

FOURTH FIVE YEAR PLAN

REPORT OF THE WORKING GROUP ON
MINING AND DRILLING
EQUIPMENT

DECEMBER 1964

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WORKING GROUP ON MACHINERY INDUSTRIES

PLANNING COMMISSION

FOURTH PLAN—PLANNING GROUP ON MACHINERY INDUSTRIES—WORKING GROUP ON MINING AND DRILLING EQUIPMENT

Pursuant to the decision taken by the Planning Group for Machinery Industries, the Working Group for Mining and Drilling Equipment was formed to report on the equipment required for Mining, drilling and other equipment for coal, mineral ore and oil industries including beneficiation of ores and coal preparation and washing. The Working Group comprised of—

1. Shri A. L. Lahiri, General Manager, Coal Mining Machinery Project, Durgapur (W. Bengal)—*Chairman*
2. Shri S. N. Sahgal, Coal Mining Adviser, Ministry of Steel and Mines, New Delhi.
3. Shri V. P. Sondhi, Chief Geologist and Director of Drilling, National Coal Development Corporation, Ranchi.
4. Shri C. G. Sarkar, S.S.O. (Gr. I), Central Fuel Research Institute, P.O. Jeologra, Dhanbad, (Bihar).

Alternate

5. Shri S. K. Majumdar, S.S.O. (Gr. I), Central Fuel Research Institute, P.O. Jealgora, Dhanbad, (Bihar).
6. Shri A. C. Bose, Chief Engineer, Indian Bureau of Mines, Nagpur.
7. Shri Ram Chander, Officer on Special Duty, National Mineral Development Corporation, New Delhi.
8. Shri Pran Parshad, Bird and Co., Calcutta.
9. Shri N. Krishnaswami, Chief Planning and Development Officer, Heavy Engineering Corporation, Ranchi.
10. Shri S. K. Sinha, Industrial Adviser, Dte. General of Technical Development, Udyog Bhavan, New Delhi.
11. Shri L. S. Gupta, Officer on Special Duty, Oil and Natural Gas Commission, 'P' Block, New Delhi.
12. Dr. B. N. Bhargava, O.S.D., Department of Heavy Engineering, New Delhi.

13. Shri V. Kalyanasundaram, Director (Minerals), Planning Commission, New Delhi.
14. Dr. D. Swarup, Chief (Industry), Planning Commission, New Delhi.
15. Shri Hari Bhushan, Director (Engineering), Planning Commission, New Delhi—*Member Secretary*.

2. The general terms of reference of this Working Group were:—

- (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, in so far 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 programmes 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 utilization 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.

3. The Working Group considered the various aspects of this problem and met on number of occasions between October 1963 to November, 1964. The Report of the Working Group is enclosed for the consideration of the Planning Group for Machinery Industries and the Department of Heavy Engineering.

for (A. L. LAHIRI)

Chairman

26-12-64.

REPORT ON COAL MINING AND DRILLING EQUIPMENT

Coal Target

At the time of submitting the interim report, the Working Group on Mining and Drilling Equipment did not have available with it reliable estimates of production targets of coal as those were under examination. Estimates of production target for the Third and of the Fourth Plan have now been made available by the Coal Controller along with the break-up of production between N.C.D.C., Singreni and private sector coleries. A break-up, according to the method of mining and secondly within the underground mining by development and depillering have also been given. These details are attached in Annexure I. Briefly, these details for the end of the Third and Fourth Plans are given and summarised below:—

	1965-66	1970-71	Increase in Prod.
(Million Tons)			
<hr/>			
<i>Target</i>			
N. C. D. C.	13.78	66.15	52.37
Singreni	5.50	10.50	5.00
Private Sector	64.72	73.79	9.07
TOTAL.	<hr/> 84.00	150.44	66.44
<hr/>			
<i>Breakdown of production</i>			
Opencast	18.08	29.05	10.97
<i>Underground</i>			
(a) Development	35.32	53.32	18.00
(b) Depillering	30.60	68.07	37.47
TOTAL	<hr/> 65.92	121.39	55.47
<hr/>			

The Working Group was given to understand that the target of production according to present indication may not exceed 130 to 140 million tonnes by the end of the Fourth Plan. As it takes a very long time to develop mining capacity it was felt that to achieve this production a substantially larger capacity would be required and for the purpose of planning machinery requirements it was decided that capacity should be created for 150 million tonnes of production of coal by the end of the Fourth Plan. For a perspective of the requirement, it was assumed that by 1975-76 the demand for coal may be of the order of 200 million tonnes. Subsequently information has been made available that the target of production for 1970-71 has been further reduced to 136.00 million tonnes.

Its break-up between N.C.D.C., Singreni and private sector as well as between opencast and underground (separately for development and depillering) is stated below:-

	Output (million tonnes)	
	1965-66	1970-71
<i>Name of the Sector</i>		
N. C. D. C.	14.08	50.04
Singreni	4.10	9.47
Private Sector	57.80	76.49
	<hr/> 75.98	<hr/> 136.00
<i>Method of Mining</i>		
Opencast	15.50	26.00
<i>Underground</i>		
(a) Development	32.00	49.50
(b) Depillering	28.48	60.50
	<hr/> 60.48	<hr/> 110.00

Since this would not affect materially the capacity target of 150 million tonnes by 1970-71 assumed by the Working Group and since the requirements of machinery and investments would be related to capacity the Working Group has retained the figures of the requirement of machinery etc. worked on the basis indicated earlier. However, if there is any further significant reduction in coal target the requirement of machinery would further go down.

Output per Man Shift

The Coal Controller has furnished the average output per man shift (OMS) in the coal industry in our country. This is given below:

Year	OMS (tonnes)
1951 ..	0.35
1961 ..	0.48
1962 ..	0.48
1963 ..	0.51
1964 ..	0.54
1965 ..	0.57
1966 ..	0.60
1967 ..	0.64
1968 ..	0.68
1969 ..	0.72
1970 ..	0.76
1971 ..	0.80

It will be seen that an average rate of increase in the OMS for 1951 to 1961 was at the level of about 0.013 tonne per year. It is now intended to be stepped up to 0.03 tonne per annum

during the 4 years from 1962-1966 and further increased to 0.04 tonne per annum thereafter till the end of the Fourth Plan. The increase in OMS is intended to be achieved by (a) greater mechanisation, and (b) to some extent also by improving on the performance of existing plant and machinery. The increased OMS of 0.80 tonne envisaged in 1971 is still low compared to countries like U.K., West Germany, Poland, France who have achieved an OMS of 1.84, 2.00, 1.54 and 1.34 tonnes respectively. The Working Group felt that it would be desirable to attempt a better OMS than envisaged above particularly since the mining conditions in our country as pointed out by CMA are stated to be more favourable and that it would be difficult to offset the rising cost of labour and material without resorting to greater mechanisation. It was considered that even from the point of view of the hazards to which mining labour is subjected it would be desirable to reduce it to the minimum. However, taking into account the limiting factors that (a) introduction of a more quickened pace of mechanisation may not be absorbed particularly in the existing mines in the private sector which would be responsible for over 50% of the output from underground mining even at the end of the Fourth Plan, (b) any large scale retrenchment of labour has to be avoided, and (c) the resources required for greater mechanisation would be too high it was felt that OMS as suggested by the Coal Controller would be practicable and may be accepted for the purpose of planning during the Fourth Plan. It would be seen from the later discussions that there would be an excess of capacity for underground coal mining machinery over its requirement by 1970-71. To the extent the industry can afford greater mechanisation for improvement of OMS, plant and machinery from indigenous sources would be available to it.

Estimates of demand

Underground Coal Mining Machinery

The trend in the use of machinery in coal mines would be apparent from the following table:—

Year	coal cutting machines		Mechanical Loaders		Mechanical Conveyors	
	No. in use	Quantity of coal cut	No. in use	Quantity of coal loaded	No. in use	Quantity of coal conveyed
		(M. tonnes)		(M. tonnes)		(M. Tonnes)
1959	510	11.96	5	0.44	73	1.51
1960	582	14.12	11	0.61	93	2.73
1961	626	14.94	17	0.91	112	4.23
1962	696	17.16	16	0.73	135	4.80
1963	742	18.79	17	0.70	153	6.05

It is apparent from the above that our progress towards mechanisation has been slow and the number of various items of machinery in use at the end of the Third Plan would be much smaller than what was envisaged earlier. This has been taken into consideration for assessing the replacement demand. The details of demand as worked out by the Coal Controller on the basis of the above assumptions with a break-up between NCDC, Singareni and Private Sector and between original demand and replacement demand have been shown.

These are summarised in the following pages. The estimated total machinery required in 1970-71 for underground coal mining including replacement requirements adds up to 31,000 tonnes. Excluding electrical items namely transformers, electric motors, switch gear and gate-end boxes the demand was placed at around 30,000 tonnes.

The Working Group felt that estimating the requirements of machinery on the basis of 1000 tonnes for every million tonne of coal currently in production could not be relied upon and would lead to an unrealistic assessment of machinery requirements.

The table below gives an estimate of coal mining machinery required per million tonne of coal from fully mechanised mining based on the project reports recently furnished by foreign experts. This is on the basis of fully mechanised mining.

Project	Target output (Million tonnes)	Total weight of equipment including steel frames (tonnes)	Weight of Machinery required per million tonne (tonne)
Surkchan (Russian)	1.00	3,485	3,485
Banki (Russian)	0.50	1,608	3,216
Sudamdih (Poles)	1.8	9,000	5,000

On the basis of the above estimates also the Working Group came to the conclusion that for stepping the production at the rate of about 8 to 10 million (the rate of development of underground coal mining during the Fourth and Fifth Plan periods) tonnes per annum during the Fourth Plan, the additional demand will be of the order of 30,000 to 32,000 tonnes of machinery per annum.

*Statement showing the year-wise requirement of Mining Machinery & Equipment for the Coal Mining Industry
(Private & Public Sector) from 1964-65 to 1970-71*

Sl. No.	Description of Machinery	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	Average of the one unit	Maximum yearly tonnage machinery required by 1970-71	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
FOR UNDERGROUND MINING											
1.	(a) Coal Cutting Machines	187	239	340	375	400	425	449	3.5 tonnes	1572	
	(b) Gate end boxes for above	204	274	427	441	455	470	485	0.28 "	145	∞
2.	(a) Cutter Loaders/Shearers/Continuous Miners	11	7	10	12	12	16	18	20 "	360	
	(b) Gate end Boxes for above	11	25	10	12	12	16	18	0.28 "	5	
3.	(a) Rotary Electric Drill	654	765	987	1089	1179	1279	1383	20 Kg.	28	
	(b) Drill Panels (Transformers)	462	558	736	777	823	883	935	65.00 Kg.	61	
4.	(a) Mechanical Loaders	6	9	16	19	20	21	22	7.00 tonnes	154	
	(b) Gate End Boxes for above	5	8	16	18	19	19	20	0.28 "	5	
5.	Conveyors—										
	(a) Chain	70	74	148	160	172	184	198	26 (50 HP, 120 meters)	5148	

	(b) Belt	34	39	74	81	87	94	99	28	tonnes (50 HP, 200 meters)	2772
	(c) Gate end Boxes for face conveyors	66	68	137	142	148	154	161	0.28	tonnes	48
6	Haulages (a) Direct	124	129	173	180	188	196	204	5.6	"	1142
	(b) Endless	84	88	73	76	79	82	86	5.05	" (Average 50 HP)	434
7.	Locomotives	16	17	45	45	45	45	45	10	"	450
8.	Shuttlecard	25	25	30	30	30	30	30	12	"	360
9.	Mine Care	306	327	985	1136	1287	1438	1589	1.5	"	2384
10.	Cages	248	242	278	288	298	306	314	2.0	"	628
11.	Cage Keps	136	127	160	165	167	173	177	0.75	"	132
12.	Cage Suspension Gear Complete	136	127	160	165	169	173	177	0.7	"	124
13.	Mechanical Ventilators										
	(a) Main fans	5	13	58	58	58	58	58	50	tonnes (including evasec etc.)	2900
	(b) Dooster Fans	40	33	58	58	58	58	58	3	tonnes	174
	(c) Auxiliary Fans	115	115	174	174	174	174	174	0.5	"	88

1	2	3	4	5	6	7	8	9	10	11	12
14.	Pumps—										
	(a) Main Pumps . . .	180	187	216	223	231	238	246	3	„	738
	(b) Intermediate Pumps . . .	267	278	317	330	343	355	367	1	„	367
	(c) Face Pumps . . .	651	678	763	800	837	873	909	0.5	„	455
	(d) Sand Pumps . . .	9	18	20	20	21	23	31	2	„	62
15.	Winders	6	6	8	8	8	10	10	55	„	550
16.	(a) Compressors	58	62	117	126	135	144	153	33	„	460
	(b) Rock Drill	174	186	351	378	406	433	462	25	Kg.	12
17.	Steel Supports	10680	11580	20100	21800	23400	25200	26900	45	Mg. for 2 meter length props. 55 Kg. for 5 meter bars.	1317
18.	Prop withdrawers	380	388	499	528	561	594	629	10	Kg.	7
19.	Ball Mills	66	18	22	22	23	23	24	10	tonnes	240
20.	Screening Plant	3+3(s)	4+4(s)	9+8(s)	10+9(s)	10+9(s)	10+9(s)	10+9(s)	200	„	2750 (S) denotes small screening plants.

