

FOURTH PLAN

PLANNING GROUP ON MACHINERY INDUSTRIES

At the instance of the Planning Commission, the Department of Heavy Industries in the then Ministry of Steel and Heavy Industries (now the Department of Industry in the Ministry of Industry and Supply) constituted a Planning Group on Machinery Industries in their O.M. No. 2070-DS (HS) 62 dated the 27th June, 1962. The composition of the Planning Group is as given below:

Chairman

1. Shri N. Subrahmanyam, Additional Secretary, Department of Industry.
2. Dr. G. P. Kane, Dy. Director General (Chemicals), Directorate General of Technical Development.
3. B. D. Kalelkar, Dy. Director General (Engineering), Directorate General of Technical Development.
4. Shri K. B. Rao, Officer on Special Duty, Ministry of Industry and Supply.
5. Shri C. S. Sridharan, Deputy Adviser, Soil Conservation (Engg.), Ministry of Food & Agriculture.
6. Shri M. N. Bery, Director (Planning), Railway Board.
7. Shri K. P. S. Nair, Vice Chairman, Central Water & Power Commission.
8. Shri Balram Sethi, Director (Production), Ministry of Defence.
9. Shri N. C. Shrivastava, Secretary, Department of Mines and Metals.
10. Dr. A. Nagaraja Rao, Adviser (I&M), Planning Commission.
Dr. D. Swarup, Chief (I&M), Planning Commission.
11. Shri G. Ramanathan, Joint Secretary, Deptt. of Iron & Steel.

During the chairmanship of Shri T. Swaminathan, the Group met a number of times and had finalised a tentative list of major groups of equipment which are homogenous from the point of view of production.

In order to get a detailed analysis of the demand for various groups of equipment and suggest a programme for development during the Fourth Plan period, it was decided to set up separate Working Groups for each group of equipment. For this purpose, the following groups of equipment were decided upon:—

1. Electrical Power Equipment.
2. Transport Equipment.
3. Steel & Metallurgical Industries Equipment
4. Mining and Drilling Equipment
5. Fertiliser and Chemical Equipment
6. Machine Tools
7. Industrial Machinery

8. Textile Machinery**9. Structural.****10. Engineering Industries**

In respect of earth moving machinery and agricultural machinery, no Working Group was formed; instead the Directorate General of Technical Development was requested to prepare a report on these items.

The Working Groups were requested to prepare preliminary reports on the subjects assigned to them. Based on these preliminary reports, the Planning Group prepared a preliminary report embodying the findings of the Working Groups. This Report, appended to this Final Report, was submitted to the Planning Commission on..... for their scrutiny and comments.

After receiving the general comments from Planning Commission and in the light of the Memorandum on the Fourth Five Year Plan prepared by the Planning Commission, the Working Groups were asked to prepare Final Reports on the items of machinery studied by them.

Mainly based on the findings and recommendations of the Working Groups, but modified or adjusted wherever the Planning Group found this necessary, the Draft Report of the Planning Group on Machinery Industries was prepared. The Draft Report was then circulated for comments. The Draft Report, along with the comments, were discussed by the Planning Group for finalisation. The Final Report has been prepared incorporating all the modifications accepted or recommended by the Planning Group, and is enclosed herewith for the consideration of the Planning Commission.

Sd. N. SUBRAHMANYAM,

Chairman.

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PLANNING GROUP FOR MACHINERY INDUSTRIES

FINAL REPORT

1.1. The Memorandum on the Fourth Five Year Plan has defined the policy regarding the industrial development in these words. "The strategy of industrial development during the Fourth Plan will by and large have to be along the lines outlined and incorporated in the Third Five Year Plan. It should, on the one hand, provide for an adequate expansion in the supply of consumer goods, particularly those which cater to the needs of the mass of the people. At the same time basic and heavy industries, supplying the capital goods and intermediate goods should continue to be expanded at a rapid pace so that the economy might be in a position to sustain an adequately high rate of development within the constraints imposed by the limited supply of foreign exchange."

1.2 In the First Five Year Plan the investment on industrial sector was less than Rs. 4,000 million. Almost all the machinery and equipment for this industrial development was imported. This strained developmental efforts tremendously and brought into sharp focus the necessity of developing basic industries. Accordingly the basic industries were given high priority during the Second Five Year Plan in which the industrial investment was stepped up to approximately Rs. 16,000 million. Notable progress was achieved in this period. The value of all kinds of industrial machinery and transport equipment produced in the country rose from Rs. 400 million in 1951 to about Rs. 2,000 million in 1960.

1.3 The emphasis on basic industries continued in the Third Plan. Since purchase of heavy machinery was and continues to be one of the principal drains on foreign exchange, the most significant growth in the Third Plan was envisaged in machinery and engineering industries (Table 1.1). In pursuance of the basic strategy of developing machine building industries, a sound base has been established during the Third Plan for the production of a wide range of capital goods as well as intermediates (See table 1.4). The steps taken in the development of machine building capacities in respect of various items of machinery e.g., power generating equipment, transport equipment, diesel engines, pumps, coal mining machinery, machine tool etc., are comprehensive enough to bring the goal of self-sustained growth within sight. While the progress achieved is undoubtedly impressive, since we had started from a very narrow base, these developments still fall short of our requirements.

1.4. An assessment of the overall requirements of machinery can be obtained by applying the past norms of utilisation of capital equipment in various sectors of economy (Table 1.2). These can of course be taken only as indicative of the order of magnitude. An attempt has been made to estimate the approximate share of indigenous equipment in the total supply of capital equipment based on proposed development (Table 1.3).

1.5. Even though these are approximate figures, yet they help us to focus our attention in the right direction. Keeping in view the requirements and feasibility of developing that industry in the specified span of time, it is possible to assign priorities and goals. While suggesting targets, not only demand was a factor but the feasibility of achieving these targets, not only in a technical sense, but also with reference to organisational and other resources were considered. Another aspect which has to be clearly understood is the role which imports will be allowed to play in the supply of capital equipment. In certain industries it is desirable that certain requirements are met from imports. The reason may be one of many. It may be that the demand for such machines is so small that production cannot be justified on economic grounds or that the developments and innovations in other countries are being made so rapidly that to maintain a competitive position, the user industry must import them from the best source available. Examples of equipment which fall in this category are special machine tools, textile machinery, chemical equipment, instruments and control equipment etc. etc. On the other hand, in respect of a large number and variety of equipments, we can strive to be not only self-sufficient but to export in substantial quantities.

1.6. This second group will comprise equipment where lack of latest technology is not a significant handicap or the techniques could be readily obtained and applied. Transport equipment, power and other electrical equipment, certain industrial plants (sugar, cement), structurals and other intermediate products etc. could be grouped in this category. The potential internal market for most of the equipment is on a big enough scale to make the manufacture of most of economically feasible and desirable. Broadly speaking, while suggesting targets in respect of certain items, it has been deliberately planned to meet approximately 20-25 per cent of the requirements by imports, while in respect of others, the suggested targets include a cushion for exporting upto 10 per cent of the output after meeting internal demand.

1.7. The capital equipments required comprise a wide variety of plant and machinery. To make the data meaningful for the purpose of planning, it becomes necessary to disaggregate the total equipment into equipment specific to any particular industry (e.g. textile machinery, printing machinery etc.) and the rest into groups comprising of equipment, homogenous from the point of view of production, rather than in terms of their end use. Such an analysis is given in the Interim Report of the Group.

1.8. From tables 1.2 and 1.8 it will be seen that among the groups of specific equipment, transport equipment forms the most important group in terms of value. The requirements of transport equipment constitute approximately 25 per cent of the total equipment required in the economy. The second largest group is of electrical equipment, both for the generation, transmission and utilisation of electrical energy. The share of this group of equipment in the total requirements of capital equipment may be around 18 per cent. Next in value, probably, machine tools would form the single largest group (7 per cent). However, it is not only the large

demand which emphasises the significance of these equipments, but the tremendous multiplier effect which sufficient availability of transport and power has on the development of economic activities, and the role of machine tools as mother machines further enhances the importance of the industries which manufacture them.

1.9. These factors were highlighted by the Planning Group on Industries for the Third Plan also and the Plan had taken full cognizance of these priorities. Table No. 1.4 (p. 12) shows the recommendations of the Planning Group for Third Plan, Targets accepted by Planning Commission and the latest estimates of likely achievements by the end of Third Plan. The result is that during the Third Plan, a sound base has been established for the development of heavy machine building industries. Most important of all during this period, valuable experience has been gained in the construction and operation of large and complex undertakings.

1.10. Realising the deficiencies and defects and yet encouraged by the past achievements, it is now proposed to intensify these priorities during the Fourth Plan period. At the same time, it is proposed to initiate corrective steps to rectify the deficiencies and defects, which have impeded in any way our progress in the past. By continuing to assign priorities to the developments in these fields, as suggested in this Report, there is every prospect that during the Fourth Plan, we can achieve a major degree of self-sufficiency in these fields. While recommending targets for the Fourth Plan, the experience of the past has been fully kept in view. Broadly speaking, the aim has been (a) to reach the goal of self-sufficiency and strive for exports in respect of those industries which are fairly well developed (e.g., transformers, motors, pumps, diesel engines, commercial vehicles, wagons, industrial plants etc.); please see table 1.9. (b) consolidate the position and establish sound bases for future expansions in respect of capital intensive and complicated industries, not yet adequately developed, e.g. steel plant equipment and (c) to start nuclei for the development of industries in which progress is lagging far behind; e.g., heavy pumps and compressors, heavy plate work equipment etc. etc.

1.11. Within the scope of these broad aims fixation of targets is influenced by other factor also. The development of capacity for machine building is a continuous and long drawn process. It is neither possible nor desirable to fragmentate it in Five Year Segments. In respect of many industries, the gestation period is so long that the Fourth Plan targets have to be related to the demand during the Fifth and subsequent plan periods rather than in the Fourth Plan itself. The priority which is being accorded to agriculture has its own repercussion on the machine building industries. On the one hand plants to manufacture agricultural machinery like tractors, power tillers, pumps etc. which are direct inputs for agriculture sector, have to be established (and there is no reason why we should not be self-sufficient in these items). At the same time, fabrication shops to manufacture chemical plants which will produce different inputs for agriculture and consumer products have to be assigned priority

1.12. The Group has attached the greatest importance to creating conditions for the optimal utilisation of established machine building capacity. The experience has been that due to insufficient availability of intermediate products like castings, forgings, gears, bearings, pipes and tubes, etc. the machine building capacity has been grossly under-utilized. This is a national loss and the Group feels that establishment of such industries which will optimise the utilisation of existing or proposed machine building capacities should be accorded the highest priority. A very important step in optimising production capabilities is the development of engineering and design facilities. Development has to be in a sequence in which capacity for production and capacity for making the equipment for such production, as well as the ability to design and the ability to produce follow each other in close harmony.

1.13. It is felt that this pattern of diversified investment in the field of heavy engineering will not only add to the strength of the economy, through a more balanced base for further development, but will also, across the field, give early and improved returns on the heavy investments that we are making and will have to continue to make for some time to come.

1.14. Based on the recommendations of the Working Groups, modified or adjusted wherever the Planning Group found this necessary or desirable, the programme for the development of heavy engineering industries has been formulated as is summarised in the following table No. 1.5 and the corresponding investment and foreign exchange are summarised in Table No. 1.6.

1.15. The figures of estimated installed capacity in 1965-66 is based on the latest information available with the Department of Heavy Engineering. The investment required during the Fourth Plan is estimated on the basis of above-mentioned achievements by the end of the Third Plan period. However, wherever reliable information was available, the addition to capacity, in excess of that indicated in the tables for 1965-66, likely to materialise in Fourth Plan in consequence of investments already made or likely to be made before the end of Third Plan, has been taken into account in assessing the Fourth Plan gap requiring additional investment. In calculating the investments required, the data have been obtained from specific project reports or estimates wherever available and otherwise, available norms of investment have been applied. The investment in public sector projects, during the Fourth Plan period, includes balances of investment needed for completion of Third Plan schemes. The total on this account comes to Rs. 1456 million out of the figure of Rs. 5483 million in the public sector. The investment shown does not include investment on townships or inventories.

1.16. With the implementation of recommended programmes, the share of investment in machine building industries over the span of four plan periods will be as shown in the Table No. 1.7. The corresponding output estimates are shown in Table No. 1.8.

1.17. In the overall frame work of development, a tentative development plan for the public sector has been suggested. Based on

general industrial policies and the role of the public sector in machine-building industries, this tentative list is put forward as the Group's best judgement up to date. This cannot, however, be taken as the final list not subject to modifications. It is quite possible that specially if in certain sectors where large expansion is called for and private sector is unable to meet the gap, new projects in public sector may have to be initiated. For example, possibility of manufacturing transformers below 33 kv, motors below 150 kw, gas cylinders, scooters, industrial valves, additional foundry forge facilities, structural fabrication, construction machinery, etc. in the public sector cannot be ruled out. At the same time the possibility of modifying the scope of certain project or their elimination altogether might have to be considered in the light of lower resources or changes in the programme of machinery using industries. For example if it is decided that the capacity for the manufacture of woollen textiles will not be augmented during the Fourth Plan, the textile machinery project may have to be deferred. Similarly a reduced power generation and distribution programme may significantly alter the electrical equipment demand and consequently the manufacturing programme.

TABLE I.1—Targetted Index of Industrial Production 1950—1965

	50-51	55-56	60-61	65-66	70-71
All commodities	100	139	194	329	
Iron and Steel	100	122	238	637	
Chemicals	100	179	288	720	
Cotton Textiles	100	128	133	157	
Machinery (All types)	100	192	503 (460)*	1224 (1290)*	3000*
Items under Deptt. of H. E.	100	180	450*	1050*	3000*

(1) Source—Third Five Year Plan p. 452.

*Latest estimates of the Group.

TABLE—1·2 Requirements of Plant, Machinery and Indicative Assessment

(Rs. Million)

HEAD	Investment during plan period			% of cost of plant and equipment	Cost of Plant Machinery and Equipment		
	II Plan*	III Plan*	IV Plan†		II Plan	III Plan	IV Plan
1. Agriculture and Community including irrigation	12550	2400	32250	8·4	1050	1770	2710
2. Power	4850	10620	20000	65	3150	6900	13000
3. Village and Small Industries	2650	4250	6800	50	1325	2125	3400
4. Organised Industries—Minerals	15450	25700	56000	50	7725	12850	28000
5. Transport and Communication	5500	5960	16500	18	990	1070	2970
6. Railways	8600	11400	20000	53	4360	6040	10600
7. Social services and Miscellaneous	12900	16970	36200	8	1030	1360	2900
8. Inventories	5000	8000	12000	5	250	400	600
9. Total	67,500	1,04,000	199,750		20080	32515	64180

Source—*Third Five Year Plan—59

(†) Memorandum on the Fourth Five Year Plan, p. 10.

TABLE 1.3—Supply of Plant, Machinery and Equipment approximate Assessment.

	Rs. Millions/Year		
	1960-61	1965-66	1970-71
Total requirements	5,635	9,205	19,370
additional capacity (1)	5,000	8,130	16,045
replacement(2)	600	975	1,925
exports	35	100	1,000
Indigenous Production (3)	2,440	6,782	17,500
of which of items under Department of H.E.	(1967)	(4782)	(13,998)
Imports : Machinery	3,195	2,423	1,870
components and raw materials (4)	490	1,356	2,625
TOTAL	3,685	3,779	4,495
Share of Indigenous Production in total supply—per- cent	36	59	77

- (1) The last year requirements are assumed to be 25 percent of the total plan periods.
- (2) On the assumption that depreciation funds are related to replacement expenditure, an average figure of 12 percent of investment on plant and machinery for establishing additional capacity is adopted for assessing replacement requirements. This works out to approximately 1.5 percent of the stock in the beginning of that year.
- (3) This is value of finished machinery plus 15 percent of the value of intermediates which will go as replacement parts or independent items. In the transport equipment output of passenger vehicles, scooter etc. is excluded.
- (4) For 1960-61, 25 percent of output of items under Department of HE., for 1965-66 and 1970-71, 20 and 15 percent respectively of total indigenous production. This is to account for the imports required for the manufacture of diesel and electric locomotives and ~~air~~ ^{air} railway equipment.
- (5) Please also see table 1.8. The demand for items under Department of Heavy Engineering add upto approximately Rs. 15,350 million. Adding to this the requirements of other items of capital equipment, e.g., Railways, cables, instruments, etc., etc., as available from various reports, the total requirements and upto approximately Rs. 18,850 million.

TABLE 1'4—Heavy Engineering Industries Third Plan Programmes

Sl. No.	Item	Unit	III Plan Planning Group Output 1965-66	Planning(1) Commission Targets		Estimates likely achievements		
				Capacity	Output	Capacity	Output	Value of out put Rs. million
1	2	3	4	5	6	7	8	9
<i>I. Electrical Machinery</i>								
1	Boiler—power	mKW	1.35	under item (40)		1.1	0.30	61
2	Turbines—steam	mKW	1.2	Heavy electrical Equipment Rs. 800 million details n.a.		0.6	(2)	
3	Turbines—hydro	mKW	0.6			0.5	..	
4	Generators—steam (including synchronous condensers)	m KW 000. KVA	1.8			0.6	..	
5	Generators—hydro	mKW			0.5	..		
6	Motors—above 150 KW	mKW	1.8	1.9		1.95	1.68	210
7	Motors—upto 150 KW	mKW	2.2					
8	Traction Motors	Nos.	n.a.			800	439	33
9	Transformers—at ove 33 KV	mKVA	5.4	included under H.E.		7.45	5.9	206
10	Transformers—upto 33 KV	mKVA		4.0		3.5		
11	Capacitors	mKVAR	0.18	n.a.	n.a.	0.15	0.14	7
12	Switchgear and Control gear	m. Rs.	56	(given in numbers)		180	160	160

1	2	3	4	5	6	7	8	9
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II. *Transport, Construction and Agricultural Machinery*

13	Commercial vehicles	th. nos.	40	60	60	44	42.2	971
14	Jeeps and station wagons	th. nos.	n.a.	10	10	10	10	134
15	Passenger cars	th nos.	n.a.	30	30	26	25	225
16	Motor cycles and scooters	th nos.	n.a.	60	50	75	50	100
17	Trailors	th.nos.	10	2.5	2.5	7.5	n.a.	..
18	Automobile ancillaries (including foundry forge facilities)	m. Rs.	n.a.	n.a	n.a.	100	330	330
19	Crawler and rubber tyred tractors	nos.	n.a.	600	500	..	..	..
20	Dumpers and Scrapers	nos.	n.a.	600	500	..	..	..
21	Excavators and shovels	nos.	2000	125	100	100	100	50
22	Road Rollers	nos.	300	800	700	1780	1600	72
23	Agricultural tractors	th. nos.	9	12	10	11.0	6.0	42
24	Power tillers	th. nos.	n.a.	n.a.	n.a.	3	1	3
25	Tractor drawn implements	m. Rs.	20	n.a.	n.a.	20	n.a.	..

1927

III. *Machine Tools*

26	Machine tools	m. Rs.	300	300	300	376	} 300	300
27	Small tools and hand tools	m. Rs.	n.a.	n.a.	n.a.	200		300

300

1	2	3	4	5	6	7	8	9
<i>IV. Industrial Machinery and Engineering Industries</i>								
28	Metallurgical and other heavy equipment	. th. tons.	75	80	n.a.	n.a.	16	56
29	Coal and other mining machinery	. „	50	45	30	45	20	88
30	Heavy plate and vessels	. . . „	n.a.	40	30	..	..	..
31	Chemical machinery	. . . m. Rs.	150	included under items (28 and 30)		135	85	85
32	Heavy pumps and compressors	. th. tons	n.a.	n.a.	n.a.	..	..	..
33	Textile machinery	. . . m. Rs.	300	220	200	400	300	300
34	Jute machinery	. . . m. Rs.	25	25	25	50	40	40
35	Paper machinery	. . . m. Rs.	79	85	70	73	30	30
36	Sugar machinery	. . . m. Rs.	100	120	100	175	90	90
37	Cement machinery	. . . m. Rs.	35	45	45	178	60	60
38	Dairy machinery	. . . m. Rs.	9	25	25	20	20	20
39	Printing machinery	. . . m. Rs.	50	n.a.	n.a.	30	11	11
40	Industrial boilers	. . . m. Rs.	90	290*	250*	108	80	80
41	Tea Processing machinery	. . . m. Rs.	30	n.a.	n.a.	21	18	18
42	Diesel engines	. . . th. nos.	60	72	66	150	80	164
43	Power driven pumps	. . . th. nos.	120	184	150	200	180	450
44	Iron castings	. . . m. tons	n.a.	1.2	1.2	1.2	0.8	800

1	2	3	4	5	6	7	8	9
45	Iron rolls	th. tons	n.a.	n.a.	n.a.	..	..	..
46	Steel castings	m. tons	n.a.	·20	·20	0·17	·09	135
47	Steel forgings	Do.	n.a.	·20	·20	0·14	·09	225
48	Iron pipes	Do.	n.a.	0·8	0·8	·47	·35	152
49	Steel pipes and tubes	m. tons.	n.a.	0·51	0·45	·65	·30	600
50	Wire ropes	th. tons	n.a.	40	40	25	n.a.	n.a.
51	Ball and roller bearings	m. number	n.a.	10	14	12·2	10	120
52	Gears	m. Rs.	n.a.	n.a.	n.a.	21·8	12·5	12·5
53	Steel structurals	m. tons.	n.a.	1·1	1·0	0·3	0·29	435
54	Cranes	th. tons.	50	60	60	20	15	58
55	Wagons (4 wheelers)	th. numbers	35	33·5	28	40	37	629
								4758

(1) Third Five Year Plan, pp. 502—509 : Programme of Industrial Development 1961-66,

(2)—indicates nil, n.a.—indicates that the source quoted did not provide data.

* includes power boilers.

TABLE No. 1.5

HEAVY ENGINEERING INDUSTRIES

FOURTH PLAN

TARGETS AND INVESTMENTS

Sl. No.	Item	Unit	Installed capacity		Total fixed investment during IV Plan (Rs. m)	Total Foreign Exchange
			1965-66	1970-71		
1	2	3	4	5	6	7
<i>I. Electrical Machinery</i>						
1	Boilers—power	m. KW	1.1	3.7	300	70
2	Turbines—steam	m.KW	0.6	4.0	400	175
3	Turbines—hydro	m.KW	0.5	1.7	105	40
4	Generators—steam (including synchronous condensers)	m.KW 000KVA	0.6	4.3	230	150
5	Generators—hydro	m.KW	0.5	1.7	105	45
6	Motors—above 150 KW	m.KW	1.95	2.0	266	96
7	Motors—upto 150 KW	m.KW		4.0	150	30
8	Traction Motors	nos.	800	2000	40	11
9	Transformers—above 33 KV	m.KVA	7.25	15.0	156	50
10	Transformers—upto 33 KV	m.KVA		9.0	140	30
11	Capacitors	m.KVAR]	0.15	1.0	45	6
12	Switchgear and control gear	m.Rs.	130	650	400	138
13	Other electrical machinery (including specialised foundry and forge facilities)	m.Rs.			290	60
TOTAL—Electrical Machinery					2627	901

1	2	3	4	5	6	7
II. Transport Construction and Agricultural Machinery						
14	Commercial vehicles . th. nos.		44	120	908	} 502 32 175 29
15	Jeeps and station wagons nos.		10	20	60	
16	Passenger cars . th. nos.		26	80	322	
17	Motor cycles and scooters nos.		75	150	51	
18	Trailers th. nos.		7.5	15	10	3
19	Automobile ancillaries (including foundry forge facilities) . m.Rs.		400	2000	300	138
20	Crawler and rubber tyred tractors nos.		..	1000	150	75
21	Dumpers and scrapers nos.		..	1000	100	65
22	Excavators and shovels nos.		100	250	50	30
23	Road Rollers . nos.		1780	1800	25	5
24	Agricultural tractors . th.nos.		15.5	40	200	} 157
25	Power tillers . th.nos.		3	60	150	
26	Tractor drawn implements m.Rs.		20	100	50	
TOTAL—Transport construction and agricultural machinery					2637	1211
III. Machine Tools						
27	Machine tools . m.Rs.		376	1250	1100	406
28	Small tools and hand tools m.Rs.		200	500	150	50
TOTAL —Machine Tools					1250	456
IV. Industrial Machinery and Engineering Industries						
29	Metallurgical and other heavy equipment . th. nos.		n.a.	100	800	146
30	Coal and other mining machinery . th. tons		45	75	150	38
31	Heavy Plate & Vessels th. tons		..	60	300	65
32	Chemical machinery m.Rs.		135	300	200	40

1	2	3	4	5	6	7
33	Heavy pumps and com- Pressors	th.tons	..	17	135	63
34	Textile Machinery	m.Rs.	400	700	200	115
35	Jute Machinery	m.Rs.	50	100	50	7
36	Paper machinery	m. Rs.	73	400	250	150
37	Sugar machinery	m.Rs.	175	250	50	45
38	Cement Machinery	m.Rs.	178	300	50	20
39	Dairy machinery	m.Rs.	20	50	15	5
40	Printing machinery	m.Rs.	30	120	80	35
41	Industrial boilers	m.Rs.	108	275	75	25
42	Tea Processing machi- nery	m.Rs.	21	21	..	..
43	Diesel engines	nos.	150	200	150	55
44	Power driven pumps	th. nos.	180	350	100	20
45	Iron castings	m.tons	1.2	3.0	600	100
46	Iron rolls	th. tons	..	45	150	70
47	Steel castings	m. tons	0.17	0.5	750	230
48	Steel forgings	Do.	0.14	0.4	750	240
49	Steel pipes & Tubes	Do. ⁿ	0.65	1.5	400	130
50	Iron pipes	Do.	0.47	1.5	250	150
51	Wire ropes	th. tons	25	60	50	20
52	Ball and roller bearings	m.nos.	12.2	40	400	220
53	Gears	m.Rs.	200	500	100	55
54	Steel structurals	m.tons.	0.3	1.25	400	161
55	Cranes	th. tons.	20	90	250	65
56	Wagons (4 wheelers)	th. nos.	50	55	45	10
TOTAL—Industrial Machinery and Engineering In- dustries					6780	2280
TOTAL						

