090 mm length.	2-5.5 KW×6 p.
5.	Pulp Tank	1	Cylindrical type 50 m^3 cap.	1-15 KW×35 rpm.
6.	Decker Machine	2	900 mm dia.× 1,800 mm width of wire cylinder, made of brass spinders and brass wire cloth.	2-5 KW×60 rpm.

Sl. No.	Particulars	Quantities	Specifications	Motors
7.	Low density Chest . .	1	Horizontal type, 250 m^3 cap.	1-40 KW×8 p.
8.	White Water Tank . .	1	Made of concrete, 100 m^3 cap. 4 m ×6 m ×5m height.	
9.	Pumps:			
	(1) Pulp Pump . . .	1	7 m^3/min. cap.× 12 m head.	1-30 KW×6 p.
	(2) Pulp Pump . . .	1	1.3 m^3/min. cap. × 18 m head.	1-10 KW×4 p.
	(3) White Water Pump .	1	4.5 m^3/min. cap. × 20 m head.	1-25 KW×6 p.
	(4) White Water Pump .	1	0.5 m^3/min. cap. × 75 m head.	1-15 KW×2 p.
	(5) White Water Pump .	1	0.8 m^3/min. cap. ×25 m head.	1-7.5 KW×4 p.
	(6) Fresh Water Pump . .	1	0.5 m^3/min. cap. × 30 m head.	1-5.5 KW×2 p.
	(7) Fresh Water Pump .	1	2.0 m^3/min. cap. × 20 m head.	1-12 KW×4 p.
10.	Pipes and Valves . .	1 set		
	E. BLEACHING			
1.	Flow Box	1	Made of wood 0.8 m×1.2. m.× 1.2m height.	
2.	Chlorination Tower . .	1	Flange jointed cylindrical type, 2.85m. dia.×14.5 m total height.	2-15 KW 1-4 KW×33 rpm.
3.	Alkali Tower . . .	1	Flange jointed cylinder type, 1.75 m dia.× 11 m. height.	2-15 KW×6 p.
4.	Hypochlorite Tower . .	1	Flange jointed cylinder type, 2.85 m. dia.× 11m. total height.	2-15 KW×6 p.
5.	Acid Proof Filter . .	2	Rotary vacuum filter treating cap. 60 T/D (10% moisture).	2-3.7 KW×4 p. 2-1.5 KW×4 p. 2-2 KW×50 rpm.

Sl. No.	Particulars	Quantities	Specifications	Motors
6.	Alkali Filter . . .	1	Same as acid proof filters.	1-3.7 KW×4 p. 1-1.5 KW×4 p. 1-2 KW×50 rpm.
7.	Pulp Mixer . . .	2	Single shaft type, 450 mm/550 mm × 2.8 m. length, 200 rpm.	2-15 KW×6 p.
8.	Seal Box	3	Made of steel plate, 1.2 m dia. ×2.5 m height.	
9.	Hot Water Tank . .	1	Made of steel Plate, 30 m^3 cap. 2.85 m dia. × 5.5 m height.	
10.	Fresh Water Tank . .	1	Made of concrete, 50 m^3 cap. 3 m × 4 m × 5 m height.	
11.	Pumps:			
	(1) Pulp Pump . . .	1	1.8 m^3/min. cap. ×10 m head.	1-7.5 KW×4 p.
	(2) Pulp Pump . . .	1	1.8 m^3/min. cap. × 20 m head.	1-15 KW×4 p.
	(3) Pulp Pump . . .	1	1.8 m^3/min. cap. × 20 m head.	1-15 KW×4 p.
	(4) White Water Pump . .	1	3.0 m^3/min. cap. ×22 m head.	1-20 KW×4 p.
	(5) White Water Pump . .	1	3.7 m^3/min. cap. × 22 m head.	1-25 KW×4 p.
	(6) White Water pump . .	1	3.7 m^3/min. cap. × 22 m head.	125 KW×4 p.
	(7) Hot Water Pump . .	1	1.0 m^3/min. cap. × 22 m head.	1-7.5 KW×4 p.
	(8) Fresh Water Pump . .	1	2.0 m^3/min. cap. × 22 m head.	1-15 KW×4 p.
12.	Pipes and Valves:			
	(1) Pulp Piping . . .	1 set	For chlorine and hypochlorite line.	
	(2) Chlorine gas Piping . .	1 set	..	

Sl. No.	Particulars	Quantities	Specifications	Motors
	(3) Alkali Piping . . .	1 set	..	
	(4) Hypochlorite Piping .	1 set	..	
	(5) Other Piping . . .	1 set	..	
13.	Instruments:			
	(1) Pulp Consistency Controller	1 set	..	1-0.4 KW×4 p.
	(2) Flow meter . . .	3 sets	..	
	(3) Recording thermometer .	1 set	..	
	(4) P.H. Recorder . .	1 set	..	
	(5) Panel	1 set	..	
	(6) Air Compressor . .	1 set	Common use with cooking plant.	
	F. After Screening			
1.	Head Box	1	Made of wood 2 m ×1.5 m×1.5 m height.	
2.	Centricleaner . . .	33	..	
3.	Suction Tank . . .	3	Made of concrete and resin lining.	
4.	Decker Machine . .	2	900 mm dia.× 1,800 mm width of wire cylinder.	2-5 KW×60 rpm.
5.	Low density Chest . .	1	Horizontal type 250 m^3 cap.	1-40 KW×8 p.
6.	White Water Tank . .	1	Made of concrete 100 m^3 cap. 4 m ×6 m×5 m height.	
7.	Pumps:			
	(1) Pulp Pump . . .	1	10 m^3/min. cap. × 40 m head.	1-100 KW×4 p.
	(2) Pulp Pump . . .	1	2.2 m^3/min. cap. × 40 m head.	1-25 KW×4 p.
	(3) Pulp Pump . . .	1	0.6 m^3/min. cap. × 40 m head.	1-10 KW×2 p.
	(4) White Water Pump . .	1	11 m^3/min. cap.× 20 m head.	1-60 KW×6 p.