21.	(a) Cranes	9	10	13	13	14	14	14	20	tonnes	280
	(b) Winches	161	183	239	250	277	288	299	2	„	600
	(c) Pulley Blocks	125	143	185	194	213	221	228	0.3	„	68
22.	•Transformers—										
	(a) H.T. Power Transformers	33	38	45	50	60	65	65	12	„	790
	(b) Mining Type Transformers	65	85	118	118	118	118	118	5	„	590
	(c) Industrial Transformers .	65	85	118	118	118	118	118	4	„	472
	(d) Lighting transformers .	142	117	295	295	295	295	295	0.75	„	222
23.	Electric Motors—										
	(a) Flame Proof	110	135	175	200	240	240	250	1	„	250
	(b) Open Type	125	180	225	320	350	350	350	0.75	„	265
24.	Switch Gear—										
	(a) H.T. (Oil immersed) .	254	263	435	455	477	497	519	1	„	519
	(b) L.T.	395	409	667	694	721	747	774	0.5	„	387
	(c) Airbreak Circuit Breakers	529	548	892	927	963	998	1035	0.5	„	518
25.	Exploders	462	558	736	777	833	883	935	3	Kg.	3

Total Underground Machinery required by 1970-71

31,046 tonnes

Existing Capacity—(i) Durgapur Coal Mining Machinery Project.

The Durgapur Coal Mining Machinery Plant when in full production will produce the following items according to the DPR:—

Description	Quantity	Weight in Tons
Coal Cutters	600 Pcs	1,704
Loaders	250 Pcs	1,371
Conveyors	1,800 Pcs	2,487
Trolley, Battery and other types of Locomotives	150 Pcs	1,300
Haulages	400 Pcs	3,804
Main Axial Fans	100 Pcs	1,154
Electric Winders	25 Pcs	1,167
Booster Fans	250 Pcs	50
Centrifugal pumps	500 Pcs	998
Sand Pups	300 Pcs	550
Automatic Cage-Keps and safety hooks, etc.	..	2,000
Light Drill Rigs	25 Pcs	28
Spare parts . . . . .	..	8,387
	TOTAL	45,000

However, the Working Group was given to understand that this programme of manufacturing is subject to adjustment according to the quantum and nature of demand. The production of items either already planned for manufacture at Durgapur plant or which could be conveniently taken up for manufacture total up to about 23,000 tonnes as per details given below based on the norms available at present:—

	Tonnage
Coal Cutting Machines	1572
Cutter Loaders/Shearers/Continuous Miners	360
Mechanical Loaders	154
Conveyors (a) Chain	5148
(b) Belt	2772
Haulages (a) Direct	1142
(b) Endless	434
Locomotives	450
Shuttlecars	360
Mine Cars	2384
Cages	628
Cage Keps	132

Cage Suspension Gear Complete Mechanical Ventilators—	Tonnage 124
(a) Main Fans	2900
(b) Booster Fans	174
(c) Auxiliary Pumps	88
Pumps—	
(a) Main Pumps	738
(b) Intermediate Pumps	367
(c) Face Pumps	455
(d) Sand Pumps	62
Winders	550
Steel Supports	1317
Prop Withdrawers	7
Ball Mills	240
	<hr/>
TOTAL .	22,558
<i>Add items for opencast mining .</i>	442
	<hr/>
GRAND TOTAL .	23,000
	<hr/>

Against the requirements of 23,000 tonnes of machinery the capacity of CMMP, Durgapur is 45,000 tonnes. Its present estimate of year-wise production is given below:—

1964-65	10,000 tons
1965-66	12,500 "
1966-67	17,600 "
1967-68	25,440 "
1968-69	35,030 "
1969-70	40,440 "
1970-71	45,000 "

(ii) Capacity in the Private Sector

In addition, certain capacities have been licensed in the Private Sector as indicated in Annexure III. It is understood that satisfactory progress is being achieved in most of the cases and a capacity of about 8,000 tonnes on conservative estimates would be available by 1970-71.

(iii) Total Capacity

The combined capacity of CMMP, Durgapur and private sector would thus be over 50,000 tonnes per annum by 1970-71 against an early requirement of about 30,000 tonnes of underground coal mining machinery.

No need for establishing further capacity

The Working Group, therefore, came to the conclusion that in view of the reduced target of coal production there would be no need for establishing further capacity for underground coal mining equipment for meeting their demand during the Fourth Plan and early Fifth Plan. On the other hand, it would be essential for the CMMP, Durgapur, to examine what further items of machinery particularly as part of the mining equipment for minerals other than coal can be taken up by it and necessary adjustment in the production pattern carried out. The Working Group has noted that out of a capacity of 45,000 tonnes, 7,000 tonnes is expected to be utilised for the manufacture of coal washery equipment. It should be possible to step up the production of conveyors and perhaps also take up some items of screening equipment. Further, in view of a cushion in the capacity of the plant it may be desirable that they proceed with their proposal to produce some of the items of electrical equipment such as flame proof electrical motors of integral and smaller types and gate-end boxes based on their existing casting and machining facilities.

Other items needed for underground coal mining as considered by the Working Group are indicated below:—

Electrical items

Electric Motors, Transformers, Switch Gear and Gate-End Boxes.

The estimates of these requirements for 1970-71 are indicated below:—

Item	Demand by 1970-71		
	Nos.	Wt. per unit tonnes	Total Wt. tonnes
<i>Gate-end Boxes</i>			
(i) Gate-end boxes for coal cutting.	485	0.28	145
(ii) Gate-end boxes for loaders/Shearers/Continuous Miners.	18	0.28	5
(iii) Gate-end boxes for mechanical loaders.	20	0.28	5
(iv) Gate-end boxes for face conveyors.	161	0.28	48
TOTAL	684		203

Item	Demand by 1970-71		
	Nos.	Wt. per unit tonnes	Total Wt. tonnes
<i>1. Electric Motors</i>			
(i) Flame Proof	250	1	250
(ii) Others	350	0.75	265

The above requirements of electric motors are in Nos. and weight as furnished by the Coal Controller. It would be helpful if the requirements of electric motors in KW as given by the CMMP, Durgapur are also indicated. Their requirement corresponding to a full rated capacity of 45,000 tonnes would be for flame proof motors aggregating an output of 80,200 KW of which 18,000 KW is for motors of above 100 KW and 62,200 KW for motors of 100 KW and below. Of 62,200 KW integral types would constitute 18,550 KW.

Item	Demand by 1970-71		
	Nos.	Wt. per unit tonnes	Total Wt. tonnes
<i>2. Transformers</i>			
(i) H.T. Power Transformers	65	12	780
(ii) Mining type Transformers	118	5	590
(iii) Distribution Transformers	118	4	472
(iv) Lighting Transformers .	295	0.75	222
<i>3. Switch-Gear</i>			
(i) H.T. (Oil immersed) .	519	1	519
(ii) L.T. (Oil immersed) .	774	0.5	387
(iii) Air Break Circuit Breakers	1035	0.5	518

It would be essential that capacity and suitable designs for flame proof motors, gate-end boxes and mining type transformers will have to be developed keeping pace with their demand by CMMP, Durgapur and other producers of mining equipment.

Mills and Accessories

Compressors and Rock Drills

(a) **Compressors.**—It was noted that the requirements will be met by the private sector units as 13 firms have been licensed to manufacture a total of about 7,500 Nos. per year for capacity up to 1000 cft. per minute. For compressors of higher capacity the demand will have to be met either by diversified production or some of the licensed units in private sector or by the proposed public sector plant for heavy pumps and compressors.

(b) **Rock Drills.**—The requirements of rock drills for underground coal mining are indicated as 462. Taking into account some additional requirements for opencast mining and for other minerals the requirement was estimates at less than 600. The following capacity for rock drills has been licensed which *inter alia* is likely to meet the above requirements also:

Name of the Unit	Licensed capacity	Remarks
	Nos.	
1. Consolidate Pneumatic Tool Co. of India Ltd., Bombay.	396	In production
2. Holemam Climax Co. Ltd., Calcutta.	600	Do.
3. Kirloskar Pneumatic, Poona.	360	Do.
4. Atlas Copco Pvt. Ltd., Poona.	720	Do.
	2076	

Electric Coal Drills and Panels.

The requirements of these items are indicated to increase from 654 in 1964-65 to 1383 in 1970-71 (the requirements for opencast mining is placed at 10 Nos. in 1970-71). The two firms as below are licensed for these items:—

Name the of firm	Nos. licensed	
	Electrical coal Drills	Drill Panels
1. McNeill & Barry Ltd., Calcutta.	600	300
2. Consolidated Pneumatic Tool Co. (I) Pvt. Ltd.	600	..
TOTAL	1200	300

It would be reasonable to envisage that by 1970-71 these units would have marginally expanded their capacity and that the requirements of electric coal drills can be met by the above units. With regard to drill panels further capacity would need to be created.

Opencast Coal Mining Machinery

The assessment of coal to be raised from opencast mining at the end of the Third Plan and at the end of the Fourth Plan is indicated on page 1 and the increase in output amounts to 9.25 million tonnes during the Fourth Plan period. The requirements of machinery for meeting these requirements are indicated on the next page. The equipment is mainly earth-moving machinery.

Some of the items such as compressors and drills have been discussed earlier along with underground coal mining machinery. It is understood that adequate capacity would be in existence to meet the requirements of such items as road rollers, low bed trailers, jeeps, pick-ups, 5 tonne trucks and pumps. The capacity licensed for earthmoving equipment in private sector is already given in Annexure II. One unit has been licensed in the public sector namely Bharat Earth Movers of HAL which expects to produce about 150 motorised scrapers, 125 rear dumpers and 150 haul packs.

It is understood that manufacturing programme of shovels by TELCO and Hindustan Motors is progressing satisfactorily. In addition, HEC, Ranchi, has also programmed the manufacture of shovels at Ranchi. One unit namely, Tata Robin Fraser has been licensed for the manufacture of processing equipment such as jaw crushers, hammer mills, gravity breakers, vibrating equipment, conveyors, washing trommels etc. and it is expected to commence production in 1965. This would contribute to some extent also to the surface coal processing equipment. It is, therefore, felt by the Working Group that capacities of various equipment already under implementation would by and large meet the requirements of opencast mining of coal including Neyveli Lignite (as given in Annexure III).

*Statement showing the year-wise requirement of Mining Machinery & Equipment for Coal
(Public and Private Sector) from 1964-65 to 1970-71*

	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	Average Wei- ght per unit	Total tonnage	Remarks	
0	1	2	3	4	5	6	7	8	9	10	11
For opencast mining											
N.C.D.C.											
1. Portable Compressors .	7	7	7	7	7	7	7	3 tonnes	21		
2. Rotary Blast hole drills	7	7	7	7	7	7	7	30 „	210		
3. Coal Drills . .	10	10	10	10	10	10	10	20 Kg.	1		
4. 25 Cy. Yd. Dragline .	1	1	2	2	2	2	2	170 tonnes	340		
5. 15 Cu. Yd. Dragline .	1	1	2	2	2	2	2	100 „	200		
6. 6/8 Cu. Yd. Shovels .	7	7	7	7	7	7	7	145 „	1015		
7. 4 Cu. Yd. Shovels .	3	3	3	3	4	4	4	32 „	128		
8. Dumper Shovels .	70	70	70	70	70	70	70	35 „	2450		
9. Dumpers . . .	34	34	34	34	34	34	34	10 „	340		
10. Crawler Tractor Dozers.	24	24	24	24	24	24	24	14 „	336		
11. Wheel Type Dozers .	7	7	7	7	7	7	7	45 „	315		
12. Motor Grader . .	3	3	3	3	4	4	4	14 „	56		

13. Road Rollers . . .	3	3	3	3	4	4	4	5 tonnes	20
14. 40 ton bottom dumpers	32	32	32	32	32	32	32	35 „	1120
15. Towing units for item 14 above.	14	14	14	14	14	14	14	10 „	140
16. 30/40 ton cranes .	3	3	3	3	4	4	4	35 „	140
17. 5 tons wrecker crane .	3	3	3	3	4	4	4	7 „	28
18. Pneumatic Jack hammers and picks.	35	35	35	35	35	35	35	25 Kg.	1
19. Scrapers with towing units.	7	7	7	7	7	7	7	30 tonnes	210
20. Low Bed trailers .	3	3	3	3	4	4	4	12 „	48
21. Jeeps . . .	10	10	10	10	10	10	10	1 „	10
22. Pick-ups . . .	7	7	7	7	7	7	7	1.25 „	9
23. 5 ton trucks . .	14	14	14	14	14	14	14	2 „	28
24. Pumps . . .	14	14	14	14	14	14	14	1 „	14
25. Flexible non-spin galvanised.	5	5	5	5	5	5	5	5 C lbs. per 250 fathem	*Year-wise requirement in lacs—of feet.
									7430
									1486
26. Spares	20% of weight							TOTAL	8916 tonnes

Earth moving machinery

On recommendation of the Chairman, Main Planning Group, D.G.T.D., took up an overall assessment of the demand and programming of the production of earthmoving equipment during the Fourth Plan period. Their report has been finalised. The salient features of the report are indicated below:—

- | | |
|---|------------------|
| (1) Value of production of earth moving and construction equipment required by 1970-71. | Rs. 66 crores |
| (2) Capital Investment needed to achieve this order of production, of which foreign exchange. | Rs. 22 crores |
| (3) Capital investment needed in ancillary sector, of which foreign exchange. | Rs. 16.50 crores |
| | Rs. 5 crores |
| (4) Maintenance requirements (Rs. crores) | Rs. 3.75 crores |
| | (Rs. crores) |

	Main equipment	Ancillary	Total
1966-67	8.3	0.83	9.13
1967-68	12.3	1.23	13.53
1968-69	14.2	1.42	15.62
1969-70	13.8	1.37	15.17
1970-71	11.0	1.09	12.09

Coal washery equipment

The detailed requirements of coal washery equipment are indicated in the Interim Report of the Working Group. A statement of washeries which are in operation or under construction or proposed to be installed by 1970-71 are detailed in Annexure IV. The number of new washeries planned for the public sector in the Fourth Plan is 15. This includes Kargali extension, Kathara, Gidi and Sawang orders for which have been placed. The new washeries requiring plant and machinery is thus reduced to 11. TISCO is expanding its existing washery and setting up a new washery. Thus the total number of new washeries which have to be considered for placement of orders on new parties is 13 (NCDC 11 and TISCO 2). The NCDC has already placed an educational order for four washeries on the HEC. Accordingly maximum number of new washeries that may be further available for placement is reduced to 9.