TABLE 1.6
FOURTH PLAN
INVESTMENTS AND FOREIGN EXCHANGE
MACHINERY INDUSTRIES

Groups	Rs. Million															
	Fixed Investment during IV Plan					Foreign exchange during IV Plan					Total Foreign exchange					
	Total	Public sector				Capital account		Maintenance			Capital	Maintenance		Total	Com- po- nents	raw mater- ials
		Total	Spil over	New schemes	Private	Public sector Total	Spill over	private New schemes	public	Private		Total	Com- po- nents				raw mater- ials
I. Electrical Machinery Industries	2627	1918	638	1286	709	736	238	498	165	1298	562	901	1860	1070	790	
II. Transport, construction and agri- culture machinery industries	2376	550	..	550	1826	247	..	247	964	1	2873	1211	2873	1390	1483	
III. Machine Tools	1250	767	160	607	483	286	80	206	170	613	770	456	1383	1002	381	
IV. Industrial Machinery	2635	1320	630	690	1315	337	94	243	492	429	1811	829	2240	1467	3099	
V. Engineering Industries	4145	960	..	960	3185	386	..	386	1065	214	1112	1451	1326			
TOTAL	13033	5515	1397	4118	7518	1992	412	1580	2856	2554	7128	4848	9682	4929	4753	

Table No. 1.7—Allocated investment distribution in various sectors of economy percentage

Sector	II Plan	III Plan	IV Plan
1. Agriculture and Community Development	12	14	12
2. Major and Minor Irrigation	6	6	5
3. Power	7	10	10
4. Village and Small Industries	4	4	3
5. Organised mining and manufacturing industries Department of Heavy Engineering	23 (1.65)	25 (5)	28 (6.5)
6. Transport and Communication	21	17	18
7. Social services and miscellaneous	19	16	18
8. Inventories	8	8	6
TOTAL	100	100	100

TABLE No. 1.7

Table No. 1-8—Demand and Output during 1970-71

Value in Rs. million

Items	Demand 1970-71			Output during 1970-71			Value of production	
	Unit	Quantity	Value	III Plan Schemes	IV Plan Schemes	Total	1970-71	Ultimate
1	2	3	4	5	6	7	8	9
I. Electrical Machinery			3065				2521	4144
Boilers Power	MKw	2.5	563	1.1	0.4	1.5	335	832
Turbines steam	"	2.5	350	1.71	..	1.71	239	560
Turbines Hydro	"	1.0	60	1.0	..	1.0	60	102
Generators steam	"	2.5	150	1.71	..	1.71	103	258
Synchronous Condensers	oooKva	300	30	90	..	90	9	30
Generators Hydro	MKw	1.0	60	1.0	..	1.0	60	102
Motors above 150 Kw	"	2.0	250	1.0	0.75	1.75	220	250
Motors upto 150 Kw	"	3.0	375	1.75	1.25	3.0	410	500
Traction Motors	Nos.	1600—1800	135	800	1000	1800	135	150
Transformers above 33 Kv	MKva	12	240	4	6	10	200	300
Transformers upto 33 Kv	"	7.8	312	4	4	8	320	360
Capacitors	MKVAR	.8	40	.2	.4	.6	30	50
Switch gear and control gear	m. Rs.	500	500	200	200	400	400	650

	1	2	3	4	5	6	7	8	9
2. Transport, Construction and Agricultural machinery			6167					6122	7186
Commercial vehicles 000 nos.		110	2530	61	49	110	2530	2760	
Jeeps and station wagons „		20	268	10	10	20	268	268	
Passenger cars „		80	720	30	30	60	540	720	
Motors, cycles and scooters „		150	300	75	75	150	300	300	
Trailors „		15	45	7.5	2.5	10	30	45	
Automobile ancillaries m. Rs.		1500	1500	400	1100	1500	1500	2000	
Crawler and hobble tyre tractors nos.		900	126	200	700	900	126	140	
Dumpers and Scrappers nos.		1100	187	425	675	1100	187	187	
Excavators and Shovels nos.		200	100	200	..	200	100	125	
Road Rollers nos.		1800	81	1800	..	1800	81	81	
Agricultural Tractors 000 nos.		30	210	16	14	30	210	280	
Power Tillers „		n.a.	n.a.	3	47	50	150	180	
Tractor drawn implements m. Rs.		100	100	25	75	100	100	100	
3. Machine Tools			1650				1400	1750	
Machine Tools m. Rs.		1300	1300	450	550	1000	1000	1250	
Small tools and hand tools m. Rs.		350	350	200	200	400	400	500	

	1	2	3	4	5	6	7	8	9
4. Industrial machinery				15783				14764	17711
Metallurgical and other Heavy Machinery . 000 tons		110	660	50	merg		50	250	480
Coal and other mining machinery		55	242	60		..	60	264	330
Heavy Plate and Vessels		50	150	..		40	40	120	180
Chemical machinery m. Rs.		300	300	135		175	310	310	310
Heavy Pumps and Compressors 000 tons }		12	120	..		2	2	20	160
Textile Machinery m. Rs.		610	610	400		170	570	570	700
Jute Machinery }		80	80	50		30	80	80	100
Paper Machinery }		400	400	75		125	200	200	400
Sugar Machinery }		225	225	170		55	225	225	250
Cement Machinery }		250	250	180		70	250	250	300
Dairy Machinery }		40	40	25		15	40	40	50
Printing Machinery }		120	120	30		30	60	60	120
Tea Processing Machinery }		18	18	21		..	21	21	25
Industrial boilers }		200	200	100		100	200	200	275
Diesel Engines 000 nos. }		190	390	150		50	200	410	410
Power driven pumps }		320	800	180		150	330	825	875

	1	2	3	4	5	6	7	8	9
Iron Castings		m. tons	2.2	2200	1.5	0.7	2.2	2200	3000
Iron Rolls		000 tons	45	135	..	30	30	90	135
Steel Castings		m. tons	.475	713	0.2	.275	.475	710	750
Steel Forgings		m. tons	.40	1000	0.17	.230	.40	1000	1000
Iron Pipes		„	1.5	675	0.6	0.4	1.0	450	540
Steel Pipes and Tubes		„	1.5	3000	0.75	0.75	1.5	3000	3000
Wire Ropes	000 tons	55	165	30	25	55	165	180
Ball and Roller bearings		m. nos.	38	456	15	15	30	360	480
Gears		m. Rs.	400	400	200	200	400	400	500
Steel Structural		m. tons	1.0	1500	0.4	0.6	1.0	1500	1875
Cranes		000 tons	60	234	20	40	60	234	351
Wagons		000 nos.	50	850	40	10	50	850	935

EXPORT

The scarcity of foreign exchange has been and will continue to be an impediment against our efforts to develop the economy at the desired rate of growth. Traditionally India has been exporter of some cash crops, industrial raw materials and some industrial products. Competition from other countries exporting these commodities as well as synthetic substitutes is increasing and it seems that further increase in the exports of traditional items to any striking extent may be increasingly difficult. Moreover, lately there has been often a steady decline in the prices of these items while the prices of capital goods has increased, thus worsening our balance of payment position. In view of these difficulties, while preparing a plan for the development of machine building industries, one of the main considerations will have to be not only to achieve self-sufficiency to the extent possible to reduce the import but also to start exporting capital goods as much as possible, to open new avenues for earning foreign exchange.

It is realised that this will not be easy since we will have to compete with advanced countries in markets already held by them. However, there are certain factors in our favour and we must take full advantage of them. For example, the advanced countries are diverting their resources for the production of highly complicated and expensive machines and find it unremunerative to manufacture simpler types of equipment, specially if they are labour intensive and yet these equipments or intermediate products are needed in almost every country. Many under-developed countries would rather save American or European currency if they could get the same things from soft currency areas. Thirdly, in many under-developed countries conditions are similar to those existing in India and Indian made equipment, though based on imported technology but modified to suit our conditions, may prove better than those obtained from advanced countries. For example, it has been reported that some makes of Indian built commercial vehicles have proved more successful in our neighbouring countries than those built in collaborators' countries. Since a large number of Indian products have internationally known brand names also, they will not be unknown in the market.

The high cost of production and the growing unsatisfied demand in India prove an obstacle in export promotion. The Group recommends that Government should take every possible action to promote exports inspite of these difficulties and handicaps. It is felt that the vastness of our internal market is such that, if properly planned, sooner or later it should be possible to manufacture most of the products at internationally competitive prices and the output can be planned in excess of internal demand. To an increasing extent, the device of deliberate lower prices for export at the cost of comparatively higher price for internal consumption should also be followed. It is by such developments that progressively large scale exports will become feasible. But since the market cannot be created overnight, it is necessary that we start building the base right now. It is estimated that at present approximately 3 per cent of the output of engineering industries is exported, however the share of machinery industries is low.

While suggesting export targets, the Planning Group took into account the recommendations made by (a) the Study Group of the Export Sector Committee for Minerals, Steel and Engineering Industries; (b) Engineering Export Promotion Council and (c) Indian Institute of Foreign Trade.

Based on the various factors the Group suggests the following export programme. According to this programme, the export of engineering machinery and equipment (listed in the following table) will have to be increased from the present level of approximately Rs. 60 million to about Rs. 700 million by 1970-71. Even this forms only 5 per cent of our production and is a comparatively small percentage considering our export needs. A 10 per cent export target will be more commensurate with our foreign exchange. Yet unless energetic effort on a continuing basis are carried on even the more modest target may prove difficult to achieve.

TABLE 1-9

EXPORTS

HEAVY ENGINEERING INDUSTRIES

FOURTH PLAN

Exports target 1970-71

(Rs. million)

Sl. No.	Item	1970-71
1	2	3
<i>I. Electrical Machinery</i>		
1	Boilers—power	..
2	Turbines—steam	..
3	Turbines—hydro	..
4	Generators—steam (including synchronous condensers)	..
5	Generators—hydro	..
6	Motors—above 150 KW	..
7	Motors—upto 150 KW	20
8	Traction Motors	..
9	Transformers—above 33 KV	20
10	Transformers—upto 33 KV	20
11	Capacitors	..
12	Switchgear and control gear	20
13	Other electrical machinery (including specialised foundry and forge facilities)	..
TOTAL—Electrical Machinery		80

1	2	3
<i>II. Transport, Construction and Agricultural Machinery</i>		
14	Commercial vehicles	150
15	Jeeps and station wagons	10
16	Passenger cars . . . . .	..
17	Motor cycles and scooters	30
18	Trailers	1.0
19	Automobiles ancillaries (including foundry forge facilities)	30
20	Crawler and rubber tyred tractors . . . . .	..
21	Dumpers and scrapers . . . . .	..
22	Excavators and shovels	10
23	Road Rollers	5
24	Agricultural tractors	15
25	Power tillers . . . . .	..
26	Tractor drawn implements	3
TOTAL—Transport, construction and agricultural machinery		254
<i>III. Machine Tools</i>		
27	Machine Tools	1000
28	Small tools and hand tools	20
29	TOTAL—Machine Tools	120
<i>IV. Industrial Machinery and Engineering Industries</i>		
30	Metallurgical and other heavy equipment . . . . .	..
31	Coal and other mining machinery	20
32	Heavy plate and vessels . . . . .	..
33	Chemical machinery	10
34	Heavy Pumps and compressors . . . . .	..
35	Textile machinery	40
36	Jute machinery	5
37	Paper machinery . . . . .	.
38	Sugar machinery	0
39	Dairy machinery . . . . .	..

1	2	3	4	5	6
---	---	---	---	---	---

3. HEL, Ramachandrapuram

(a) Completion of III Plan Scheme

87

(b) Capacity for large sized motors and turbo-blowers

0.5 m. KW

40

TOTAL—HEL, RAMACHANDRA PURAM

127

40

4. HEL, Hardwar

Completion of III Plan Scheme

510

215

5. H. T. Switchgear Project (ASEA)

Airblast circuit breakers (132/230 KV) 200 Nos.

25

4.0

6. Central Foundry Forge for heavy electrical equipment

Steel castings 15,000 tons.

210

63

Steel forgings 15,000 tons

7. New unit for power boilers.

1.0—1.5 m. KW.

180

50

This unit is intended to meet gap after expansion of AVB and HEL, Trichy, and will cover large capacity thermal boilers of 200 MW and above and also nuclear power equipment.

8. New unit for heavy electrical rotating equipment.

Steam turbines and gas turbines; generators; synchronous condensers; and large size industrial motors —2.0 m. KW

350

215

9. New unit for heavy electrical stationary equipment.

Transformers —6 m. KVA
Capacitors —0.4 m. KVAR.

250

100

Switchgear and control-gear
Rs. 150 m.

This unit is intended to meet gaps in stationary equipment. The alternatives between combining these products in one unit, with common facilities, including testing and research, or taking them up separately in existing or new projects will be examined.

25

1	2	3	4	5	6
10.	Passenger cars	50,000 units Passenger cars and light commercial vehicles.	350	150	
11.	Agricultural tractors and power tillers.	Tractors—12,000 Nos. Tillers—15,000 Mps. Implements—50,000 Nos.	200	97	
12.	HMT, Piniore Completion of III Plan Scheme (Expansion)	..	25	10	
13.	HMT, Kerala Expansion	Rs. 50 m. to Rs. 100 m.	35	12	
14.	HMT, Hyderabad Expansion	Rs. 50 m. to Rs. 100 m.	35	12	
15.	New Machine Tool Factory	Rs. 50 m.	77.5	22	
16.	New Machine Tool Factory II.	Rs. 50 m.	80	22	
17.	New Czech assisted Machine Tool Factory—I	Rs. 70 m.	120	49	
18.	New Czech-assisted Machine Tool Factory-II	Rs. 40 m.	60	27	
19.	Additional capacity for machine tools.	Rs. 150 m.	200	50	It is intended to take up new machine tool projects with GDR, Polish and US assistance.
20.	Heavy Machine Tool Project, Ranchi.				
	Completion of III Plan Scheme	..	135	80	
21.	<i>HEC, Ranchi</i>				
	(a) Completion of III Plan schemes	..	557	86	
	(b) Structural shop	Associated structurals 10,000 tons Medium structurals 8,000 tons Technological structurals	25	6.5	
		7,000 tons			
		25,000 tons			

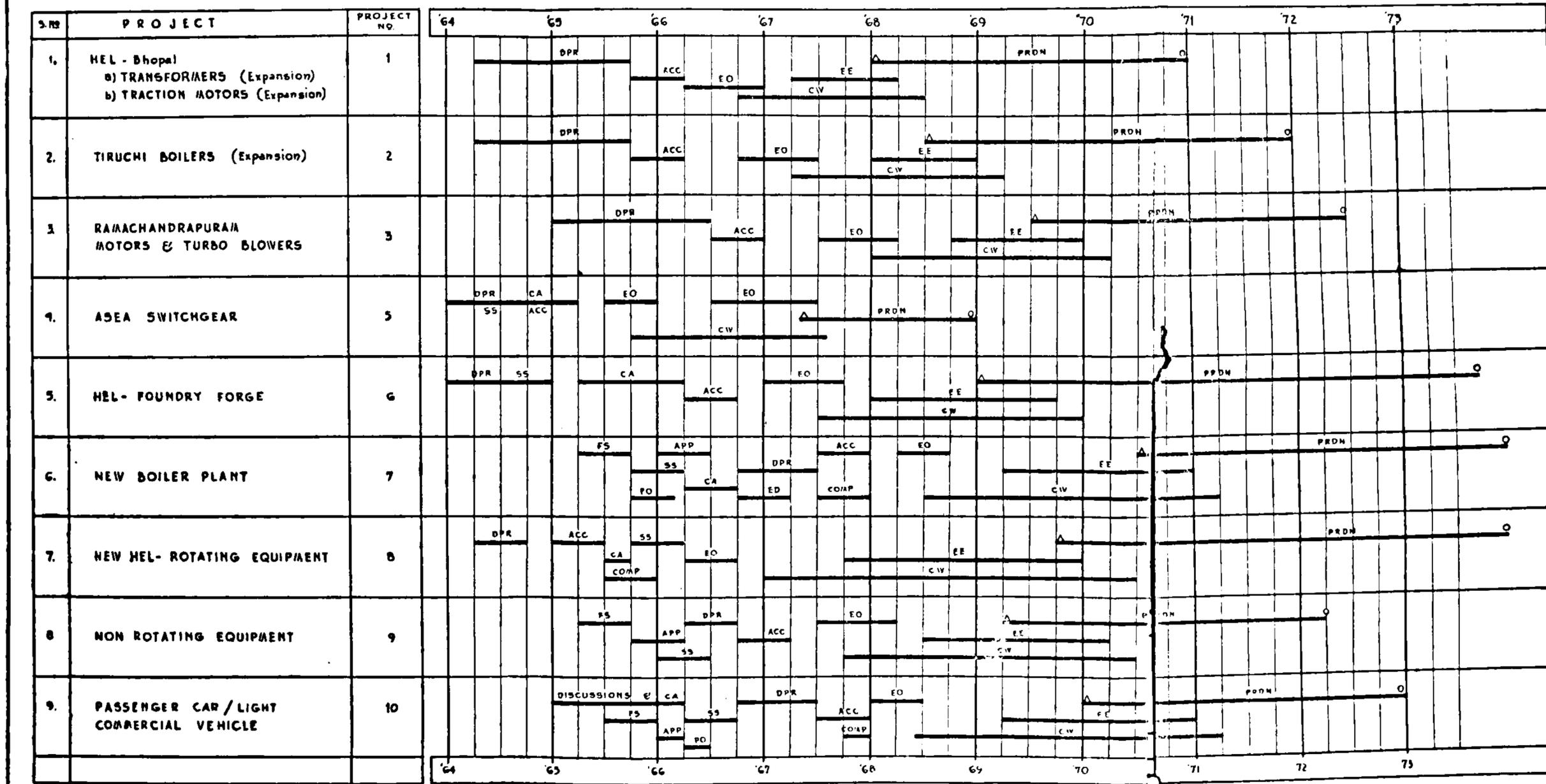
	2	3	4	5	6
(c) Rationalisation of heavy machine building capacity		20	10	As indicated in the Babich Report on the Heavy Machine Building Plant, it is intended to review the capacity and production programme of HMBP and FFP, as now set up, with a view to maximise production of heavier items and facilitating higher output. For this purpose, a detailed technical appraisal will be necessary.
TOTAL—HEC, RANCHI			<u>602</u>	<u>102.5</u>	
22. Additional capacity for Heavy machinery		200	50	Related to the rationalisation and maximisation of output at HMBP, it is proposed to plan additional capacity mainly for items such as heavy excavators, oil drilling rigs, crushers, and grinders, hydraulic presses and smaller rolling mills. This is intended to augment and complement HMBP in certain ranges.
23. CMMP, Durgapur— Completing of III Plan Scheme		73	8	
24. Coal and mineral handling and processing equipment		50	15	

1	2	3	4	5	6
25.	Heavy Plate & Vessels Project—IX	Plate & Vessels, including blast furnace shells etc., 15,000 tons	75	25	
26.	Heavy Plate & Vessels Project-II.	Plate and Vessels including heavy chemical equipment and associated structurals 25,000 tons..	60	20	
27.	Fabrication Shop for Fertilizer and Chemical Equipment.	15,000 tons.	45	17.5	
28.	Heavy pumps & compressors.	16,700 tons (including 25,000 tons grey iron castings)	135	63	
29.	Textile machinery	Rs. 75 m.	50	15	
30.	Printing machinery	Rs. 50 m.	30	10	
31.	Diesel engines	200 to 1000 H. P. engines 1000 nos.	50	15	Mainly to meet requirements of earth moving equipment, mobile generating sets, meter gauge locos and shunters etc.
32.	Cast Iron rolls.	10,000 tons	50	20	
33.	New Foundry Forge, Wardha	Steel forgings (including moulds for C.I. spun pipes)—8,300 tons steel casting and alloy steel castings 12,000 tons.	160	70	
34.	Seamless pipes	50,000 tons.	100	40	It is intended to cover the gap to meet requirements of high pressure boilers, heat exchangers etc., including alloy steel pipes and pipes for core drilling both for irrigation wells and ONGC.

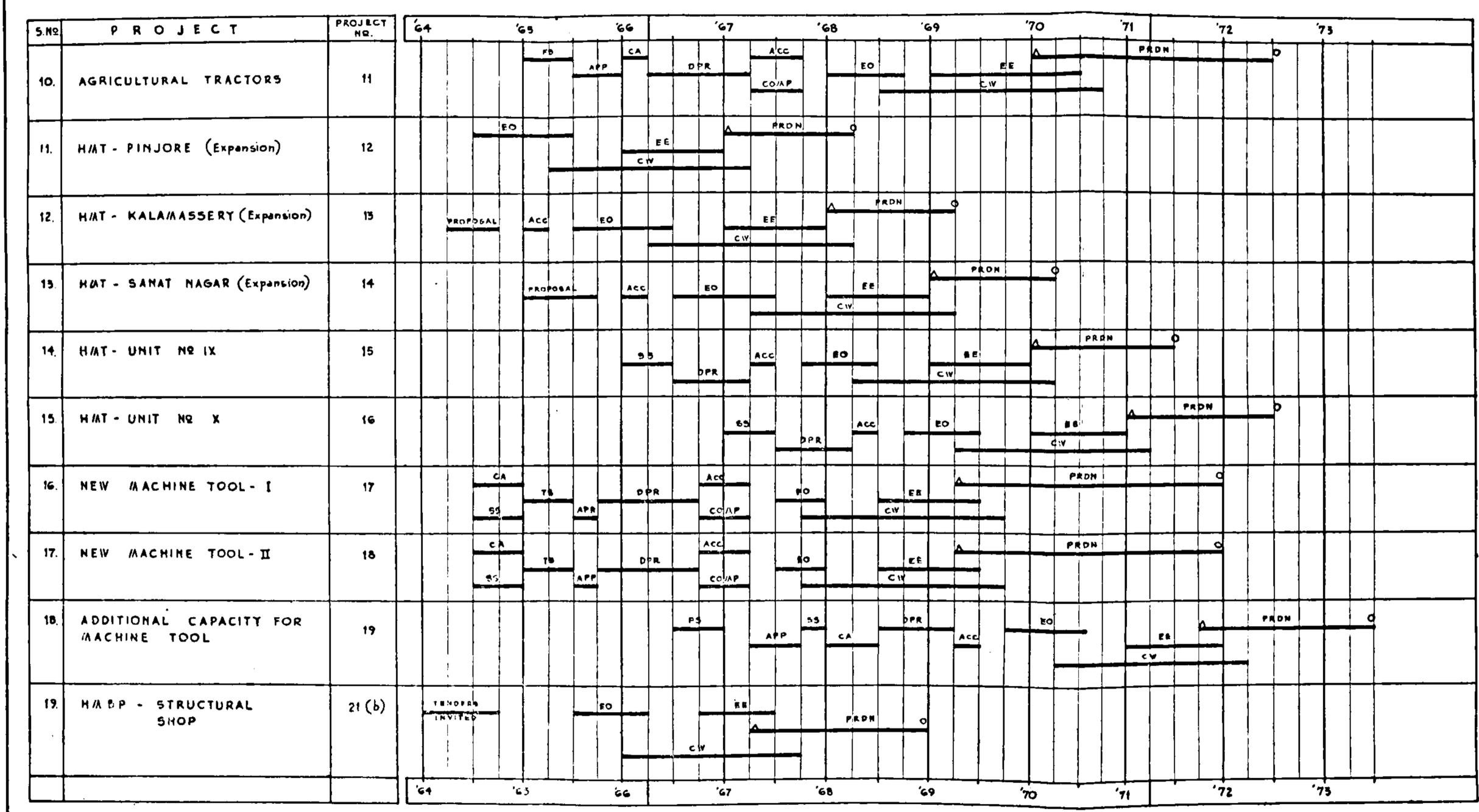
1	2	3	4	5	6
35.	Ball & roller bearings project	22.5 m. nos.	305	165	
36	Gears	Rs. 75 m.	50	15	Mainly to meet requirements of new M.T. factories and for production of standard sized gears.
37.	Heavy Structural Project	25,000 tons, including hydraulic structures.	45 .	15	
38.	Structural Design Bureau . . . . .	..	..	5	To be attached to Heavy Structural project.
39.	Gantry Cranes & hoists.	25,000 tons, including medium structurals.	110	30	includes manufacture of standard mechanical equipment for hoists and cranes.
40.	Harbour and construction cranes.	25,000 tons, including heavy structurals.	90	20	
		TOTAL	5491	1988	
		3 m. KV _a power transformers (Project not identified)	24	4	
			1515	1992	

FOURTH PLAN

SCHEDULING OF PUBLIC SECTOR PROJECTS



- NOMENCLATURE:**
- ACC ACCEPTED BY GOVT.
 - APP APPROVED BY GOVT.
 - SS SITE SELECTION
 - FS FEASIBILITY STUDY
 - TS TECHNO-ECONOMIC STUDY
 - DPR DETAILED PROJECT REPORT
 - PO APPOINTMENT PROJECT OFFICER
 - CA COLLABORATION AGREEMENT
 - COMP COMPANY FORMED
 - CIV CIVIL WORKS
 - ED EQUIPMENT DETAILS
 - EO EQUIPMENT ORDERED
 - EE EQUIPMENT ERECTION
 - PRDN PRODUCTION BUILD-UP
 - Δ START OF PRODUCTION
 - FULL PRODUCTION



- NOMENCLATURE**
- ACC ACCEPTED BY GOVT
 - APP APPROVED BY GOVT
 - SS SITE SELECTION
 - FS FEASIBILITY STUDY
 - TS TECHNQ-ECONOMIC STUDY
 - DPR DETAILED PROJECT REPORT
 - PO APPOINTMENT OF PROJ. OFFICER
 - CA COLLABORATION AGREEMENT
 - COMP COMPANY FORMED
 - CW CIVIL WORKS
 - ED EQUIPMENT DETAILS
 - EO EQUIPMENT ORDERED
 - EE EQUIPMENT ERECTION
 - PRDN PRODUCTION BUILD-UP
 - Δ START OF PRODUCTION
 - O FULL PRODUCTION

SNO.	PROJECT	PROJECT NO.	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13
20.	H M B P. RATIONALISATION	21 (c)				FS	APP	EO		EE	PRDN	O
21	HEAVY MACHNERY ADDITIONAL CAPACITY	22				F.S	APP	DPR	EO		PRDN	
22	HEAVY PLATE & VESSELS I	25	PROPOSAL	FS	APP	SB	DPR	ACC	EO	EE	PRDN	O
23.	HEAVY PLATE & VESSELS II	26.				FS	SB	DPR	ACC	EO	EE	PRDN
24.	FERTILIZERS & CHEMICAL EQUIPMENT	27	FS	APP	CA	SB	DPR	ACC	EO	EE	PRDN	O
25.	HEAVY PUMPS & COMPRESSORS	28	CA	FS	APP	CONTRACT	DPR	ACC	EO	EE	PRDN	
26.	TEXTILE MACHINERY	29.				FS	APP	CA	DPR	ACC	EO	PRDN
27	PRINTING MACHINERY	30				FS	APP	CA	DPR	ACC	EO	PRDN
28.	DIESEL ENGINES.	31.				TS	APP	DPR	ACC	EO	EE	PRDN

- NOMENCLATURE :**
- A.C.C. ACCEPTED BY GOVT.
 - APP. APPROVED BY GOVT.
 - SB SITE SELECTION
 - FS FEASIBILITY STUDY
 - TS TECHNO-ECONOMIC STUDY
 - DPR DETAILED PROJECT REPORT.
 - PO PROJECT REPORT
 - CA COLLABORATION AGREEMENT.
 - COMP. COMPANY FORMED
 - CW CIVIL WORKS
 - ED EQUIPMENT DETAILS
 - EO EQUIPMENT ORDERED
 - EE EQUIPMENT ERECTION.
 - PRDN. PRODUCTION BUILD UP.
 - Δ START OF PRODUCTION.
 - O FULL PRODUCTION.
 - EQUIPMENT LIST.