Sl. No.	Particulars	Quantities	Specifications	Motors
8.	Pipes and Valves :			
	(1) Pulp and White Water Piping	1 set	..	
	(2) Other piping . . .	1 set	..	
G.	STOCK PREPARING—2 *Treating Lines* (M/C for ONE TREATING LINE AS BELOW)			
1.	Receiving Chest	1	150 m^3 cap.	1-25 KW × 6 p.
2.	Stock Maker . . .	3	Conical type.	3-110 KW × 6 p.
3.	Mixing Box . . .	1	600 mm × 1,200 mm × 800 mm height, made of wood.	1-0.4 KW × 4 p.
4.	Intermediate Chest . .	1	Same as item 1.	1-25 KW × 6 p.
5.	High Speed Jordan . .	2	Sliding adjustable rotor.	2-75 KW × 6 p.
6.	Machine Chest . .	1	Same as item 1.	1-25 KW × 6 p.
7.	Pumps:			
	(1) Stock Pump . .	1	1.4 m^3/min. cap. × 28 m head.	1-15 KW × 4 p.
	(2) Stock Pump . . .	1	2.0 m^3/min. cap. × 15 m head.	1-2 KW × 4 p.
	(3) Stock Pump . .	1	2.0 m^3/min. cap. × 15 m head.	1-12 KW × 4 p.
8.	Pipes and Valves . .	1 set	..	
H.	LOAD AND SIZE PREPARING			
1.	Electric Hoist . . .	1	Low head hoist with chain drive trolley, 500 kg. cap. lift 6 m.	1-1.5 KW.
2.	Caustic Soda Tank . .	1	Made of steel plate, 4 m^3 cap. 1.58 m dia. × 2.5 m height.	
3.	Resin Dissolving Tank .	1	Made of steel plate, 2.8 m dia. × 3 m height.	1-10 KW × 150 rpm.

Sl. No.	Particulars	Quantities	Specifications	Motors
4.	Resin liquor storage . .	2	Made of steel plate, 15 m^3 cap. × 2.8 m dia. × 3 m height.	2-3 KW × 50 rpm.
5.	Alum Dissolving Tank .	1	Made of concrete and resin lining 2.0 m dia. × 2.0 m. height.	1-3 KW × 50 rpm.
6.	Slum Storage Tank . .	1	Made of concrete and resin lining, 15 m^3 cap. 3. 0 m dia. × 3 m height.	
7.	Clay Hopper . . .	1	Conical bottom vertical type, 4 m^3 cap. 1.5 m dia. × 3 m height, made of concrete.	
8.	Vibrating Screen . .	1	One step vibrating type 1.0 m width × 1.8 m length.	1-3 KW × 4 p.
9.	Clay Dissolver and Storage Tank.	2	Vertical cylindrical type, 20 m^3 cap.	2-10 KW × 150 rpm.
10.	Starch Dissolver . .	2	Made of steel plate, 5 m^3 cap. 1.9 m dia. × 2.0 m height.	2-3 KW × 50 rpm.
11.	Pumps:			
	(1) Resin Liquor Pump . .	1	0.1 m^3/min. cap. × 10 m head.	1-0.75 KW × 4 p.
	(2) Alum Liquor Pump .	1	0.1 m^3/min. cap. × 10 m. head.	1-1 KW × 4 p.
	(3) Clay Water Pump . .	1	0.1 m^3/min. cap. × 10 m head.	1-0.75 KW × 4 p.
	(4) Starch Pump . . .	1	0.1 m^3/min. cap. × 10 m head.	1-0.75 KW × 4 p.
12.	Flow Meter . . .	8 sets	..	
13.	Pipes and Valves . .	1 set	..	

Sl. No.	Particulars	Quantities	Specifications	Motors
	Paper Making—2 sets of machine (MACHINERY FOR 1 SET)			
1.	Mixing Box . . .	1	600 mm × 1,200 mm 800 mm height of wood.	
2.	Consistency Regulator .	1	Torque balance air transmitter type stock consistency recording controller.	1-0.4 KW × 4 p.
3.	Vortrap	11	Made of brass, 100 mm dia. × 1,00. mm length, 1st stage 9, 2nd stage 2.	
4.	Suction Tank . . .	2	Made of concrete and resin lining, 1st stage 50 m^3 cap., 2nd stage 20 m cap. with Float type level controllers.	
5.	Bird Screen . . .	2	1.25 m dia. × 2.5 m face width of screen slit, 0.5mm.	2-4 KW × 6p, 2-2.2 KW × 50 rpm. 2-0.1 KW × 4p.
6.	Stock Inlet:			
	(1) Flow Box . . .	1	Made of wood and copper plate lining.	2-0.5 KW × 50 rpm.
	(2) Slice	1	..	
7.	Wire Part	1 set	Quick wire changing type, wire size, 3,600 mm width × 24.5 m length, taper adjusting type.	1-3.5 KW × 6p.
	(1) Breast Roll . . .	1	Stainless steel roll, 560 mm dia. × 3,760 mm length.	
	(2) Formation Board . .	1	Light alloy body, with draw out rails.	

Sl. No.	Particulars	Quantities	Specifications	Motors
(3)	Table Roll . . .	23	Steel tube and abonite lined roll 200 mm dia. × 3,760 mm length.	
(4)	Wire Roll . . .	3	Steel tube and hard copper plating roll 318 mm dia. × 3,800 mm length.	
(5)	Guide Roll . . .	1	Same as wire roll	
(6)	Dookle Device . .	1	Made of brass.	
(7)	Suction Box . . .	7	Light alloy body with slid device 200 mm width × 3,600 mm suction length.	
(8)	Suction Couch Roll .	1	Perforated roll, of stainless steel, 810 mm dia. × 3,920 mm length.	
(9)	Lump breaker Roll . .	1	Steel tube and rubber lining roll, 335 mm. dia. × 3,600 mm length.	
(10)	Deflector . . .	12	Made of Brass.	
(11)	Dandy Roll . . .	2 (1 spare)	Made of brass 355 mm dia. × 3,650 mm length.	
(12)	Save all	1	Fabricated shape steel and brass plate.	
(13)	Doctor	1 set	For above all roll	
(14)	Shower Pipe . . .	1 set	..	
(15)	Antifoam Sprays . .	1	Made of brass tube, 70 mm dia. with sprays.	
(16)	Trimming jet device .	1	Double nozzle cutter, made of brass nozzles.	
(17)	Wire Stretch Device .	1 set	..	