The units licensed for the manufacture of washery equipment in the private sector are:

- (1) McNally Birds Engineering Co.

- (2) Britannia Engineering Co.
- (3) Tata Robins Fraser.
- (4) Argent Engineers Ltd.

Their total manufacturing capacity when in full production is estimated at 5.5 washery plants per annum. This together with the capacity with H.E.C. including CMMP, Durgapur would be considerably in excess of requirements and it may be necessary for some of the above units to diversify their production. To avoid idle capacity on one hand and over diversification on the other hand leaving inadequate capacity for washery equipment, the Working Group recommends that the requirement of individual washeries may be tied up at the earliest with the manufacturing programme of HEC and the existing units. One of the main difficulty in placing orders with indigenous sources so far has been their inability to provide cyclone washeries of Dutch State Mines (DSM) design preferred by NCDC. The Working Group hopes that the question of manufacture of suitable cyclone washers will be satisfactorily sorted out to avoid expenditure of foreign exchange on the import of complete washery equipment from abroad. HEC is expected to finalise shortly a collaboration agreement with Poland for the production of 4 Nos. washeries for which it has secured an order. It is hoped that arrangements for the manufacture of cyclone washers of suitable design will also be finalised by them soon. They are also negotiating with Poland for setting up a design and technical bureau to enable HEC to design and coordinate supplies for a washery plant and take it up on a turnkey basis. It is expected that these steps would enable HEC to manufacture and supply washery equipment on a sustained basis.

A wide variety of equipment is needed for coal washery. Their details have been circulated with the Interim Report. The increase in washeries capacity during the Fourth Plan is expected to be of the order of about 20 million tonnes of input. Broadly, the requirements of washeries may be taken as $1\frac{1}{2}$ washeries per annum by 1970-71 to increase to about 2 washeries per annum during the Fifth Plan. No further capacity however needs to be licensed for coal washeries equipment during the Fourth Plan.

Drilling rigs

(a) Core Drilling (Diamond) Rigs

Core Drilling Rigs, while penetrating any strata recover a continuous core of rock or ore which is brought to the surface analysed and measured to determine the mineral content, the size and the value of the vein or deposit located. They are

used for prospecting and for drawing sub-surface contour maps. These can be used with the primemover either as diesel engine or electric motor or compressed air-drive. They can be either skid-mounted or otherwise as required.

The licensed capacity for core Drilling Rigs along with their production in 1963 is indicated below:

Name of the firm and collaborator	Type of drilling equipment licensed	Capacity		Production (1963) (Rs. Lakhs)
		By Nos.	Value (Rs. Lakhs)	
1. Garlick & Co. Ltd. Bombay (No. collaboration).	Core Drills calyx type 2" to 6" dia hole, 500' to 1000' depth.	18	3	3.32
2. Voltas Ltd. Bombay (in collaboration with Joy Manufacturing Co. of USA).	(a) Core Drill (No. 7) 13/16" to 2 1/8" dia. hole & upto 500 depth	120	130	46.67
	(b) Core Drill No. 12) 13/16" to 3" dia. & upto 1350' depth.	120		
	(c) Core drill (No. 22 HD and 22 SHD) 13/16 to 3" and upto 4000' depth.	60		
	(d) Core drill (No. 45 & 30) 3" dia. hole and upto 5000' depth.	20		
	(e) Hand operated drills upto 300 depth.	600		
3. Christiansen Long year (P) Ltd. Bombay (in collaboration with Christiansen Diamond of France and B. J. Long Year of USA).	(a) Core drill model 34, 1-15/16" dia. hole × 1400" depth and 5" dia. × 275' depth.	40	49	25.46
	(b) Core drill model 38, 1-15/16" dia. hole × 2800' depth and 3" dia. × 275'.			
4. Killick Nixen & Co. Ltd. Bombay (in collaboration with M/s. English Drilling equipment Co. of U.K.)	Core drill 1 1/2 dia. 3000' depth and 3" dia. × 400' depth.	25	20	Licensed on 28-4-64 not yet in production.

There are 4 units which are licensed of which 3 are in production so far. Total value of production for these 3 units in 1963 was Rs. 75.65 lakhs against a licensed capacity of

Rs. 265 lakhs for the 4 units. The production is expected to pick up rapidly during the current and the coming years.

(b) Well Drilling Rigs

Only one unit namely M/s. Reliable Water Supply Company, Lucknow is so far licensed to manufacture these drilling rigs as per the following details:

<ul style="list-style-type: none"> (i) Reverse circulation 16" to 60" dia. hole up to a depth of 600'. (ii) Reverse circulation 12" to 30" dia. hole up to 500' depth. (iii) Reverse circulation up to 8" dia. hole × 350 ft. depth. (iv) Direct Rotary 6" dia. × 1500' depth (v) Percussion drill 8" to 15" dia. up to a depth of 700 ft. 	} 43 Nos.	Rs. 65 Lakhs. Licensed 9th August 1963 and likely to go into production before end of 1964.
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(c) Oil Drilling and Prospecting Rigs

In addition to the above drilling rigs are those required for Oil and Gas Drilling and prospecting. These Drilling Rigs are included in the manufacturing programme of Heavy Engineering Corporation, Ranchi, where Oil Well Drilling Rigs totalling 5,500 tonnes are to be produced out of the envisaged production of 80,000 tonnes when the plant reaches full capacity. This would be equivalent to about 50 rigs per annum. It has at present order for only 3 Nos. drilling rigs from O.N.G.C.

The requirement of drilling rigs for different end-use and by the different organisations is discussed in the following paragraphs:

(i) **Indian Bureau of Mines.**—The requirements for drilling rigs (for Metalliferous Mines) have been indicated to the Working Group by the D.G.T.D. and are reproduced below. The entire requirement is of Core (Diamond) Drills:

Details	Requirement during 1965-66 and during the Fourth Plan	Phasing		Total cost (Rs. lakhs)
		Year	Q.y. reqd	
1	2	3	4	5
(a) 3000'/4000' Cap. × 3" dia.	1	1967-68	1	1.5
(b) 2000' Cap. × 3" dia.	8	1965-66	1	3.5
		1967-68	4	

1	2	3	4	5
(c) 1000' Cap. × 3" dia.	22	1965-66	1	15.6
		1967-68	21	
(d) 500' Cap. × 3" dia.	130	1965-66	52	45.5
		1967-68	78	
(e) 250' Cap. × 3" dia.	30	1965-66	15	6.0
		1967-68	15	
(f) Air Driven 500' Cap. × 1½" dia.	12	1965-66	6	1.8
		1967-68	6	
TOTAL		1965-66	75	
		1967-68	125	
		TOTAL	200	

It would be seen that the Fourth Plan requirements of Indian Bureau of Mines total 125 Nos. These have been phased for a single year during the plan *i.e.*, for procurement in 1967-68. These can be all met from the indigenous source, but it would be desirable to rephase the requirements to spread uniformly during each year of the Fourth Plan and to tie up with the manufacturing programme of the several units.

(ii) **National Coal Development Corporation.**—The total requirements during the Fourth Plan are indicated as 15 Nos. comprising of 5 Nos. core diamond drilling rigs with a capacity of 1500 ft. depth, 3" dia. and 10 Nos. for deeper drilling. These are envisaged to be procured in 1966-67. Some phasing of these requirements may be advisable. In addition to complete drilling rigs NCDC has indicated a requirement of about Rs. 50 lakhs of components and spares during each year of the Fourth Plan for the maintenance of its stock of drills expected to number 118 by the end of the Third Plan.

(iii) **National Mineral Development Corporation.**—The stock of drills expected to be held by the NCDC by the end of the Third Plan is anticipated as 29 Nos. and further requirements during each year of the Fourth Plan (excluding deep hole blast drills which can be met by indigenous producers of drills) have been indicated to us as 16 Nos. per year totalling 80 Nos. during the Fourth Plan.

Irrigation

Drilling rigs for agricultural sector.—The Working Group on inter-relationship between agriculture and industry has estimated the demand for well-drilling rigs as 400 Nos. with year-wise requirements as indicated below:

Year	Total requirements of rigs	Rigs already available in the previous year	Additional rigs required during the year
1966-67 . . .	272	200	72
1967-68 . . .	345	272	73
1968-69 . . .	417	345	72
1969-70 . . .	489	417	72
1970-71 . . .	560	489	71
		TOTAL	360

Taking into account about 20 per cent for replacement of the existing rigs including spares, the total requirements have been estimated at 400 divided into the following categories:

(a) Core diamond drilling rigs	30 Nos.
(b) Direct rotary	90 Nos.
(c) Reverse circulation rotary	90 Nos.
(d) Percussion	130 Nos.
(e) Rotary <i>cum</i> percussion . . .	60 Nos.

400 Nos.

The Working Group has assumed an average price of Rs. 1.5 lakhs per drill *i.e.*, totalling Rs. 600 lakhs and Rs. 120 lakhs per annum. With the slow development of manufacture of these drills in the country, the Working Group had placed the imported components at Rs. 540 lakhs.

The Irrigation Adviser in the Ministry of Food and Agriculture was also consulted regarding the assessment of rigs for well drilling. We were informed (on 27th July 1964) that

based on a conference of State Engineers and Administrators, their requirements would be:

(1) Core diamond drilling rigs.	17 Nos.
(2) Direct rotary rigs	133 Nos.
(3) Reverse circulation rotary rigs.	6 Nos.
(4) Rotary-cum-percussion	3 Nos.
(5) Percussion	150 Nos.
TOTAL	309 Nos.

In view of the emphasis on minor irrigation for quick augmentation of agricultural production, we have assumed that it would be desirable to plan a capacity of 400 rigs as it would be preferable to have some built-in extra capacity for meeting the demand for an item of this importance.

Of the total, the requirement of core (diamond) drilling rigs is 30 Nos. With regard to the requirements of the well drilling rigs (other than core drilling) the requirement during the Plan would be 370 including replacements (Neyveli Lignite Corporation would also require about 10 drilling rigs of this type during the Fourth Plan).

It has also been observed that within the total numbers of drilling rigs required, there is considerable divergence in the requirements of different categories of drilling rigs as indicated by the Working Group on Inter-Relationship of Agriculture and Industry and the Irrigation Adviser. It is felt by us that the manufacturing programme of the existing producer and the new capacity is likely to have flexibility to meet any shift in demand from one to the other type.

At present, there is only one company, namely M/s. Reliable Water Supply Service of India Limited which has been licensed for the manufacture of well drilling rigs. Its licensed capacity is 43 Nos. per annum. They had an existing factory where they were producing drilling rigs in the past on small scale basis. They are expected to commence production on large scale before the end of 1964. The progress of the unit needs to be carefully watched. New capacity (preferably by diversification of the manufacturing programme of one of the reputable units producing drilling rigs of the other types) should be created or in case there is no ready response capacity in a new unit to the extent of 50-60 rigs per annum has to be established as early as possible.

The total investment at approximately 1:2 investment/output ratio (due to a considerable portion of parts being bought-out) is estimated at Rs. 50 lakhs of which about Rs. 20 lakhs investment may be assumed to be made by 1965-66. The rest of the investment of about Rs. 30 lakhs will have to be made during the Fourth Plan.

The maintenance import requirement may be assessed at approx. 20% of the value of output *i.e.* at about Rs. 20 lakhs per annum.

Oil and Natural Gas Commission and Oil India Limited

The basis of the assessment of the requirement of drilling rigs has been indicated in our Interim Report in paragraph 6.6, 6.7 and 6.8.

In order to achieve its drilling target of about 2.38 million metres during the Fourth Plan, it will be necessary for ONGC to keep 50 rigs in continuous operation throughout the Plan period; in addition another 15 rigs will be required in reserve on assumption of a rig circulation coefficient of 1:1.3. At present, ONGC owns 43 rigs as per following details:

Category	Capacity	No. of rigs
A	About 5000 metres	13
B	About 3000--3200 metres	14
C	About 2400 metres	16
		43

Of these, the 'C' category rigs are operating at present only in Gujarat. The 'B' category rigs are operating both in Gujarat and other regions while the 'A' category rigs are operating in areas other than Gujarat.

The ONGC has already placed orders for 6 more rigs making a total of 49. Out of these 49, 14 rigs which are already worn out or likely to be worn out in the near future will have to be replaced. This deficiency of 14 rigs as proposed to be made good by importing 10 new rigs and by re-conditioning 4 rigs out of the useful parts and assemblies, which would be written off. Thus, a net of 10 new rigs will be required in replacement.

The category-wise requirement of rigs before the commencement of the Fourth Plan is desired by ONGC to be as below:

Category	A	.	.	.	.	33 Nos.
Category	B	.	.	.	.	19 Nos.
Category	C	.	.	.	.	13 Nos.
TOTAL						65 Nos.

The total number of rigs to be, therefore procured before the commencement of the Fourth Plan period is $65 - 49 + 10 = 26$ Nos.

The following tentative financial provision has been kept in by the ONGC for the procurement of 26 drilling rigs and other equipment.

8 Nos. with a drilling capacity of up to 3400 metres	Rs. 104 lakhs
18 Nos. with a capacity up to 5000 metres	Rs. 414 lakhs
Re-conditioning of 6 worn out rigs (4 deep and 2 structural rigs).	Rs. 36 lakhs
Spare assemblies for old rigs	Rs. 65 lakhs
2 off-shore rigs and equipment	Rs. 250 lakhs
TOTAL	Rs. 899 lakhs
Say	Rs. 900 lakhs

In addition to the existing 4 structural rigs ONGC proposes to obtain 4 more structural rigs so that during the Fourth Plan period it will have 8 structural rigs. Out of these 8, 6 rigs are expected to be in operation and to drill about 92 wells during the Fourth Plan period. It also proposes to procure 15 additional work-over rigs and 50 drill stem testing sets.