S.NO.	PROJECT	PROJECT NO.	64	65	66	67	68	69	70	71	72	73
29	CAST IRON ROLLS.	32	FS	APP	PO SS	DPR	COMP ACC	EO		EE	PRON	O
30	FOUNDRY FORGE (WARDHA)	33	FS	CA	DPR	EO	EE				PRON.	O
31	SEAMLESS PIPES.	34		FS	SS	DPR	EO	EE		PRDN	O	
32	BALL & ROLLER BEARINGG.	35		APP	DPR	ACC	EO		EE	PRON	O	
33	GEARS.	36		FS	APP	DPR	ACC	EO	EE	PRON	O	
34	HEAVY STRUCTURALS (TRIVENI)	37	DPR PO	SS ACC	CA	EO	EE	PRDN	O			
35	GANTRY CRANES & HOIGTS	39		FS	APP	DPR	ACC COMP	EO	CW	EE	PRON	O
36	HARBOUR & CONSTRUCTION CRANES	40		FS	APP	DPR	ACC COMP	EO	CW	EE	PRON	O

- NOMENCLATURE**
- A.C.C. ACCEPTED BY GOVT.
 - A.P.P. APPROVED BY GOVT.
 - SS SITE SELECTION.
 - FS FEASIBILITY STUDY.
 - TS TECHNO ECONOMIC STUDY
 - DPR DETAILED PROJECT REPORT
 - PO APPOINTMENT OF PROJECT OFFICER
 - CA COLLABORATION AGREEMENT.
 - COMP. COMPANY FORMED
 - CW CIVIL WORKS
 - EO EQUIPMENT DETAILS.
 - EO EQUIPMENT ORDERD
 - EE EQUIPMENT ERECTION
 - PRDN PRODUCTION BUILD UP
 - Δ START OF PRODUCTION.
 - O FULL PRODUCTION.
 - EQUIPMENT LIST.

IMPLEMENTATION OF PUBLIC SECTOR PROJECTS

The Planning Group would like to again repeat that it attaches prime importance to creation of conditions for achieving maximum benefits in the shortest possible time from both existing and proposed projects. The problem can be divided in two broad heads: (a) pre-production phase and (b) production phase. These are discussed below:

I. IMPLEMENTED OF PROJECTS

A tentative time schedule for the new projects proposed for implementation during the Fourth Plan is shown in Appendix 'A'. The procedure for processing the projects is assumed to be, more or less, the same as exists today, except that certain steps not considered necessary in future have been omitted. In preparing this time table, the periods, allotted for various steps are considerably less than the actuals in the past based on the hope that all stages will follow smoothly without any bottlenecks or unnecessary delays. In spite of these optimistic assumptions, it will be seen that for most of the projects, construction cannot start in less than 2 to 3 years and the production cannot commence in less than 3½ to 4½ years. In respect of some projects, production may start only in the Fifth Plan. The Group feels that the procedure for processing the projects should be modified to shorten these periods considerably.

The very first step for achieving this aim would be to analyse whether it is necessary to go through all these steps in respect of all projects or in certain cases, the scope of some of the steps can be modified and some may be omitted altogether, without any adverse effect on the technical or financial aspects of the projects.

The various projects may be grouped in two broad categories:

- I. The industry is being established for the first time in the country or has been established only in recent past. This implies that the technical know-how or organisations to implement this industry does not exist in the country.
- II. The industry is well established in the country;
 - (a) but the technical know-how and organisations for establishing such industry is lacking,
 - (b) competent organisations equal to the task exist.

It can be concluded that, by and large, in case of category I projects, most of the help will have to be obtained from abroad, while in case of category II the extent and type of help will vary from case to case. Another factor which again influences the scope of external aid is the indigenous availability of capital equipment and the availability of foreign exchange for importing the balance of capital equipment from desired sources. To account for these factors, the projects may be divided into following categories:

- (1) projects for which external aid is required for construction, operation and financing;
- (2) projects for which aid is required for construction and operation, but not for financing.

- (3) projects for which aid is required only for establishing the plant.
- (4) projects for which only operational know-how has to be acquired.
- (5) projects for which only financial assistance is required.
- (6) projects for which no external aid is required.

In the first case where it is essential to obtain technical and financial aid, generally both are obtained from the same source. In this case the details of the equipment to be incorporated in the project, specifications of the plant and machinery and to a large extent, the prices of equipment are decided by the aid giving country. In spite of these factors and the lack of expertise in our country, generally an *ad hoc* committee is appointed to pass judgement on the Report submitted by foreign experts. In the past some of the such *ad hoc* committees have provided valuable guidance. Yet while there is no assurance that the recommendations of the *ad hoc* committee will result in sound decisions, the implementation is certainly delayed. The Group feels that instead of *ad hoc* committees an Indian firm of engineers and consultants should be assigned this role, and they should be associated with the project till its completion. In order to check and ensure the economics of the project their scrutiny will be very helpful. Within these constraints it seems on the whole better to give foreign consultants a free hand in technical matters and hold them responsible for the promised production at promised cost. This may reduce the project implementation period and at the same time impart technical know-how to Indian engineers.

The Group feels that by modifying the procedure even in respect of these projects, processing time and expenditure in foreign exchange can be reduced without in any way jeopardising the soundness of the project. At the same time this may initiate a process by which expertise also may develop in the country.

For this purpose the Group feels that when the demand studies indicate the necessity of a project an Indian organisation (if considered necessary, help of a foreign organisation or experts may be solicited by the Indian organisation) should be asked to prepare a technical feasibility report. This report should be in greater details than the prevailing practice, specially the economic aspect of the project. In addition to the data included at present, it should contain information on (a) need and scope of collaboration, (b) possible and desirable collaborators, (c) possible and most suitable site, and (d) a draft memorandum of instructions for the preparation of the project report. (In case the project is already earmarked under any specific aid, association of some experts from aid giving country in the preparation of the feasibility study may be desirable). This Report should form the basis for administrative and financial decision by the Government on the implementation or otherwise of the project. As soon as this Report is accepted by the Government and a decision is taken in principle to go ahead with such a project several actions can be initiated simultaneously, e.g., negotiations with the foreign collaborators, appointment of plant manager, land acquisition, financing arrangements etc. Once these formalities are over, the

chosen foreign consultants may be asked to scrutinise and finalise the Project Report incorporating such modifications as they feel necessary.

Generally the practice has been that after the Project Report has been approved by the Government the agency is asked to go ahead with the preparation of working drawings. If this procedure is to be followed the Group feels that the scope and extent of details in the Detailed Project Report should be modified so that this Report could be completed in a much shorter period. The proposal is that details like electrical wiring diagram, cross sectional drawings of buildings, air, gas and water supply piping diagrams, detailed bills of material etc. etc. should be deleted from the Report. These details are unnecessary for judging the technical or financial soundness of the project. At the same time they are insufficient even for the purpose of inviting tenders. For the purpose which normally a project report is supposed to serve, only the various parameters should be explicitly defined in the Report. For example, it must indicate the major details of the project, a list and broad specifications of major equipment, total investment, phasing of investment, foreign exchange, capacity, product mix, cost and phasing of production. It must indicate the details of power supply, energy consumption, the details of all inputs, space, transport, man power etc. but not those details which are repeated again and in greater details in the working drawings. Such a Report can be expected to be prepared in less than six months.

Such a document will enable the implementing authorities to scrutinise technical and financial aspect of the project, obtain financial sanction, and make arrangements for the provision of foreign exchange for procuring equipment and services from abroad and also place orders for the major part of equipment. If possibilities exist for obtaining such project reports and offers from more than one source, it will certainly be advantageous to get them.

Another advantage this procedure will offer is that while Working Drawings are being prepared, orders for the supply of equipment can be placed thereby shortening the pre-production period substantially.

Another modification the Group would like to suggest is in respect of division of work between Indian organisation and foreign consultants for the preparation of Working Drawings. It is suggested that Foreign Organisation should prepare the "scope drawings" and then pass them on to Indian organisation along with all necessary information for the preparation of detail drawings. In respect of civil engineering building construction, utilities and services, the know-how in India is at par with advanced countries and Indian Organisations are naturally much better informed about various by-laws governing civil construction, electrical distribution system, water supply transport, etc in India. In respect of specialised designs; e.g. foundation of heavy machinery etc., the approval of collaborators/machinery suppliers may be obtained. This procedure will, therefore, not only ensure better and readily acceptable designs but will ensure optimum utilisation of Indian material and effect substantial savings in time and foreign exchange.

In respect of other categories of projects the procedure will vary with each project. By and large, it is felt that if operational know-how is indigenously available, foreign assistance will be needed only for financing the imports. It certainly is possible that even though the expertise in the country is available it may not be on large enough scale to meet the entire load and as such some foreign help may become necessary for these industries also.

In case operational know-how is not available indigenously, the Group feels that the extent to which collaboration agreement should be entered should be carefully examined. In any case, the Group feels that feasibility reports and project reports should be entrusted to Indian Organisation as long as they have the capacity to meet the demand. If foreign help is considered necessary in executing these studies, it should be channelled through these Indian Organisations which should be entrusted with the responsibility of preparing these Reports.

As mentioned earlier, while the above detailed procedure may be accepted in principle the indigenous engineering, designing and drafting facilities may not be sufficient to meet the entire work load. The Group recommends that while steps should be taken to augment these facilities, a selective approach may be adopted in assigning the work to Indian parties in the following order of preference till the entire Indian capacity is fully occupied.

(1) The projects for which no foreign technical aid is necessary

- (a) majority of equipment is indigenously available,
- (b) major portion of equipment has to be imported. Projects like seamless tubes, gears, etc. could be classified in this category.

(2) The projects for which foreign assistance may be necessary only to the extent of procurements of designs and some technicians for teaching certain operational techniques. Projects like structural shops, crane shops, plate & vessel shops etc. could be classified in this category.

(3) Rest of the projects. The larger the dependency on external help, the lower the priority they should be accorded for assigning it to an Indian party.

In this connection it is felt that our industrial development has reached a stage that while planning for new projects we should avoid entering into contracts with foreign parties for setting up composite plants the like of which already exist in the country. Because in such an arrangement it is likely that foreign party will ignore the aspect of coordination and will be unmindful of the nature of specialised equipment available elsewhere in the country which may not be even fully used. Since we have to conserve foreign exchange, a degree of care is necessary to ensure that a specialised equipment of an expensive nature is installed in a new unit only when it is found by reviewing the available resources that it is unavoidable.

II. PROJECT IMPLEMENTING AGENCY

The failure to appoint the top management group for the project as soon as the decision to proceed with it is taken causes good deal of delays. Fortunately in respect of some major industries there are already a few large corporations in the public sector, and it is suggested that in the early stages of new projects, the help of corporations dealing with an industry may be sought for organising the task. As the work develops a new nucleus can be formed. If no such agency exists then it will be necessary to appoint project authorities so that they could be associated with the project from a fairly early stage.

Since in the very early stage the work load may not justify appointment of an agency, at least a project officer should be assigned as soon as a firm decision is taken to implement the project.

The Group has recommended approximately forty schemes for implementation during the Fourth Plan. Out of these at least 22 schemes would require fresh implementing agencies. Since most of them are in embryonic stages, even appointment of project officers for each may not be necessary. It is suggested that all these projects should be aggregated into few groups comprising of projects of similar nature. Officers may be appointed for the intensive follow up of these groups of projects and as the project processing shapes up individual project officers may be appointed and gradually project implementing agencies may be developed around these officers. It is also suggested that the same groupings of similar projects be kept and corporations formed so that the same corporation looks after projects engaged in similar work or mainly catering to the needs of the same group of industries. This will enable better coordination of effort on similar work and reduce the need for a very large number of highest level management personnel.

III. PROJECT CONSTRUCTION AGENCIES

One factor that seems to create difficulties in the way of construction going ahead speedily is the failure to make arrangements for essential preliminary tasks in good time. It is hoped that with the early appointment of project personnel, as outlined above, the deficiencies might be eliminated.

In most projects a large part of the construction work is carried out through contractors. This is useful. These contractors, however, do not often have the capabilities for undertaking the construction of many major items of work which involve either special technical know-how or special equipment or both. This may be due to their not possessing the means to acquire these or because of the uncertainty about the continuity of jobs, on account of which they do not wish to risk larger liabilities. Another consequence is that most of the workers employed are either absorbed in the project in some capacity or are dispersed. The Group feels this is not a particularly happy way of developing construction skill and know-how in the country.

During the Fourth Plan over Rs. 5,000 million will be invested in public sector projects under this Department and another Rs. 8,000 million in private sector. The expenses incurred on construction and erection of machinery in public sector projects alone may exceed Rs. 75 million per annum. The Group feels that in view of the large programme establishment of a project construction organisation specialising in the erection of engineering industries projects should be given serious consideration. They may equip themselves adequately with necessary facilities and develop a cadre of skilled personnel on a continuing basis.

IV. MAXIMISING THE CAPACITY UTILISATION

This relates to the post construction phase. It has been the experience that the existing production capacity has been continuously under-utilised. The Group feels that perhaps not enough emphasis is being attached to the fullest utilisation of capacity already established or projected as compared to the establishment of additional capacity. In major projects, more especially heavy engineering projects, full production will not follow the establishment of physical manufacturing capacity, as a matter of natural course or even by efflux of time, but needs deliberate and sustained effort, not only at the plant, but elsewhere also. This involves building up design and engineering skills at the plant, and coordination between the user and the manufacturing units. Such coordination has to be not only intimate and continuing in the present, but with reference to plans and programmes several years ahead.

Insufficient supply of raw materials and foreign exchange for the import of raw materials and components has been a major cause for under-utilisation of machine-building capacity. The Group would, therefore, like to draw the attention of concerned Ministries and Departments to this deficiency and hopes that effective steps will be taken to produce basic raw materials in sufficient quantities and develop ancillary and auxiliary industries or plants for manufacturing specialised products on priority basis. At the same time the Group would like to point out that our industries are not following enthusiastically the policy of import substitution in the use of scarce raw materials. The industry is slow in adopting latest innovations which may result in substantial reductions in the requirements of raw materials. The Group feels that Government should take positive steps to ensure that all designs and technologies resulting in these savings should be speedily adopted. However, till such time it is necessary that existing manufacturers are provided with adequate foreign exchange enabling them to operate the plants at full capacity. It will be easier for the authorities to allocate foreign exchange in the most judicious manner if all the manufacturers supply the details of their import requirements along with their production programme well in advance. In respect of general purpose machinery and equipment like standard machine tools, pumps and compressors, distribution transformers and motors, transport equipment, agricultural machinery and various intermediate products etc. this could be done easily on the basis of past sales, irrespective of whether or not the manufacturers have firm orders. However, a large variety of equipment are tailor made and unless firm orders with detailed

specifications are placed the manufacturers will be in no position to formulate a production programme. Heavy electrical equipment, metallurgical equipment, equipment for chemical industries, cranes, mining and drilling equipment, industrial plants etc. etc. fall into this category. Further, it happens that most of these equipment require two to three years, after order has been placed, for designing and machining before they could be delivered to the customers. Thus, in all probability plants like HEL and HEC cannot operate at optimum level unless they have orders for at least five years in advance and continuity of orders is maintained, thus emphasising the need for coordination between user and manufacturing units on an intimate and continuing basis.

Efforts at intermediate levels in various Ministries and Departments have not as yet yielded the desired results. Instances of mutually agreed solutions can be cited e.g., the manufacture and supply of 120 KW boiler and turbogenerator set involving a private firm, a public enterprise and a Government agency. At the same time examples of failures can also be given. No systematic formula has so far been devised to ensure a coordinated planning by the producers of the heavy capital equipment and the user industries even though in many cases both are Government agencies. While such *ad hoc* committee might continue to render useful service, it is felt this may not be the best way of handling these problems. The Group feels that a committee at high enough level should be entrusted on a continuing basis with the task of coordinating the supply of equipment to user industries ensuring the full utilisation of indigenous machine building capacity.

The second and very important aspect is the development of consultancy, designing and engineering organisations at appropriate places. The designing organisations required by various industries vary in type and scope. These are discussed in detail along with development plan for the particular industry later in the Report, while some aspects regarding the consultancy services have already been discussed earlier. Here only design and other facilities which machinery fabricators should develop are briefly discussed.

These could be grouped into two categories, viz. (a) suppliers of complete plant (not necessarily fabricators of all equipment) and (b) suppliers of equipment for certain sections of the plant. In the first group industrial plants like sugar plants, cement plants and paper plants etc. are included. In these industries even though the main plant manufacturers may fabricate only approximately 50 to 60 per cent of the equipment in the total plant supplied by them it is necessary for them to design the complete plant. In respect of bought out items normally it should not be necessary for them to prepare the manufacturing designs. In respect of these industries it is felt that though these facilities are developing, yet there is much to be desired. The main plant fabricators should have sufficient facilities to design all necessary equipment, manufacture certain equipment, purchase others, erect the plants and undertake the performance guarantee. In respect of the second category the position is not very happy. This group of equipment includes general-purpose ready made machi-

nery and tailor made machinery also needed for all kinds of industries including metallurgical and chemical industries, power and transportation. The Group feels that machine building plants for these industries need not establish facilities for plant designs but develop expertise for designing individual pieces of equipment along with their necessary adjuncts. However, in certain cases it may be necessary to create facilities for the supply of identifiable units of the plant, for example, coke oven batteries, oxygen plant, material handling plant etc. on a turn-key basis. This generally holds true for plants manufacturing equipment for large industries like metallurgical industries, refineries and fertiliser plants, power plants etc. The various aspects of the facilities connected with these industries are discussed later in the Report. It has been observed that there are number of small general purpose fabrication shops in the country which can undertake the manufacture of various other equipment or components and parts provided they are supplied with designs and drawings. They themselves are not in a position to undertake the investments on these facilities. The Group would like therefore to recommend that (a) near complete plant manufacturers should have a full-fledged organisation to enable them to supply customers the plants on a turn key basis, (b) all such fabrication shops in the public sector should have a full-fledged design bureau attached to their shops, (c) they should develop a purchasing and commercial organisation so that some identifiable units of the plants could be supplied by them on turn-key basis, (d) large plants in private sectors should be urged to develop these facilities and (e) engineering and designing organisations should be encouraged so that the productive capacities of small fabricators could be fully exploited.

Another bottleneck is the capacity of trained personnel. Generally, public sector projects have training facilities, but not all private sector plants provide these facilities. The Group suggests that steps should be taken to ensure that private sector industries also fulfil their obligations. The Group further suggests that all industrial plants should make arrangements for the students to have some practical training in between academic sessions in these plants. It is felt that if public and private, enterprises join hands in establishing such facilities on a co-ordinated basis, this deficiency may be eliminated in the near future.

GROUP I

ELECTRICAL POWER EQUIPMENT

1. Introduction:

The capacity required for the manufacture of heavy electrical equipment has been estimated keeping in view of growth of power generating capacity in the country, the time lag between the production of these equipments and their commissioning in the generating and distribution systems, and the extent of utilisation of the established manufacturing capacity.

The data supplied to the group indicates that the annual rate of addition to the power generating capacity may be approximately 2, 3, 4 to 4.5 and 5 to 6 millions KW by 1965-66, 1970-71, 1975-76 and 1980-81 respectively. Taking into account the time taken for erection and commissioning period, the output of various equipments will have to keep ahead of the generating capacity and it is required to be approximately 2.3, 3.4, 4.5 and 6 million KW per annum respectively for the years specified above.

2. Demand and Existing capacity:

21.1. *Turbo-generator sets.*—The group of equipment may be divided into two main groups; viz. thermal and hydro. From the available data it appears that the average annual demand for hydro turbo-generators is not expected to exceed 1.5 million KW even upto the end of the 5th or 6th Plan. On the basis of known plans up to 1970-71 and on the understanding that beyond 1970-71, the addition to generating capacity by hydro power will average around 5 million KW for each plan period, it seems that the output of thermal generating sets, including for nuclear power stations, should be planned to be of the order of 1.6, 2.5, 3.5 and 5 million KW/year by 1965-66, 1970-71, 1975-76 and 1980-81 respectively.

At present there are three Heavy Electrical Equipment plants being set up to manufacture turbo-generator sets. The manufacturing capacities of these plants will be as follows:—

TABLE I—*Turbo-generator sets—million KW.*

Plant	Hydro	Thermal	Total
Bhopal	0.5	0.6	1.1
Hardwar	1.2	1.5	2.7
Hyderabad	..	0.8	0.8
	1.7	2.9	4.6

This is an industry which inherently has a long gestation period and even after all the facilities in the plant are set up the production build-up takes a number of years before full capacity production can

be achieved. It was, therefore, considered advisable to plan the manufacturing capacity on the assumption that by 1975-76, actual production would not exceed 90 per cent of the rated capacity. On this basis, it can be seen that while in respect of hydro turbo-generators, capacity already planned will be sufficient, in respect of thermal turbo-generators it will be necessary to plan additional capacity. To manufacture turbo-generator sets with an aggregate capacity of 3.5 million KW/year by 1975-76, it will be necessary to establish a capacity of about 4 million KW by 1970-71. This capacity should enable the country to be self-sufficient from about the middle of the Fifth Plan.

2.2. Power Boilers.—The output of boilers has to match the requirements of steam turbo-generators, which may be approximately 2.5 and 3.5 million KW per year by 1970-71 and 1975-76 respectively. To achieve an output of 3.5 million KW by 1975-76, it is suggested that a capacity of 3.7 million KW may be planned for 1970-71. It is estimated that with the establishment of this capacity by 1970-71, it may be possible to be self-sufficient in respect of this item during the Fifth Plan period.

At present there are two major units in the field of power boilers; the capacities are given below:—

1. AVB Works, Durgapur	0.35 million KW/year
2. HEL, Tiruchi	0.75 million KW/year
Total	1.1 million KW/year

Thus, it will be necessary to plan for an additional capacity of 2.6 million KW/year during the Fourth Plan period.

2.3. Transformers.—For an annual addition of 2, 3, and 4 million KW generating capacity the requirements of transformers as estimated by the Group are reproduced below:—

TABLE 2.—Requirements of Transformers (million KVA)

	66-67	70-71	75-76
1. Estimated addition to generating capacity—million KW	2.0	3.0	4.0
2. Estimated demand for transformers—66 KV and above.	8.0	12.0	16.0
3. Estimated demand for transformers—33 KV & below	5.2	7.8	10.4

Taking into consideration the time taken for production build-up in new plants, and the time lapse between the production build-commissioning of transformers it is suggested that a capacity to produce 15 million KVA for transformers classified as 66 KV and above and 9 million KVA for transformers below 33 KV should be able to meet the entire demand.

At present in the public sector facilities exist only at Bhopal plant which has a capacity to produce transformers (above 33 KV) with an aggregate capacity of 3.0 million KVA. While, broadly speaking, it was envisaged that public sector will concentrate in the manufacture of transformers of sizes over 33 KV and private sector will produce sizes below 33 KV, some private firms have established capacities to manufacture transformers in the range over 33 KV also. The total capacity in the private sector is reckoned at about 2.9 million KVA, of which about one million KVA is for transformers in the higher ranges.

Thus, the gap that has to be filled during the Fourth Plan will be:

- | | |
|---------------------------------|------------------|
| 1. Transformers 66 KV and above | 11 million KVA |
| 2. Transformers upto 33 KV | 7.1 million KVA. |

2.4. Motors—Industrial.—On the basis of overall power development programme, the proportion of power consumption by industries and agriculture, the load factor between the power demand and the installed motor capacity in industries and a broad division between motors in the bigger and smaller ranges. The Group has assessed that the demand for motors will increase to about 5 million KW per annum by 1970-71, of which approximately 2 million KW is estimated to be for motors above 150 KW. Accordingly, a capacity target of 6 million KW is suggested, 2 million KW for motors above 150 KW and 4 million KV for motors upto 150 KW.

By and large the capacity available in the private sector is for motor in sizes below 150 KW. This capacity is estimated to be about 1.2 million KW by 1965-66 and as such, an additional capacity of 2.8 million KW will have to be established during the Fourth Plan period.

In regard to large motors, Bhopal and Hardwar plants are establishing facilities to manufacture motors aggregating to about 740,000 KW, even though by 1965-66 the established capacity is not expected to exceed 250,000 KW. Thus the gap that has to be filled by establishing additional capacity is approximately 1.25 million KW.

2.5. Traction Equipment.—The Railways are planning to manufacture 300 motors for A.C. freight locomotives at Chittaranjan works and procure traction equipment for Diesel locomotives and EMVs from Bhopal. The facilities at Bhopal plant were planned to manufacture about 800 traction motors annually. In view of the enhanced requirements emerging now, it will be necessary to establish capacity to manufacture approximately 2,000 motors, generators etc., by the end of the Fourth Plan. Thus an additional capacity for 1,200 units will have to be established during the IV Plan.

2.6. Capacitors.—The Group has estimated that there will be an annual average demand of 330,000 and 700,000 KVAR for synchronous condensers during the Fourth and Fifth Plans respectively. In Western countries, there has been a switch over from

synchronous condenser to static condenser, along with its automatic switching arrangement. The Group is of the view that India may not go in a big way in adopting static condensers in their power generating system. Keeping these various factors in view, a capacity target of 300,000 million KVAR for synchronous condensers and one million KVAR for static capacitors (all ranges) has been recommended.

The Heavy Electrical Plant at Bhopal is the only unit in the country with facilities to manufacture synchronous condensers. Its capacity is for 90,000 KVAR. For static capacitors, a capacity to produce capacitors of 150,000 KW capacity is likely to materialise by 1965-66.