Sl. No.	Particulars	Quantities	Specifications	Motors
(18)	Screw Conveyor .	1	..	1-3.5 KW × 150 rpm.
(19)	Wire Changing Device .	1	Quick change and draw out type, with necessary accessory for wire change.	1-1.5 KW × 150 rpm.
(20)	Shake Rail . . .	1	..	
(21)	Shaking Device . .	1	High Speed and adjustable type.	1-5.5 KW-DC (1350/450 rpm).
(22)	Frame and Stand . .	1 set	..	
(23)	Staging and Balustrad .	1 set	..	
8.	Press Part	1 set	Consists of 3(three) stages.	
(1)	No. 1 Press . . .	1 set	Suction type, 1-Top roll 610 mm dia. × 3,760 mm length 1-Bottom roll (Suction roll) 660 mm dia. × 3,860 mm length made of stainless steel/and rubber lining. 100 mm width × 3,600 mm suction length with spherical roller bearings.	
(2)	No. 2 Press . . .	1 set	1-Top roll 610-mm dia. × 3,760 mm length. 1-Bottom roll 660-mm dia. × 3,760 mm length made of cast iron and rubber lining with spherical roller bearings.	
(3)	No. 3 Press . . .	1 set	Same as No. 2 press.	
(4)	Felt Roll . . .	23 (1 spare)	280 mm dia. × 3,800 mm length.	

Sl. No.	Particulars	Quantities	Specifications	Motors
(5)	Worm Roll . . .	3	280 mm dia. × 3,800 mm length.	
(6)	Felt Guide . . .	3	Manual operation type.	
(7)	Felt Stretcher . . .	3	Manual operation type.	
(8)	Shower Pipe . . .	3	70 mm dia. × 4,000. mm length.	
(9)	Press roll lifting device .	1 set	..	
(10)	Pressing Device . .	1 set	Lever weight type	
(11)	Flet cleaner . . .	3	For each press	3-1.5 KW × 50 rpm.
(12)	Paper Carrying Device .	1	Compressed air jet type.	
(13)	Doctor	1	Made of brass plate	
(14)	Broke Conveyor . .	2	Screw Conveyor	2-0.75 KW × 33 rpm.
(15)	Sole plate and frame .	1 set	Made of cast iron	
(16)	Save all	1 set	Made of fabricated brass plate.	
(17)	Staging and Balustrad .	1 set	For Press part both side.	
(18)	Paper Roll . . .	1 set	..	
9.	Dry Part	1 set	Consists of 3 (three) groups: 1st Group 10-Paper dryer 4-Canvas Dryer 2nd Group: 8-Paper dryer 2- Canvas Dryer 3rd Group: 8- Paper Dryer.	
(1)	Smoother . . .	1 set	1-Top roll 560 mm. dia. × 3,650 mm length, of cast iron and rubber lining. 1-Bottom roll 610 mm dia. × 3,650 mm length.	

Sl. No.	Particulars	Quantities	Specifications	Motors
(2)	Paper Dryer . . .	26	1,520 mm dia. × 3,550 mm length.	
(3)	Canvas Dryer . . .	6	1,200 mm dia. × 3,600 mm length.	
(4)	Canvas Roll . . .	84	250 mm dia. × 4,050 mm length.	
(5)	Canvas Stretcher . .	6 sets	Manual and automatic operation type.	
(6)	Canvas Guide . .	6 sets	Manual and automatic operation type.	
(7)	Paper Carrier . . .	1 set	Rope, 16 mm dia. with automatic stretchers.	
(8)	Spring Paper Roll . .	1	265 mm dia. × 3,600 mm length.	
(9)	Sole Plate and Frame .	1 set	..	
(10)	Staging, Ladder and Balustard.	1 set	..	
10.	Sizing Press . . .	1 set	..	
(1)	Top Roll . . .	1	610 mm dia. × 3,650 mm length.	
(2)	Bottom roll . . .	1	Same as top roll	
(3)	Size liquor vat . .	1	Made of stainless steel plate, over flow type.	
(4)	Leading Roll . . .	1	250 mm dia. × 3,600 mm length.	
(5)	Spring Paper Roll . .	1	250 mm dia. × 3,600 mm length.	
(6)	Spray Pipe . . .	1	70 mm. dia. × 3,700 mm length.	
11.	Calendar	1	8 (eight) roll type, 3,500 mm face width, made of chilled steel.	

Sl. No.	Particulars	Quantities	Specifications	Motors
12.	Reel	1 set	Pope reel drum, 1,050 mm dia. × 3,500 mm length.	
13.	Driving Device . .	1 set	..	
14.	Ventilator	1 set	Forced draft type, made of steel plate, with 2-Axial Flow fan, 1000 m^3/min. × 400 mm Aq.	2-15 KW×6 P
15.	Drain Tank . . .	1	Made of Steel Plate, 2m^3 Cap. 1.1 m dia. × 2.4 m height.	
16.	Over head travelling crane .	1	Over head travelling crane with double rail hoist, cap. ST, 20 gauge distance, 10 m lift.	1-5.5 KW 1-2 KW 1-3 KW
17.	Pumps:			
	(1) Stock pump . . .	1	7 m^3/min. cap. × 25 m head.	1-50 KW× 6 P
	(2) Stock Pump . . .	1	2.1 m^3/min. cap. × 25m head to 2nd stage vortrap.	1-15 KW× 4 P
	(3) Stock Pump . . .	1	1.50 m^3/ min. cap. × 10 m head.	1-7.5 KW× 4 P
	(4) Fresh Water Pump . .	1	1.4 m^3/min. cap. × 54 m head.	1-20 KW× 4 P
	(5) White Water Pump . .	8	m^3/min. cap. × 15 m head.	1-40 KW× 6 P
	(6) Drain Pump . . .	1	0.8 m^3/min. cap. × 18 m head.	1-5 KW× 4 P
18.	Vacuum Pumps:			
	(1) Roots pump . . .	1	7.7 m^3/min. cap. × 400 mm Hg for suction box with drain pump, 1.3 m^3/min. cap. × 10 m head.	1-25 KW× 6 P 1-4 KW× 4 P (Vertical type)