The entire requirements of about 30 additional rigs are indicated for procurement before the commencement of the Fourth Plan. It would be necessary to take action for the import/indigenous manufacture/re-conditioning of rigs immediately. Some thought, however, needs to be given for re-phasing the requirements which may be advantageous both from the point of view of ONGC as well as the suppliers.

The Heavy Machine Building Plant at Ranchi has made a provision to include 5,500 tonnes of drilling rigs in a total production of 80,000 tonnes per annum. This may be equivalent to about 50 rigs per annum. Discussions have already taken place between the Heavy Machine Building Plant at

Ranchi and ONGC as far back as July 1963 as a result of which the HEC is understood to have obtained necessary documentation for BU 75 drilling rigs of Russian design. The HEC is in an immediate position to execute the structural work. Items like engines, pumps, generators etc. could be procured by it from other indigenous firms. In view of considerable expense incurred by HEC in procuring documentation for BU 75 which may not be put to use it is keen to ask for documentation and take up manufacture of drilling rigs of ONGC after placement of firm orders. It is understood that orders for 3 Nos. drilling rigs have now been placed with HEC but the ONGC is reluctant to place further orders till it is satisfied with the performance of 3 rigs when supplied by HEC. As the manufacturing capacity has been set up by HEC at such heavy investment and since it has available with it the technical know-how, documentation and even supervision by Russians the Working Group does not share the views of ONGC and recommends that orders for their entire demand should be placed with HEC who could then firmly programme a phased manufacture of these rigs. Even after placing of order for entire demand of ONGC there will be substantial surplus capacity left with HEC. It is recommended that they should take immediate steps to investigate manufacture of alternative items so as to utilise their manufacturing as fully as possible. The Working Group is of the view that immediate steps may be taken to tie up the requirement of ONGC with the manufacturing programme of HEC.

The requirement of Geological Survey of India for core (diamond) drilling rigs for the Fourth Plan desired to be procured at the commencement of the Plan are:

Capacity up to 500 ft. (4 x type)	10 Nos.
" " 750 "	8 Nos.
" " 1000 "	12 Nos.
TOTAL	<u>30 Nos.</u>

Core (Diamond) Drilling Rigs

It is seen from the above assessment of demand that the largest demand is that for core (diamond) drilling rigs which would total for the Fourth Plan period approx. as below:

Indian Bureau of Mines	125 Nos.
NCDC	15 Nos.
NMDC	80 Nos.
Minor irrigation	30 Nos.
G. S. I.	30 Nos.
	<u>280 Nos.</u>

There would be some additional requirement from the State and Private Agencies. The requirement of core drilling

rigs can be met indigenously from the capacity already licensed and likely to be established by 1965-66. Perhaps, some marginal adjustments to meet the specifications of the customers may be necessary. In conclusion, the Working Group would like to recommend:

- (1) Immediate steps should be taken for establishment of additional capacity for 50-60 well drilling rigs per annum for which the additional investment in the Fourth Plan will be about Rs. 30 lakhs.
- (2) Immediate effort should be made to tie up the requirement of ONGC with that of the manufacturing programme of HEC, Ranchi on the basis of firm orders.
- (3) The requirements of IBM, NCDC and NMDC, ONGC, OIL etc. should be properly phased for each year of the Fourth Plan instead of the entire requirements being lunched for a single year by each of these organisations. The requirements should be tied up with the manufacturing programme of the producers.
- (4) The requirement of accessories, components and spares should be met by and large from indigenous sources. A close liaison should be established between the producers and the users of drilling rigs to coordinate the manufacturing programme to suit to and phase it to the requirements of customers. Adequate attention will have to be paid to ensure the supply of items like engines, generators, pumps etc. and components and spares required in large quantities and to effect any diversification desired.

Rock Drilling

In addition to the above drills, substantial capacity has been created for rock drills which could be both electric as well as pneumatic. These are used in mining as well as for such other purposes as construction and road building etc. The licensed position regarding the rock drills is indicated below. It is expected that this capacity would be by and large adequate:

Name of the firm	Type	Specification	Licensed capacity	Name of foreign collaborator	Remarks
1	2	3	4	5	6
Rock					
M/s. Consolidated Pneumatic Tool Co. of India Ltd. Bombay	Drill (pneumatic operated)	32F Rock Drill (Dry) 225 " " (Wet) 225 " " (Dry)	395 Nos. (Dry) P.A.	Consolidated Pneumatic Tool C.O.U.K.	In production

1	2	3	4	5	6
	Demolition Tools Feed Legs.		80 Nos. p. a.		
M/S. Holman Climax Co. Ltd. Calcutta	Cock Drills	(i) Holman Rock Drills Models Silver 3/30	600 Nos. p. a.	Holman Bros U. K.	In Pro- duction
		(ii) SL-9D			
	Air Legs	(iii) Holman Cli- max Air Legs 36 " Feed 52 " Feed	120 Nos. p. a.		
M/s. Kirloskar Pneumatic Ltd. Co. Poona	Rock Drills 30/40 lbs	(i) Rock Drills CB-250 CB-600	180 Nos. p. a.	M/s Broom- wade, U.K.	In produ- ction
	Rock Drills 45/50 lbs		180 Nos. p. a.		
M/s. Atlas Copco (I) Pvt. Ltd. Poona.	Rock Drills	(i) Rock Drills RH659 4 " RH658 4L	720 Nos. p. a.	M/s. Atlas Co- pco, Sweden.	Do.
	Pushers	(ii) Pusher Leg BMK 62	300 Nos. p. a.		

Minerals other than Coal

Requirement of machinery and equipment for mining industry, other than coal.

The most important programme in this field would be with that of iron ore. The other minerals are: limestone, bauxite, copper, lead and zinc ore, manganese, chromite etc.

Iron Ore.—The Third Plan envisaged a capacity target of 32 m. tonnes and a production target was fixed in the context of the requirements of the steel programme which was estimated at 10 million tonnes and an export target (without taking into account exports from Goa) of 10 million tonnes. As against this target of 30 million tonnes, current estimates place the production in 1965-66 at about 22 million tonnes. The shortfall will be due partly to delay in the implementation of

steel expansion programmes and the demand for the steel industry not materialising as originally envisaged and partly due to the export programme not going according to schedule.

For the Fourth Plan, the Committee of Secretaries recommended a target of 25 million tonnes for export, though for the purposes of planning mines, as well as the transport and port facilities, a figure of 30 million tonnes was kept in view. This target of 25 million tonnes is inclusive of the exports from Goa which is currently running at between 5 and 6 million tonnes. The main sources from which these 25 million tonnes are to be drawn are:

Kiriburu	2 m. tonnes	
Bailadila	4*	„ * (To be later increased to 6 m. tonnes on diversion of supplies from Kiriburu to Bokaro.)
Tomka. Daiteri	2	„
Goa	6	„
Bellary-Hospet	5 to 7	„
	<hr/>	
	19 to 21	
	<hr/>	

The balance is to be obtained from other minor deposits. Although the World Bank is in favour of more modest target of export of 18.20 million tonnes, it may be advisable for the purpose of making provision for machinery to go on the basis of higher targets.

Besides the requirements for export, the Planning Group on Minerals other than coal and oil, had estimated the requirements of iron ore for the steel programme at 35 million tonnes by 1970-71. In this case also, there is a possibility of steel target being somewhat modified which would affect the iron ore requirements. The Working Group, however, feels that in view of the considerable time lag between supply and installation of machinery and the achievement of full rated production of iron ore, and to ensure continued increase of production during early 5th Plan, it would be advisable to take into account the more liberal estimates and capacity which may therefore be assumed at about 60 million tonnes to be established by 1970-71.

The revised requirement of machinery for iron ore programme is indicated in Annexure IV. These may be categori-

sed as below. (Drills and compressors have been left out as these have been taken into account earlier).

Requirements for the plan period

(Rs. Lakhs)

Items of machinery	Nos.	Total requirements during the plan period
I. Earth moving and allied equipment:		
(a) Ripper-cum-bulldozer 250-350 DBHP	36	108.00
(b) Front end crawler tractor loader	10	20.00
(c) Rear dumpers—30-35 tons.	104	354.00
(d) Rear dumpers—10-15 „	33	66.00
(e) Electric shovel 4.5 cu. ft.	22	308.00
(f) Diesel shovel 2.5 cu. ft.	10	40.00
(g) Motor grader 12' blade	5	5.00
(h) Road roller capacity 10 tons	7	4.20
(i) Mobile truck mounted crane cap. 10 t.	4	7.00
(j) Truck trailer cap. 30 tons	4	8.00
(k) Truck trailer cap. 45 tons	2	5.00
		Rs. 925.00 lakhs
II. Iron ore dressing handling and conveying equipment (as per details in Annexure VI).		
	5	1,250.00

Limestone.—The quarrying capacity for limestone is expected to rise from about 25 million tonnes at the end of the Third Plan to about 60 million tonnes at the end of the Fourth Plan. Details about the specific type and quantity of equipment required for this programme could not be obtained. As bulk of limestone would be required for cement industry of say unit capacity of 0.2 million tonnes, full mechanisation would not be possible in all cases. Nevertheless the requirements of earthmoving, dressing, handling and conveying equipment would be substantial.

Bauxite.—The requirement of bauxite is likely to increase from about 0.5 million tonnes to 1.0 million tonnes. The requirements in this case also would be largely earthmoving equipment along with dressing, handling and conveying equipment.

Copper Ore.—Apart from the development programme already in hand at Khetri the main activity and investment would be in regard to Kolihan and Rakha mines (to augment capacity by 1 million tonnes) whose requirements have been listed in Annexure VIII. The requirements comprise a number of common items such as earthmoving equipment, drills, compressors, motor generators, conveyors, crushers etc. The more specific items are haulage cars, service and haulage locomotives, skip loaders loaders, cages, hoists. These items are stated to be somewhat similar to those used for underground coal mining. As the requirements are not large and as CMMP, Durgapur, will have substantial surplus capacity, the Working Group suggests that NMDC should discuss their requirements with details of specifications and phasing etc. with CMMP, Durgapur to enable the latter to supply their requirements.

Lead and Zinc.—In addition to the development of mining at Zawar the production of lead and zinc metals is expected to be based mainly on imported concentrators.

Lignite.—It is proposed to mine 7.0 million tonnes of lignite in a second mine at Neyveli to be developed during the Fourth Plan. The requirements of machinery are already listed in Annexure IV and comprise mainly of earthmoving machinery, drilling equipment and conveyors.

Categories of Equipment

It would be seen from the description of equipment required for mining of minerals other than underground coal that the equipment would broadly fall under the following categories:

1. Earth moving.
2. Drilling.
3. Size reduction machinery.
4. Washing, screening and vibrating equipment.
5. Conveyors.

Earth Moving and Drilling Equipment

Items (1) and (2) have been covered earlier in the report. Earth moving equipment is also required in a number of other fields such as dam construction, road building and construction work, site levelling for industrial projects etc. it is not intended to make any specific recommendation. The Working Group would however like to mention that the earthmoving industry has yet to be developed and early steps need to be taken that the requirement of mining industry *inter-alia* others are adequately met. The requisite ancillaries for this industry would

also need to be developed simultaneously. The other categories of equipment are discussed below:

Size reduction Machinery

These constitute mainly (a) ball mill and tube mill (b) jaw crushers (c) hammer mill (d) gyro or cane crushers and (e) roll crushers.

A list of important producers in this field is given below:—

1. HEC, Ranchi	Ball mills, hammer mills and roller crushers.
2. M/s. A.C.C. Vickers Babcock Pvt. Ltd. Durgapur, West Bengal.	Jaw crushers double rotor hammer crusher.
3. McNally Bird Engg. Co. Ltd. Chartered Bank Building, Calcutta.	Jaw crushers, roll crushers cone crushers.
4. Utkal Machinery Pvt. Ltd. P.O. Box 47; Rourkela, Orissa.	Jaw crushers.
5. International Combustion (I) Ltd. Park street, Calcutta.	Raymond roller mills.
6. Marshall Sons & Co. Ltd. 33/1, Netaji Subhas Road, Calcutta.	Jaw crushers.
7. Sayaji Iron & Engg. Co. (P) Ltd., Chani Road, Baroda.	Jaw crusher.
8. Garlick & Co. Ltd., Hainer Road, Jacop Circle, Bombay.	Do.
9. Kusum Engg. Co. Ltd., 25, Swallow Lane, Calcutta-1.	Do.
10. Elecon — Baroda } 11. Tata-Frazer-Robins }	Crushing equipment as part of complete processing and handling plants.

Ball mills were included in the original manufacturing programme of CMMP, Durgapur, but later the item was dropped when it was anticipated that some of the items could be produced by the proposed second plant. While considering the scope of supply for Coal Mining Machinery from Durgapur, we have taken into account that it would supply ball mills aggregating a total tonnage of 240 tonnes for underground coal mining. The figure of 23,000 tonnes of anticipated supply per annum includes this figure for the ball mills. Ball mills are also included in the manufacturing programme of HEC, Ranchi.

This item of equipment is required for various other industries also such as cement plants and ceramic plants etc. and is being manufactured by the producers of cement plant and other heavy engineering machinery. However, atleast so far as the requirements of ball mills for mineral industries are concerned it would be desirable to investigate whether the item

could more suitably be taken up to be manufactured at CMMP, Durgapur, instead of HEC, Ranchi whose capacity for metallurgical equipment would be in any case far from adequate to meet the demand. This would be, of course, conditional on Durgapur Plant having the requisite plate forming and other machining and welding facilities for such a manufacturing programme as envisaged according to its original project report.