Thus during the Fourth Plan an additional capacity for approximately 210,000 KVAR synchronous condensers and for 850,000 KVAR static condensers will have to be established.

2.7. Switchgear and Control gear.—This group of equipment includes all types of circuit breakers and control gears required in generation, distribution and utilisation of electrical energy and therefore covers a wide range of equipment. The Report of the Working Group has analysed the requirements of these various categories in detail and suggested development plans for them. For the purpose of this report, the total requirements have been converted into value terms and the aggregate figures are given here.

From the available data it appears that the installed capacity for the manufacture of this group of equipment will be of the order of Rs. 180 million by the end of III Plan. A capacity target of Rs. 650 million has been suggested for 1970-71.

3. Fourth Plan Programme:

3.1. Turbo-generators.—In respect of hydro turbo-generator sets, as pointed out earlier, the capacity being established at Hardwar and Bhopal Heavy Electrical Plants will be sufficient to meet our entire requirements when these plants achieve full production.

In respect of Thermal turbo-generators, it is felt that additional capacity of around one million KW should be established during the Fourth Plan period. Since the present under construction plants will reach their capacity production only during Fifth Plan period, it is difficult to foresee the extent to which these plants can be expanded. The output, however, is quite likely to be in excess of the capacities indicated since later units of much larger sizes will be manufactured in these plants. This aspect should be thoroughly investigated and if still a gap remains steps should be initiated immediately to establish fresh capacity. Accordingly, it is suggested that a new plant should be initiated during this Plan period, specialising in higher ranges, i.e., in unit sizes over 200 MW and these suitable for nuclear power plants. The Planning Group, however, feels that first efforts should be directed towards achieving maximum possible, production from existing plants in shortest possible time. If possible, all necessary steps should be taken to meet the entire demand from existing plants, both quantitatively and qualitatively.

3.2. *Power Boilers.*—The additional capacity of 2.6 million KW to be established during the Fourth Plan period will be obtained partly by expansion of existing plants and partly by a new unit. It is expected that AVB works will expand their manufacturing capacity to 0.5 million KW per year. Studies are under way to examine the expansion of Tiruchi boiler plant. Only after the report of the experts studying Tiruchi expansion is available can a firm view about its final capacity be taken. At present it has been tentatively assumed that this plant is capable of being expanded to 1.5 to 2 million KW. It is further assumed that some of the units in private sector, at present engaged in the manufacture of Industrial boilers, may contribute upto 200,000 KW per annum by 1970-71. An analysis of the power development plan indicates that the demand for boilers required for turbo-generator units of sizes below 200 MW may not exceed 2-2.25 million KW per annum. The rest of the demand will be for boilers to match the large size turbines planned to be manufactured in the Hardwar plant and in the new proposed plant. Thus qualitative analysis indicates that it may not be desirable to expand the facilities at Tiruchi plant to beyond 1.5 million KW. If that plant still has spare capacity, it seems better to utilize it for the fabrication of high pressure equipment for chemical industries.

For meeting the requirements of higher size boilers it is suggested that a new plant of capacity 1.5 million KW/year may be installed. It is suggested that this plant should specialise in the manufacture of boilers of higher capacities, i.e., those suitable for turbo-generator sets of 200 MW and above and, if possible, the steam raising equipment for nuclear power stations.

3.3. *Transformers*

1. *Above 33 KV.*—The gap of 11 million KVA in this range is planned to be filled by (a) expanding the capacity at Bhopal HEL from 3 million KVA to 6 million KVA, (b) establishing a new plant of capacity 6 million KVA at Hyderabad and (c) by allowing the private sector to expand their production by another 2 million KVA.

In this connection it may be mentioned that when setting up additional capacity for the manufacture of transformers, the possibility of including the manufacture of other non-rotating electrical equipment in this plant may also be kept in view.

2. *Below 33 KV.*—The gap in this range also is quite high and expansion by about 4.5 times is required to meet the anticipated demand. The Working Group is of view that the private sector would be able to establish targetted capacity and hence no public sector project is recommended. However, in the light of such large scale expansion and the implication of technological innovations such as use of cold rolled grain oriented sheets, these recommendations may have to be reviewed at an appropriate time.

3.4. *Motors*

1. *Above 150 KW.*—The additional capacity required to meet the Fourth Plan targets is approximately 1.25 million KW. It is proposed that facilities should be established at Ramachandrapuram

plant to manufacture large industrial motors with a total capacity of 0.5 million KW per year. For the rest, it is proposed that the new heavy electric plant for the manufacture of thermal turbo-generator set should also establish capacity to produce motors sufficient to meet the balance of requirements.

2. *Below 150 KW.*—The present thinking is that, by and large, the production of these motors should be left to the private sector. However, in view of (a) the rapid expansion envisaged and (b) the poor progress shown so far in adopting more compact and efficient designs and in economic use of scarce raw materials, this position may have to be reviewed at an early date.

3.5. *Traction Motors.*—The Bhopal plant has at present a capacity to manufacture 800 motors per annum. It is recommended that this plant be enlarged to a capacity of 2,000 Nos. per annum.

3.6. *Capacitors.*—

(a) *Synchronous condensers.*—It is suggested that the new heavy electrical plant for rotating equipment should establish sufficient capacity for the manufacture of synchronous condensers to meet the demand in conjunction with the Bhopal plant, which will be the only other unit in the country manufacturing synchronous condensers.

(b) *Static capacitors.*—In view of the large gap of about 850,000 million KVAR, that has to be met during the Fourth Plan, it is suggested that a capacity to manufacture capacitors of 0.4 to 0.5 million KVAR capacity per annum may be established in the public sector. It is further recommended that inclusion of its production in the new transformer plant should be examined.

It is presumed that the private sector will be able to expand its production to meet the remaining gap.

3.7. *Switch Gear and Control Gear.*—At present, Bhopal HEL is the only public sector plant which has facilities to manufacture switch gears and control gears of large capacities. Recently, a proposal of Bhopal HEL to manufacture 132/230 KV air blast circuit breakers, in collaboration with ASEA has been finalised. The Group recommends its implementation with the utmost speed. In view of the large gap, the Group has recommended that possibility of producing these equipments, suitable for high tension operations, of a total value of approximately Rs. 150 million should be considered. Accordingly, it is recommended that possibility of setting up a new unit for heavy electrical stationary equipment may be examined. This plant may include the production of:—

(a) transformers—6 m KVAR.

(b) capacitors—0.4 m KVAR.

and (c) switch gear and control gear and silicon rectifiers—Rs. 150 million capacity to be assumed.

If this product mix does not present any definite advantages, then the group recommends that plants specialising in one type of product may be examined for speedy implementation.

4. Investment

Table No. 3 shows the capacities covered under Third Plan schemes and additional capacities that will have to be established during the Fourth Plan period. In many cases, the Third Plan schemes will not be completed before end of Third Plan and such listed capacities will not be installed by 1965-66. Accordingly the investment shown for Fourth Plan includes the outlay required for completing the Third Plan public sector schemes also. This table summarises the development of programme for the Heavy Electrical equipment.

TABLE 3.—Development of Heavy Electrical Equipment

Items	Unit	1970-71		III Plan scheme capacity	Gap	Total investment Rs. million	F. E.	Estimated output	
		Demand	Capacity					1965-66	1970-71
1. Boilers	mill. KW.	2.5	3.7	1.1	2.6	300		0.3	1.5
2. Turbines steam	„	2.5	4.0	2.9	1.1	400		..	1.71
3. Turbines-hydro	„	1.0	1.7	1.7	..	105		nil.	1.0
4. Generators-steam	„	2.5	4.0	2.9	1.1	} 230		nil.	1.71
Sync. condensers	M. KVAR	0.3	0.3	0.09	0.21			..	0.09
5. Generators-hydro	Mill. KW	1.0	1.7	1.7	..	105		nil.	1.0
6. Motors above 150 KW.	„	2.0	2.0	0.75	1.25	266	}	1.68	1.75
7. Motors below 150 KW	„	3.0	4.0	1.8	2.2	150				3.00
8. Traction Motors	Nos.	2000	2000	800	1200	40		439	1800
9. Transformers above 33 KV.	M. KVA	12	15.0	4.0	11	156	}		10
10. Transformers below 33 KV.	„	7.8	9.0	1.9	7.1	140			5.9	8
11. Capacitors	M. KVAR.	0.8	1.0	0.15	0.85	45		0.14	0.6
12. Switchgear/control gear.	Rs. mill.	500	650	180	470	400		160	400
13. sc. incl. F.E.	„					290			
TOTAL						2627	includes spill over in public sector projects.		

Specific projects in the Public Sector and the Corresponding Investments

Project	Scope	Investment Rs. million
I. Third Plan Schemes completion of :		
1. Bhopal		25
2. Tiruchi		10
3. Ramachandrapuram		87
4. Hardwar		510
	TOTAL	622
II. New Schemes :		
1. Bhopal :		
Power Transformers—expansion & traction Transformer.	3 million KVA to 6 million KVA	32
Traction motors—expansion	800 to 2000 Nos.	39
Balancing facilities, stores, tools, etc.		26
Steam turbine facilities		150
2. Tiruchi :		
Expansion	from 0.75 million KW to 1.5 to 2 million KW.	110
3. Ramachandrapuram :		
Large size motors, turbo blowers	0.5 million KW.	40
4. High tension switch gear project	Air blast circuit breakers 132/230 KV. 200 Nos./year	25
5. New unit for electrical rotating equipment	Steam and gas turbo-generators, syn. condensers large size industrial motors (2.0 million KW)	350
6. New unit for heavy electrical non-rotating equipment.	Transformers—6 m. KVA Capacitors 0.4 m. KVAR Switchgear & control gear Rs. 150m.	250
7. New power boiler plant	1.0 to 1.5 million KW.	180
8. Foundry Forge for Heavy Electrical Equipment	Steel castings 15,000 tonnes Steel forgings 150,000 tonnes	210
	TOTAL—NEW SCHEMES	1262
	GRAND TOTAL	1894
	Extra provision for 3 MKVA of power transformers for which the project has not been identified	24
		1918

RAW MATERIALS AND COMPONENTS

The requirements of components and raw materials, commensurate with the installed capacity for the manufacture of heavy electrical equipment by 1970-71 are summarised below:

Requirements of raw materials and equipment

Item	Unit	Annual requirements
1. Steel castings	Tonnes	26,000
2. Steel forgings	Tonnes	24,000
3. Tubes	Tonnes	35,000
4. Boiler quality plates and other special steel		
5. Conductors	Tonnes	4,000
6. Transformers strip wires	Tonnes	30,000
7. Enamelled wires & stripes	Tonnes	25,000
8. Transformer grade electrical sheets	Tonnes	55,000
9. Dynamic grade electrical sheets	Tonnes	135,000
10. Stampings for rotating equipment	Tonnes	60,000
11. Transformer lamination	Tonnes	40,000
12. Porcelain for bushing & insulators.		
13. Insulating material		
14. Tissue paper and aluminium foil		
15. Instruments, meter, relays, etc.		
16. General engineering items		

In order to meet the requirements of castings and forgings a plant is contemplated in the public sector. It is expected that with the commissioning of this plant there will be no gap left. While it seems there will be no difficulty in procuring tube indigenously the supply position of quality plates for boilers is a cause of concern. In respect of wires and strips capacity is insufficient specially for multi-layer electrical sheet no arrangements so far been made for the production of cold rolled grain oriented sheets. Even in respect of dynamo grade sheets capacity is insufficient Sankey Electrical Stampings Ltd. are the principal producers of lamination and stampings in the private sector. In the public sector Bhopal and Hyderabad units have these facilities. On the whole it is felt that additional capacity will have to be established to meet the demand. The largest deficiency exists

in respect of insulating materials. It will be necessary to make arrangement for the supply of latest types of insulating materials which are now replacing older techniques, e.g. using class E type insulation in the manufacture of motors. Tissue paper and aluminium foil are required for the manufacture of condensers. The quality of these products as now produced in India is not suitable for this purpose.

Public sector plants are being established to manufacture various types of instruments. Instrument plants are established in private sector also, but it is not clear whether these plants cover all types and ranges required in power plants. Besides manufacturing of instruments the major problem is "instrumentation engineering" facilities. Unless these facilities are provided instruments might have to be imported.

In regard to general engineering items the Working Group has pointed out that the manufacture of Feed waterheaters Economisers, Air pre-heaters, etc., would have to be obtained from outside as these are outside the scope of HEL programme. The Planning Group does not agree with this promise. It is felt that the Tiruchi Boiler Plant should undertake the manufacture of these items also. In respect of other items, the Working Group feels private sector may establish sufficient capacity. In any case the situation should be reviewed again.

GROUP II

TRANSPORT EQUIPMENT

The assessment of the requirements of various types of transport equipment has to be based on a comprehensive view of the growth of the economy; the related growth of goods and passenger traffic; economics and technology of transport etc., unless the programme of development of other sectors of economy are finalised, the assessment of transport equipment remains tentative. Based on several studies done in the past year on the growth of traffic, the Working Group adopted the following pattern for estimating the demand for transport equipment.

TABLE I

1. <i>Volume of Goods traffic</i>	1970-71
Total—billion tonne kilometers—approx. of which	300
Railways " " "	184
,, (originating traffic million tonnes billion tonne kilometers)	365
Motor transport ,, " "	70
Others " " "	20
2. <i>Volume of passenger traffic</i>	
Total—billion passenger kilometers—approx. of which	260
Railways " " "	120
Motor transport " "	140

Road Transport

While assessing the demand for transport equipment and suggesting a production programme the Group took full cognizance of the dominating role transport plays in vitalising the economy of a country. Assuming the above stated volume of traffic will materialise and taking into account the Defence requirements, the following production programme for the road transport equipment has been suggested.

TABLE 2.—Road transport equipment.

Type of vehicle	1970-71		
	Demand	Capacity	Production
1. Commercial vehicles			
Total—Nos.	120,000	1,20,000	110,000
of which over 9 tonners	5,000	5,000	5,000
3—9 tonners	85,000	85,000	80,000
below 3 tonners	30,000	30,000	25,000
2. Passenger vehicles			
Total—Nos.	100,000	100,000	80,000
of which jeeps Nos.	20,000	20,000	20,000
cars Nos.	80,000	80,000	60,000
3. Motor cycles/scooters etc. No.	150,000	150,000	150,000
4. Ancillaries—Rs. million	1,500	2,000	1,500

If the above programme is implemented, the growth of the automobile industry over the 20 years of planned development in the country will be as shown below:

Types of vehicles	1950-51	1955-56	1960-61	1965-66	1970-71
Commercial vehicles	8,600	9,900	28,200	42,250	110,000
Jeeps & Cars	7,900	15,400	26,600	35,000	80,000
Motor cycles/scooters etc.	Nil	1,500	18,000	50,000	150,000

The working Group has recommended a production target of 8,000 trailers by 1970/1971 however the Planning Group feels that 15,000 nos. will be a better target.

Investment

For establishing the desired production capacity by 1970-71, the investment required during the Fourth Plan will be as follows:—

	Rs.
I. Main manufacturers	
Total for Fourth Plan	1150 million
of which foreign exchange	612 million
Spill over	234 million
of which foreign exchange	130 million
2. Ancillary manufacturers	
Total	300 million
of which foreign exchange	138 million

Out of this total foreign exchange requirements of Rs. 880 million, commitments have already been made for Rs. 304 million. Out of which approximately Rs. 175 million will have been spent before the end of III Plan, rest is shown above as committed spill over. Thus

it will be necessary to arrange Rs. 750 million in foreign exchange for the import of capital goods during the first two years of the Fourth Plan.

Maintenance Imports

For the production of automobile and ancillaries at the suggested level, it will be necessary to import components, parts and raw materials. During this period, the indigenous content is expected to rise from 90 per cent to 95 per cent. The foreign exchange required for the import of raw materials is computed on existing availability. The requirements of foreign exchange for this purpose will decrease to the extent of increased availability of raw materials indigenously.

TABLE 3.—Foreign exchange required on maintenance account during IV Plan.

	(Rs. million)				
	1966-67	1967-68	1968-69	1969-70	1970-71
I. Main manufacturers					
(a) Components	104	99	121	126	129
(b) Raw materials	182	197	272	358	464
2. Ancillary manufacturers					
Raw materials	110	126	151	181	225
TOTAL	396	472	544	665	818

The total annual requirements of ferrous products by 1970-71, required by main manufacturers, including ordnance factories, are expected to be approximately as follows:—

TABLE 4.—Estimated annual requirements of ferrous products 1970-71

Category	Quantity (tonnes)
Sheets & plates	180,000
Bars, billets, tubes & rolled sections	
Total	200,000
of which carbon steel	90,000
alloy steel	110,000
Steel castings	7,500
Iron castings	90,000

Man Power Requirements

It is estimated that a total number of approximately 50,000 persons may be absorbed by automobile industry excluding the ancillary manufacturers for which no data were available.

According to existing pattern, semi-skilled and skilled personnel constitute approximately 52 per cent of the total strength. However, it is felt that in the additional employment, the percentage of skilled and semi-skilled workers may be as high as 75 per cent.

Railways

Based on the assumption that the originating goods traffic would increase to about 365 million tonnes by 1970-71 and the passenger traffic to increase by 4 per cent per annum over the plan period, Railway Board has assessed the requirements of rolling stock as given below:—

TABLE 5.—Requirements of rolling stock for Railways—Fourth Plan period.

Item	Additional	Replacement	Total
I. Locomotive			
(i) Steam	Nil	804	804
(ii) Diesel . . . . .	..	..	1,158
(iii) Electric	555	57	612
II. Wagons	155,700	59,900	215,600
III. Coaches	9,710	8,090	17,800
IV. EMJ	699	158	857
V. Rail Cars	400	Nil	400

*The figures for steam/diesel/electric locos are approximate and the *inter se* number may change.

According to the plans made by Railways, the plants they are establishing will be in a position to manufacture annually 250 diesel locomotives and 150 electric locomotives by 1970-71. Except Talco, locomotive manufacturing facilities are in public sector. It is expected that by 1970-71 India will be, more or less, self-sufficient in respect of all rolling stock required by the Railways. Since the Ministry of Railways is incharge of the development of these items, their development programme is not discussed here. However, a number of ancillary items and components will have to be produced outside Railway plants and these are discussed in the Working Group's Report. The DGTD is studying the possibility of producing these items in the country. Wagon manufacturing is mostly confined to the private sector. It is estimated that by 1965-66, a capacity to produce 40,000 wagons (in terms of four wheelers) will have been established in the country. It is recommended that by 1970-71 this capacity should be increased to 55,000 nos. for which an investment of Rs. 45 million may suffice.

General Recommendations

The Group feels that light duty commercial vehicles have not been allowed to play their role properly in this country. The Group recommends that a total production of 30,000 per annum should be reached by 1970-71. Group feels that the additional passenger vehicle production capacity should be obtained by concentration in one plant rather than by piecemeal expansion of existing plants. Group suggests that, in order to reduce the production cost of the additional capacity, the production of light duty trucks and passenger vehicles may be included in one and the same plant. These two vehicles should use the same engine (with different bore sizes) and transmission. If possible, production of industrial trucks, delivery vans, ambulances etc. also may be included in the production programme of this plant. The engine, transmission and many other parts, of course, should be common to all products of this plant. The Group likes to emphasise the fact that the existing facilities for car production in India are out-dated and expensive. The car demand is bound to grow and unless proper actions are taken now, it will not be possible ever to take advantage of the economy of size. The investment that will be made during the next decade will be much more than the existing figure; therefore, care should be taken that the existing investment does not prove a hurdle in rationalising the manufacturing facilities in this industry.

It is felt that the bullock carts will continue to play major role in the economy of rural areas. It is recommended that their efficiency should be improved by providing them pneumatic wheel assembly at reasonably low cost.

GROUP III

STEEL AND METALLURGICAL EQUIPMENT

The pivotal role occupied by iron and steel industries in the economy of country places the metallurgical equipment industry in a very important position. Since the iron and steel industry will be growing at the present or even faster pace for decades to come, it is obviously necessary that machine building industry should be geared to meet these requirements. But equally clearly there are limits to this pace of development of the indigenous industry, taking into account all the connected problems of investment, technical and technological skills, consolidation of established capacity and its fullest utilisation as quickly as possible. On the other hand, it has to be ensured that such inevitable limitations on the growth of indigenous machine building potential does not retard the development of metallurgical industries themselves. Though in a fully developed technological stage, there will be no such dilemma, in the present stage of development in our country, these different purposes and objectives need to be properly reconciled. The Group attaches the greatest importance to the striking of a proper balance in this connection.

The Working Group has assumed that the steel production capacity will be increasing at the rate of 2 million ingot tonnes per annum. Of this, one million tonnes will be by establishing new capacity and another million tonnes by expansion of existing plants. On these assumptions, the Working Group has assessed the average annual requirements of equipment as given below:—

APPROXIMATE AVERAGE ANNUAL REQUIREMENTS FOURTH PLAN

Tonnes/Year

Group of equipment	Total	Of type included in HMBP programme	HMBP capacity
1. Coke Oven and by-product plant	22,500	13,700	7,700
2. Sintering plant	5,500	..	..
3. Blast furnace	19,000	10,000	5,500
4. Refractory material plant	3,000	..	..
5. Steel melt shop	30,000	14,000	7,000
6. Rolling mills	55,000	46,000	34,500
7. Ancillary services	10,000	..	..
8. Crushing and grinding equipment	10,000	7,000	3,150
9. Cranes	11,000	9,000	6,570
10. Electrical and power equipment	25,000	..	..
11. Transport equipment	n.a.	..	..
12. Pure structurals	150,000	..	..
13. Piping	12,000	..	..
14. General engineering equipment	5,000	..	..
TOTAL—(rounded)	360,000	100,000	65,000
Spares etc.	15,000	8,000	1,100
TOTAL	375,000	108,000	66,000

In regard to structurals, piping and transport equipment, the Working Group has made recommendations and it is felt that if the recommendations are adopted, then we will be, by and large, self-sufficient in respect of these items. The main problems arise in regard to mechanical and electrical equipment. Four heavy electrical equipment plants in the public sector are in various stages of construction. It is expected that when these plants reach their rated output, indigenous industry will be in a position to meet almost all the requirements of electrical equipment for steel industry. This, of course, is on the assumption that the mechanical equipment, of which electrical equipment forms part of or is associated with, will be manufactured in India. Otherwise, certain electrical equipment may have to be imported as part of connected mechanical equipment which is imported. Thus restricting the import of electrical equipment depends to a great extent on the development of mechanical equipment production.

Thus, the main group of equipment which may continue to be source of drain on foreign exchange seems mechanical equipment. It appears that if the indigenous industry supplies all mechanical equipment required by iron and steel industry, we may become, more or less, independent of imports for developing metallurgical industries.

This group of equipment (mechanical equipment) has been divided into two main categories—one comprising those which are included in the production programme of HMBP, and the other covering the rest.

The Heavy machine Building Plant at Ranchi has a capacity to fabricate 80,000 tonnes of equipment, of which approximately 65,000 tonnes is for iron and steel industry. A million ton steel plant has approximately this quantity of equipment in it. If the rest of the equipment is available in the country, HMBP can supply a complete one million ton steel plant every year from indigenous sources. The requirements are however close to 100,000 tonnes per annum, since the steel production capacity is planned to increase at the rate of 2 million tonnes per annum. This shows clearly the necessity of expanding suitably the capacity for the manufacture of this group of equipment.

It is estimated that by 1966, all machinery and equipment will have been installed in HMBP. The Group has estimated that by 1973, the annual output of the plant will reach capacity production. It appears that while it may be possible to shorten this period by a year or two, it generally takes a plant of this nature a number of years before it can reach optimum production level. The reasons are discussed in the working Group's report. In view of this long gestation period, the Group has for the present neither recommended the doubling of the HMBP capacity, nor establishing another similar plant even on a smaller scale. The Group feels that following approach might be most appropriate:—

- (a) Allow HMBP to follow the production programme as given in the DPR for say, 3 or 4 years.

- (b) While following the agreed production programme, the plant may farm out the fabrication of smaller and lighter items, thereby increasing its output of heavier items and in turn, the total output of heavier equipment.
- (c) After a couple of years of operational experience, try to reduce the production of non-metallurgical equipment, and correspondingly increase the output of metallurgical equipment, even if it involves addition of some balancing equipment.
- (d) Lastly, the possibility of only manufacturing metallurgical equipment in this plant may be considered. It is estimated that by marginal expansion of this plant; i.e. by adding certain balancing facilities, this plant may be able to produce approximately 100,000 tonnes of equipment every year and as more experience is gained, output may further increase.
- (e) Along with the rationalisation programme as suggested in (d) above, steps should be taken to set up units for the production of items withdrawn from HMBP production programme, to which may be added manufacture of suitable types of other specialised metallurgical equipment, to make the plants as a whole, economic and well-proportioned, apart from filling in the relevant gaps in the requirements of such machineries for the country's needs.

In order to accomplish the above aims, it is suggested that a competent body be assigned the task of studying the HMBP production for the next two or three years with the aim of suggesting the most appropriate manner in which the output of heavy machinery can be increased to meet our requirements in the shortest possible time.

Technological structurals (e.g. blast furnace shell) is another item where further facilities will have to be developed. It may be noted that facilities available with M/s. Utmals are complimentary to HMBP and as such a close liaison should be established between the two. Besides this it will be necessary for HMBP to increase its technological structural fabrication capacity.

Regarding building structurals, the Group strongly feels that we should strive not only for self-sufficiency, but also some exports. The Group feels that as a rule a structural plant of capacity of around 25,000 tonnes per annum should precede the construction of an iron and steel complex on a new site both to serve the needs of that steel plant in the first instance and then on a permanent basis, contribute to additional heavy structural capacity, based on the supply of steel on the spot.

General purpose machinery and equipment are produced in the country in various sizes and designs. For most of the equipment, plans are under way for their manufacture in sizes and designs acceptable to steel plants. At present, however, many of these equipment are not produced in sizes and designs required by steel plants, and it is felt that unless HMBP becomes the main supplier of plant

and equipment to steel industry, growth of these other engineering equipment will remain uncertain.

Turbo blower is one item which is mainly required for the production of iron, but is not included in the manufacturing programme of HMBP. The Heavy Electricals Equipment Plant at Ramachandrapuram is in a position to manufacture these equipment with, more or less, existing facilities. The Group strongly recommends that BHEL should be urged to undertake the manufacture of this item expeditiously.