Sl. No.	Particulars	Quantities	Specifications	Motors
	(2) Roots Pump . . .	2	14.5 m^3/min. cap. × 500 mm Hg, for suction couch with drain pump. 0.23m^3/min. cap. × 8m head.	2-50 KW× 6 P 1-0.75 KW× 4 P (Vertical type).
	(3) Roots Pump . . .	1	14.5 m^3/min. cap. × 500 mm Hg for No. 1 press with drain pump, 0.05 m^3/min. cap. 10 × m head.	1-50 KW× 6 P 1-0.5 KW× 4 P (Vertical type).
	(4) Nash Pump . . .	3	3.7 m^3/min. cap. × 400 mm Hg for felt cleaner.	3-20 KW× 6 P
19.	Compressor . . .	1	Vertical water cooling type air compressor for paper carrier, 5.5 m^3/min. cap. × 7 kg./cm^2 with air receiver, safety valve.	1-40 KW× 6 P
20.	Pipes and Valves . .	1 set		
J.	PAPER FINISHING—2 *Treating Lines* MACHINERY FOR ONE TREATING LINE			
1.	Winder & Unwinder . .	1	Machine width, 3,500 mm Winding speed, 550 m/min. max. winding dia.1,200 mm drum roll, 500 mm dia. × 3,500 mm length of a semi-steel.	1-40 KW VS 1-1.5 KW× 4 P
2.	Double Cutter . . .	1	Machine width, 3,500 mm.	1-15 KW× 4 P
3.	Lay boy	1	"	
4.	Weighing Scale . . .	1	2T Cap.	
5.	Baling Press . . .	1	Oil hydraulic type, table size, 800 mm × 1,600 mm max. table distance, 1.6 m press ram, 250 mm dia. × 450 mm stroke with plunger pump.	1-3 KW× 6 P

Sl. No.	Particulars	Quantities	Specifications	Motors
6.	Electric Hoist . . .	1	Low head electric hoist with chain drive trolley, 3T cap. Lift 6m.	1-5.5 KW
7.	Hydra Pulper . . .	1	Cap. 7 m³ 1.8 m tub dia.	1-30 KW × 6 P (Vertical type).
8.	Stock Pump . . .	1	1.1 m³/min. cap. × 10 m head.	1-5.5 KW × 4 P
9.	Pipes and Valves . .	1 set	..	
	K. Black Liquor Evaporating Plant			
1.	Thin Liquor storage tank .	2	150 m³ volume 5.7 m dia. × .6m height, made of steel plate.	
2.	Oxidization system:			
	Oxidization tower . .	1	2 m dia. × 4 m height.	
	Turbo-blower . . .	1	4,000 m³/h. cap. × 750 mm Aq.	1-30 KW × 2 P
	Cyclone	1	1.3 m dia. × 2 m height.	
	Foam tank . . .	1	200 m³ volume 6.5 dia. × 6 m height.	
	Foam Killer . . .	4	Vertical rotary type.	4-5.5 KW × 6 P (Vertical type).
3.	Evaporator . . .	1	Heating surface 400 m² heating chamber 2m dia. × 4.5 m height evaporating chamber 3 m dia. × 5 m height.	
4.	Evaporator . . .	3	Heating surface 400 m² heating chamber 2.3 m dia. × 4.5 m height evaporating chamber 3 m dia. × 5 m height.	
5.	Liquor Preheater . .	3	Vertical multi-tube type heating surface 30 m².	

Sl. No.	Particulars	Quantities	Specifications	Motors
6.	Soap separating tank . .	1	50 m^3 volume 2.5 m width × 3.5 m height × 8 m length.	1-3.7 KW×33 rpm.
7.	Soap tank	1	5 m^3 volume 1.7 m dia. × 2.1 m height.	
8.	Liquor Flash Tank . .	1	0.4 m dia.× 1.4 m height.	
9.	Thick Liquor Storage Tank .	1	50 m^3 volume 3.8 m dia.× 4.5 m height.	
10.	Surface Condenser . .	1	Horizontal multi-tube type Cooling surface 260 m^2 1.8 m dia.× 3 m length.	
11.	Barometric Condenser .	1	1.5 m dia.×4 m height.	
12.	Steam Ejector . . .	1	2 stage steam jet type.	
13.	Hot Water Tank . .	1	50 m^3 volume 3.2 m dia.× 3.8 m height.	
14.	Pumps:			
	(1) Thin Liquor Pump . .	2	50 t/h cap.× 15 m head.	2-5.5 KW× 4 P
	(2) Liquor feed pump . .	2	50 t/h cap. × 15 m head.	2-5.5 KW× 4 P
	(3) Medium Liquor pump (A)	2	32 t/h cap.× 20 m head.	2-5.5 KW× 4 P
	(4) Medium liquor pump (B)	2	32 t/h cap. × 30 m head.	2-5.5 KW× 4 P
	(5) Medium Liquor Pump (C)	2	22 t/h cap. × 20 m head.	2-3.7 KW× 4 P
	(6) Thick Liquor Pump .	2	Vertical type 10 t/h cap.× 20 m head.	2-3 KW× 4 P (Vertical type).
	(7) Drain pump for No. 1 evaporator.	2	Vertical type 11 t/h cap. × 20 m head.	2-2.2 KW× 2 P (Vertical type).

Sl. No.	Particulars	Quantities	Specifications	Motors
	(8) Drain pump for No. 4 evaporator.	2	Vertical type 28 t/h cap. × 20m head.	1-5.5 KW× 2 P (Vertical type).
	(9) Cooling water pump .	1	800 t/h cap. × 20 m head.	1-75 KW× 6 P
	(10) No. 1 evaporator circulating pump.	1	Axial flow type 4,000 t/h × 2 m head.	1-37 KW× 4 P
15.	Pipes and Valves . .	1 set	..	
16.	Gauges and Automatic Instruments.			
	(1) Level indicating controller		..	
	(2) Level indicating alarmer .		..	
	(3) Pressure indicating and recording controller for heating steam.		..	
	(4) Flow recording totalizer .		..	
	(5) Flow recording totaliser .		..	
	(6) Vacuum recording controller.		..	
	(7) Temperature indicating controller.			
	(8) Panel			
	L. Recovery Boiler Complete with All Auxiliary Equipments			
	M. Recasticizing			
1.	Liquor Storage Tank . .	4	150 m^3 cap. 6.5 m dia. × 5 m height.	
2.	Green liquor Heater . .	1	Heat transfer area, 20 m^2.	
3.	Green liquor Clarifier . .	1	Multi-compartment tray thickner 7.34 m dia. × × 3.67 m height.	1-0.75 KW × 33 rpm.
4.	Dregs Mixer . . .	1	1.83 m dia. × 1.53 m height.	1-2.5 KW × 6 P
5.	Dregs Washer . . .	1	Multi-compartment tray thickner, 4.27 m dia. × 2.44 m height.	1-0.75 KW × 33 rpm.