With regard to jaw crushers, the 7 units in the private sector understood to have been licensed to produce this item are already indicated above. In our view, the capacity licensed, if developed fully and allowed to have the facility to add balancing equipment whenever required would be sufficient to meet the demand. Attention will however, have to be paid in regard to the heaviest types of jaw crushers and to make provision for the special steel castings required by the manufacturers of this item.

The position with regard to capacity licensed for Gyro or cone crushers is not available. An assessment of demand for this item specifically could not be made. Cone crushers would be required for iron ore and limestone dressing for steel plants. The position regarding demand and creating of sufficient capacity will have to be examined immediately.

Hammer mills for use by various industries and 2 roll crushers for coke and coal are included in the manufacturing programme of HEC within a capacity of 3,150 tonnes which includes roller screens, reversible hammer crushers, 2-roll crushers and ball mills. The above items of machinery are required for other users also such as cement plants and are included in the manufacturing programme of private sector units for this equipment.

Washing and Screening Equipment

An idea of the diverse type of equipment required under this head can be had from details furnished for iron ore dressing crushing and screening equipment as per Annexure VIII. The capacity for the manufacture of these items is existing with washery manufacturers as mentioned under 'Washery Requirements'. HEC, Ranchi has included the manufacture of roller screen 125 × 125 mm. with eccentric discs and roller screening machine (twin type) 1,650 mm. Elecon and Tata Frazer Robins have also included this line of equipment in their manufacturing programme. The latter would also be setting up design and engineering facilities in this field. In the opinion of the Working Group the design and engineering involved in manufacture and co-ordinated supply of a complete

plant is a more complicated problem. There would be scope for duplicating the design and engineering facilities particularly since arising of ore fines and their use will be on a much larger scale. There is expected to be an increasing trend to wash limestone for use in steel industry. Apart from a total of about 5 washing and screening plants valued Rs. 12.5 crores for iron ores required by NMDC over the Fourth Plan period large quantum of equipment will also be required by the steel plants themselves for their captive mines. Washing and screening equipment will also be required increasingly for limestone, stone grits for construction purposes etc. It is expected that fuller data will be provided by the Working Group on beneficiation of ores and minerals. Earlier we have recommended that the coal washery manufacturers should diversify their production. This would be a suitable range of items for such a diversification.

Conveyors

(a) Coal Mining Machinery Project, Durgapur, has a provision to manufacture about 10 to 12,000 tonnes of chain conveyors. It has not been possible for the Working Group to make a precise estimate of demand for chain conveyors. But it was felt that this capacity would suffice to meet the demand of such conveyors from mining industry.

(b) **Belt Conveyors.**—The demand for belt conveyors as assessed for the mining industry as well as for major users is indicated below:

(i) Underground coal mining at about 2,800 tonnes along with opencast coal mining.	4,000 tonnes
(ii) Coal washeries 2 Nos. at about 1,000 tonnes per washery including supporting structurals, sheds, covers etc.	2,000 tonnes
(iii) Steel plants.	3,000 tonnes
(iv) (a) Iron ore mining (NMDC)	800 tonnes
(b) Iron ore mining captive for steel plants and other producers.	1,000 tonnes
(v) Neyveli Lignite Corporation.	1,000 tonnes
(vi) Other minerals.	1,000 tonnes
(vii) Other major users such as chemical & Fertilisers, cement plants paper and pulp, sugar etc.	6,000 tonnes

TOTAL: 18,800 tonnes

say, 20,000 tonnes approx. (without belt).

CMMP, Durgapur, has a provision to produce 22,487 tonnes of chain and belt conveyors of which 50% capacity is expected to be used for belt conveyors. It is further noted that the trend is to use belt conveyors of greater widths and it should be possible, therefore, for CMMP, Durgapur to produce within its overall plant capacity over 12,000 tonnes of belt conveyors.

We have also been furnished with the licensed capacity for belt conveyors by the D.G.T.D. as per Annexure IX. It would be noted that the total licensed capacity for conveyors aggregates a value of Rs. 764 lakhs. It is understood that over 70% of this capacity could be assumed for belt conveyors, which would approximate about Rs. 530 lakhs. On the basis of discussions with the representative of D.G.T.D. it was agreed that we may safely assume a figure of Rs. 400 to Rs. 450 lakhs (without belt) worth of belt conveyors capacity to materialise in the private sector in the latter part of the Fourth Plan period. It was also agreed that assuming a value of about Rs. 4,000 per tonne the capacity likely to materialise in the later half of the Plan period in the private sector would amount to over 10,000 tonnes of belt conveyors.

The total capacity for belt conveyors thus, would be over 20,000 tonnes and would be adequate to meet the demand for this equipment as envisaged. It takes into account that some of the units which have been licensed for a very small capacity would only be catering to specialised demands for engineering and chemical industries. It was noted that Elecon Engineering Company which specialises in coal handling plants and is already licensed to produce conveyors worth about Rs. 120 lakhs may be shortly permitted to expand its capacity for belt conveyors to Rs. 250 lakhs. It should be, therefore, possible for this industry to meet *inter-alia* the demand for the belt conveyors for thermal plant as well.

Investment in creating capacity for mining and drilling equipment

The main investment in the sector of mining machinery and drilling rigs would be against the following:

- (a) Spill over of expenditure of CMMP, Durgapur.
- (b) Setting up of a design and engineering bureau for coal washing and other similar equipment.
- (c) Spill over and expansion of Tata-Frazer-Robins.
- (d) Expansion of Elecon.

The spill over of expenditure of CMMP, Durgapur, is indicated at Rs. 2.4 crores of which Rs. 2.2 crores would be the foreign exchange. There will be an additional spill-over

on township of about Rs. 1.5 to 2 crores. It is likely that the actual spill over may somewhat exceed this figure. No cost estimates of the design and engineering bureau are at present available. As these would be mainly the expenses for setting up an organisation and not for creating manufacturing facilities excepting marginal, in the existing HEC plants, it is expected that the expenses on this bureau may not exceed about Rs. 2 crores. In case of Tata-Frazier-Robins the authorised capital is Rs. 1 crore. The Company may complete its investment programme of this order by 1965-66 but a provision for further expansion along with the expansion of Elecon may be of the order of about Rs. 2 to 3 crores. Thus the total figures would amount to about Rs. 8 crores. The figures of total investment taking into consideration a large number of industrial units in the private sector (excluding that required for earth moving and electrical equipment) may be taken of the order of about Rs. 15 crores. This would include investment required in creating additional capacity for well drilling equipment, cone crushers and probably some of the specialised items of ore dressing and screening plant. About 50 per cent of this investment may be the foreign exchange component including lump sum payments etc. for technical collaboration and know-how. Of Rs. 15 crores, about Rs. 6-7 crores would be the investment in the Public Sector.

Raw Material

It has not been possible to assess the requirement of raw-material for an industry covering such wide scope. It would be, however useful to indicate the requirement of raw-materials for the major unit in this industry namely CMMP, Durgapur. The requirement of important raw-materials available from the indigenous sources are indicated in the following table:

Item	Years					
	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71
1	2	3	4	5	6	7
Mild Steel Merchant Section	10,000 tons	15,000 tons	22,000 tons	31,000 tons	35,000 ton	35,000 tons
Pig Iron	5,500 tons	8,400 tons	12,100 tons	16,800 tons	19,400 tons	19,400 tons
Coke	1,400 tons	2,100 tons	3,000 tons	4,200 tons	5,000 tons	5,000 tons
Scrap-Iron . . .	3,000 tons	5,000 tons	8,000 tons	10,000 tons	12,000 tons	12,000 tons

1	2	3	4	5	6	7
Ferro alloying elements.	120 tons	150 tons	200 tons	250 tons	300 tons	300 tons
Steel Tubes (seamless E. R. W.).	600 tons	1,000 tons	1,200 tons	1,800 tons	2,000 tons	2,000 tons
Non-ferrous elements.	100 tons	200 tons	250 tons	300 tons	400 tons	400 tons
Paints	10,000 litres	20,000 litres	40,000 litres	60,000 litres	70,000 litres	80,000 litres
Timber for pattern making and packing.	cu. m. 2,000	2,800	4,500	7,500	7,524	7,524

A further list of items of raw materials and components which would be partly available from indigenous sources and partly imported is also given below:

Items	Approx. Value in Lakhs of Rupees					
	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71
Alloy Steel (including Steel).	25	30	35	40	45	50
Ferro-alloying elements.	5	6	8	10	12	12
Ball and Roller Bearings.	25	30	40	50	50	55
Cutting Tools	20	20	25	25	30	30
Flame-proof electrical motors and controllers.	30	35	40	45	50	60
Hydraulic couplings, fittings etc.	8	10	10	12	15	15
Lubricating pumps and elements.	5	6	6	7	7	7
Measuring & Scientific instruments.	5	6	8	8	8	8

Technical and non-technical personnel

As in the case of raw materials, in this case also it would be possible only to indicate the strength of technical and non-technical personnel for the major unit in the industry i.e., CMMP Durgapur:

Category	As on 1-10-64	As per 45,000 tons capacity
Engineers & Technicians.	400	550
Non-technical staff.	1,029.	430
	(Including administrative & Accounts)	(Excluding Administrative & Account's Staff.)
Skilled Labour	} 1,305	3,411
Unskilled & Semi skilled		
Temporary (construction)	486	..
TOTAL:	3,220	4,391

Power Requirement:

The power requirements of CMMP, Durgapur, are also given below:

Item	As on 1-10-1964	At full production stage
Installed capacity	18,000 KW.	37,490 KW.
Load Peak	5,000 KW.	18,500 KW.

SUMMARY AND CONCLUSIONS

(i) The indigenous capacity for the manufacture of coal mining machinery would be sufficient to meet our requirements during and at the end of the Fourth Plan period. On the other hand, the manufacturing capacities established in the major public sector project namely Coal Mining Machinery Project (CMMP), Durgapur, will be in excess of the demand and will need to be diversified. A welcome feature is to divert about 7,000 tonnes of capacity (out of a total capacity of 45,000 tonnes) for washery equipment. (It needs to be examined whether this allocation of capacity is on the high side). The

possible products which may be taken up by the CMMP, Durgapur as part of this diversification are: (a) re-inclusion of the production of ball mills (and it should be excluded from the manufacturing programme at HMBP, Ranchi), (b) electrical items like flame proof motors particularly of the integral type, gate-end boxes etc. should be produced at CMMP, Durgapur, making use of its existing foundry and matching capacity (c) production of items of machinery, specific to the copper mining which is of similar nature to that of under-ground coal mining.

(ii) There is need to create additional capacity for drilling rigs for tube wells to the extent of about 50 to 60 drilling rigs per annum. This may be either carried out preferably by diversification of the production programme of existing producers or by diverting the surplus capacity for the production of drilling rigs for oil drilling in HEC, Ranchi, if technically feasible.

(iii) The requirement of various kinds of drilling rigs seems to have been bunched by the user organisations for procurement in the course of one or two years during the Fourth Plan period. This should be properly phased as to give due weightage to the indigenous manufacturing programme.

(iv) ONGC should be persuaded to place orders for its entire requirements of drilling rigs with the HEC, Ranchi, which may then plan its production programme to suit ONGC.

(v) The progress of the earth moving industry is very vital to the mining programme and due care should be taken to ensure that the industry *inter alia* meets the needs of mining. Due attention needs to be given to the development of ancillary industries for earth moving equipment.

(vi) The position regarding the demand for cone crushers and creating of sufficient capacity for this item will have to be examined immediately.

(vii) Coal washery manufacturing by HEC should be on a sustained basis. It should strive to procure manufacturing licence for DSM cyclone as early as possible and it should also expedite the setting up of Design and Engineering Bureau for washery and allied projects which is under consideration.

(viii) The coal washery manufacturers should diversify their production in view of substantial excess capacity. They may take up the manufacture of washing, screening and vibrating equipment for ore dressing for all minerals.

(ix) The capacity for conveyors likely to materialise would be sufficient to meet the demand during and at the end of the Fourth Plan period.

(x) The total investment in the industry for manufacture of mining and drilling equipment would be of the order of Rs. 15 crores of which about Rs. 6 to 7 crores may be the investment in the Public Sector. Further, the foreign exchange component of Rs. 15 crores may be about 50%.

(xi) It has not been possible to make an assessment of the requirement of raw materials, technical and non-technical personnel and the power requirements. However, these have been indicated for the major plant namely CMMP, Durgapur.