From the available information, it appears that physical facilities to manufacture most of the equipment required in a steel plant are established or are being established. In case of certain equipments, the capacity is sufficient and in case of other some expansion may become necessary. However, actual production seems well below capabilities and this underutilisation is attributed to lack of orders. It appears while the buyers have reservations about putting their faith in indigenously manufactured equipment, produced necessarily for the first time in India, the main reason seems to be that while manufacturing facilities are being established, the associated facilities like design and engineering services, an organisation which could produce component parts and equipment and supply a complete plant, etc. etc. are lagging far behind. The Working Group has discussed this problem in some detail, but this Group feels that this problem needs much more extensive and deeper study and more clear-cut recommendations. The Group therefore recommends that this aspect be studied explicitly and necessary steps should be initiated for establishing the necessary organisation at appropriate places so that optimum use could be made of indigenous manufacturing capacity.

The Group attaches the highest importance to the maximisation of production from existing facilities. It can be easily seen that a plant like HMBP, built mainly to produce such heavy equipment which require 20 to 30 months of processing in various shops, can maximise its production only if it has orders for at least five years and continuity of orders is maintained. Repeat orders would, of course, further increase the productivity. But unless this sort of perspective planning is done, the nature of manufacturing process is such that plant will not be able to achieve a high degree of utilisation of the capacity.

In this report the Working Group has another suggestion to offer. It feels that while it should not disturb its production programme of main equipment (e.g. blast furnace equipment, rolling mills, etc.), it should try to manufacture independent items of equipment; e.g. cranes, ladle cars, charging cars, crushing and grinding equipment etc. etc. in sufficient quantities to meet the entire demand as early as possible. Then in respect of such items import should be completely banned.

It is estimated that approximately Rs. 555 million will be spent during the Fourth Plan for completing the Foundry Forge & HMBP, of which the import content will be Rs. 86 million. For the supplies

coming from USSR and Czechoslovakia, payment will be in rupees. Besides this expenditure, the Group has suggested an *ad hoc* provision of Rs. 20 million for the rationalisation of HMBP's production programme. If it is decided that at a later date, HMBP should concentrate only on certain metallurgical equipment, new plants may have to be set up specialising in the production of other specific equipment going out of HMBP's programme. For this purpose, an *ad hoc* provision of Rs. 200 million is suggested. Besides these financial provisions, following projects are suggested for implementation during Fourth Plan.

		(Rs. million)	
Fourth Plan Schemes		Investment	
Project	Scope	Total	Foreign exchange
1. Structural Shop at Ranchi	25,000 tonnes/year technological associated and medium structurals	25	7·9
2. Heavy Structural project	25,000 tonnes/year includes facilities for technological structurals	45	15
3. Cranes	25,000 tonnes/year includes facilities for hoisting mechanisms etc.	110	30
4. Building Structurals	25,000 tonnes/year	20	5
TOTAL		200	57·9

GROUP IV

MINING AND DRILLING EQUIPMENT

1. Introduction

This group—Mining and Drilling Equipment and associated machinery, covers a wide variety of equipment for coal mining, under-ground and open cast, mining of other minerals and drilling equipment of different categories. It also includes equipment required for preparation and handling of coal and iron ore. While specific equipment is required for some of the operations, a large variety of equipment such as earth moving machinery, conveyers, crushers, screening equipment, etc. are common for a range of operations for different minerals. Besides, other sectors of economy also are large users of these machineries. The requirements are, however, assessed separately for the main mining and drilling activities classified broadly as:

- (1) Coal Mining
 - (a) Underground
 - (b) Open cast
- (2) Coal Washery Equipment
- (3) Ore Mining
 - (a) Iron Ore
 - (b) Copper
- (4) Drilling (Prospecting and drilling operations by Indian Bureau of Mines, Geological Survey of India, National Mineral Development Corporation, National Coal Development Corporation, State Governments, Oil and Natural Gas Commission as well as for deep well drilling.)

The Working Group report has attempted to give phased annual requirements based on the estimated annual activities in mining and drilling during the Fourth Plan period. The estimates of demand of mining machinery and drilling rigs are based on the following targets of production and capacity.

II. Targets of mining operation:

1. *Coal*.—The latest information regarding the development of coal industry available to the group was as given below:

TABLE 1—*Coal production target* — *Million tonnes*

Method of mining	1965-66	1970-71
Opencast	15.50	26.00
Underground of which	40.50	110.00
(a) development	32.00	44.50
(b) depillaring	28.50	60.50
	<hr/>	<hr/>
	76.00	136.00
	<hr/>	<hr/>

Keeping in view the key-role of this industry for an overall growth of industrialisation and the long gestation period required for developing mining capacity, it was decided by the Working Group for assessment of machinery requirement, to adopt the following capacity targets:

TABLE 2—Coal capacity target		Million tonnes
Method of mining	1965-66	1970-71.
Opencast	18	29
Underground of which	66	121
(a) development	35	53
(b) depillering	31	68
Total	84	150

2. *Iron Ore*.—Against a likely production of 22 million tonnes and capacity of about 25 million tonnes by 1965-66, it has been assumed that the capacity will be increased to about 60 million tonnes of iron ore by 1970-71.

3. *Bauxite*.—The capacity for mining of bauxite will have to be raised from about 0.5 million tonnes in 1965-66 to 1 million tonnes in 1970-71.

4. *Other Ores*.—(a) *Copper*.—It is proposed to develop two mines namely Kolihan and Rakha to augment capacity by about 1 million tonnes during the Fourth Plan period. This would be in addition to the copper ore mines which are already under development.

(b) *Lead and Zinc*.—The main development for these will have to be based on imported concentrates apart from the development and expansion of mining operations already in hand at Zawar.

5. *Limestone*.—The output of limestone quarries will have to be raised from about 25 million tonnes at the end of the Third Plan to about 60 million tonnes at the end of the Fourth Plan.

III. Assessment of demand:

While the development of manufacturing capacity for mining, washing and dressing and drilling equipment along with some allied items are discussed here, no specific suggestions are made in respect of those items which are also required by other sectors of economy in much larger quantities like earth moving machinery, which is covered by a separate Report.

MACHINERY & EQUIPMENT: REQUIREMENTS vs. MANUFACTURING CAPACITY

6. *Coal—Underground*.—The detailed assessment based on available norms indicate that the total requirement of equipment and machinery specific to this sector i.e. excluding electrical items, general engineering and earth-moving machinery add up to approximately 30,000 tonnes per annum by 1970-71. Of this total, the type of equipment included in the manufacturing programme of CMMP Durgapur, add up to approximately 23,000 tonnes. Against this quantum of demand CMMP has a capacity of 38,000 tonnes, out of

a total capacity of 45,000 tonnes) i.e. excluding about 7000 tonnes of capacity now proposed to be utilised for washery equipment. Private sector is expected to develop a capacity to fabricate 8000 to 10,000 tonnes by the end of the Fourth Plan. Table 3 gives the details of this assessment. From the available information it may be concluded that with the capacities already planned for the manufacture of underground mining machinery we will attain a stage of self-sufficiency.

7. Coal Washery Equipment.—The number of washeries to be installed during the Fourth Plan is estimated to be about 15. The equipment for some of the washeries have already been ordered out. Against these requirements the total manufacturing capacity in the country is estimated to be approximately 5 to 6 washeries per annum. What appears to be, however, lacking is the Design & Engineering organisation for designing and coordinating supplies and delivering complete washery to the users. To fill this gap, talks are now being held with a Polish Team for setting up an organisation essentially for Design, Drawing and erection of complete washeries.

With regard to mining of coal by open cast methods, iron ore mining and quarrying etc., the requirements are largely for removal of top surface, drilling operations, blasting, crushing conveying. The bulk of the requirements is for the earth moving equipment. As this equipment is also required in large quantities by other sectors of economy, no specific suggestions are made, beyond stating that steps should be taken to create sufficient capacity for meeting the requirements. With regard to the crushing equipment, sufficient capacity has been licensed both in the Public (HEC) and Private Sectors to meet the requirements of various kinds of crushers.

In regard to conveyor equipment, CMMP, Durgapur has provided a capacity of 10,000 tonnes of belt conveyors. Capacity licensed in the Private Sector is about 20 to 25,000 tonnes per annum and it is assumed that at least half of this capacity i.e. 10,000 tonnes per annum should materialise by 1970-71. This capacity is expected to be adequate for meeting the requirements of coal mining, coal washeries, steel plants, other minerals and allied users.

TABLE 3.—Mining and drilling equipment—Requirements and manufacturing capacity :

Equipment	Annual requirements			Manufacturing capacity Licensed			
	65-66 Nos.	70-71 Nos.	70-71 Tonnes	CMMP Nos.	CMMP Tonnes	Private Nos.	Total Nos.
I	2	3	4	5	6	7	8
1. Coal cutters	240	450	1575	440	2160	200	640
2. Cutter loaders/Shearers/cont. miners	7	18	360	•			
3. Mechanical loaders	9	22	154	250	1370		

	1	2	3	4	5	6	7	8
4. Conveyors		115	300	7920	880	24,000	250	1130
(a) chain		75	200	5150				
(b) belt		40	100	2770				
5. Haulages		220	285	1575	400	3770	400	800
(a) direct		130	200	1140				
(b) endless		90	85	435				
6. Mine locos		17	45	450	160	1300	..	160
7. Shuttle cars		25	30	360	•			
8. Mine cars		30	50	2385	•			
9. Cages		240	300	630	•			
10. Cage keps		125	180	130	•			
11. Cage supervision gear		125	180	125		2000		
12. Mechanical ventilators		185	295	2265	350	1200		
(a) main fans		30	60	2000				several manufac-
(b) Booster fans		40	60	175				turers
(c) auxilliary fans		115	175	90				
13. Pumps		1165	1520	1625	1555			Do.
(a) main		185	250	740				
(b) intermediate		280	350	370				
(c) face		700	900	455				
(d) sand pumps		18	30	60				
14. Winders		8	12	550	25	1165	12	37
15. Steel supports	12,000	27,000	1320		•			
16. Prop with drawers	390	630	7		•			
17. Ball mills	18	24	240					
18. Exploders								
								chemical industry
				23,000		38,000 excluding wash-		
						ery equipment, spares and		
						miscellaneous		
19. Electric coal drills	765	1400	..	..	..	1200	..	
20. Electric drill panel	560	935	..	..	..	300	..	
21. Core drilling rigs (dia-	..	75	..	..	..	385		
mond)								
22. Rock drills	190	500	..	..	..	2075	..	
23. Well drilling rigs . . . . .	..	100	..	..	..	43	..	
24. Oil drilling and pros-	..	15						
pecting								
25. Winches	180	300	..	..	50			
26. Pulley blocks	140	230			(HMBP)			
27. Screening plants					•			
(complete)	7	20						

Note: The weights under demand column are based on controller.

The weights shown under CMMP programme are based on its D.P.R.

*CMMP can undertake the manufacture of these items also.

a total capacity of 45,000 tonnes) i.e. excluding about 7000 tonnes of capacity now proposed to be utilised for washery equipment. Private sector is expected to develop a capacity to fabricate 8000 to 10,000 tonnes by the end of the Fourth Plan. Table 3 gives the details of this assessment. From the available information it may be concluded that with the capacities already planned for the manufacture of underground mining machinery we will attain a stage of self-sufficiency.

7. Coal Washery Equipment.—The number of washeries to be installed during the Fourth Plan is estimated to be about 15. The equipment for some of the washeries have already been ordered out. Against these requirements the total manufacturing capacity in the country is estimated to be approximately 5 to 6 washeries per annum. What appears to be, however, lacking is the Design & Engineering organisation for designing and coordinating supplies and delivering complete washery to the users. To fill this gap, talks are now being held with a Polish Team for setting up an organisation essentially for Design, Drawing and erection of complete washeries.

With regard to mining of coal by open cast methods, iron ore mining and quarrying etc., the requirements are largely for removal of top surface, drilling operations, blasting, crushing conveying. The bulk of the requirements is for the earth moving equipment. As this equipment is also required in large quantities by other sectors of economy, no specific suggestions are made, beyond stating that steps should be taken to create sufficient capacity for meeting the requirements. With regard to the crushing equipment, sufficient capacity has been licensed both in the Public (HEC) and Private Sectors to meet the requirements of various kinds of crushers.

In regard to conveyor equipment, CMMP, Durgapur has provided a capacity of 10,000 tonnes of belt conveyors. Capacity licensed in the Private Sector is about 20 to 25,000 tonnes per annum and it is assumed that at least half of this capacity i.e. 10,000 tonnes per annum should materialise by 1970-71. This capacity is expected to be adequate for meeting the requirements of coal mining, coal washeries, steel plants, other minerals and allied users.

TABLE 3.—Mining and drilling equipment—Requirements and manufacturing capacity :

Equipment	Annual requirements			Manufacturing capacity Licensed			
	65-66 Nos.	70-71 Nos.	Tonnes	CMMP Nos.	Private Tonnes	Private Nos.	Total Nos.
1	2	3	4	5	6	7	8
1. Coal cutters	240	450	1575	440	2160	200	640
2. Cutter loaders/Shearers/cont. miners	7	18	360				
3. Mechanical loaders	9	22	154	250	1370		

	1	2	3	4	5	6	7	8
4. Conveyors		115	300	7920	880	24,000	250	1130
(a) chain		75	200	5140				
(b) belt		40	100	2770				
5. Haulages		220	285	1575	400	3770	400	800
(a) direct		130	200	1140				
(b) endless		90	85	435				
6. Mine locos		17	45	450	160	1300		160
7. Shuttle cars		25	30	360	*			
8. Mine cars		30	50	2385	*			
9. Cages		240	300	630	*			
10. Cage keps		125	180	130	*			
11. Cage supervision gear		125	180	125		2000		
12. Mechanical ventilators		185	295	2265	350	1200		
(a) main fans		30	60	2000				several manufac-
(b) Booster fans		40	60	175				turers
(c) auxilliary fans		115	175	90				
13. Pumps		1165	1530	1625	1555			Do.
(a) main		185	250	740				
(b) intermediate		280	350	370				
(c) face		700	900	455				
(d) sand pumps		18	30	60				
14. Winders		8	12	550	25	1165	12	37
15. Steel supports	12,000	27,000		1320	*			
16. Prop with drawers	390	630		7	*			
17. Ball mills	18	24		240				
18. Exploders								
				23,000		38,000 excluding wash-		
						ery equipment, spares and		
						miscellaneous		
19. Electric coal drills	765	1400	..	..	..	1200	..	
20. Electric drill panel	560	935	..	..	..	300	..	
21. Core drilling rigs (dia-	..	75	..	..	..	385	..	
mond)								
22. Rock drills	190	500	..	..	..	2075	..	
23. Well drilling rigs . . . . .	..	100	..	..	..	43	..	
24. Oil drilling and pros-	..	15	..	..	50			
pecting					(HIMBP)			
25. Winches	180	300	..	..	*	..	..	..
26. Pulley blocks	140	230						
27. Screening plants								
(complete)	7	20						

Note: The weights under demand column are based on controller.

The weights shown under CMMP programme are based on its D.P.R.

*CMMP can undertake the manufacture of these items also.

TABLE 4.—Requirements of electrical equipment

Equipment	1965-66	Nos. 1970-71
Transformers		
High tension	28	65
Mining type	85	120
Industrial type	85	120
Lighting type	180	300
Motors (replacement only)		
Open type	180	350
F.L.P. type	135	250
Switchgear		
High tension (oil)	260	520
Low tension (oil)	410	775
Air-break	550	1050

IV. Investment:

It is estimated that the total investment on this industry during the Fourth Plan would be of the order of Rs. 150 million. Of this, Rs. 73 million is for the completion of CMMP project, and the rest for the completion or expansion of schemes in the private sector. This amount also includes provision for setting up a Drawing and Design Bureau for coal washeries in the Public Sector, as an independent unit of the Coal Mining & Machinery Project.

V. Raw materials:

The requirements of major raw materials and components are listed below:

Sl. No.	Raw material, components, etc.	Unit	Annual requirements 1970-71
1	Ball and roller bearing	Rs. million	7.5
2	Cutting tools	"	3.0
3	Flame proof motors and switchgear	"	7.0
4	Hydraulic Couplings, fittings etc.	"	1.5
5	Lubricating pumps and elements	"	0.7
6	Instruments	"	0.8
7	Mild steel	Tonnes	42,000
8	Pig iron	"	23,000
9	Scrap iron	"	15,000
10	Alloy steel	"	20,000
11	Coke	"	7,000
12	Steel tubes	"	3,000

VI. Man power requirements:

At full operational level, CMMP, Durgapur, will have a staff of 4391. At present 3220 persons, including 486 as construction staff, are employed. It will need to recruit another 150 engineers and technicians and probably another 2,000 skilled and unskilled labour. No

firm estimates are available for private sector plants. Preliminary estimates are that the additional requirements during the Fourth Plan period may be of the order of 50 engineers and technicians and about 500 skilled and unskilled workers.

VII. Special recommendations:

(i) The indigenous capacity for the manufacture of coal mining machinery of the types included in the production programme of CMMP, Durgapur, is sufficient to meet our requirements during and at the end of the Fourth Plan period.

(ii) On the other hand, the group feels that the manufacturing capacities at CMMP may not be fully utilised and to avoid this, its production programme should be diversified. A welcome feature in this regard is to allocate about 7000 tonnes of capacity for washery equipment. It should also be possible for CMMP, Durgapur, to produce part of its requirements for electrical items like flame proof motors, mainly of integral types, gate-end boxes etc., making use of its existing foundry and machining capacity.

(iii) The manufacture of ball-mill should be reincluded in the production programme of CMMP, Durgapur.

(iv) The requirements of various kinds of drilling rigs seem to be concentrated by the user organisations in one or two years. These should be properly phased as far as possible to give due weightage to the indigenous manufacturing programme.

(v) HMBP, Ranchi, has more than sufficient capacity to meet all the requirements of drilling rigs for O.N.G.C. and it is in a position to get the necessary documentation and guidance in the manufacture from Russian experts. A firm arrangement should be made to ensure that O.N.G.C. places order for all its requirements with HEC will in advance to enable HEC to draw up a manufacturing programme to suit O.N.G.C.

(vi) Capacity is also required for the manufacture of about 50 to 60 drilling rigs for drilling of deep wells. To the extent that the manufacturing facilities in HMBP will not be full utilised for oil rigs, manufacture of these deep well rigs in HMBP should be explored, both in order to meet the demand for the latter and avoid idle capacity in HMBP.

GROUP V

HEAVY PLATES & VESSELS

A plant to fabricate equipment out of heavy plates is termed here as Heavy Plates and Vessels works. Chemical Industries (including fertilisers, petroleum refining and petrochemical industries) are the largest consumers of these equipments (e.g. heat exchangers, reaction vessels, towers, tanks, distillation and fractioning equipment, filters, driers, crystallizers, agitators, other cylindrical vessels etc. etc.) Besides chemical equipment, these shops sometimes fabricate ductings, piping and structurals also. Steel industry is another important consumer of plate work equipment. Blast furnace shell, coke ovens, steel melt furnaces, gas holders, etc., are examples of plate work. Other metallurgical industries also require good deal of equipment fabricated out of heavy plates.

During the Fourth Plan period at least Rs. 10,000 millions will be invested on chemical and allied industries. The Planning Group on Chemical and Allied Industries has estimated an investment of more than Rs. 16,000 millions during the Fourth Plan period. For assessing the requirements of equipment, in this note, it has been assumed that investment in chemical and allied industries (including petroleum refining) will be of the order of at least Rs. 10,000 million during Fourth Plan and Rs. 10,000 million during the Fifth Plan. If higher investments are contemplated, the demand for equipment will be proportionately higher. Of the total investment, approximately 50-60 per cent will be the cost of plant and machinery. For the present calculations, the cost of plant and machinery has been assumed to be 50 per cent of the total fixed investment on the plants, excluding townships and similar expenses. It is estimated that the share of plate work equipment in the total plant and machinery would be of the order of 30 to 35 per cent—i.e., the cost of plate work equipment will be approximately 15-17 per cent of the total fixed investment. Accordingly, the total requirements of this group of equipment during the Fourth Plan may be of the order of say Rs. 1600 million and during the Fifth Plan approximately of the order of Rs. 2500 million. The annual requirements may thus rise from about Rs. 100 million per annum during 1965-66 to approximately Rs. 400 million per annum by 1970-71 and Rs. 600-650 million per annum by the end of Fifth Plan. Adding replacement requirements, the demand by 1970-71 may be of the order of Rs. 5000 million per annum, and Rs. 800 million per annum by 1975-76.

For the purpose of planning the manufacturing facilities, further relevant data are (a) the thickness of the plate, (b) the diameter of the vessel or equipment to be produced, (c) its length, and (d) the material of construction etc. It is assumed here that small fabricating shops would be able to fabricate plate upto 20 mm (may be 10 mm will be the more appropriate size) and vessel diameters upto 2

meters (category I). The second category of fabrication shops is assumed to have facilities to handle plates upto 40 mm thickness. It is further assumed that these shops will fabricate equipment of plate thickness below 20 mm, provided the vessel diameter are over 2 meters (category II). The third category of shops is assumed to be for plates over 40 mm thick (category II). These classifications, however, need to be carefully examined and adjusted accordingly.

There is no precise data available about the shares of various categories (defined above) in the total demand. However, from the available data it is concluded that, by value the shares of equipment falling into the first category (0-20 mm thick—upto 2 m dia) will constitute approximately 30 per cent of the total plate work equipment, that of category two approximately 60 per cent and approximately 10 per cent is the share of heavier equipment in the third category. These figures, however, need verification by a detailed analysis.

According to these assumptions, the demand for equipment in different categories would be approximately as given below:—

Type	Annual demand	(Rs. million)	
		1970-71	1975-76
Category I			
0-20 mm thick 0-2 meter dia	45	150	240
Category II			
0-40 mm thick 2-4 meter dia for 0-20 mm 0-4 meter dia for 20-40 mm	90	300	420
Category III			
heavier than 40 mm	15	50	80
Total	150	500	800

In order to meet the total demand indigenously, the total value of production will have to be approximately Rs. 500 million by 1970-71. However, it may not be desirable to do away completely with imports of chemical equipment. The technology in chemical and allied industries is improving every day; new products and processes are being introduced continuously. To utilize the newer and improved processes the design of equipment also is changing, and by allowing imports of such processes and equipment, our industries will be able to keep pace with other countries. Therefore, certain amount of imports is highly desirable. At the same time, provision for export of simpler and standard items and even plants should be made while planning for their manufacturing facilities. Based on these considerations, a capacity target of Rs. 450 million per annum on double shift operation is suggested for 1970-71.

The above estimates indicate that the requirements of plate work equipment in ranges covered by category (II) may be approximately Rs. 300 million per annum by 1970-71. If a production target of

Rs. 250 million is aimed at the capacity target on two shift basis may have to be planned for Rs. 300 million. Assuming an average price of Rs. 5,000 per ton the capacity for plate work will have to be for approximately 60,000 tons per annum. Allowing on one hand for the weight of the tubes in heat exchangers and on the other hand, providing extra capacity for catering to the demand for the plate work required in the construction of blast furnace, steel smelting equipment, coke oven, gas holders, etc. a capacity of 70,000 tons per annum is suggested.

The requirements of fabrication of the plate and vessels type of equipment have been independently assessed by two of the Working Groups appointed, namely the Working Group for Fertilizer Heavy Chemical and Petroleum Refining Industries and the second partly of the working group on steel and metallurgical equipment. Both these groups have studied the expected requirements of the respective industries as well as the present available capacity for these types of work and have estimated the additional capacity to be established at over 75,000 tons per annum as follows:—

(a) *Fertilizer, Chemical and Petroleum and other Units :*

	per annum Tons
Class I Vessels	5,000
Class II Vessels	4,500
Class III Vessels and miscellaneous plate work	12,500
Heat Exchangers	3,000
S. S. and Alloy Steels	1,500
	<hr/> 26,500 <hr/>

To account for the requirements of petrochemicals and other heavy chemical industries the requirements have been rounded off as 30,000 tonnes per annum. It is felt that the demand may be higher than assumed here.

(b) The Working Group for Steel and Metallurgical equipment has recommended that in addition to the present fabrication capacity and the proposed additional capacity to be installed in the Heavy Machine Building Plant, six units with capacities between 6,000 to 10,000 tons per year—say a total of 50,000 tons per year may be established. This quantity of 50,000 tons per year may be expected to include the following items of work:

	Tons
Plate work about 25 mm but less than 75 mm	13,000
Less than 25 mm	13,000
Pressed ends etc.	8,000
	<hr/> 34,000 <hr/>
Total of (a) and (b)	30,000
	34,000
	<hr/> 64,000 <hr/> tons per annum.

To meet the above requirements, it is being proposed to construct one fabrication shop which will be oriented towards the fabrication of pressure vessels, heat exchangers, etc., including stainless and other alloy steel fabrication as usually required by the fertilizer, petroleum and other chemical units and two more fabrication shops for handling heavy plate and vessels type of work oriented towards the requirements of steel and metallurgical industries including a considerable volume of equipment for the coke even by-product plant, tar distillation, gas purification plants etc. which are essentially chemical plant type of equipment. Each of these shops will have an ultimate capacity of between 16,000 and 20,000 tons per annum, thus establishing a total fabrication capacity of 50,000 to 60,000 tons per annum while working on full two shift basis although in the initial stages, the shops will work on a single shift basis to enable sufficient number of skilled workmen, supervisory staff, etc., to be trained for complete manning of the projects.

Sometimes back when it was decided to establish just one heavy plates and vessels shop, the scope of work included the full range of equipment required for chemical as well as metallurgical industries. But the present proposal, it will be noticed, suggests shops which will more or less be specialised in the respective lines. The chemical plant vessels shop will fabricate mostly equipment such as pressure vessels and heat exchangers, a very high percentage of which will be shop assembled, welded, tested and despatched as complete units, whereas the shop fabricating metallurgical equipment will be called upon to supply a higher percentage of re-formed and trial assembled plate work which will have to be assembled at site and welded. This shop will also have to handle a comparatively higher percentage of structural work forming an integral part of the equipment being fabricated. This variation in the scope and constitution of the output makes it advisable to have the shops specialising in particular field and not a general shop to handle all types of equipment.

With this in view it is proposed to include the following projects for implementations:—

- (1) A fabrication shop for fertilizer, petroleum, refining and other heavy chemical industries with an ultimate capacity of 16,000 to 20,000 tons per annum fabricating pressure vessels, heat exchangers, etc. in carbon steel as well as alloy steels.
- (2) Two Heavy plate and Vessels shops catering mainly to the requirements of steel and metallurgical industries with necessary structural fabrication facilities and an annual capacity of between 16,000 and 20,000 tons each.