Sl. No.	Particulars	Quantities	Specifications	Motors
6.	Lime Slaker . . .	1	Dorr No. 6 type or Similar.	1-0.75 KW × 6 P
7.	Sump Tank . . .	2	1.8 m dia. × 1.8 m height.	
8.	Causticizer . . .	3	2.75 m dia. × 2.75 m height.	
9.	White liquor Clarifier .	1	Multi-compartment tray thickner 8.5 m dia. × 4.6 m height.	1-1.5 KW × 33 rpm.
10.	Lime mud washer . .	1	Multi-compartment tray thickner, 8.5 m dia. × 4.6 m height.	1-1.5 KW × 33 rpm.
11.	Lime mud storage tank .	1	3.6 m dia. × 4.3 m height of concrete.	1-1.5 KW × 33 rpm.
12.	Lime and Filter . . .	1	1.83 m dia. × 1.83 m face width of drum.	1-2.5 KW × 4 P 1-0.75 KW × 100 rpm.
13.	Filtrate Receiver . .	1	860 mm dia. × 1,600 mm height.	
14.	Condenser Scrubber . .	1	585 mm dia. × 2.74 m height.	
15.	Hot Water Heater . .	1	Heat Transfer area 25 m^2.	
16.	Hot Water Tank . .	1	Made of steel plate 25 m^3 vol. 3.0 m dia. × 3.6 m height.	
17.	Pumps:			
	(1) Diaphragm pump . .	3	..	
	(2) Diaphragm pump . .	2	..	
	(3) Filtrate pump . .	1	150L/min. cap. × 25 m head.	1-2.5 KW × 2 P
	(4) Slurry pump . .	3	520 L/min. cap. × 18 m head.	3-7.5 KW × 4 P
	(5) Green liquor pump . .	1	480 L/min. cap. × 15 m head.	1-5.5 KW × 4 P

Sl. No.	Particulars	Quantities	Specifications	Motors
(6)	Strong white liquor pump	1	600 L/min. cap. × 20 m head.	1-5.5 KW × 4 P
(7)	Week liquor pump . .	2	800 L/min. cap. × 20 m head.	2-7.5 KW × 4 P
(8)	Fresh water pump . .	1	600 L/min. cap. × 20 m head.	1-3.7 KW × 4 P
(9)	Hot Water Pump . .	1	400 L/min. cap. × 25 m head.	1-3.7 KW × 4 P
(10)	Booster Pump . .	1	Bore, 25 mm dia.	1-0.5 KW
18.	Vacuum Pump . . .	1	Nash type, 130 mm bore, 720 rpm.	1-30 KW × 6 P
19.	Air Compressor . . .	1	For blow off of lime mud with air receiver.	1-5.5 KW × 6 P
20.	Pipes and Valves . .	1 set	..	
21.	Instruments:			
(1)	Temperature recording controller.	2	For hot water temperature and green liquor temperature.	
(2)	Flow recording controller	2	For hot water and green liquor flow.	
(3)	Level indicating recorder .	4	For liquor storage tank.	
(4)	Recording thermometer .	1	6 (six) points recorder.	
(5)	Specific gravity recorder .	1	For strong white liquor.	
(6)	Flow recorder integrator .	2	For strong white liquor and weak liquor.	
(7)	Over load forecasting apparatus.	4	For thickener	
(8)	Panel	1	Open type .	
(9)	Air Compressor . .	1 set	For instruments with air receiver, drying apparatus, oil separator etc.	1-7.5 KW × 6 P

Sl. No.	Particulars	Quantities	Specifications	Motors
	N. Lime Sludge Recovering			
	(1) *Raw material conveying equipments*			
1.	Belt Conveyor . . .	1	Inclined belt conveyor, 3 T/H cap. 450 mm width × 15 m length.	1-2.2 KW×50 rpm.
2.	Impeller Breaker . .	1	1.38 mm length × 1.14 m width × 1.12 m height.	1-7.5 KW× 6 P
3.	Belt Conveyor . . .	1	Inclined belt conveyor, 3 T/H cap. 400 mm width × 8 m length.	1-2.2 KW× 50 rpm.
4.	Rod Mill . . .	1	3 T/H cap. in dry raw material, 900 mm dia. × 1.8 m length.	1-15 KW× 8 P
5.	Vibrating Screen . .	1	3 T/H cap. in screening to the fineness 90% passing through 20 mesh sieve.	1-4 KW× 4 P
6.	Belt Conveyor . . .	1	Inclined belt conveyor, 3 T/H cap. 400 mm width × 8 m length.	1-2.2 KW× 50 rpm.
7.	Bucket Elevator . . .	1	Totally enclosed type 3 T/H cap. 10 m lift.	1-2.2 KW× 50 rpm.
8.	Raw material Bin . .	1	Made of concrete 10 T cap. 2.3 m dia. × 2.8 m height.	..
9.	Screw Conveyor . .	1	5 T/H cap. in dry raw material, 200 mm dia. × 3.0 m length.	1-1.5 KW× 50 rpm.
10.	Screw Feeder . . .	1	6 T/H cap. in wet raw material, 250 mm dia. × 2.0 ml.	
11.	Double paddle Mixer . .	1	8 T/H cap. in wet raw material, 2-300 mm dia. × 3.5 m length.	1-7.5 KW× 4 P

Sl. No.	Particulars	Quantities	Specifications	Motors
12.	Screw Feeder . . .	1	4 T/H cap. of wet raw material, 250 mm dia. × 2.5 m length for feed to kiln.	1-1.5 KW × 50 rpm.
	(2) *Rotary kiln equipments*			
1.	Rotary kiln . . .	1	30 T cap. in CaO/24h, slurry moisture, 45% 2.1 m dia. × 35 m length.	1-25 KW × 8 P
2.	Kiln Hood . . .	1	..	
3.	Smoke Chamber . .	1	..	
4.	Measuring and Controlling Instruments.	1 set	..	
	(3) *Burning equipments*			
1.	Oil storage Tank . .	2	400 KL cap.	
2.	Oil heater	2	1,000 L/h cap.	
3.	Oil transportation pump .	2	2 m^3/H cap. × 5 kg/cm^2g head.	2-1.5 KW × 6 P
4.	Auxiliary oil Tank . .	2	10 KL cap.	
5.	Oil Heater . . .	1 set	1,000 L/h cap.	
6.	Oil Filter	1 set	1,000 L/h cap.	
7.	Oil Pump	1	1,000 L/h cap. × 10 kg/cm^2g head.	1-0.75 KW × 6 P
8.	Oil Burner . . .	1	..	
9.	Blast Fan	1	..	1-4 KW × 4 P
	(4) *Flash drying equipment*			
1.	Cage Mill	1	3 t/h cap. in wet raw material disintegration type.	1-12 KW × 8 P
2.	Drying Tube . . .	1	3 t/h cap. in wet raw material.	
3.	Cyclone Collector . .	2	..	2-0.5 KW × 50 rpm.
4.	Induced draft Fan. . .	1	900 m^3/min. cap.	1-40 KW × 2 P