ANNEXURE I

Break up of production statistics sector wise and according to the method of working

(Figures are in million tonnes)

	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71
	1	2	3	4	5	6	7	8	9	10
<i>TABLE-A.—Sector-wise Production Figures:</i>										
N. C. D. C. Ltd.	6.05	8.43	9.01	11.00	13.78	24.40	35.00	46.06	56.20	66.15
Singareni	2.83	3.23	3.47	4.50	5.50	6.50	7.50	8.50	9.60	10.50
Private Sector.	46.42	51.79	52.65	57.50	64.72	66.50	68.30	70.10	71.90	73.79
TOTAL PRODUCTION	55.30	63.45	65.13	73.00	84.00	96.00	110.00	124.00	138.00	150.44

TABLE-B.—Breakdown of Production figures (Public and Private sectors) according to method of working:

TOTAL PRODUCTION	55.30	63.45	65.13	73.00	84.00	96.00	110.00	124.00	138.00	150.44
1. Open cast.	11.44	13.66	14.52	16.00	18.08	19.80	22.00	24.05	26.10	29.05
2. Underground	43.86	49.79	50.61	57.00	65.92	76.20	88.00	99.85	111.90	121.39
(a) Development	29.02	32.73	33.00	33.90	35.32	40.52	43.82	47.92	51.07	53.32
(b) Depillaring	14.84	17.06	17.61	23.10	30.60	35.68	44.18	52.03	60.33	68.07

TABLE-C.—Breakdown of output figures of N.C.D.C. Collieries according to method of working:

1. Open cast	3.04	4.56	5.02	6.50	8.58	10.80	13.00	15.30	17.60	20.58
2. Underground	3.01	3.87	3.99	4.50	5.20	13.60	22.00	30.30	38.60	45.57
(a) Development	2.00	2.50	2.60	3.10	3.60	8.60	12.00	16.30	19.60	22.00
(b) Depillaring	1.01	1.37	1.39	1.40	1.60	5.00	10.00	14.00	19.00	23.57

TABLE-D.—Breakdown of output figures of Singareni Collieries according to method of working:

1. Open cast.										
2. Underground	2.83	3.23	3.47	4.50	5.50	6.50	7.50	8.50	9.50	10.50
(a) Development	1.90	2.23	2.40	2.80	3.50	4.00	4.30	4.50	4.75	5.00
(b) Depillaring	0.93	1.00	1.07	1.70	2.00	2.50	3.20	4.00	4.75	5.50

TABLE-E.—Breakdown of output figures of Private Sector Collieries according to method of working:

1. Open cast	8.40	9.10	8.50	9.50	9.00	9.00	9.00	8.75	8.50	8.47
2. Underground	38.02	42.69	43.15	48.00	55.22	57.50	59.30	61.35	63.40	65.32
(a) Development	25.12	28.00	28.00	28.00	28.32	27.92	27.52	27.12	26.72	26.32
(b) Depillaring	12.90	14.69	15.15	20.00	26.90	29.58	31.78	34.23	36.68	39.00
TOTAL PRODUCTION	46.42	51.79	52.65	57.50	64.22	66.50	68.30	70.10	71.90	73.79

ANNEXURE II

Private Sector

Sl. No.	Name of items	Name & address of manufacturers	Name of collaborator	Ultimate capacity Nos./yrs.	Production during 1962	Remarks
1	2	3	4	5	6	7
(A) UNDERGROUND MINING						
	Coal cutters	1. M/s Meameco Ltd., Dhanbad, Bihar.	Cobmin, U. K.	24 Nos/yr.	13 Nos.	
		2. M/s Hindustan Development Corporation.	British Jeffrey Diamond Co., U. K.	175 Nos/yr.	Nil	Production commended
	Gate End Boxes	1. M/s Meameco Ltd., Dhanbad, Bihar.		72 Nos/yr.		..
	Conveyors (Chain)	1. M/s Dynacraft Machine Co. Ltd., Juhu Lane, Andheri, Bombay-14.		Not separately available	Rs. 86 lakhs (total for all types)	Total 22 firms are engaged in the mfr. of conveyors & elevators with total capacity of Rs. 150 lakhs.
		2. M/s Garlick & Co. Pvt. Ltd., Haines Road, Jacob Circle, Bombay.		"	"	
		3. M/s Robert Mclean Co. Pvt. Ltd., Netaji Subhas Road, Calcutta.		"	"	
		4. M/s McNeil & Barry Ltd., P. O. Box No. 15, Calcutta.		"	"	
	Conveyors (belt)	1. M/s Dynacraft Machine Co. Ltd., Bombay.		Not separately available	Rs. 86 lakhs (total for all types)	There are 22 firms engaged in the mfr. of these items with total capacity of Rs. 150 lakhs.
		2. M/s Elecon Engg. Co., Steelcrete House, 125, Dinchaw Vacha Road, Bombay.				
		3. M/s Garlick & Co. Ltd., Bombay.				

Conveyors (belt)—Contd.	4. M/s Memeco Ltd., Dhanbad.				
	5. M/s Robert Mclean & Co. Ltd., 527, Netaji Subhas Rd., Calcutta.				
	6. M/s William Powell & Sons (P) Ltd., 36 A, Jatin Das Rd., Calcutta.				
	7. M/s Wesmen Engg. Co. (P) Ltd., 71, Ganesh Chandra Avenue, Calcutta.				
Haulages (Endless & direct)	1. M/s Kilburn & Co. Ltd., 2, Fairly place, Calcutta.	1. M/s Austin Hopkin- sonn, U. K.	400 Nos./yr.	157 Nos. (total)	
	2. M/s Memeco Ltd., Dhanbad.	2. John Mills, U. K. Morley Electrical Engg. Co. Ltd., U.K.	36 Nos./yr.		
	3. M/s Barakar Engg. & Foundry Works	Clarke Chapman & Co. Ltd., U. K.	Not yet assessed		Mainly for own re- quirements.
	4. M/s Shalimar Works (P) Ltd., Foreshore Road, Howrah.	Morley Electrical Engg. Co. Ltd., U.K.	To be assessed one year after they go in for Production.		Production in 1963.
Electric Winders	5. M/s Meameco Ltd., Dhanbad.	..	12 Nos./yr.	Nil (total)	These are for Indus- trial type of fans.

ANNEXURE II—Contd.

1	2	3	4	5	6	7	
Main Mine Ventilating fans with motors and Booster fans.	1.	M/s Air Conditioning Corp. Buffalo Forge Ltd., E-2, Giffander House, Co., Calcutta.	540 Nos.		1584 (total)	Total 11 firms are licensed to mfr. Industrial fans & blowers.	
	2.	M/s Davidson of India (P) Davidson & Co. Ltd., 31, Chowringhee Road, Calcutta.	298 Nos.				
	3.	Aircan Industries (P) Ltd, Mahalaxmi, Bombay.	Smith & Son (England) Ltd., U. K.	9600 Nos.			
	4.	M/s S. F. Products (P) Ltd., Lyons Range, Calcutta.	A. B. Swanska Flat Fabriken, Sweden.		..		
	5.	M/s New Standard Edge Co. Ltd., Carrol Road, Bombay.					
	6.	M/s P. S. G. & Sons, Coimbatore.		..	..
	7.	M/s Forge Blower Co., Naroda Rd., Ahmedabad.		..			
	8.	M/s Voltas Ltd. Bombay.	Joy Mfg. Co., U. S. A.	250 Nos.			
Main Pumps	..	..	..	..	1,28,250 Nos.	Recommended grant of licence. Specifications not indicated. Pumps of up to 36" dia are being mfr. & 70 firms are licensed to manufacture this.	
Crushers (Jaw)	1.	M/s Marshall Sons & Co. Ltd., 33/1 Netaji Subhas Road, Calcutta.	W. H. Baxter, UK.	160 Nos./yr.	194 Nos.		Closed due to labour trouble.
	2.	M/s Sur Iron & Steel Co. Ltd., 15, Convent Rd., Calcutta.	..	120 Nos./yr.	(Total)		

Crushers (Jaw)—Contd.	3.	M/s Sayaji Iron & Engg. Co. (P) Ltd., Chhani Rd., Baroda.	..	24 Nos.	
	4.	M/s Garlick & Co. Ltd., Bombay.	..	24 Nos/yr.	
	5.	M/s Kusum Engg. Co. Ltd., 25, Swallow Lane, Calcutta.	..	Against order	
Coal drills (electric)		M/s McNeil & Barry, Calcutta.	Hugh Wood & Co., U. K.	600 Nos/yr.	Nil
Coal Drilling	1.	M/s Sandvick Asia Ltd., Bombay.	Sandvick Coromant, Sweden	10,000 Nos/month	12500 Nos. (total)
Bits & drill rods.	1.	M/s India Hard Metal Wks. Ltd., Calcutta.	William, U. K.	2000 Nos/month	
	2.	M/s Voltas Ltd., Bombay	J. K. Smith, U. K.	10,000 Nos/yr.	
	3.	M/s Christensen Long Year, Bombay	Christensen Diamond Products, France.	10,000 Nos/yr.	
	4.	M/s Greaves Cotton, Bombay	N. J. Longyear USA. Mindrel Australia	10,000 Nos/yr.	
	5.	M/s Precision Tools (I) Ltd.	Trinffers, U. K.	10,000 Nos/yr.	

Compressors 2270

13 firms are licensed to mfr. Total capacity 7540 nos./yr. (up to 1000 cfm.)

ANNEXURE II—Contd.

1	2	3	4	5	6	7
Flameproof Switches	1.	M/s Kilburn & Co. Ltd., Calcutta.	Erskine Heap of 1208 Nos./yr. UK.		Nil	
	2.	M/s Barm & Co. Ltd., Calcutta.	Rayrolle, UK. 503 Nos./yr.			
Power Transformers					2250 KVA.	19 firms are licensed with total capa- city of 1.5 million KVA.
Motors	..	..	..	..	735000 K.W.	About 50 firms are licensed—total ca- pacity—1.6 million K.W. {Approx.}
To Wire Ropes	1.	M/s J. K. Steel. Ltd. Calcutta.	..	Total capacity	3000 tonnes.	
	2.	M/s National Rolling & Steel Ropes Ltd., Calcutta.	..	15000 tons/yr.		
	3.	M/s Usha Martin Black, Calcutta.	..			
	4.	M/s United Wire Ropes Ltd., Bombay.	..			
	5.	M/s Fort William & Co. Ltd. Calcutta.	..			

PILCDWA Cables	1. M/s Indian Cables Co. Ltd., 9, Hare Street, Calcutta.	..	1950	12 firms are licensed to mfr. power cables with total capacity of 5100 miles/ yr.
	2. M/s Cable Corporation of India Ltd., Bombay.	..		
Core Drills	1. M/s Voltas, Bombay.	Jey, U. S. A.	240 Nos.	Rs. 52.27 lakhs
	2. M/s Christensen Longyear, Bombay.	1. Christensen Diamond product France. 2. N. J. Long- year, USA.	6 Nos.	
	3. M/s Garlick & Co., Bombay.			
Theodelite	1. M/s P. Orr & Sons, Mount Road, Madras.	Nil	Total capacity 1152 Nos./yr.	685 Nos.
	2. M/s National Instruments, Jadavpur.	Metrimpex, Hungary		
	3. M/s Andhra Scientific Co. Ltd., Masulipatan.	Nil		
Dumpy Levels	1. M/s P. Orr & Sons, Mount Road, Madras.	..	Total capacity 6790/yr.	4548 Nos.
	2. M/s National Instruments, Jadavpur.	..		
	3. M/s Andhra Scientific Co. Ltd., Masulipatan.	..		
	4. M/s Kohinoor (India) Ltd., Varanasi.	..		

ANNEXURE II—Contd.

1	2	3	4	5	6	7
	5.	M/s Government Electric Factory, Bangalore.	..			
	6.	M/s Scientific Engg. House, Hyderabad.	..			
	7.	M/s Sur Iron & Steel Co. Ltd., Calcutta.	..			
	8.	M/s Hindustan Stanley Ltd., Calcutta.	Stanley of UK.			
Safety Helments		M/s Kilburn & Co. Ltd., Calcutta.		N.A.		Small Scale.
Weighbridges	1.	M/s Avery Co. of India Pvt. Ltd., 28/2, Waterloo Street, Calcutta	Subsidiary of Avery of U.K.	Against order. Sufficient capa- city exists.	545 Nos.	
	2.	M/s India Machinery Co. Ltd., 29, Strand Road, Calcutta.	..			
	3.	M/s Asiatic Machinery Corpn. (P) Ltd., 10/1, Kailash Chandra Lane, Howrah.	..			
	4.	M/s India Weighing Scales & Engg. Co. Ltd., 233, Beli- liens Road, Howrah.	..			
	5.	M/s Bharat Weighing Scales & Engg. Syndicate, 75/1, Kalachand Nandy Lane, Howrah.	..			

OPEN CAST MINING:

Shovels	M/s Telco Ltd., Jamshedpur	Harnishfoger, USA	100 Nos./yr.	Nil
Dumpers	M/s Hindustan Motors	Athey Product Corporation, U.S.A.	..	Nil
Road Rollers	1. M/s Jessops & Co. Ltd., Calcutta.	Aveling Belford Ltd., U.K.	380 Nos.	554 Nos.
	2. M/s Britannia Engg., Ltd., Calcutta.	Marshall Sons & Co., U.K.	300 Nos.	
	3. M/s Agrind Fabrications Ltd., Calcutta.	Moore Road Machinery Australia,	144 Nos.	
	4. M/s Kamani Engg. Corpn. Ltd., Bombay.	E. V. Towse Mfg. Ltd., U. K.	360 Nos.	
	5. M/s Garlick & Co. Ltd., Bombay.	Sakai Works, Japan	100 Nos.	
5 tons Wreckes/ cranes.	1. M/s K. T. Steel Industries, Bombay.	Establishment Boiler Petelet, France.	120 Nos.	Nil
	2. M/s Coles Cranes of India (P) Ltd. Calcutta.	Steel & Co., U.K.	35 Nos.	
Pneumatic Jack Hammers.	1. M/s Consolidated Pneumatic Tool Co. Ltd., Bombay.	C. P. T. of U.K.	1000 Nos./yr.	

ANNEXURE II—Contd.

1	2	3	4	5	6	7
Pneumatic Jack Hammers—Coldn.	2.	M/s Atlas Copco India (P) Ltd., Bombay.	Atlas Copco, Sweden	1020 Nos./yr.		
	3.	M/s Helman Climax Mfg. (P) Ltd., Calcutta.	Holman Brothers, U.K.	1320 Nos./yr.		
	4.	M/s Kirloskar Pneumatic Co. Ltd., Poona.	Brownwade, U.K.	2130 Nos./yr.		
Scraper	1.	M/s Tractors & Bulldozers (P) Ltd., Bombay.	Vickers Armstrong, U.K.	40 Nos./yr.		Nil
	2.	M/s Hindustan Motors Ltd., Calcutta.	Caterpillar Tractor Co., U.S.A.	N.A.		
Low bed trailers	..	..	..	1912 Nos.	13 firms licensed total capacity 7860 Nos.	
250/300 cu. ft. portable compressors.	1.	M/s K. G. Khosla & Co. Pvt. Ltd., New Delhi.	MAW Varmala Stranger Co., Vienna.	N.S.A.		2270
	2.	M/s Consolidated Pneumatic Tool Co. Ltd., Bombay.	C. P. T., U.K.	..		
	3.	M/s Kirloskar Pneumatic Tool Co. Ltd., Poona.	Brown & Wade Ltd., U.K.	..		
	4.	M/s Hindustan Gas Co., Calcutta.	Limok, Berlin Ltd., U.K.	..		