It may be noted that Tiruchi Boiler Plant may have excess capacity for the fabrication of high pressure drums and for bending tubes. Therefore while planning these new projects these factors should be taken into consideration to avoid duplication of facilities and to obtain better utilisation of existing facilities.

GROUPS VI

MACHINE TOOLS

The Planning Group attaches greatest importance to this Industry due to its vital role in the development of machine building industry which in turn lays the foundation for a self-sustained growth of industries. Due to rapid growth in the industrial sectors there has been a very steep rise in the demand for machine tools. In the past decade the Indian machine tools industry has made rapid progress and it is expected that by the end of Third Plan indigenous production will be worth approximately Rs. 300 million per year. In spite of this, the indigenous production will be slightly less than half of our requirements. The Group feels that as this industry occupies a pivotal role in the process of industrialisation, the country should attain near self sufficiency i.e., approximately to the extent of 85 per cent of the overall demand by the end of Fourth Plan.

The Working Group on Machine Tools has suggested that, in order to achieve the above mentioned goal, and also keeping some provision for exporting approximately 10 per cent of the output, following targets should be accepted.

Machine Tools Targets 1970-71

Rs. million

Item	Capacity	Production	demand
Machine tools—total of which	1310	1190	1650
1. Group (A) metal cutting and forming type	1130	1030	1320
2. Group (B) metal forming, foundry, hand tools etc.	180	160	330

2. It is expected that by the end of the Third Plan a capacity to manufacture machine tools worth Rs. 375 million will have been established, while the investments already made by III Plan schemes will eventually establish a capacity of Rs. 450 million.

This leaves a gap of Rs. 860 million to be filled in during the Fourth Plan period and unless actions are initiated immediately, the targets may remain beyond reach. The response to the questionnaires sent to various machine tool manufacturers indicate that it should be possible to achieve these targets without any great difficulty. The Working Group feels that the production projections as supplied by private sector are optimistic. It is felt that

the Public Sector should gear itself to shoulder a major share of this expansion. Schemes to increase the production of machine tools in the Public Sector (in H.M.T. and H.M.T.P.) from Rs. 165 million in 1965-66 to approximately Rs. 500 million by 1970-71 have been suggested by these organisations. To meet the Fourth Plan targets, the private sector will have to increase its production from Rs. 135 million in 1961-66 to Rs. 690 million by 1970-71. Even though the past progress in the private sector has been quite remarkable, it is felt this order of expansion in the private sector may not be possible. The Planning Group would like to, therefore, recommend that Public Sector should prepare itself to attain a capacity to produce machine tools with an aggregate value of Rs. 700 million by the end of Fourth Plan, in case private sector progress lags behind schedule. This means a capacity target of Rs. 850 million may be recommended for public sector.

The Working Group has broadly classified machine tools into two main categories namely, metal cutting and major metal forming machine tools and another category comprising some metal forming machines, foundry machines, portable tools, machine tool accessories etc. Out of a total production of Rs. 1190 million, Rs. 1030 million will be of first category and Rs. 160 million of second group.

The respective figures for the year 1965-66 are expected to be about Rs. 280 million and Rs. 20 million. Thus, while in respect of first group a 3½ fold increase is envisaged, in respect of second group 8 fold increase is necessary. Even after this rapid increase, indigenous production will meet only half of the total demand, in the second category of machine tools. Early steps should be taken both in the public and private sectors to organise production of these items in sufficient measure, if imports are to be avoided.

The Group has attempted to subdivide the demand of machine tools into about 25 categories. However, the Group has stated that this division is only indicative and tentative. The Group feels that in order to plan a rational development of the industry it is necessary to undertake a census of machine tools installed upto 1964. This would give the present pattern of machine tools installed and reflect the change in pattern over the last ten years. The last census was taken in 1954. From the available information it has been concluded that major gaps exist in respect of drilling, lapping and honing, lathes, capstan and turrets, milling machine tools and presses.

Investment and foreign exchange.—For establishing an additional capacity of Rs. 1010 million, an investment of Rs. 1050 million will be necessary, of which Rs. 440 million will be in foreign currency. Of this, Rs. 140 million will have to be released before 1966. In respect of maintenance imports, the Working Group has estimated that approximately 25 per cent of the value of machine

tools produced in the country will have to be spent on the import of raw materials and components.

Specific projects in public sector

Schemes	Scope	Investment Rs. million
1. HMT Kerala expansion	Rs. 50 million to Rs. 100 million	35
2. HMT Hyderabad expansion	-do-	35
3. 5 New Machine Tool Plants	Rs. 250 million	350
	<u>Rs. 350 million</u>	<u>420 million</u>

With these seven schemes, the capacity covered will be for approximately Rs. 850 million. However, the installed capacity by 1970-71 is not expected to exceed Rs. 700 million. Essentially the suggested schemes include advance action for Fifth Plan also.

Special Recommendations:

(1) The Working Group recommends that a machinery for taking machine tool census should be set up so that a new census would be possible every five years. It is proposed that this study should be comprehensive enough to provide sufficient data for forecasting the demand over the next 10 to 15 year period keeping in view the changing technologies in various manufacturing industries. Taking full cognizance of the likely availability of skills and technical knowledge in the country it should suggest a programme for the development of machine tool industry. Any assistance from abroad should be welcomed in this study.

(2) Procedure recommended by the Engineering Capacity Survey Committee be adopted for the collection of statistics of imported and indigenous machine tools.

(3) Special attention should be paid to the development electronic and hydraulic controls for the machine tools.

(4) It is recommended that machine tool manufacturers should be encouraged to modify their production pattern to suit latest technological innovations.

GROUP VII

INDUSTRIAL MACHINERY

This group—industrial machinery—includes only sugar plants, cement plants, paper plants, industrial boilers, tea machinery and dairy machinery.

I. DEMAND

1. *Sugar Plants.*—The demand for sugar plant machinery has to be correlated to the annual increase in the sugar making capacity, which has remained a controversial subject. The Memorandum in the Fourth Plan has assumed that sugar capacity will increase from 3·2 million tonnes in 1965-66 to 4·5 million tonnes in 1970-71, implying a rate of growth of approximately 7 per cent per annum. It is assumed that the rate of growth of sugar industry in the Fifth Plan will not be less than that assured for Fourth Plan. On these assumptions, the annual addition to sugar making capacity would be about 220,000 tonnes by 1965-66 and approximately 300,000 tonnes per annum by the end of Fourth Plan.

Approximately 18 months lapse between the manufacture of the equipment and its commissioning for sugar production. To this extent machinery manufacturing capacity will have to be ahead of sugar production target and will have to be for about 325,000 tonnes sugar per annum by 1970-71.

At present the indigenously manufactured standard sized sugar plants have a cane crushing capacity of 1000/1200 tonnes per day. Depending upon the location of the plant the annual output of sugar may vary between 14,000 and 18,000 tonnes. An average figure of 15,000 tonnes per annum has been assumed. The total cost of such a plant has been assumed to Rs. 8·5 million. The production of sugar plants with an aggregate capacity of 325,000 tonnes per annum, amounts to the manufacturing of 22 plants per annum, i.e. an annual production of machinery worth Rs. 186 million. Allowing for normal maintenance needs and spares, the demand may be placed at about Rs. 200 million per annum. At present they are close to 200 plants in operation and majority of them are fairly old and may require substantial equipment for replacement or modernisation. Keeping this factor in mind, a capacity target of Rs. 250 million has been suggested. The Group considered the argument

that by installing 2000 tonnes plant instead of 1000 tonnes/day plants, the total requirement of equipment will be reduced, but agreed to retain the figure of Rs. 250 million.

According to present practice, sugar plant manufacturers fabricate approximately 55 per cent (by cost) of the plant, import 15 per cent and procure the rest indigenously. In order to supply plants and equipment totalling Rs. 200—225 million per annum by 70-71, the output of plant manufacturers will have to be around Rs. 120 million.

2. *Cement plants.*—The Fourth Plan targets for cement also have been modified on different occasions. The Memorandum on the Fourth Five Year Plan has suggested that cement production should increase from 14 million tonnes in 1965-66 to 30 million tonnes in 1970-71. The machine building capacity cannot be correlated to any one particular Plan target but has to be established on the basis of continuous annual demand. In case requirement in any particular year or over some period differ from established machine building capacity, then the shortfall will have to be met by diverting some other machine building capacity for the production of deficient items or by imports. Therefore, for the purpose of planning the manufacturing capacity for cement plants, it has been assumed that the annual rate of commissioning additional cement making capacity would be about 1.5 million tonnes in 1965-66 and this will have to be raised to 2.5 to 2.75 million tonnes by 1970-71. Accounting for the time required for erecting a cement plant—approximately 18 months to 20 months—the output of the cement machinery manufacturers should be for an aggregate capacity of 2.8—3 million tonnes per annum by 1970-71. In terms of standard 600 tonnes per day, rotary kiln type plants, production of 15 plants per annum will be necessary. The total ex-factory value of these plants would be approximately Rs. 225 million, excluding the cost of quarrying machinery and power generating equipment, if any. Allowing for maintenance and replacement requirements, an output of Rs. 250 million per annum and a capacity target of Rs. 300 million per annum is suggested for 1970-71.

According to available information, at present approximately 30 per cent of the plant (by cost) is imported, about 50—60 per cent is fabricated by the plant manufacturers and the rest is procured from other indigenous sources. By 1970-71 in order to supply cement plants valued at Rs. 250 million, the output of main plant manufacturers will have to be of the order of Rs. 150 million.

Various suggestions have been made in regard to size of the plants. It is recommended that 1200 tonnes/day plants should be encouraged. If larger capacity plants are fabricated, then the total number of plants required as well as the total cost will be lower than estimated above.

3. *Paper plants.*—The earlier targets for paper, paper board and newsprints furnished to the Group have since been revised. The

Memorandum on the Fourth Plan has adopted the following targets:

	Target in tonnes	
	65-66	70-71
Paper and paper board	680,000	1,350,000
Newsprint	30,000	165,000
Total	710,000	1,515,000

This indicates a rate of growth of slightly more than 16 per cent per annum. In view of very low *per capita*, consumption at present and Government's emphasis on increasing literacy, it is assumed that the annual increment during Fifth plan will not be less than the annual increment during 1970-71. These assumptions imply that the annual rate of commissioning additional paper making capacity should be approximately for 110,000 tonnes at the beginning of Fourth Plan and about 250,000 tonnes per annum by the end of Fourth Plan, which in terms of value amount to Rs. 400 million per annum. It is estimated that the contribution of main plant manufacturers would be around Rs. 200 million.

4. *Industrial boilers.*—The Working Group has estimated the annual average demand for industrial boilers during the Fourth Plan period at Rs. 18.5 million. It is possible that during the later half of Fourth Plan the demand may be higher. The second aspect which the Group considered in suggesting the Fourth Plan capacity target is the very high replacement requirements of the textile industry. At present most of the units have boilers designed for high grade coal, while they are being supplied high ash coal resulting in inefficient operation. If boilers are designed to use high ash coal and in some case oil fired boilers are available from indigenous sources, it is learnt that most of the textile mills, far away from coal-fields, will replace their boilers. Keeping all these factors in view a capacity target of Rs. 275 million is suggested.

5. *Printing Machinery.*—Some time back a panel of experts was appointed to assess the demand for printing machinery. This panel assessed the annual demand as Rs. 73 million for 1965-66 and Rs. 120 million by 1970-71. The Working Group has adopted these figures. In this industry it may not be possible nor desirable to be self-sufficient. However, it is felt that indigenous production to the tune of 80 per cent of the total demand may be aimed for. Accordingly, a capacity target of Rs. 120 million has been suggested.

6. *Tea processing machinery.*—The Working Group has expressed the view that this industry is well established in the country. It cannot only meet internal demand, but is in a position to export tea machinery also. It is expected that indigenous production of tea machinery will exceed Rs. 20 million/annum by 1970-71.

Manufacturing Facilities.—The Working Group has given the following assessment of indigenous manufacturing capacity likely to

be established by 1965-66 and the corresponding estimated production for the industrial plants.

Estimated production of industrial machinery

Rs. million

Industrial Plants.	Likely capacity 1965-66	1965-66		1966-67		1967-68	
		Production	Maint. imports	Prod.	Maint. imports.	Prod.	Maint imports
1	2	3	4	5	6	7	8
1. Sugar Plants	172	90	15	105	17.5	120	20
2. Cement plants	178	60	18	75	22.3	90	27
3. Paper plants	73	30	12	40	16	50	20
4. Industrial boilers	83	..	..	..	..	..	..
5. Printing machinery	6	3	0.75	5	1.25	10	2
6. Tea machinery	21	18	2.7	19	2.8	20	

The above table clearly indicates that the indigenous production will not be able to meet the demand unless immediate steps are taken (a) to maximise the production from existing units and (b) to augment the production capacity. It is rather disappointing to note that capacities established by 1965-66 will not achieve more than 70 per cent capacity utilisation even as late as 1968. The first reason is, particularly in respect of cement industry, the lack of orders from the cement manufacturers for expansions and for new units on account of difficulties in finding financial resources and the reported unattractive. Another reason is insufficient supply of raw materials indigenously and foreign exchange for the import of raw materials and components. In the interest of both timely development of these vital consumer industries and the corresponding machinery manufacturing capacities, the Group would strongly recommend elimination of these bottlenecks. Another reason may be double counting of the capacity. A glut in the sugar industry a few years back rendered the sugar machinery manufacturing capacity idle. To utilise their manufacturing capacities they diversified their production and have included cement plants and chemical equipment also in their production programme. This is no doubt a healthy and desirable pattern of development. However, for planning exercise care should be taken not to double count the capacity.

According to licensed capacity, the facilities available are for the production of plants of aggregate value Rs. 506 million (sugar 172, cement 178, paper 73, industrial boilers 83). Of this probably Rs. 250 million will be the cost of items fabricated by main plant manufacturers. This will imply a fabrication capacity of 50,000 tonnes per annum. It is doubtful that physical facilities to fabricate 50,000 tonnes per annum exists with the firm whose capacities are discussed above.

In order to meet the Fourth Plan targets, it is necessary that main plant manufacturers have a fabrication capacity of approximately 130,000 tonnes per annum by 1970-71.

On maintenance imports, the Planning Group feels there is no reason why the percentage of imported components should not decrease as the indigenous production of large size castings, forgings, gears, electric motors etc. increases as programmed below:

Industry	Capacity Rs. Million		Investment Rs. Million during IV Plan	
	1965-66	1970-71	Total investment	of which foreign exchange
1. Sugar machinery	172	250	80	45
2. Cement machinery	178	300	120	80
3. Paper machinery	73	400	300	200
4. Industrial boilers	83	275	250	150
5. Printing machinery	6	120	150	100
6. Tea machinery	21	21	n.a.	n.a.

The Planning Group is of the view that with the development of other engineering industries, the share of main plant manufacturers in the total cost of the plant will decrease. Accordingly, it is felt that it should be possible for them to meet the targets with a lesser investment than indicated by the Working Group. The estimates of the Planning Group are as given below:—

Industrial machinery—Fourth Plan

Item	Capacity		Rs. million Investment 1966-71	Production 1970-71	
	likely by 1965-66	Targetted 1970-71		No.	Rs. million
1. Sugar machinery	170 (20)	250 (24)	80	22	225
2. Cement machinery	180 (11)	300 (17)	50	(15)	250
3. Paper machinery	70 (1.5)	400 (8)	250	(4)	200
4. Industrial boilers	80	275	75	..	200
5. Printing machinery	5	120	80	..	60

() The figures in paranthesis indicated number of standard size plants :

1. Sugar 1000/1200 tonnes/day.
2. Cement 600/1200 tonnes/day.
3. Paper. 100/1200 tonnes/day.

The values include the values of spares and components supplied for replacement and maintenance.

Raw materials.—The Working Group has assessed for the manufacture of sugar, cement and paper plants as programmed the annual requirements of castings and forgings by 1970-71 will be as given below:—

<i>Item</i>	<i>Tonnes/year</i>
Grey iron castings	20,000
Steel castings	10,000
Forgings	2,500

These are weights of finished items.

Special recommendations:

(1) Supply of raw materials and components should be ensured to the manufacturers. If these items are not available indigenously, adequate foreign exchange in proper time should be provided.

(2) All steps necessary to optimise the production of existing firms should be expeditiously taken.

(3) The capacity of existing plant manufacturers should be assessed on realistic basis and suggestion for its increase should be obtained.

(4) The facilities available with other fabricators should be fully utilised for augmenting the production of main plant suppliers. For example, HEC can supply all heavier components, crushing and grinding equipment for cement plants, rolls and rolling stands etc. to paper and sugar plants etc. etc. The possibility of fabricating complete cement plants at HEC also may be explored.

GROUP VIII

TEXTILE MACHINERY

I. Introduction

The requirements of textile machinery are correlated to the increase in the textile production capacity and also rehabilitation and modernisation of existing mills. In the opinion of the Group modernisation on a very large scale is necessary, and according to their estimates, investment on modernisation will have to be almost of the same order as on expansion. The development of textile industry as assumed by this Working Group is summarised below:—

TABLE I.—*The programme of textile industry*

Item	Unit	Capacity		
		Present position 1963-64	Likely achievement 1965-66	Target 1970-71
1. Cloth (mill made)	mill. metres	4450	5000	5650 ⁽¹⁾
2. Yarn	mill. kg.	890	990	1250
3. Woollen Worsted fabric	mill. metres	34	34	25.5
Woollen fabric	" "			12
				37.5
4. Worsted yarn	mill. Kg.	9	10	18
Woollen yarn	" "	7.3	7.5	12.5
Shoddy yarn	" "	4.2	4.5	8.5

(1) Textile group has fixed a target of 6,350 million metres.

II. Requirements of Machinery:

Commensurate with these textile targets, the Group has assessed the in-position number of major machinery as given below:—

TABLE 2.—*Installed machinery programme*

Item	Unit	Present 1963-64	Likely by 1965-66	Requirement 1970-71
I. Cotton industry				
1. Looms	th. nos.	200	218	248 ⁽¹⁾
2. Spindles	mill. nos.	13.66	16.5	19.7
II. Woollen Industry				
1. Power looms	nos.	3130	3130	3430
2. Worsted spindles	th. nos.	141	141	151
3. Woollen spindles	} th. nos.	66.4	66.4	69.4
4. Shoddy spindles				
5. Combing		<i>No expansion necessary.</i>		

(1) Textile group has assessed this figures as 254.

Based on the above requirements for expansion of the textile industry and adding to them the rehabilitation requirements, the total demand during the Fourth Plan period may be summarised as follows:—

TABLE 3.—*Textile machinery requirements, 1966-71.*

Item	Unit	Expansion	Rehabilita- tion	Total
I. Cotton Industry				
1. Looms				
Powerlooms . . .	th. nos.	30 ⁽¹⁾	33	63
Powerlooms. . . .			7.5	7.5
			40.5	70.5
2. Spindles	mill. nos.	3.2	2.7	5.9
II. Woollen Industry				
1. Powerlooms . . .	nos.	300	1500	1800
2. Worsted spindles .	th. nos.	10	75.6	85.6
3. Woollen and shoddy spindles.	„	..		

(¹) The Textile Group has assessed the requirements as 38,000 nos.

In respect of artificial fibre, the equipment required for the production of fibre (i.e., pre-spinning section) is more of the nature of chemical equipment rather than textile machinery and as such is not discussed in this note. The Textile Fibre Group has not suggested any provision of machinery for the spinning and weaving of artificial fibre on the assumption that cotton industry has sufficient capacity for processing artificial fibre also, while the Textile Machinery Group has shown it separately. This may perhaps be the reason for a part of the difference in the assessment of the requirements of looms for cotton textile industry. The Machinery Group has not estimated the requirements for additional capacity; for rehabilitation the assessments are 6,000 plain looms, 8,000 automatic looms and 1,000 special looms along with corresponding equipment in other section. The total value of all kinds of machinery required for rehabilitation of this industry is assessed at Rs. 200 million for the Fourth Plan period.

III. Manufacturing Capacity

1. *Cotton Textile Machinery.*—There are at present 18 firms licensed for the production of textile machinery, of which 15 are in production. Based on their past performance, the Group has estimated the likely output from the 15 plants, and is shown in Table Nos. 4 and 5. On the assumption that the annual demand for machinery will be more or less constant for the next decade, the gap between demand and supply for each year of the Fourth Plan has been assessed and is shown in Table No. 4.

COTTON TEXTILE

TABLE

Average annual demand

Item of machinery	Demand						Licensed capacity	
	Expansion		Rehabilitation		Total			
	No.	Value	No.	Value	No.	Value		
1. Blooming room machinery	51	20.5	44	17.6	95	38.1	66	
2. Carding Engines								
Conv.	1066	19.2	917	16.5	1983	35.7	} 2976	
H.S.	355	14.2	306	12.2	661	26.4		
3. Comber set	26	10.2	22	8.8	48	19.0	60	
4. Draw frame set	154	10.8	132	9.2	286	20.0	490	
5. Speed frame	256	19.2	220	16.5	476	35.7	858	
6. Ring frames (400 sp.)	1600	76.8	1375	66	2975	142.8	3856	
7. H. S. Winding m/c.	137	12.3	115	10.3	252	22.6	120	
8. H. S. Warping m/c.	30	2.1	41	2.9	71	5	60	
9. Auto prin winder (spindles)	1800	1.8	2000	2	3800	3.8	3000	
TOTAL								

COTTON TEXTILE

Item of machinery	Demand		Phased Production and Gap—Numbers					
	Expansion No.	Value	Rehabilitation No.	Value	Total No.	Value	Licensed capacity	
1. H.S. sizing machine	30	7.5	41	12.6	71	20.1	104	
2. Plain looms	2400	7.2	4100	12.3	6500	19.5	5640	
3. Auto looms	3600	36	4000	40	7600	76	5100	
4. Processing/finishing (Rs. million)	30			41		71	n.a.	

NOTE :—It may be noted that the output of ring frames and looms is shown in excess be taken as indicative of production capabilities rather than the actual production.

MACHINERY

4

and likely production

Production & Gap—Numbers						Spinning Section (Rs. million)				Manufacturer's estimate		
66-67		67-68		68-69		69-70		70-71		Gap	Pro- duc- tion 70-71	Nos. Value
Prod.	Gap	Prod.	Gap	Prod.	Gap	Prod.	Gap	Prod.	Gap			
28	-57	44	-51	57	-38	64	-31	64	-31	+231	12.5	86
1880	-764	2125	-519	2200	-444	2250	-400	2300		-350		294
	-48	18	-30	36	-12	36	-12	36		-12	4.7	
104	-82	128	-158	133	-153	139	-147	145		-141	9.9	192
267	-209	342	-134	369	-107	423	-53	441		-35	2.6	588
2607	-368	3037	+62	3409	+334	3544	+569	3675		+700	33.6	4900
182	-72	200	-52	220	-32	240	-12	240		-12	1.1	240
45	-26	50	-21	55	-16	60	-11	60		-11	0.8	60
1800	-2000	2000	-1800	2000	-1800	2200	-1600	2400		-1400	1.4	2400

MACHINERY

Weaving Section (Value in Rs. millions)											
66-67		67-68		68-69		69-70		1970-71		Manufacturers estimate	
Prod.	Gap	Prod.	Gap	Prod.	Gap	Prod.	Gap	Prod.	Gap	No.	value
31	-40	36	-35	49	-22	54	-17	54	-17	4.2	72
6000	-500	6200	-300	6400	-100	6600	1100	6800	+300	0.9	5330
6500	-1100	7000	-600	7500	-100	8000	+400	8500	+900	9.0	6300
30	41	40	31	50	21	60	11	70	-11		75

of demand. Unless an export market for these items can be found the above figures can

2. *Woollen Textile Machinery.*—In respect of woollen textile machinery, development of indigenous capacity has been slow. Against an anticipated demand for approximately 86,000 spindles during the plan period the indigenous output, based on present schemes, is not expected to exceed 45,000 nos. The licensed capacity is for 8,000 units per annum and the current production is about 1600 units/year. In regard to looms, no indigenous production is expected, while in respect of finishing, processing and miscellaneous preparatory equipment for felt, combing, carpet industry etc. the indigenous production is not expected to exceed 10 per cent. of the requirements.

3. *Artificial fibre textile machinery.*—A comprehensive demand picture for this industry is not available. The Machinery Group has assessed the requirements as 15,000 looms (see p. 3), along with its corresponding equipment in other sections for rehabilitation purposes during the Plan period.

The licensed capacity is for 2280 plain looms and 1200 automatic looms. The established capacity for plain looms is 2,160 and the production in 1963 was 35 looms. There seems to be no installed capacity in respect of automatic looms and indigenous availability during the Fourth Plan is assumed nil.

TABLE 5.—*Textile machinery—Fourth Plan Demand vs. indigenous production*
(Rs. million)

Industry	Expansion	Rehabilita- tion	Total*	Indigenous Production (P)
1. Cotton textile	1339	1326	2665	22.52
2. Woollen textiles	92	120	212	9.5
3. Man made fibre	n.a.	172	172	67
	1431	1618	3049	2328.5

*This does not include investment on other facilities like humidification, heating power, lighting etc.

(P) Please see over.

The phasing of production is expected to be as:—

Year	Rs. million
1966-67	350
1967-68	410
1968-69	470
1969-70	530
1970-71	570
	2330

IV. Fourth Plan Programmes

The major gaps seem to be in respect of woollen textile machinery, which may be around Rs. 50 million per annum by 1970-71, and is likely to grow during the Fifth Plan period. There do exist gaps

in respect of some equipment for cotton and man made textile also, but it is difficult to say whether the existing manufacturers would be able to increase their production to meet the entire demand and if not, whether the gap is large enough to establish an economic sized new unit. Besides it may not be desirable to completely stop the import of all kinds of textile machinery. The technologies are developing so rapidly that in order to increase or even maintain exports of textiles, import of certain types of machines will be necessary.

It is therefore, suggested that a competent body should be asked to assess the manufacturing capabilities of existing firms and estimate the likely gap that may exist by 70-71 and beyond. This study should clearly point out the machines in respect of which we should strive for self-sufficiency and exports, and those in which some imports will be always desirable. It is felt that it will be necessary to establish a plant for the manufacture of woollen textile machinery. What other equipment this plant could conveniently include in its production programme, what its product mix, scope and size should be, may be left to this agency to suggest. Accordingly, the Group is provisionally recommending a public sector project, with an output of approximately Rs. 50 million. An *ad hoc* provision of Rs. 75 million is made for investment on this plant.