Sl. No.	Particulars	Quantities	Specifications	Motors
(5)	Active Sillica dissolving Tank.	1	1.5 m^3 vol. 3.0m × 2.5m × 2.0m height.	
(6)	Active silica storage Tank.	1	2.1 m^3 vol. 3.0 m × 3.5 m × 2.0 m height.	
(7)	Accessory . . .	1set	..	6-2.5 KW × 4P
(8)	Chemical feed pump .	3	1 m^3/hr. cap. × 10m head.	3-¼ KW × 4P
6.	Rapid Sand Filter . .	8	..	
7.	Filtrate Water Pit . .	1	..	
8.	Back wash Pump . .	1	740 m^3/hr. cap. × 10 m head.	1-40 KW × 6P
9.	Feed water Pump . .	2	24 m^3/min. cap. × 25 m head.	2-150 KW × 6P
10.	Vacuum Pump . . .	1	..	1-2.2 KW × 4P
11.	Pipes and Valves—			
	(1) Chemical Feed Piping .	1 set	..	
	(2) Other Piping . . .	1 set	..	
12.	Instruments—			
	(1) Indicating area flow meter.	6	..	
	(2) Indicating flow meter .	2	..	
	(3) Indicating muddiness meter	1	..	
	(4) Portable PH Indicator .	1	..	
	(5) Flow indicating recorder. .	8	..	
	(6) Flow Controller. . .	8	..	
	(7) Panel	1	..	

NOTE:

(*C*) *Paper Machinery*

For a typical 50-ton per day Paper Machinery Plant, the following quantities of Gray Iron Castings, Steel Castings and Forgings will be required:—

Gray Iron Castings . . . Total weight—500 tons, of which max. weight of one piece may go up to 6 tons.

Steel Castings . . . . Total weight—50 tons. Maximum weight of 1 piece may go up to 1 ton.

Forgings . . . . Total weight—15 tons. Maximum weight of 1 piece may go up to 600 lbs.

APPENDIX 9

Boiler Industry

Sl. No.	Name of firm	Type of Boiler	Annual Capacity		Remarks
			No.	Value Rs. Lakhs.	
1.	Texmaco, Calcutta (Collaborator: Edwin Danks UK Combustion Engg. U.S.A.).	(*i*) Lancashire Cornish Economic Vertical.	50	30	Lancashire—Up to 250 lbs. sq. inch pressure—10,250 lbs./hour 212°F. Cornish—150 lbs./sq. inch. pressure 3,800 lbs./hr 212°F. Economic-225 lbs/sq.inch 24,000 lbs./hour 212°F. Vertical—100 lbs./sq. inch 250 to 9,000 lbs.hr.
		(*ii*) Water Tube	25	150	Water Tube—Up to 400 lbs./sq. inch & 75,000 lbs./hr. (in production.)
2.	Walchanagar Industries Distt: Poona. (Collaborator:Skoda).	Water Tube Boiler (Industrial)	6	36	Up to 400 lbs./sq. inch and 75,000 lbs./hour. (in production).
3.	K.C.P. Madras (Collaborator—Fives CAIL France)	Water Tube Boiler (Industrial)	6	36	Do.
4.	I.S.G. Yamunanagar Punjab (Collaborator:John Thompson UK).	(*i*) Water Tube Boiler (Industrial)	20	120	Up to 400 lbs./sq. in. pressure: 75,000 lbs. of steam/hour.
		(*ii*) Thermal Station Boiler	1	70	Up to 30 MW at present; 650 lbs./sq. inch (in production for Industrial boilers; ready to accept orders for thermal station boiler).

Sl. No.	Name of firm	Type of Boiler	Annual Capacity		Remarks
			No.	Value Rs. Lakhs.	
5.	A.B.V. Durgapur (Collaborator: Babcok & Wilcox, U.K.)	(*i*) Water Tube Boilers (Industrial)	18	108	For pressure up to 1,000 lbs./q. inch and capacity, 80,000 lbs./hour.
		(*ii*) Thermal Station Boilers.	..	750 at present 1,000 (by 1966/67)	Up to 120 MW at present. Bigger sizes up to 200 MW (or higher if required) (in production).
6.	Nestler Boilers, Bombay (Collaborator: Standard Kessel West Germany)	Package type Boilers and Baby Boilers.	..	25	250 to 9,000 lbs./hour.
7.	Structural Engg. Works, Bombay Collaborator:Cockran and Co. U.K.)	(*i*) Vertical Boiler (Industrial)	20	100	Vertical: 250 to 9,000 lbs./hour.
		(*ii*) Horizontal Boiler (Industrial)			Horizontal: 4,800 to 27,500 lbs. hour. (C.G. taken expected to go into production on by end of 1964).
8.	Karamchand Thaper and Bros., Calcutta. (Collaborator: Steinmuller, West Germany)	(*i*) Package type boiler (Industrial)		200	Package Boilers: up to 20 tons steam/hr. 250 lbs./steam per hour.
		(*ii*) Industrial Boilers.			
		(*iii*) Thermal Station Boilers.		70	Industrial: 20-70 tons steam/hr. 450 lbs./sq. inch Boilers. Thermal Station: Boilers up to 30MW may go up to 50 MW by 1970-71 (C.G. taken expected to go into production by end of 1965).

9.	National Steel Equipment Co., Bombay (Collaborator: Wanson Const. De Matehal Belgium).	Industrial Boiler.	..	15	150-5,000 lbs./hour., pressure from 75 lbs./sq. inch onward. (C.G. taken expected to go into production by end 1964).
10.	Industrial and Agricultural Engg. Co. Bombay (Collaborator: Siller and Jamar, West Germany).	Flue tube Boilers (Industrial).	..	12	15,000 kg./hour (C.G. recently cleared—accepted orders for boilers expected to go into production by end of 1964).
11.	Public Sector Project at Tiruchi, Madras (Collaborator:Technoexport, Czechoslovakia).	Thermal Station Boilers.	...	1800	Up to 660 tons of steam per hour—200 MWP lant to come into production by end of 1964 or early 1965. First two boilers have to be delivered by March 1966.