Jeeps	Mahindra & Mahindra, Bombay.	Willy, U.S.A.	5500 Nos./yr.	N.A.
Picks-Ups	1. M/s Leong Motor Works Calcutta	..	..	N.A.
	2. M/s Jayenand Khira Pvt. Ltd., Bombay.	..	..
	3. M/s Grant James (P) Ltd.	..	..
Trucks (5 tons)	1. M/s Premier Automobiles, Bombay.	Dodge, U.S.A.	N.A.	
	2. M/s Telco Ltd., Jam- shedpur.	Mercedes Benz, Germany.	12000 Nos./yr.	N.A.
	3. M/s Hindustan Motors, Calcutta.	Bedford, U.K.	6000 Nos./yr.	
	4. M/s Ashok Leyland, Madras.	Leyland, U.K.	3000 Nos./yr.	
Pumps (1000 gallons capacity 200 ft. & 400 ft. heads).	M/s Kirloskar Brothers, Poona.	Sulzer Brothers Ltd., Switzerland.	N.A.	13 Nos.
Coal Washery	1. M/s McNally Bird Engg. Co. Ltd., Calcutta.	Menally Pittsburg Corp., U.S.A.	3 plants/yr.	Ready to go into Production.
	2. M/s Britannia Engg. Co. Ltd., Calcutta.	India Pvt. Ltd.	1½ plants/yr.	Do.
	3. M/s Tata Iron & Steel Co. Ltd., Jamshedpur.	Hewitt Robins, U.S.A.	1 plant/yr.	Do.
	4. M/s S. S. Jalan, Calcutta.	Roberts Schaefer, U.S.A.	1 plant/yr.	Licensed under the Act.

ANNEXURE III

Statement showing the Particulars of Mining Equipments required

Sl. No.	Nomenclature of equipment showing the brief specification (existing)	Quantity required during 4th Five Year plan
1	2	3

The following is the requirement for 4th Plan Period:— For Mining 7 million Tonnes of lignite in a second mine to be developed.

Specialised Mining Equipment

1.	Bucket Wheel Excavator 1500 litres 30/6 m.	3 Nos.
2.	Bucket Wheel Excavator 560 litres 15/5 m.	2 Nos.
3.	Bucket Chain Excavator 1000 litres . . .	1 No.
4.	Spreader 90 metres length	3 Nos.
5.	Mobile Transfer Conveyors 60 m.	2 Nos.
6.	Slewable conveyor 40 metres	1 No.

Conveyors

1.	2000 m.m. conveyors (overburden)	14000 metres (Approx.)
2.	1200 m.m. conveyors (Lignite)	8000 metres (Approx.)

Conventional Mining Equipments & Ancillary Machinery

1.	30 cubic metres dumpers	16 Nos.
2.	Shovel/Dragline 1.5 cubic metres	2 Nos.
3.	Wheel Excavator 500 litres	2 Nos.

4.	Dozers	14 Nos.
5.	Towing tractors	4 Nos.
6.	Trench cutter	5 Nos.
7.	Cranes 20 Tons 3 Nos. } 5 Tons 3 Nos. }	6 Nos.
8.	Lorries	10 Nos.
9.	Tractors and trailers	8 Nos.
10.	Water lorries	10 Nos.
11.	Jeeps	12 Nos.
12.	Drills (Forward preparation) to drill 20 to 30 m.	4 Nos.
13.	Explosive van	2 Nos.
14.	Mobile Repair unit	4 Nos.
15.	Track shift dozer.	4 Nos.
16.	Motor graders	4 Nos.

Drilling Equipment

1.	Drilling rigs: Auger 48", 54" & 60"	4 Nos.
	Reverse Circulation Drills 48"	4 Nos.
	Straight Circulation Drill 16" to 20"	2 Nos.
2.	Hydraulic jacking unit 100 ton capacity	1 Set

ANNEXURE IV

Statement showing yield of washed products from washeries which are in operation or under construction or proposed to be installed by 1970-71.

Name of washery	Location source of feed coal	Type of washery	Owner	Raw coal input in met.		Yield of clean coal having 15-17% ash		Yield of by-product (sinks) with 38-45% ash			Yield of middlings with 28-35% ash			Yield of rejects with 50-60% ash		
				/yr.	Wt. %	m.t/yr.	Size	Wt. %	m.t/yr.	Size	Wt. %	m.t/yr.	Size	Wt. %	m.t/yr.	
																5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

**WASHERIES
IN
OPERATION**

*Public Sector
Washeries*

· Dugda I	J.C.F.	Three Product	H.S.L.	2.40	60.0	1.44	3"- $\frac{1}{4}$ "	40.0	0.96	3"- $\frac{1}{4}$ "	30.0	0.72	3"-0	10.0	0.24
· Durgapur	Durgapur J.C.F.	"	"	1.50	60.0	0.90	3"-0	40.0	0.60	$\frac{1}{2}$ "-0"	25.0	0.38	3"-0	15.0	0.22
· Kargali (before expansion)	E.B.C.F.	"	N.C.D.E.	1.60	65.0	1.04	3"-0	35.0	0.56	3"-0	18.0	0.29	3"-0	17.0	0.27
· Bhojudih	J.C.F.	Two Product	H.S.L.	2.00	80.0	1.60	$\frac{1}{2}$ "-0	20.0	0.40	..	..	..	..	..	..

II. *Private Sector Washeries*

5.	Jamadoba	J.C.F.	Three Product	TISCO	1.60	68.0	1.10	3"- $\frac{1}{8}$ "	32.0	0.50	1"- $\frac{1}{8}$ "	18.0	0.28	3"- $\frac{1}{8}$ "	14.0	0.22
6.	West Bokaro (before expansion)	W.B.C.F.	„	„	0.70	55.0	0.39	3"-0	45.0	0.31	3"- $\frac{1}{8}$ "	30.0	0.21	3"-0	15.0	0.10
7.	Lodna	J.C.F.	„	Lodna Colly. Co.	0.40	70.0	0.28	$\frac{1}{2}$ "-0	30.0	0.12	$\frac{1}{2}$ "-0	15.0	0.06	$\frac{1}{2}$ "-0	15.0	0.06

B. WASHRIES UNDER CONSTRUCTION
Public Sector Washeries

8.	Patherdih	J.C.F.	„	H.S.L.	2.00	60.0	1.20	3"-0	40.0	0.80	3"-0	25.0	0.50	3"-0	15.0	0.30
9.	Kargali expansion	E.B.C.F.	„	N.C.D.C.	1.12	65.0	0.73	3"-0	35.0	0.39	3"-0	18.0	0.20	3"-0	17.0	0.19
10.	Kathmara	„	„	„	3.00	45.0	1.35	3"-0	55.0	1.65	$\frac{1}{2}$ "-0	30.0	0.90	3"- $\frac{1}{2}$ "	25.0	0.75
11.	Gidi	S.K.C.F.	„	„	2.84	65.0	0.92	6"-1"	35.0	0.50	„	„	„	„	„	„
				lump-slack	78.5	78.5	1.12	1"-0	21.5	0.30	1"-0	16.5	0.23	1"-0	5.0	0.07
12.	Sang	E.B.C.F.	Two Product	„	0.75	60.0	0.45	$\frac{1}{2}$ "-0	40.0	0.30	„	„	„	„	„	„
13.	Dugde II	J.C.F.	„	H.S.L.	2.40	45.0	1.08	$\frac{1}{2}$ "-0	55.0	1.32	„	„	„	„	„	„

ANNEXURE IV—Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
14.	Durgapur	J.C.F. & R.C.F.	„	W.B.Vot.	1.35	50.0	0.67	½"-0	50.0	0.68	..	..	..	..	..
II.	<i>Private Sector Washeries</i>															
15.	West Bokaro (expansion)	W.B.C.F.	Three Product	TISCO	1.74	55.0	0.96	3"-0	45.0	0.78	3"-½"	30.0	0.52	3"-0	15.0	0.26
C.	WASHERIES PROPOSED															
I.	<i>Public Sector Washeries.</i>															
16.	Sudamdih	J.C.F.	Three Product	N.C.D.C.	2.16	70.0	1.51	3"-0	30.0	0.65	3"-0	15.0	0.33	3"-0	15.0	0.32
17.	Central Jharia I (Monidih)	„	„	„	1.25	70.0	0.87	3"-0	30.0	0.38	3"-0	15.0	0.19	3"-0	15.0	0.19
18.	Central Jharia II (Fatehpur)	„	„	„	0.75	60.0	0.45	3"-0	40.0	0.30	..	25.0	0.19	..	15.0	0.11
19.	Jharia standard	„	„	„	0.50	50.0	0.25	..	50.0	0.25	..	35.0	0.17	..	15.0	0.08
20.	Ramgarh I & III	Ramgarh C.F.	„	„	3.00	55.0	1.65	1"-0	45.0	1.35	1"-0	25.0	0.75	1"-0	20.0	0.60
21.	Ramgarh II & Maod	„	„	„	1.00	60.0	0.60	..	40.0	0.40	..	20.0	0.20	..	20.0	0.20

22.	Bokaro (Bermo & Karo)	E.B.C.F.	„	„	1.50 (0.38)	40.0	0.60 (0.15)	..	60.0	0.90 (0.23)	..	40.0	0.60 (0.15)	..	20.0	0.30 (0.08)
23.	West Bokaro (Pundi Block)	W.B.C.F.	„	„	1.50	40.0	0.60	..	60.0	0.90	..	40.0	0.60	..	20.0	0.30
24.	Govindpur Jarandih	E.B.C.F.	Three Product	N.C.D.C.	1.50 (0.30)	50.0	0.75 (0.15)	..	50.0	0.75 (0.15)	..	30.0	0.45 (0.09)	..	20.0	0.30 (0.06)
25.	Pench Kanhana	P.V.C.F.	„	„	0.75 (0.45)	45.0 (60)	0.34 (0.27)	..	55.0 (400)	0.41 (0.18)	..	40.0 (25.0)	0.30 (0.11)	..	15.0	0.11 (0.07)
26.	Chancha	Jhilmili	„	„	0.60	65.6	0.40	..	34.4	0.20	..	19.4	0.11	..	15.0	0.09
27.	Kutkone	do-	„	„	1.00	65.6	0.65	..	34.4	0.35	..	19.4	0.20	..	15.0	0.15
II. <i>Private Sector Washeries</i>																
28.	Chesnalla	J.C.F.	„	I.I.S.C.O.	2.70	60.0	1.62	3"-0	40.0	1.08	3"-0	20.0	0.54	3"-0	20.0	0.54
29.	Bhelatand	„	„	TISCO	1.60	62.5	1.00	3"-0	37.5	0.60	3" 0	22.5	0.36	3"-0	15.0	0.24
					45.22 (42.59)	26.58 (25.40)		18.69 (17.19)			9.28 (8.28)		6.21 (5.74)			

Summary of results and explanatory notes for the table

	Target Production	Expected Production by 1970-71
Clean coal	26.53	25.40
Middlings	9.28	8.28
Sinks	3.20	3.20
Rejects	6.21	5.71
	<u>45.22</u>	<u>42.59</u>

- B. 1. The washeries at Bokaro (Bokaro & Naro), PENCH Kanhari and Govindpur Jarangdih are not likely to reach their targeted production by 1970-71. The expected figures have been shown in parenthesis.
2. The estimate under the column bye-product fuel includes sinks product from washeries which have no provision for separation of middlings and rejects, as well as the total of middlings and rejects where there are provision for separating them.
3. It is expected that the proposed washeries will mostly have provision for three product separation and the rejects in these cases have been assumed to be of the order of 15-20% as almost all the new mines will have mechanised working.
4. Abbreviations: J. C. F. Jharia Coalfield.
R. C. F. Raniganj Coalfield.
W. B. C. F. West Bokaro Coalfield.
S. K. C. F. South Karangura Coalfield
P. V. C. F. Pinch Valley Coalfield.
E. B. C. F. East Bokaro Coalfield.
5. The yield of washed products presented in the table are on the basis of available results and supply of coals as stipulated. The recovery will vary with the change of quality and proportions of raw coal feed to the washeries.