V. Investment

Besides Rs. 75 million provided for a new plant, the existing plant may invest Rs. 125 million on machine tools during the Fourth Plan period. The total investment in this industry is likely to be of the order of Rs. 200 million.

VI. Foreign Exchange

On capital account the foreign exchange is likely to be of the order of Rs. 100 million. It is estimated that for the import of raw materials and components, this industry will need Rs. 550 million in foreign exchange during the Plan period.

VII. Raw material

It is estimated that by 1970-71 the annual requirements would be as follows:—

1. Pig Iron	85,000 tonnes
2. Coke	32,000 tonnes
3. Power	36,000 kw.

VIII. Special recommendations

1. In respect of cotton textile machinery, the licensed capacity seems, more or less, sufficient to meet the entire demand, specially if rehabilitation is properly phased. The production is far below capabilities. The Group suggests that special attention should be paid to maximise the output as early as possible. It may be possible for these units to meet the requirements of art silk industry also. A close

liaison between textile industry and textile machinery manufacturers should be established to ensure maximum utilisation of indigenous capacity.

2. A study should be immediately initiated to
 - (a) suggest the means for achieving abovementioned objectives;
 - (b) estimate the gap in respect of various equipment and suggest how it could be met, to the extent desirable; and
 - (c) if a new plant has to be established, what its capacity and product mix should be.

GROUP VIII-A

JUTE MACHINERY

The Working Group has assumed that production of jute goods will increase from 1.3 million tonnes in 1965-66 to 1.7 million tonnes by 1970-71.

In calculating the requirements of machinery and equipment for expansion and modernisation during the Fourth Plan period, the Group has taken into account the additional supplier of equipment to this industry that have taken place upto September 1964 and those likely to materialise by March 1966. According to the Working Group, machinery valued at Rs. 345 million may be required during the Fourth Plan period. The demand and availability for each type of machine have been assessed in detail and it is concluded that, by and large, the existing firms, with marginal expansions, can meet the entire demand, except for some special kinds of machines. The present facilities show gap in respect of carding machinery and cop-winders, but it is felt that schemes are under way which may wipe off this deficit. At the same time indigenous production capabilities in respect of drawing frames, spinning frames, prebeamers, dressing and carpet backing loom will be in excess of internal demand. It is necessary that immediate steps are taken to find export market for these items otherwise the plants will not be able to operate at optimum level. It is felt that unless additional production capacity in respect of carding machinery and cop-winders is established soon the total production of jute machinery during the Fourth Plan period may not exceed Rs. 275 million.

The estimates of the Working Group regarding the production build up, foreign exchange on capital and maintenance account etc. are given in the following table.

Production during IV Plan

Year	Output Rs. million	Imports of components and raw materials	
		%	Value (Rs. million)
1966-67	49	20	9.8
1967-68	59	20	11.8
1968-69	79	15	11.85
1969-70	79	12	9.48
1970-71	79	10	7.9
TOTAL	345		50.83
Accessories spares etc.	184	10	18.40
	529		69.23

The Group feels that approximately Rs. 75 million worth of specialised items of machinery may have to be imported during the Fourth Plan period.

It is estimated that for establishing the contemplated additional capacity, import of capital equipment may be approximately Rs. 7 million. Total investment in this industry may not exceed Rs. 50 million during the Plan period.

NOTE:—Investments shown here differ from those given in various Working Groups reports because of the changed budgetary allocations for the year 1965-66. These are the latest estimates.

It is difficult to foresee the extent to which these plants can be expanded. This aspect should be thoroughly investigated and if still a gap remains steps should be initiated immediately to establish fresh capacity.

For this specified range of structurals it is estimated that at present, the existing capacity on single shift basis is as follows:

	tonnes/year
1. Calcutta region	73,000
2. Bombay region	64,000
3. Southern region	14,000
TOTAL	<u>151,000</u>

or say 300,000 tonnes per annum of multiple shift basis.

The total production in 1963 was approximately 180,000 tonnes.

Fourth Plan Programmes

(1) *Maximising output.*—The Group assigns first priority to finding ways and means to optimise the output from the existing plants. Most of the plants at present are handicapped by lack of raw materials and matching steel and shortage of power. If these deficiencies are eliminated, these plants could work on multiple shift, thereby increasing their output by at least 60 per cent. Secondly, if this industry is supplied with broad flanged beams, the output will automatically increase due to decrease in processing time. Standardisation is another factor which helps in increasing output.

(2) *Additional capacity.*—It is felt that under ideal conditions, the existing capacity can be rated equivalent to 300,000 tonnes per annum. The Panel for Structural Fabrication Industry has assessed the present effective capacity as 326,150 tonnes per annum. Thus, measures have to be taken to establish additional capacity for the fabrication of 900,000 tonnes structurals per annum by the end of Fourth Plan. Of this probably 400,000 tonnes will be light structurals, for which in most of the cases, no large scale plants are necessary. A large percentage of this type of fabrication is done on site. Thus planners may focus their attention on the development of medium and heavy structurals for which a gap of approximately 300,000 tonnes may exist. The plants for the fabrication of medium and heavy structurals can not function properly unless backed up by a well developed design organisation. Further more these types of plants have comparatively large gestation period making the capital input-output rates in the early years of operation unremunerative. The progress in the past discourages hopes regarding the role of private sector in meeting the gap in these ranges. It is felt that unless the public sector enters this field to bridge a major share of the gap, large scale imports will be inescapable. The manufacturing facilities and techniques required for this industry are comparatively less complicated and as such, this is one industry in which we should be not only self-sufficient as early as possible but also plan for export of these products in substantial quantities. While in the case of heavy and complicated structural plants, foreign collaboration may be necessary, a good portion of the requirements could be met from plants designed and established without any external help.

In order to increase the indigenous capacity, the following projects are suggested.

1. One structural fabrication plant, with a capacity of 25,000 tonnes per annum should be established close to each new steel plant.

2. Two heavy structural plants with facilities to fabricate hydraulic structures, penstocks and other heavy plate fabrications. The capacity of each plant may be 15,000 tonnes per annum, with provision for expansion to 25,000 tonnes.
3. Two plants specialising in crane fabrication, with sufficient capacity to manufacture medium or heavy structurals. Capacity of these plants may be 25,000 tonnes each.

It may be pointed out here that most of the structural fabrication shops can fabricate the bridge of the crane provided they have the drawings. But to complete a crane they would require hoisting mechanisms, wheels, etc., for which no specialised plant exists in the country and as such they are imported. It is, therefore, recommended that one of these crane plants should have facilities to manufacture hoisting mechanism for its own needs and for other crane manufacturers also.

4. Besides these specific schemes, it is recommended that four plants of capacity 10,000 to 15,000 tonnes, one each in the four regions of the country should be established to meet the requirements of factory building structurals, associated structurals for chemical and metallurgical plants and other users. Preferably these should be, if possible, located at or near the site for the future steel plants, and should precede the construction of the steel plant.

5. The above plants should be processed with the utmost speed and should be considered as advance action projects. After another couple of years if progress in the private sector is found to be unsatisfactory, more plants in the public sector will have to be planned.

It is possible that even after implementing these projects shortage may continue in respect of medium and heavy structurals depending upon the extent of expansions in the private sector fabrication capacity. It is suggested that the position should be reviewed again a couple of years later and if found necessary more plants should be established in the public sector. In order to achieve better utilisation of facilities in the private sector it is suggested that public sector fabrication shops should provide designs and drawings to fabricators in the private who lack such facilities. Another suggestion is that public sector projects requiring large quantities of structurals should provide certain facilities to the fabricators which may increase their efficiency and output. This may include renting of equipment to the fabricators which may later be used in projects maintenance shop. This would be in the interest of the project itself.

Investment.—The total investment on all these plants with a combined capacity of 200,000 tonnes per annum is estimated to be approximately Rs. 400 million, while the total investment in this industry during the Fourth Plan period may be of the order of Rs. 600 million. The norms of investment are spelt out in the Working Group's Report.

Foreign Exchange.—The Working Group has expressed the view that approximately 40 per cent. of the capital equipment can be procured indigenously. Accordingly, the total foreign exchange on capital account may be of the order of Rs. 200 million for this industry.

Raw materials, components, power and transport requirements.— For an output of 1·2 million tonnes fabricated structurals, approximately 1·35 million tonnes of structurals and plates would be required. The demand for fasteners and welding wire will rise rapidly. Steps should be taken to establish sufficient capacity for these items. Similarly, this industry is unable to get sufficient quantities of castings and forgings. Capacity for the manufacture of electric control gears is insufficient. The power requirements of this industry may add up to approximately 150,000 kw. Regarding transport requirements, it is suggested that while for incoming material provision for indicated tonnage may be sufficient, in respect of outgoing products, the provisions for transport will have to be for twice the quantity, the reason being that by the nature of the product the wagons and lorries remain underloaded. Special types of wagons for heavier and bigger pieces will also have to be arranged by the Railways.

Imported components are required mainly for cranes and hydraulic gates. The percentage of imported components varies from 5 to 30 depending on the end use of the product. It is however expected that after the implementation of above suggested crane-plant with facilities to manufacture hoisting devices etc., the imports of components may altogether cease.

Special Recommendations

1. It is suggested by the Working Group that a panel comprising of representatives of fabricating firms, Iron and Steel Controller, Railway Board, D.G.S. & D., Ministry of Steel, Department of Heavy Engineering, Ministry of Finance and D.G.T.D. should be appointed to assess the installed capacity of each plant and ensure that they are evenly booked as far as practicable. This panel may also coordinate the raw material supply, both indigenous and imported and help the industry in import of capital goods whenever necessary.

2. Facilities for the fabrication of light structurals, specially those required for material handling equipment should be separately established and firms capable of fabricating medium and heavy structurals should be discouraged from undertaking these kinds of jobs.

3. As far as possible site fabrication should be encouraged.

4. Public Sector structural shops should provide designs and drawings to the fabricators in the private sector who lack such facilities.

GROUP NO. X

ENGINEERING INDUSTRIES

The Working Group has, in its studies, covered the following semi-products:

- (i) Iron castings.
- (ii) Malleable castings.
- (iii) Steel castings.
- (iv) Non-ferrous castings.
- (v) Cast iron pipes.
- (vi) Steel forgings.
- (vii) Steel pipes and tubes.
- (viii) Gears.
- (ix) Patterns.
- (x) Forging dies.
- (xi) Rolling contact bearings.

The Group attaches great importance to this group of products and is of opinion that every effort should be made to be self-sufficient in these industries as early as possible. Without proper development of these products, it will not be possible to ensure optimum utilisation of machine building facilities without dependence on imports.

The programme of development and the corresponding investments as suggested by the Working Group are summarised in the table No. 3.

The specific projects the Working Group has suggested are:—

- (1) A foundry forge plant to meet the requirements of heavy electrical equipment plants—Capacity—20,000 tonnes.
- (2) In addition to facilities at HEC, additional capacity for the manufacture of 45,000 tonnes of iron based rolls per annum should be established.

- (3) To meet the specialised requirements of heavy pumps and compressors, large diesel engines etc. a G.I. Foundry with a capacity of 25,000 tonnes per annum.
- (4) Several plants, each of capacity around 10,000 tonnes, of aggregate capacity 170,000 tonnes for the production of thin walled castings.
- (5) Additional capacity by establishing new plant(s) for the production of 40,000 tonnes per year of malleable castings.
- (6) A plant(s) for the production of 25,000 tonnes per annum of steel rolles.
- (7) Two plants (each around 10,000 tonnes/Year) for the production of specialised steel castings required for heavy pumps and compressors, large diesel engines, marine diesel engines, cranes etc. etc.
- (8) Two plants (each around 30,000 tonnes/year) for the manufacture of spun iron pipes.
- (9) The plant suggested above for supplying castings to heavy electrical plant may include forging capacity—of about 11,000 tonnes per annum.
- (10) Two plants, each around 6,000 tonnes capacity, for the production of pipe moulds.
- (11) Another plant(s) for the production of forged rolles—capacity 8,200 tonnes/year.
- (12) A forge plant for meeting the requirements of pumps, compressors, diesel engines etc.—capacity 5,600 tonnes/year.
- (13) New units, each of capacity 75,000 tonnes to 100,000 tonnes, of aggregate capacity 220,000 tonnes for the manufacture of pipes over 200 mm. diameter.
- (14) New units, each of capacity around 24,000 to 30,000 tonnes, with an aggregate capacity of 630,000 tonnes for pipes below 300 mm.
- (15) One new plant for the production of rolling contact bearing. It may have a capacity of 10 million bearing per annum with adequate provision for expansion.
- (16) In case the existing firms do not increase their combined capacities to around 20 million bearings per annum, additional capacity elsewhere will have to be established to meet the deficit.

The Planning Group has analysed the report submitted by the Working Group and after taking other relevant factors into consideration has proposed the following programme.

TABLE NO. I
Development of Engineering Products (Contd) I/a

Item	Unit	Capacity		Investment Rs. million
		1965-66	1970-71	
Iron Castings	th. tonnes.	1500	3000	600
Iron rolls	"	..	45	150
Steel Castings	"	170	500	750
Steel forgings	"	140	400	750
Iron pipes	"	600	1500	250
Steel pipes & tubes	"	500	1500	400
Gears	Million Rs.	200	500	100
Rolling contact bearings	Million Nos.	15	40	400

It will be seen that in certain cases, the capacities and investment shown here are at variance with those given in the Working Group's report. The capacities and investments given here are exclusive of the facilities for the production of these items in captive capacities, while the Working Group has given an overall picture. The Group does not have sufficient data to suggest a programme for forging dies, wood patterns, malleable and non-ferrous castings and as such, has offered no comments. It is suggested that a study to analyse these industries to prepare a comprehensive development programme should be undertaken as early as possible. Similarly, the position regarding gears is not quite clear. It appears that most of the major gear users, e.g. the manufacturers of machine tools, automobiles, steel plant equipment, mining machinery etc. have their own gear making facilities. Furthermore, it appears that the capacities of these captive facilities are in excess of their requirements. On the other hand, there is a large import of gears. One of the reasons for this anomaly might be that these manufacturers cover only a limited range and are not known as gear manufacturers. To reduce this under-utilisation of existing capacity and eliminate imports as far as possible, it is suggested that (a) plants with gear making capacities should be urged to advertise their capacity and (b) instead of future

public sector plants having captive gear making plants in each case, a centralised gear plant should be established, which should produce standard gears for various users. The Group recommends the following public sector projects for this group of industries:—

TABLE No. 2
List of Public Sector Projects—Fourth Plan.

Projects	Scope	Investment: Rs. million.
1. Foundry Forge for HEL	Steel Castings . . . 15,000 tonnes !	230 (1)
2. Cast Iron Rolls . . .	Steel forgings 10,000 tonnes. . . 15,000	50
3. Foundry Forge, Wardha	Steel Castings . . . 12,000 tonnes. Steel Forging including pipe moulds . . . 8,300 tonnes	130
4. Foundry Forge for pumps and compressors etc. . . .	25,000 tonnes G. I. foundry.	Included in Pumps and Compressor Plant investment.
5. Seamless pipes	30,000 tonnes.	100
6. Gears	Rs. 75 million	50
7. Rolling contact bearings	22.5 million Nos.	305

(1) Of this total, Rs. 20 million will have been spent during the Third Plan.

TABLE No. 3
Development of Engineering Projects—Fourth Plan.

Item	Unit	Estimated annual demand		Installed Capacity Likely by 65-66	Targetted : 1970-71	Investment Rs. million		
		65-66	70-71			Indian currency	Foreign exchange	Total
1	2	3	4	5	6	7	8	9
Iron Castings	1000 tonnes	1300	2200	1500	2800	610	380	990
Malleable iron castings	"	50	110	80	140	63	43	106
Steel Castings	"	232	475	200	590	643	480	1073

1	2	3	4	5	6	7	8	9
Non-ferrous castings	1,000 tonnes	25	55	n.a.	(31)68	24	..	24
Cast iron pipes	„	620	940	900	1130	21	32	53
Steel forgings	„	234	395	170	440	610	390	1000
Steel pipes and tubes	„	700	1450	480	1500	319	200	519
Gears	Million Nos.	6·4	13·4	n.a.	(7)15	80	200	280
Forging dies	„	10·6	29·4	n.a.	(10) 29·4	5	10	15
Wood patterns	„	270	510	..	..	20	..	20
Rolling contact bearings	„	19	37·4	15	40	180	220	400

GROUP No. XI

CONSTRUCTION MACHINERY

At the request of Planning Group, the Automobile Division of the D.G.T.D. prepared a paper dealing with the development of the following items:

1. Road rollers.
2. Crawler and rubber tyred tractors.
3. Motorised scrapers.
4. Motorised dumpers.
5. Motorised graders.
6. Loaders.
7. Excavators.
8. Mobile cranes.

For estimating the demand, the requirements of irrigation and power, mining, road and agricultural development have been taken into account. The estimates of demand, licensed capacity, investment during the Fourth Plan, likely production by 1970-71 and the requirements of foreign exchange as given in this paper are summarised in Table 1.

TABLE No. 1
Development of Construction Machinery—Fourth Plan (D.G.T.D.)

Items	Unit	1970-71	Licen-	Investment		1970-71	
		Annual	sed/ap-	during	Nos.	Rs. million	F.E. @
		Production	proved	IV Plan		million	Rs. million
1. Road Rollers . . .	Nos.	1800	2100	Nil	1800	81	1.8
2. Crawler tractors . . .	"	775	440	68	800	110	32
3. Rubber tyred tractors	"	100	250	7.5	100	15	3
4. Dumpers and Scrapers	"	1075	665	101	1100	186	50
5. Graders	"	300	..	11.3	300	.22	3.6
6. Loaders	"	125	300	7	125	13	2.5
7. Excavators and shovels	"	200	200	Nil	200	100	15
8. Mobile Cranes	"	125	195	5	125	25	1.3
					200		
					50		
9. Ancillaries					250*		
						552	109
						110	11
						662	120

*Of this approximately Rs. 175 million will be in foreign exchange.

@ For the import of raw materials and components.

The Group analysed the progress of the licensed firms, and in the light of the D.G.I.D. paper has pictured the development of this group of equipment as given below:

TABLE NO. 2
Construction Machinery—Development of

Item	Unit	Capacity		Investment Rs. million
		Existing	Targetted	
1. Crawler and rubber tyred tractors .	Nos.	Nil	1000	150
2. Dumper and Scrapers .	Nos.	Nil	1000	100
3. Excavators and shovels	Nos.	100	250	50
4. Road Rollers	Nos.	1000	1800	25
		TOTAL		325

GROUP No. XII

AGRICULTURAL MACHINERY

The items included in this Group are:—

1. Power driven pumps.
2. Diesel engines.
3. Tractors.
4. Power tillers.
5. Tractor drawn implements.

1. *Power driven pumps.*—No working Group was asked to study this industry. The Planning Group has based its recommendations on the basis of the report of Development Council and information available elsewhere. The pump industry is well-developed in this country and it is expected that by 1965-66, the indigenous production will be approximately 180,000 Nos. The Development Council has estimated an annual demand of 320,000 pumps by 1970-71. In view of the enhanced priority being given to agricultural development, it is felt that pump demand may exceed Council's estimates. Accordingly, a capacity target of 350,000 Nos. per annum for the Fourth Plan is suggested. It is expected that if demand warrants, the industry can achieve a production level higher than the indicated capacity. It is estimated that the industry may invest approximately Rs. 100 million to meet the Fourth Plan targets.

2. *Diesel engines.*—The Group's recommendations for this industry are primarily based on the recommendations of the Development Council.

At present, the installed capacity (on single shift) for the manufacture of diesel engines, in the organised sector, is approximately for 78,000 Nos. The Development Council has estimated that the production of diesel engines, both in the organised and small scale sectors together, may be of the order of 100,000 Nos. by 1965-66. The horse power per engine averages to about 7 to 8. According to the Council's estimates, the demand by 1970-71 may be approximately 190,000 Nos. and has recommended a capacity of 210,000 Nos. for 1970-71. The Group has suggested a capacity target of 1.75 million horse power for 1970-71.

Based on the past progress of this industry, there is every hope that these targets will be fulfilled. Qualitatively speaking, it is felt that the industry will not be able to meet the demand for engines over 200 h.p. It is expected that the schemes approved for the production of heavy earth moving equipment will commence production during the Fourth Plan. The requirements of diesel engine for earth moving machinery, meter and narrow gauge diesel locomotives,

shunters and diesel power generating sets etc., may be of the order of 2,000 Nos. per annum during the later part of Fourth Plan. It is, therefore, recommended that one plant for the manufacture of diesel engines in the horse power range 200—1500, may be established in the public sector, with a capacity of 1,000 engines per annum. The total investment on this plant is estimated to be approximately Rs. 50 million, while the investment on this industry as a whole, during the Fourth Plan is estimated to be about Rs. 150 million.

3. *Agricultural Tractors.*—It is estimated that the average annual demand for tractors during the Fourth Plan will be approximately 30,000 Nos. and to meet this demand, it would be desirable to have a licensed capacity of 40,000 Nos. per annum. There are, at present, four units licensed for the manufacture of tractors. One of them has not made any progress in implementing the scheme. The other three have started regular manufacture of tractors with varying percentage of indigenous content. Recently, another party has been given a letter of intent for the manufacture of tractors and the three existing units have been allowed to double their licensed capacity. These units will together account for the entire capacity in the ranges over 20 H.P. leaving a gap of 12,000 Nos. per annum in the range below 20 H.P. The position is summarised in the following Table No. 1. The gap is proposed to be covered by the establishment of a plant in the public sector with a capacity of about 12,500 tractors per annum together with about 30,000 implements.

4. *Power Tillers.*—Various agencies have estimated the demand for power tillers at different levels, but as yet an agreed figure has not been arrived at. Based on the available figures, the group is suggesting a target of 60,000 power tillers per annum for the Fourth Plan. At present there is only one licensed unit with a small capacity of 3,000 power tillers per annum. This unit has just started production and proposes to expand its capacity to 6,000 Nos. per annum. A large number of schemes proposed in the private sector are under consideration. There is also one scheme in the State Sector. It should be possible to select three or four out of these schemes to make up a total capacity of 60,000 power tillers.

5. *Tractor drawn implements.*—It is estimated that with the increased availability of tractors and power tillers, the demand for implements may be of the order of Rs. 100 million per annum by 1970-71. There are already a number of units in the private sector manufacturing tractor-drawn implements. Even so, it is suggested that the public sector project for tractors may include in its scope the production of a variety of implements also.

TABLE
**AGRICULTURAL
 DEVELOPMENT PROGRAMME—**

Items	Unit	Fourth Plan		Licensed/ approved capacity
		Annual demand	Recommended capacity	
1. Power driven pumps	Nos.	320,000	350,000	180,000
2. Diesel engines	h. p.	1,500,000	1,750,000	900,000
3. Tractors	Nos.	30,000	40,000	27,000
1. 12—18 DBHP	Nos.	9,000	12,000	1,000
2. 20—30 DBHP	Nos.	16,000	23,000	24,000
3. 33 & above DBHP	Nos.	5,000	5,000	2,000
4. Power Tillers	Nos.	n.a.	60,000	18,000
5. Implements	Rs. m.	100	100	

No 1

MACHINERY

FOURTH PLAN

Effective capacity 1965-66 (multiple shift)	Gap	Investment Rs. million	Remarks
200,000	150,000	100	1. Production of heavier pumps included in the public sector pumps and Compressor project.
300,000	185,000	150	2. A public sector project proposed—200—1500 h.p. 1,000 Nos./Year.
11,000	29,000	200	3. (a) A public sector project proposed :
Nil	12,000(a)		(i) Tractors—12,000 Nos. /Year. (ii) Implements—30,000 Nos./Year.
9,000	14,000(b)		(b) This gap has been covered by expansion of existing units and licensing of an additional unit.
2,000	3,000(c)		(c) This gap need not be specifically covered by additional licensing. The only licensed unit in this range can be expected to plan production according to demand.
3,000	57,000	150	
30	80	50	

APPENDIX
TO
REPORT OF THE PLANNING GROUP FOR
MACHINERY INDUSTRIES (PRELIMINARY REPORT)

PLANNING GROUP ON MACHINERY INDUSTRIES

PRELIMINARY REPORT

I. INTRODUCTORY

At the instance of the Planning Commission, the Ministry of Steel & Heavy Industries (Department of Heavy Industries) constituted a Planning Group on Machinery Building Industries in their O.M. No. 2070-DS(HS)/62 dated 27th June 1962. The composition of the Planning Group is shown in Annexure I. The Planning Group was required to undertake studies in respect of various machinery building industries and to prepare estimates of demand and recommend targets of production for the Fourth and Fifth Five Year Plans.

2. Even in initiating this formidable task, the Group faced serious difficulties. Firstly, in order to arrive at realistic programmes for the Fourth Plan, having regard to the gestation period of these industries, it was necessary to have a clear idea of the likely targets and rate of growth of the major user industries in the Fifth and subsequent Plans. The Group did not have before it definite information on these, and indeed it was known that final conclusions had not been reached on the overall dimensions or specific targets even for the Fourth Plan. Secondly, while for the purpose of arriving at requirements of machinery, the basis of end use would be adequate, it was necessary, for the purpose of indicating the way in which manufacturing facilities may be established, to classify such equipment, having regard to similarity of manufacturing facilities and skills. The Machinery Working Group for the Third Plan had stated that "a break-up of projects and industries in terms of different categories of equipment is important for grouping allied items with a view to making arrangements for their bulk manufacture. Specialised equipment that do not lend themselves for such arrangements are to be isolated and endeavours made to develop their production on jobbing basis. Studies connected with both aspects assume considerable importance against the self-sufficiency objective". The Group was faced with the problems that such studies had not been conducted so far, nor had the Group at its disposal any agency which could undertake this work in any detailed manner. At the request of the Group, the Perspective Planning Division prepared certain tentative estimates regarding the likely targets in the Fourth Plan for major manufacturing and mining industries and the total requirements of plant and machinery for achieving these targets and for maintenance and replacement. These estimates necessarily proceed on certain assumptions and the Group considers that these assumptions should be stated. The estimates postulate a certain rate of growth and assume that the pattern of development followed in the Third Plan would broadly continue, at higher levels. Wherever tentative targets had been worked out by the Ministries and other agencies, these had been taken into account. Care had been taken to ensure internal

balance between different sectors. The requirements of plant and machinery in the various sectors were then determined, and, in turn, classified into nineteen different groups, some of which are specific to individual industries and others common to more than one industry, such as process equipment; material handling equipment; machine tools etc. In determining these requirements and in making this classification, norms were adopted either on the basis of actual experience in projects or on the basis of general experience and judgment. After considerable discussion, the Group came to the conclusion that these estimates would provide a working basis for its further work. The limitations of such an approach were realised, and it would, in any case, be necessary, after the detailed studies are completed, to fit them into a composite plan for machinery industries, related to the dimensions and programmes for the Fourth Plan, which may, by then, have emerged. These estimates were given wide circulation and have been scrutinised by the officers of the Department of Technical Development and others, and modifications suggested by them have also been incorporated. A copy of this paper is annexed to this report (Annexure II).