APPENDIX 10

Note on the development of the Indian Cement Industry

(Jointly by: Mr. E. B. Mogensen and Mr. G. R. Tongaonkar)

Production Targets during the Plan period:

The cement production capacity in India at the end of the 2nd Five-Year Plan was approximately 8.5 million tons per year.

The Planning Commission has fixed a target of 15 million tons per year for the capacity to be achieved by the end of the 3rd Five-Year Plan period, *i.e.*, by April 1966.

The targets for production capacity as proposed by the Perspective Division of the Planning Commission for the 4th and 5th Five Year Plan periods are as follows:—

By end of March 1971 ..... 26 million tons per year.

By end of March 1976 ..... 40 million tons per year.

In addition to the new plants or extensions it is assumed that a certain percentage of the existing capacity will become obsolete year by year and will, therefore, need to be replaced, and this figure is estimated at 4% corresponding to 340,000 tons per year during the 3rd Plan period, 600,000 tons per year by April 1966 and 1 million tons per year by April 1971.

In accordance with the above, the new capacity required to be installed in order to achieve the target capacities referred to above is as follows:—

3rd Five-Year Plan (April 1961/March 1966)	1.30+ 0.34=1.64,	say 1.6 million tons per year.
4th Five-Year Plan (April 1966/March 1971)	2.2+0.6=2.8	million tons per year.
5th Five-Year Plan (April 1971/March 1976)	2.8+1.04=3.84,	say 3.8 million tons per year.

Assuming that the new capacity is installed in units of 200,000 tons, corresponding to 600 tons per day, the above figures correspond to an average of 8, 14 and 19 units per year in the respective Plan periods.

Today the position is that 36 cement factories with a total rated capacity of 10 million tons are in operation and additional new units/extensions at a rated capacity of 2.5 million tons are under construction as indicated in the attached sheet.

In addition to the schemes actually in the process of being constructed, a great number of licences for new plants have been issued which may or may not materialise.

Factors hampering developments:

The targets for cement production mentioned above may in our opinion be termed rather ambitious and we believe that it may present some difficulties to reach them, and in the following we shall mention some of the factors which are likely to hamper the development of the Cement Industry.

Technical Difficulties:

(a) *Raw Materials.*—It is true that there are large limestone deposits in various parts of the country, and on an all India basis the resources may presumably be adequate to meet the demands in the forseeable future. There are, however, several difficulties in harnessing these deposits.

The manufacture of cement requires limestone with a certain minimum content of lime (CaO) and a maximum content of magnesia (MgO). Many of the limestone deposits do not fulfil these specific requirements and especially it may be noted that a large number of the deposits in the Northern and North Eastern part of India are marginal. Some of them can be used only after beneficiation (which means higher capital cost as well as higher production cost) and others will not be suitable even with this treatment.

The Geological reports available from official sources very seldom attach sufficient importance to the problem of quality and many promoters of new cement schemes do not realise how essential is this factor until at a late stage, thereby creating a wrong impression regarding the feasibility of the scheme.

(b) *Transport.*—Secondly, it is essential that the limestone deposits which are to be harnessed are within easy reach of the existing transportation systems, as otherwise the capital cost required to be incurred for connecting up the proposed new cement works with these systems as well as the transportation cost may be prohibitive. Many of the large limestone deposits on the South Coast of Saurashtra have for this reason remained unutilised.

Financial Difficulties:

A few essential facts regarding the cost of cement works may be noted.

First of all it is a fact that the capital cost per ton capacity varies a good deal with the total capacity and rises substantially if the installed capacity is small. Further the cost of an extension to an existing cement works will normally be appreciably lower than the cost of a complete new work with the same capacity.

The capital cost of a new 600 tons cement works may at present be estimated at approximately Rs. 3.5-4 crores, whereas further units may be installed at a capital outlay of Rs. 2-2.5 crores. The capital cost of the first unit of a new plant will therefore be Rs. 175/200 but is reduced to Rs. 137/162 for the extended plant. This again reduces the depreciation charges as well as overhead charges. For a 300 tons plant the capital cost may be Rs. 200-250 per ton which in most cases makes the plant unremunerative unless the retention price is suitably increased.

For a survey of this nature, the machinery can be conveniently split up into the following categories:—

	Rupees c.i.f. Rs. lakhs.	f.o.r. Rs. lakhs.
A. Imported Parts	50	60
(1) Large reduction gears		
(2) Large electrical motors, A.C. Commutator motors, and control gears.		
(3) Large size steel castings.		
(4) Forgings over 1 ton.		
(5) Boiler quality plates and normalised mild steel plates of thickness 1 5/8"-2 1/4" and over.		
(6) Alloy steel castings.		
(7) Special machinery (*e.g.* packing machine etc.)		
(8) Components of special design/material.		
B. Heavy Equipments Large grinding mills, heavy crushers, heavy kiln shell sections (under tyres), machined self-aligning bearings for kiln and mills etc.		10
C. Manganese: steel and steel castings of small and medium size		12
D. Light Equipment		54-58
E. Electrical Equipment . . .		14
		150-154
F. Miscellaneous items		16

A. *Imported Parts.*—The parts under this head are not being manufactured in India at present. There is, as far as we know, no project under actual implementation today which will meet the requirements of large size helical gear boxes required for cement as well as other industries. As regards large size electrical motors, it is hoped that Messrs. Heavy Electricals, Bhopal, may be able to deliver such motors in years to come. As regards large steel castings and heavy forgings, it was hoped that these would be available after the Ranchi Foundry Project goes into commission, but there are unconfirmed reports that this will be largely a captive project meant for satisfying the requirements of the Heavy Engineering Corporation. It is also hoped that the supply of Boiler quality plates and mild steel plates of 1-5/8"—3" thick from indigenous sources should be possible after some time.

B. *Heavy Equipment*.—The heavy equipment can be manufactured only in a few shops in India and the quantity thereof which can be manufactured is limited at present to about 6-8 plants per year. To increase this capacity the workshops of the licensed cement machinery manufacturers—or at least some of them—will have to be strengthened by provision of heavier machining and fabrication capacity and heavier cranage.