ANNEXURE V

Statement of estimated requirements of Mining, Drilling and Processing Equipments for Iron ore projects of Fourth Five Year Plan

Sl. No.	Description	Quantity					Cost		Remarks
		Hospet Bellary	Bara-Jamda	3rd Mine Bailadila	Mega-hatuburu	Total	Unit cost in Rs. lakhs	Total cost in Rs. lakhs	
1	2	3	4	5	6	7	8	9	10
1.	Ripper cum Bulldozers 250-350 D.B.H.P.	15	6	7	8	36	3.00	108.00	
2.	Front End Crawler Tractor Loader	4	2	2	2	10	2.00	20.00	
3.	Rear Dumpers 30-35 tons capacity	50	16	20	18	104	3.50	354.00	
4.	Rear Dumpers 10-15 tons capacity	15	6	6	6	33	2.00	66.00	
5.	Deep Hole Blast Drill Cap 6"-9"	10	4	5	5	24	5.00	120.00	
6.	Electric shovel 4.5 cu. yd. capacity	8	4	5	5	22	14.00	308.00	
7.	Diesel shovel 2.5 cu. yd. capacity	4	2	2	2	10	4.00	40.00	
8.	Air compressor 17 cu.m./365 cu.ft.m. capacity.	10	4	5	5	24	0.55	13.20	
9.	Air compressor 10 cu.m./210 cfm. capacity	8	4	4	4	20	0.40	8.00	
10.	Air compressor 6 c.um./110 cfm. capacity	8	4	4	4	20	0.25	5.00	

1	2	3	4	5	6	7	8	9	10
11.	Crawler mounted Drill cap. 4" complete with 600 cfm. Air compressor.	5	2	2	3	12	1.75	21.00	
12.	Motor Grader 12' Blade	2	1	1	1	5	1.00	5.00	
13.	Road Roller Cap. 10 tons	2	1	2	2	7	0.60	4.20	
14.	Mobile Truck mounted crane capacity 25 tons	1	1	1	1	4	2.50	10.00	
15.	Mobile Truck mounted crane capacity 10 tons	1	1	1	1	4	1.75	7.00	
16.	Truck Trailer capacity 30 tons	1	1	1	1	4	2.00	8.00	
17.	Truck Trailer capacity 45 tons	1	1	1	1	2	2.50	5.00	
18.	Diamond Cores Drill with accessories	10	4	4	4	22	2.00	44.00	
19.	Iron ore dressing, handling and conveying plant.	2	1	1	1	5	250.00	1,250.00	

Rs. 2,406.40 Lakhs

ANNEXURE VI
(Crushing and Screening Plant)

Sl. No.	Name of Equipment	No. of units required	Price per unit in Lakhs	Total price Rs. Lakhs	Foreign Exchange component Rs. Lakhs
1	2	3	4	5	6
<i>Crushing plant</i>					
1.	Hopper 100 tons	1	1.50	1.50	Nil
2.	Feeder <i>cu m</i> grizzly 2,000 tons/hr.	2	4.00	8.00	7.00
3.	Belt conveyor (for grizzly U/S)	2 Nos.	0.80	1.60	1.00
4.	Gyratory crushers 2,000 tons/hr.	2 Nos.	13.00	26.00	20.80
5.	Conveyor Belt Scalper Screens	2 Nos.	0.50	1.00	0.50
6.	Weightometer	2 Nos.	0.50	1.00	0.80
7.	Scalper screen extra heavy duty	3 Nos.	0.60	1.80	1.30
8.	Metel detector	2 Nos.	0.20	0.40	0.32
9.	Belt conveyor (Scalper U/S)	3 Nos.	0.40	1.20	0.60
10.	Tripper or travelling conveyors to sec. crushers.	2 Nos.	0.50	1.00	0.80
11.	Gyratory secondary crushers 550 tons/hr.	2 Nos.	5.00	10.00	8.00
12.	Belt conveyor for collecting from 2 gyratories with a tripper.	1 No.	1.50	1.50	1.20
13.	Misc. chutes and gauges	L. S.	5.00	5.00	4.00
14.	Dust collectors	L. S.	2.00	2.00	1.60
15.	Overhead elec. travelling crane 66 tons capacity.	1	5.00	5.00	4.00
16.	Overhead elec. travelling crane 25 tons.	1	3.00	3.00	2.40
17.	Elect. hoist 5 ton capacity	1	0.55	0.55	0.45
18.	Chain hoist pulley 5 tons	1	0.12	0.12	0.10
19.	Portable winches	4	0.25	1.00	0.80
20.	Elec. control gear, cables and fittings, etc.	L.S.	10.00	10.00	8.00
21.	Tripper or travelling conveyors	2	0.50	1.00	0.80
22.	Conveyor from crushing plant to screening plant.	1	70.00	70.00	42.00
23.	Conveyor 1,525 metres or 500' long—1,220 mm or 48" width 200 tons/hr.	1	40.00	00.40	00.82
24.	Tripper	1	40.00	00.40	0.32

1	2	3	4	5	6
<i>Screening Plant</i>					
1. Hoppers with metal etc. each 100 tons.	12	0.50	6.00	..	
2. Vibrating gates	8	0.45	0.36	0.25	
3. Primary vibrating screen 175 tons/hr. each.	8	0.45	0.36	0.25	
4. Collecting belt conveyor for lump ore.	L.S.	2.00	2.00	0.90	
5. Secondary screens	8	0.45	3.60	2.80	
6. Lump ore conveyor	1	2.00	2.00	0.90	
7. Fine ore conveyor	1	2.50	2.50	1.50	
8. Gates, chutes, etc.	..	2.00	2.00	1.50	
9. Sampling plants (one for lump ore and one for fine ore).	2	2.00	4.00	3.00	
10. Classifiers	2	4.50	9.00	7.00	
11. Thickeners	2	3.90	7.80	3.20	
12. Overhead travelling crane 10 tons.	1	1.00	1.00	0.80	
13. Elec. hoist 5 tons	1	0.50	0.50	0.40	
14. Chain hoist	1	0.12	0.12	0.10	
15. Elec. control cables and fittings, etc.	L.S.	10.00	10.00	8.00	
16. Water supply pipes and fittings etc.	L.S.	5.00	5.00	1.00	
17. Weightometers	2 No.	0.50	1.00	0.80	
18. Transportation, freight, customs, etc. @ 20%.			43.65	Nil	
TOTAL.			261.60	141.34	

Conveying of Lump ore, Fines Stacking and Loading

1. Lump ore conveyor 1,800 tons/hr.	13.00	13.00	8.60
2. Fine ore conveyor	9.00	9.00	6.00
3. Stacker	5.00	5.00	4.00
4. Reclamation Tunnels conveyors	L.S.	..	22.00
5. Feedo weightometer, chutes bunker.	L.S.	..	4.00
6. Slime pumps and pipes	L.S.	..	2.00
			1.60

ANNEXURE VII

Estimated Requirements of Equipment for Copper Projects for the Fourth Five-year Plan

Sl. No.	Description .	Kolihan	Rakha	Total
1.	Core Drills	6	6	12
	Copper Projects			
2.	Drifters	10	10	20
3.	Eimco 21 B loaders	2	2	4
4.	Stoppers	36	36	72
5.	Slushers, three drums	2	2	4
6.	Feed air legs	10	10	20
7.	Scrapers 40	4	4	8
8.	Bit Grinders	5	5	10
9.	Tuggers	7	7	14
10.	Tram cars	25	25	50
11.	Haulage cars	12	12	24
12.	Flat cars	10	10	20
13.	Service locomotives	2	2	4
14.	Haulage locomotives	2	2	4
15.	Motor generators (Service)	2	2	4
16.	Motor generators (haulage)	2	2	4
17.	Crusher 30" x 42"	1	1	2
18.	Chain feeder	1	1	2
19.	Conveyors:			
	(a) 36"	1	1	2
	(b) 24"	..	..	..
20.	Tramp Magnet M/Rectifier	1	1	2
21.	Bridge cranes	2	2	4
22.	Skip loaders	2	2	4
23.	Skips	2	2	4
24.	Cages (Man)	2	2	4
25.	Cages (Emergency)	1	1	2
26.	Hoist (Production)	1	1	2
27.	Hoist (Service)	1	1	2
28.	Hoist (Escope)	1	1	2
29.	Apron feeders	1	1	2
30.	Compressors:			
	(a) 1000 cfm	2	2	4
	(b) 500 cfm	..	..	..
31.	Raise Climber	1	1	2

ANNEXURE VIII

Requirements of machinery & equipment for Coal Washeries

Sl. No.	Item	Total quantity during 3rd Plan nos.	Requirement per year
1	2	3	4
A. Raw Coal Stocking, Bunkering and reclaiming			
1.	Bin gates (hand operated or chain wheel operated)	104	21
2.	Bin gates with electrically operated adjustable devices	36	7
3.	Feeding shoes with bevel and spur wheel gearing	32	6
4.	Discharge chutes with electrically operated adjustments	24	5
5.	Vibrating feeders	350	70
6.	Reciprocating feeders	32	6
7.	Belt tripper	15	3
8.	Coal stocking boom having electric rope winch for travelling the stocking belt conveyor and electric hoist for lifting or lowering the feeding arms.	14	3
9.	Automatically travelling coal reclaiming machines or caterpillar grab excavator	14	3
B. Raw and Washed Coal crushing			
1.	Belt conveyor of various widths varying from 0.5 m to 1.6 m	250	50
2.	Apron conveyor	14	3
3.	Chain conveyor	46	9
4.	Bucket elevator	46	9
C. Tram Iron Separator & picking Belt			
1.	Drum type Tram-Iron separator	40	8
2.	Suspended type Tram-Iron separator	8	2
3.	Picking belt	30	6
D. Coal crushers			
1.	Single/Double/gyratory Crusher	30	6
2.	Hammer crusher	12	2

1	2	3	4
<i>E. Screens</i>			
1.	Roll or reciprocating or jiggling or vibrating screens 75 mm aperture	28	6
2.	Resonance or vibrating screens 25 mm, 15 mm, 13 mm aperture	45	9
3.	Double deck shaker screen of 25 mm and 0.5 mm aperture for screening, destimining and depul- ping —do— — 0.5 — 0.8 mm	200	40
4.	Sieve Bend or are screens for primary destimining			158	32
<i>F. Dust Separation</i>			
1.	Suction fan	12	2
2.	Suction bag filter	12	2
3.	Dust separator	12	2
4.	Water sprayers	12	2
5.	Dust hood & duct	12	2
<i>G. Coal Washers</i>			
1.	Baum Jig with accessories	10	2
2.	Heavy Medium separators two product shallow bath type	20	4
3.	Cyclone washers	74	15
4.	Hydro cyclone for fines upgrading	140	28
5.	Froth floatation with accessories	12	2
<i>H. Deatering & Effluent treatment</i>			
1.	Centrifugal Dryers	32	6
2.	Solid Bowl Centrifuge	24	5
3.	Disc or drum type Filter with accessories	43	9
4.	Cyclone thickener	100	20
5.	Cyclone classifier	16	3
6.	Radial Thickener with rake mechanism	20	4
7.	Flocculating Equipment	12	2
<i>I. Medium classification & Regeneration</i>			
1.	Magnetic separator with accessories	34	7
2.	Densifier spiral or baffle type	22	4
<i>J. Pumps</i>			
1.	Centrifugal pumps varying from 60/hr to 3000 cum/hr.	200	40
2.	Vacuum Pumps	52	10
3.	Diaphragm pumps	22	4

1	2	3	4
4. Compressors		10	2
5. Blowers		20	4
<i>K. Control Equipment</i>			
1. Belt weigher		100	20
2. Automatic sampler		100	20
3. Bin level indicator		12	2
4. Medium tank level indicator		12	2
5. Specific gravity regulator and recorder		24	5
<i>L. Miscellaneous Equipment</i>			
1. Electric hoist or travelling crane		14	3
2. List for persons and materials		12	2

ANNEXURE IX

List of firms licensed under the Industries (D. & R.) Act for the manufacture of conveyors

Sl. No.	Name of the firm	Annual licensed capacity (in Rs. lakhs)
1	2	3
1.	M/s. Dynacraft Machine Co. Ltd., Andheri, Bombay	40
2.	Elecon Engg. Co., 185, Dinshaw Vacha Road, Churchgate Reclamation, Bombay-1	12
3.	Meamcco Private Ltd. Turnernagar, Dhanbad, Bihar	12
4.	Robert Mclean & Co. (P) Ltd., 527, Nataji Subhas Road, Calcutta-1	15
5.	William Power & Sone Private Ltd., Jatin Das Road, Calcutta	10
6.	Hindustan Sheets & Metal Co. (P) Ltd. 8 Clive Row, Calcutta	2
7.	Meneil & Barry Ltd., P. O. Box No. 15, Calcutta	21
8.	Wesman Engg. Co. Pvt. Ltd. 71, Ganesh Chandra Avenue, Calcutta	6
9.	Larson & Toubro Ltd, I. C. House, Dougal House, Ballard Estate, Bombay	20.84 (small)
10.	Western Mechanical Industries Pvt. Ltd., Vulcan Insurance Bldg, Bombay	2
11.	International Combustion India Pvt. Ltd., 1011, Park Street, Calcutta-16	5.0
12.	Chitram & Co., Main Road, Royapuram, Madras	S/4
13.	Gannon Dunkerlay & Co. Ltd., Chartered Bank Bldg. Fort Bombay	2
14.	C. Comens & Sons Ltd., 103/3, Diamond Harbour Road, Calcutta	5
15.	Elecon Engg. Co. Private Ltd., Vidya Nagar, Gujarat	120
16.	Keymer Bagshaw Mfg. Co. Ltd., Calcutta	2
17.	Garlick & Co. Ltd., Jacob Circle, Bombay	2
18.	Textile Machinery Corp. Ltd., Belghania (W. Bengal)	2
19.	Hind Laboratories Pvt. Ltd., Ahmedabad	2

1	2	3
20.	Ahmedabad Victories Iron Works Co., Ahmedabad	5
21.	A. C. C. Ltd., Sahabad, Mysore.	2
22.	Utkal Machinery Pvt. Ltd., Rourkela	5
23.	Vulcan Trading Co. Ltd., Bombay	13.5
24.	Tata Iron & Steel Co. Ltd., (Tata Frazer Robins), 24, Bruce Street, Fort, Bombay	216
25.	A. K. Sen, P-7, Belaghata Main Road, Calcutta	70
26.	Pinner Equipment Co. Ltd., A. I. Indl. Estate, Curve Road, Bombay-27	22
27.	D. S. Mahadevia, E-12, Mafatlal Park, Bholabhai Desai Road, Bombay-27	50/70
28.	Mukund Iron & Steel Works Ltd., Kurla, Bombay-7	2
29.	McNally Bird & Engg. Co. Ltd., Chartered Bank Bldg, Calcutta	20
30.	National Engg. Works, Fort, Bombay	12
31.	Konal Corporation, 104, Commerce House, Madow Street, Bombay	20
32.	Sayaji Iron & Engg. Co. (P) Ltd., Channi Road, Baroda	6
33.	De Smet (I) Private Ltd., 95-A, Marine Drive, Bombay	6
34.	Vinar Ltd., 2-A, Theatre Road, Calcutta-16	10
TOTAL.		764.34