C. *Manganese steel and steel castings of small and medium size*.—Apart from the non-availability today of large size steel castings, the existing indigenous capacity for small and medium size steel castings and manganese steel castings is grossly inadequate for the growing needs of industry. One might hope that with the schemes which are understood to be under implementation, the position would be easier after some time.

D. *Light Equipment* (*e.g.*, light fabrication, grey iron and chilled white iron castings, conveying equipment etc.)

So far as light equipment is concerned, by and large the position in the country appears to be adequate at present for meeting the needs of the cement industry.

F. *Miscellaneous Items*.—Most of the miscellaneous items which include f.inst. grinding media, refractories, compressors (except certain large units), etc., can normally be obtained in India although delivery times are sometimes rather long.

Foreign Exchange Requirements:

The conclusion of the above is that the possibility for fulfilling the target by using indigenous manufacture to the largest possible extent has some relation to the amount of foreign exchange allocated for each scheme. Today the amount required for imported components may be put at Rs. 50 lakhs for a standard 600 tons plant and Rs. 45 lakhs for a 600 tons extension, but unless speedy measures are taken to increase the manufacturing capacity of the parts mentioned under (B) and (C) the present limitation of this capacity may create a bottleneck which can only be overcome by increasing the allocation of foreign exchange. This situation may, of course, improve in the future but will depend upon the speed of the developments of the workshop capacity in the country.

In connection with the question of foreign exchange we would like to put forward the following remarks:—

Not long ago the Government indicated that the foreign exchange allocation for a standard 600 tons plant including electrical equipment excluding quarry equipment, would be fixed at Rs. 50 lakhs c.i.f. Quite recently a figure of Rs. 45 lakhs has, however, been mentioned.

We would like to state that in our opinion it will not be possible in the situation as it is today to come through with an allocation of less than Rs. 50 lakhs for a new 600 tons plant and Rs. 45 lakhs for a 600 tons extension if the cement plant is to conform to modern standards in respect of economy and performance.

We would add that the requirement of foreign exchange for different types of plant differ considerably. In the dry process plant more machinery is normally required to be installed than in the wet process plant and extra allocations are necessary for some of this machinery, as for instance electrostatic dust precipitators. On the other hand,

this is to some extent compensated by a smaller tonnage of large size steel castings on account of a shorter kiln. Similarly, slag cement plants will require a special allocation on account of larger grinding and packing capacity and the necessary slag preparation plant.

Finally, the requirement of foreign exchange will be different for plants with a capacity other than the standard capacity of 600 tons and might vary with the source of the foreign exchange as the price levels in the various countries are varying.

The allocation of foreign exchange for import can obviously be reduced as soon as the manufacturing capacity for the components mentioned under (A) become available in India but not before.

In connection with the allocation of foreign exchange we would mention that it might contribute substantially to the speedier implementation of new cement schemes if the indigenous machinery manufacturer is given a blanket bulk licence (within the fixed ceiling for the plant) for the imported components with reasonable freedom to choose and order these components from the country of his own choice.

Possibility for reaching the Target figures:

In the above we have noted some of the factors which will be decisive for the fulfilment of the targets of cement production and whether or not the fixed targets can be reached will depend to a large extent on whether the difficulties mentioned above can be removed or whether they will persist.

So far as the Third Plan is concerned it can be seen from the enclosure that the capacity figure which can be expected by end of March 1966 will be in the vicinity of 12½-13 million tons which will fall short of the target by 2-2½ million tons.

It will, further, appear from the above that unless the more important difficulties mentioned in this note are removed it may be extremely difficult, if not impossible, to reach the targets fixed for the 4th and 5th Five-Year Plan and in the present stage of development these targets appear to us to be unrealistic.

Bombay, the 8th day of January, 1964.

(Sd.) G. R. TONGAONKAR.
(Sd.) Erik B. MOGENSEN.

Cement Industry in India

Works Capacities as per 1-1-1964

(White Cement capacity is not included. The figures for capacity have been reduced to multiples of 10,000 tons).

Works	Capacity in lakh tons
A.C.C.Banmor	0.6
Bhupendra	4.0
Chaibasa	4.9
Dwarka	2.2
Khalari	1.0
Kistna	2.6
Kymore	5.8
Lakheri	3.7
Madukkarai	2.8
Mancherial	3.3
Porbandar	(White Cement)
Sevalia	2.0
Shahabad	5.7
Sindri	3.0
	41.6
Andhra Cement Co., Vijayawada	2.0
Ashoka Cement Co., Dalmianagar	2.5
Bagalkot Cement Co., Bagalkot	2.0
Birla Jute M. Co. Satna	2.5
Dalmia Dadri Dadri	2.4
Dalmia Cement (B) Dalmiapuram	4.1
Shree Digvijay Sikka	6.3
India Cements Talaiythu	4.8
India Cements Sankari	2.0
Jaipur Udyog Swami Modhopur	8.1
Kalyanpur Banjari	1.5
K.C.P. Macherla	2.5
Madras Cements Tulukkapatti	1.8
Mysore Iron and Steel, Bhadravati	0.8
Orissa Cement Rajgangpur	3.7
Rohtas Industries Dalmianagar	3.3
Panyam L. & Cem. Bugganipalli	0.6
Saurashtra Cement Ranavav	2.0
Sone Valley Japla	2.0
U.P. Govt., Churk	2.3
Mysore Cements Ltd. Ammasandra	1.0
Travancore Cements Kottayam	0.5
	58.7
GRAND TOTAL	100.3

Works	Capacity in lakh tons
Works under construction which may be completed by 1st April 1966	
A.C.C. Jamul Works.	5.4
Dwarka Extension	1.2
New Porbandar	1.7
Panyam C. & L. Co. Extension	1.3
Birla Jute M. Co., Satna Extension	3.3
Mysore Cements Extension	1.1
Orissa Development, Hirakud Works . . .	4.0
Birla Jute M. Co., Chittorgarh Works. . . .	2.0
India Cements, Sankari Ext.	2.0
Saurashtra Cement, Ranavav Ext.	3.3
	25.3
Total installed capacity 1-4-1966 . . .	125.6

We have only taken into consideration schemes, the construction of which, according to our information, has already started. It may be that a few more schemes for which foreign exchange have been allotted can be completed within the period under review, in which case the total installed capacity may be slightly higher than stated above.