3. For the purpose of undertaking detailed studies in different sectors, the Planning Group set up ten Working Groups as indicated below:

- I. Electrical Power Equipment
- II. Transport Equipment
- III. Steel & Metallurgical Industries Equipment
- IV. Mining & Drilling Equipment
- V. Fertiliser and Chemical Equipment
- VI. Machine Tools
- VII. Industrial Machinery.
- VIII. Textile Machinery
- IX. Structural
- X. Engineering Industries

The terms of reference and scope of work are indicated in Annexure III. The Working Groups are currently engaged in making the studies entrusted to them.

4. The Planning Group has been requested to submit a preliminary report urgently in regard to (i) a provisional list of important projects/schemes which are proposed to be started during the first and second years of the Fourth Plan and the broad supply and demand position in their respective sectors during those years; (ii) the provision that has to be made in the annual plan for 1964-65 for advance action in regard to those projects/schemes and for meeting anticipated demands; and if possible, (iii) a broad idea of the objectives and tentative programmes for the Fourth Plan as a whole which the group may have generally in mind. Information regarding (ii) above has to be in time for inclusion in the Annual Plan

and Budget for 1964-65. The Working Groups were accordingly requested to make interim recommendations on these points. While the Working Groups have had to work under severe limitation of time, most of them have submitted interim reports, which are enclosed.

5. The Planning Group has not been able to examine in detail the various recommendations made by the Working Groups, and for the purpose of this present report, considers it adequate to highlight some of the important issues that would need the urgent consideration of Government and to enumerate the specific projects and programmes on which urgent action will have to be taken.

II. GENERAL CONSIDERATIONS

6. The Planning Group would like to draw the attention of Government to certain important general considerations relevant to the planning, establishment and utilisation of machinery industries. The Third Plan Machinery Working Group has also dealt with some of these points. The Group considers that our present arrangements for the planning and execution of major projects and programmes are, in many respects, hardly adequate in relation to our needs and the magnitude of the investments involved. Broadly, the processing of a project would fall into four stages:

- (1) The preparatory work, up to the point when the need and the technical and economic feasibility of the project are established.
- (2) The preparation of the detailed project report, that is to say, the finalisation of the products, equipment, investment, location etc.
- (3) Execution, that is to say, construction, installation and completion.
- (4) The attainment of full production.

In the first or preparatory stage, not merely technical issues are involved. An overall view of development in different sectors and the place of the particular project or programme in this overall context; an economic evaluation of costs and benefits; and a sense of priorities, with reference to available resources, are required. Such an evaluation and judgment has to be exercised on the basis of various alternative possibilities, resulting from systematic and continuing studies on needs and possible lines of action. In the various discussions in the Planning Group, it was felt that our arrangements for such preparatory studies and evaluation were not adequate and that measures should be instituted to handle this stage of the work more purposefully.

7. For the second and third stages, namely preparation of detailed project reports and execution, we have at least some agencies in the major public sector undertakings, and we can also enlist the assistance of other agencies. Here, the main needs are to ensure higher standards of accuracy in estimating and scheduling, and to enforce greater rigour in implementation and evaluation of progress. It is also of the utmost importance that the agency or officer to whom the

project will be entrusted is designated and put in position at the earliest possible stage.

8. The Group feels that perhaps not enough emphasis is being attached to the fullest utilisation of capacity already established or projected, as compared to the establishment of additional capacity. In major projects, more especially heavy engineering projects, full production will not follow the establishment of physical manufacturing capacity, as a matter of natural course or even by efflux of time, but needs deliberate and sustained efforts, not only at the plant, but elsewhere also. This involves building up design and engineering skills at the plant, and coordination between the user and the manufacturing unit. Such coordination has to be not only intimate and continuing, in the present, but with reference to plans and programmes several years ahead. This can be ensured only by or under the highest authority.

9. Planning is not merely an assessment of needs, but also a determination of priorities with reference to resources. While the Group is required and will make an estimate of demand, it considers that these should be fitted in to some scheme of priorities. Next in importance to securing maximum production from established capacity as already stated, priority should be given to the production of basic raw materials and intermediate products. Under this category would come pig iron, tool and alloy steels, castings and forgings, pipes and tubes, ball bearings etc. The next priority should be assigned to missing items to match existing lines of production or those that will ensure better balance of established capacity. While expansion and creation of new capacity to meet increasing needs would follow the Group does not mean to suggest that creation of new capacity in any field should await attainment of full production in all fields. Any system of priorities has to be applied with discrimination, with reference to the field in question and available alternatives. In recommending the projects and programmes requiring urgent action, the Group has broadly kept in mind the above considerations.

III. RECOMMENDATIONS

10. On the basis of studies carried out so far by the Working Groups and other agencies, the Planning Group recommends urgent action in respect of the projects and programmes enumerated below. In respect of some of them, project studies of a more or less detailed nature have been carried out, and they could, therefore, be taken up for implementation straightaway. In respect of others, the Group recommends that detailed studies be initiated by the concerned agencies straightaway.

11. Among the projects included in the Third Plan, the Group considers that the Heavy Pumps and Compressors project should be implemented expeditiously. The Group understands that the Marine Diesel engine project, which has advanced in many respects, is held up due to the uncertainty about the Second Shipyard. The Group suggests that the possibility of making a beginning by way of manufacture of parts and assembly to meet current requirements may be examined. On the Heavy Plates and Vessels and Heavy Structural projects, also included in the Third Plan, the Group has further recommendations to make.

12. *Foundry Forge for Heavy Electricals.*—The heavy electrical plants, established and under construction, will require considerable quantities of medium, heavy, and very heavy forgings, some of them of a specialised nature, to match their output of electrical equipment. No capacity exists today, nor will that of Heavy Engineering Corporation be adequate, except in the very heavy range. It is also understood that the collaborators have advised that they will not be in a position to supply the castings and forgings, so that even imports are ruled out. This project has been under consideration since 1961 and the Group considers that this should be taken up for implementation without delay. Heavy Electricals has prepared a project outline, and the production programme and other aspects have been examined in detail by a committee headed by Dr. Kalelkar. The Group recommends that simultaneous action be taken regarding location and preparation of site; preparation of list of equipment required by Heavy Electricals; and arrangements for foreign collaboration for production and foreign exchange for equipment.

13. *Power Boilers.*—The study made by the Working Group shows a large gap in power boilers. Available and projected capacity will not match indigenous production of steam turbines. The Planning Group recommends that the question of expanding the Tiruchi Boiler plant to about 2 million k.w. may be examined. While undertaking this expansion, the need and the feasibility of including L.D. vessels and heavier pressure vessels for the fertiliser and chemical industries may be considered.

The A.V.B. boiler plant may be permitted to expand to about 0.5 million k.w.

14. *Steam turbines.*—Studies made so far indicate that there is likely to be a considerable gap in steam turbines. The Group understands that Government are intending to establish a new unit, to include also nuclear power equipment. The Group, at present, thinks that we will have to plan in terms of a unit of economic size, so as to include 300,000 k.w. of nuclear power equipment and possibly also other items. This is a field in which knowhow and technology are of crucial importance. Having regard to the long term significance of such a project, the Group recommends that this be implemented as early as possible.

15. *Industrial Motors.*—There will be need for additional capacity for large sized industrial motors to the extent of about 1.5 million H.P. The possibility of establishing this capacity either at Ramachandrapuram or elsewhere may be examined.

16. *Flameproof motors.*—There is likely to be a very large demand for flameproof motors. The establishment of a capacity exclusively for this purpose may be examined.

17. *Synchronous condensers.*—The capacity for synchronous condensers will have to be increased from 90,000 KVAR to about 375,000 KVAR by establishing capacity either at Ramachandrapuram or elsewhere.

18. *Power transformers.*—The capacity for power transformers at Bhopal may be increased from 3 million KVA to about 6 million KVA.

Even so, there is likely to be a gap in power transformers. The Group is not yet in a position to make further recommendations in the nature of projects, but, however, suggests that any proposals for expansion by existing units, calculated to secure economic production, should be considered favourably.

19. *Switchgear.*—The Planning Group understands that Heavy Electricals is proposing to set up a plant for the manufacture of high voltage switchgear, in collaboration with a reputed manufacturer. In the context of increasing requirements, the Group recommends approval of this proposal.

In regard to switchgear also, the Group would support favourable consideration of proposals for expansion and diversification by existing manufacturers.

20. On electrical power equipment generally, the Group would observe that there is every possibility of achieving a major degree of self-sufficiency within the next decade. It will be worthwhile to concentrate our efforts in rounding off development in this strategic sector, by covering the gaps and missing items. As already referred to, availability of castings and forgings to match indigenous manufacture of heavy rotating machinery should be ensured. Mechanical equipment, such as condensate, feed water and other pumps etc. to go with turbines and boilers will have to be covered. Above all, production of electric sheet steel, especially cold rolled grain oriented sheets, should be given high priority.

21. *Commercial Vehicles.*—The Planning Group understands that, on the basis of arrangements already made or expected to be made for the import of capital equipment, the capacity for the manufacture of medium range vehicles, with a pay load of up to 7 tonnes, will go up to about 54,000 nos. per annum. The expansion of capacity for the manufacture of heavy duty vehicles, with a pay load of up to 9 tonnes to 600 nos. per annum is currently under implementation. Government have also recently approved the manufacture of extra heavy duty vehicles, with a pay load of about 11 tonnes.

With the implementation of these schemes, there will be considerable improvement in the road transport situation in the early years of the Fourth Plan.

Apart from further expansion in the above ranges to meet requirements in the later years of the Fourth Plan, the Planning Group considers that the question of additional capacity for commercial vehicles in the light range, with a pay load below 3 tonnes, at economic prices, needs detailed examination.

22. *Diesel Locomotives.*—The Railway Board has made an assessment of requirements of rolling stock during the Fourth Plan period. These are based on their own tentative estimates of volume of traffic,

which are somewhat at variance with those made by the Perspective Planning and Transport Divisions of the Planning Commission, being generally lower. On the whole, however, there is a remarkable similarity in the assessment of requirements of rolling stock. The Railways have proposed that the capacity for the production of diesel locomotives be expanded to 250 nos. per annum. Having regard to the need and importance of diesel locomotives and the necessity to take advance action for the manufacture of the numerous ancillary items, the Planning Group recommends that early action be taken for the creation of the additional manufacturing facilities.

23. *Electric Locomotives.*—The Railways propose to expand production of electric locomotives to about 100 nos. per annum and the Group endorses the proposal.

24. *Traction Motors.*—The production of traction motors should match the output of rolling stock and replacement requirements. It will be necessary to expand production of traction motors at Bhopal from 800 nos. to about 2400 nos. per annum.

25. *Machine Tools.*—The Working Group has tentatively assessed that capacity will have to be established for an output of about Rs. 1000 million by the end of the Fourth Plan, as against an estimated production of about Rs. 250 million at the end of the Third Plan. This will require tremendous effort.

26. A part of the shortfall in the Third Plan will be attributable to the slow progress of the Heavy Machine Tool plant at Ranchi and every effort should be made to complete this project with utmost speed.

27. Hindustan Machine Tools accounts for about half the production in the country and its further expansion should be given high priority. The Group understands that, in the Fourth Plan, Hindustan Machine Tools has proposals to set up five units, that is, one a year. It will be necessary to sanction, in 1964-65, two such units, for which proposals are reported to have been finalised, so that they could be commissioned in the early part of the Fourth Plan. Another such unit will have to be sanctioned in 1965-66.

28. The part played by Hindustan Machine Tools in expansion in this field has been commendable. The technical resources and surpluses built up at Bangalore have, in a considerable measure, contributed to this. We should now also look to the newer units for similar and more rapid development. Consideration may be given to making a start with a second nucleus—possibly at Pinjore, around which further expansions could be planned by the latter part of the Fourth Plan. In this industry, there is no particular economy of scale, beyond a certain size, nor is there any decisive advantage in a monolithic structure managing more than four or five units. The necessary coordination in production and other matters could be secured at Government level.

29. We will still have to rely on considerable expansion in the private sector, despite the hitherto tardy progress. While liberal licensing has to continue, this should perhaps be more selective.

This is a field where foreign collaboration is important and where foreign investment will have a useful role. The pattern of this industry in developed countries comprises of a large number of relatively small units, specialising in particular items or groups. Many of them spend a considerable part of their income on development and research. Rapid changes of technology in design, production and usage, obsolescence and fierce competition between units and countries are normal features. The Planning Group feels that foreign investment by reputed manufacturers, in selected items, should be made specially welcome, and that, for this purpose, terms of collaboration and investment may be liberalised to the necessary extent, having regard to the features of this industry. It may be useful to enlist the services of the Investment Centre to make an organised effort and register a special impact in this field.

30. In working out the detailed pattern of demand by types, sizes etc., the Working Group is facing some difficulties. The Group has to assess the past trends in machine tool using industries; the planned investment and pattern of development in the Fourth Plan; and likely plans over a longer period. The Group has recommended that a census of machine tools in the country be undertaken as early as possible. The last census was undertaken nearly ten years ago and there must have been considerable changes in the pattern of usage since then. The automobile industry is already reaching a stage, where semi-automation is becoming important. It should be noted that the pattern of demand for machine tools will depend not merely in total metal production or overall industrial development, but also on the level of development and consequently the methods of production adopted in individual units and industries. The Planning Group endorses the recommendation for instituting a survey of machine tools in the country. It will be necessary, on the basis of such a survey, which should therefore be purposively directed, to make projections of a somewhat detailed and sophisticated kind, taking into account likely patterns of development and usage in the country and possible trends in machine tool technology abroad. For this purpose, it may be necessary to seek the services of a suitable and competent agency.

31. *Castings.*—The studies made by the N.I.D.C. indicates large gap in various kinds of castings. A major portion of existing production of steel castings and a substantial portion of grey iron castings are today consumed to meet railway requirements and these will substantially increase in the future. To the extent additional capacity has to be created in these fields, there is much to be said for ensuring that at least a portion of this additional capacity is of a kind capable of meeting the specialised requirements of railways, particularly of standard repetitive items of large volume, at economic prices, on the basis of modern and mechanised methods of production. The Group is also in favour of such capacity being under the control of the Railways, to secure control over design, quality, prices and deliveries. There are other advantages also. Today, the Railways constitute a substantial source of scrap, which is sold to collecting agents and in turn to foundries, and which again sell the same to the Railways in the shape of castings, at possibly excessive prices.

32. The Group would recommend substantial expansion of the existing railway foundries. In addition, the Group recommends that the Railways may establish new foundries, with modern equipment, for large scale production of standard items. The Group understands that the Railways have already a proposal to establish a new steel foundry, with a capacity of about 10,000 tonnes. The Group would suggest that the possibility of increasing the capacity to about 20,000 tonnes, either initially or by expansion at a later stage, be seriously considered. The Group would also advise that the production programme should be determined, not merely to match Railways' own manufacturing facilities, but rather on a selection of items used in railway stock, wherever manufactured.

33. The Working Group has also suggested a central railway foundry for grey iron castings with a capacity of 75,000 tonnes, mainly for sleepers. The Planning Group is, however, not certain that, in grey iron castings and particularly for sleeper quality, a modern central foundry would necessarily be cheaper than small and even antiquated foundries with low depreciation and overheads. In any case, the Group considers that the Railways should examine and if possible resort to alternative kinds of sleepers to a greater extent. On steel castings, however, the Group is of the decided view that the establishment of additional capacity by the Railways would be, by far, the best course. Even so, a major portion of their requirements will still be secured from outside sources.

34. *Structurals.*—The Working Group has made an estimate of the demand for structurals, project-wise and category-wise, and has recommended that, in addition to expansion of existing units, there is scope for setting up further new heavy and medium structural manufacturing units, as a long term measure. Qualitatively, the gap is very large under heavy structurals. There is a particularly steep increase in the requirements of structurals of various kinds by the steel plants and other public sector projects, which the Working Group has estimated at nearly a million tonnes by the end of the Fourth Plan and which more or less equals the total increase in requirements during the Plan period.

35. The Planning Group recommends that the following projects, which, the Group understands, are already under the consideration of Government be taken up for urgent implementation. Hindustan Steel has proposed to set up, at Bokaro, a heavy and medium structurals plant with a capacity of 24,000 tonnes per annum. A technical committee, convened by Dr. B. D. Kalelkar to consider the scope of indigenous supply for the Bokaro steel plant, has estimated its requirements, for the 1.5 million tonne stage, at 145,000 tonnes, of which, as things stand, about 55,000 tonnes will have to be imported. The committee has, accordingly, recommended that a structural plant of the capacity as above be set up urgently. The output of such a plant, if set up within two years from now, will, over a period of three to four years thereafter, be more or less fully engaged in meeting the requirements of the Bokaro steel project. Thereafter, apart from any requirements for the expansion of Bokaro, the plant will be located at a source of supply for plates and in an area of large demand for heavy and medium structurals. Hindustan

Steel has prepared a project outline and it will not be difficult to finalise the list of equipment and to purchase the same from an appropriate source. No collaboration will be required and the necessary designs can be supplied by Hindustan Steel.

36. The Heavy Engineering Corporation has proposed to add a structural bay at Ranchi, with a capacity of about 10,000 tonnes. The requirements of associated structurals, to match machinery output at Ranchi, will be about 8,000 tonnes in the first stage and about 18,000 tonnes at the final stage. It will be possible to manufacture some of the associated structurals in the present shops in H.E.C. in the initial period, but this will not be desirable for any length of time. It may be possible to procure some of the associated structurals from outside sources, and in any case, this will have to be done to a considerable extent. It will be necessary, from the point of view of production control in respect of critical items, and to enable H.E.C. to adhere to delivery and guarantee terms, that H.E.C. has its own source of supply. As the design organisation and other available facilities can be utilised, the additional investment and overheads will be smaller. The Group recommends that H.E.C. be requested to proceed with this proposal straightaway. Here again, a list of equipment required, which should not amount to an unduly large sum, can be prepared, and purchased from an appropriate source, including U.S.S.R.

37. There has been a proposal to set up a heavy structurals plant at Wardha. The Group understands that the production programme of this project has been modified, so as to provide for a certain portion of heavy and medium structurals, and, more importantly, to include specialised fabricated structural items, such as wharf and other cranes, sluice gates, penstock pipes, and certain other structurals items pertaining to steel plants. Discussions are being held with Voests of Austria for technical collaboration and possible investment, to cover import requirements, in full or in part. The capacity may be between 12,000 to 24,000 tonnes, depending on the detailed production programme and other factors. The Planning Group considers this to be a sound approach and commends that this be pursued with all possible speed.

38. The Working Group has enumerated various difficulties that stand in the way of full utilisation of existing installed capacity. Some of these, like the shortage of matching sections, have prevailed, in varying degrees of acuteness, for some considerable time. The Planning Group considers that sporadic attempts to review and resolve such difficulties will not answer the situation and that this must be handled on a more abiding basis. As a long term measure, the Group suggests that steel sections used in structural fabrication should be rationalised. The Indian Engineering Association has undertaken detailed studies and made some proposals for rationalisation. The Group recommends that these be considered, in consultation with those concerned, and early decisions taken, which should be adopted, after due notice, both for future production plans and design of structurals. Even so, short term adjustments will be called for. As the situation is likely to vary from time to time and from the firm to firm, the Group considers that the only point at

which such adjustments can be made, effectively and with maximum speed and economy, is at the individual firm. The Group, therefore, recommends that some limited amount of foreign exchange and discretion, for the import of matching sections, be given to firms engaged in the fabrication of medium and heavy structurals. What the Group envisages is that the Iron & Steel Controller will publish, each half year, a list of banned sections, the availability of which is fully adequate to meet requirements, and that, subject to this and the limit of foreign exchange allocation, the firm should have freedom to import matching sections, without further scrutiny or formality. The distribution of the foreign exchange made available for this purpose, as between different firms, could be channelised, as suggested by the Working Group, by an Advisory Panel. The Planning Group also endorses the recommendation of the Working Group for the constitution of such a Panel, to deal with the above and other functions, the most important of which would be coordination between the steel industry and structural fabrication industry, in regard to rolling programmes, ordering, despatches etc.

39. The Third Plan Machinery Working Group recommended that, as a necessary adjunct to the Heavy Structural Works, there should be a Design Bureau for designing structurals for heavy industry on an efficient and economic basis. The Planning Group would reiterate this recommendation and suggest that such a Bureau be established at an early date. The Bureau may also be responsible for rationalising steel sections, evolving designs based on such sections and other Indian conditions, and generally act as a service agency for industries in the public and private sectors.

40. *Fabrication Shop for Fertiliser and Chemical Equipment.*—The interim report of the Working Group is in the form of a self-contained project outline. The Planning Group has little to add to it, except to say that it is a realistic proposal, calculated to secure the maximum benefits in the shortest possible time. Here again, the Group would recommend simultaneous action regarding the selection of a suitable agency to execute the project; location and preparation of site; preparation of the detailed project and list of equipment; and initiation of discussions with selected foreign manufacturers, with a view to secure technical collaboration and possibly also investment to cover import of capital equipment.

41. *Coal Mining Machinery.*—Government have already under consideration a second coal mining machinery plant, with Polish collaboration. After a study of requirements during the Fourth Plan, the Working Group on Mining and Drilling Equipment has made some suggestions on the scope and products, more particularly regarding provision of chain and belt conveyors and bulk material handling equipment. The Planning Group suggests that these be considered and final decisions, on the production programme, be taken, in consultation with experts concerned.

42. *Industrial Machinery.*—In regard to industrial machinery, the capacity, existing and in sight, for sugar and cement machinery is, on the whole, adequate to meet requirements in the foreseeable future. Additional capacity will need to be sanctioned for paper and

pulp machinery. Apart from the adequacy of capacity to meet future requirements, the Planning Group would like to draw attention to the imperative need to ensure the fullest utilisation of such capacity as exists. Paper machinery and coal washery equipment are examples of unutilised capacity in industries of admitted importance. There is not, as yet, in the view of the Group, a sufficient recognition of the nature and problems of these newly emerging capital equipment industries. These need to be identified and our policies and measures suitably adjusted, if these industries are to take root and grow in strength. Firstly, machinery industries are critically dependent on the rate of growth and investment in user industries, and to the extent there are fluctuations, machinery industries falter and lose in confidence. To some extent, this can be met by greater diversification of manufacturing capacity to general purposes. However, diversification of design and engineering skills, which constitute an integral part of machinery industries and which are inherently more specialised, will present difficulties. Secondly, the custom-built nature, large unit value and the long interval between order and delivery, especially under Indian conditions, raises problems in regard to standardisation, ordering, price, release of foreign exchange etc., which need a unified approach and coordination. Perhaps, a compact standing committee in respect of each of these industries, including representatives of manufacturers and users, may be of assistance in resolving some of these problems, which are of a detailed and operational nature, rather than of a general or policy kind. Lastly and perhaps most importantly, there is the problem of finance. It would seem that the specialised requirements of this group of industries would need to be handled in some special way.

43. *Rolls*.—The Department of Technical Development has estimated requirements of rolls by 1970-71 as follows:

	Steel (18 million tonnes)	Other Industries	Total
Forged Steel	10,800	..	10,800
Cast Iron	15,120	10,000	25,120
	33,030	9,000	42,030
Total	58,950	19,000	77,950

The planned capacity at Ranchi is as follows:

	Own require- ments	For outside supply	Total
Forged Steel	2,450	1,120	3,570
Cast Iron	200	6,000	6,200
	240	11,300	11,540
Total	2,890	18,420	21,310

Full production to this level is likely to be reached by about 1972-73. A few schemes have been sanctioned in the private sector, but the

Group understands that the prospect of any capacity materialising is not bright, except, perhaps in the case of TISCO. The Group considers that additional capacity should be planned even now, having regard to the substantial overall gap and more especially because of increasing requirements of a variety of chilled, grain and other rolls, based on diverse technologies.

44. At Ranchi, the limiting factor will be the machining capacity, and the Group is not sure that this should be increased, at any rate, for some time to come. Up to the limit of this capacity, Ranchi should meet all requirements of forged rolls, as this increases, and we need not plan for another centre for forged rolls. For the rest, Ranchi could produce steel and cast iron rolls, according to circumstances.

45. The gap will thus be mainly in cast iron rolls. The Group suggests that a roll foundry, of appropriate size, should be established, possibly at one of the plants of Hindustan Steel. As technical collaboration is important and foreign investment is also a possibility, a joint enterprise could be considered.

46. *Heavy Machine Building Capacity.*—A preliminary assessment indicates that for steel expansion, replacement and other demands, total requirements of heavy equipment of the kind in the scope of Ranchi, will be over 300,000 tonnes by the end of the Fifth Plan. This could mean that Ranchi should be doubled from 80,000 to 165,000 tonnes, and another plant, similar in size and scope, will be needed.

47. In the preliminary report on Ranchi, the Russian experts, headed by Mr. Babich, had assessed that for steel expansion, at the rate of 2 million tonnes per annum, for replacement and for other demands, total requirements would be about 165,000 tonnes. This included 20,000 tonnes of rolls. As a plant of this size could not be projected at one go, they recommended a plant of 80,000 tonnes in the first instance, capable of expansion to 165,000 tonnes at a later stage. However, on our insistence, mainly with reference to availability of resources, it was decided to go ahead with 45,000 tonnes in the first stage, expanding to 80,000 tonnes at the next. The Babich report visualised that the plant will still go to 165,000 tonnes after the established capacity has been achieved. For further requirements, the experts recommended specialised plants, covering the following items:

- (a) Excavators and other earth handling equipment.
- (b) Crushing and grinding equipment.
- (c) Oil extracting equipment.
- (d) Auxiliary equipment for iron and steel works.
- (e) Press forging equipment. Small and medium size machinery.
- (f) Mechanical handling equipment.

The intention was that, when relieved of the manufacture of the above equipment, Ranchi could correspondingly increase production of major machinery for steel works and heavy parts and assemblies

for other industries. For plants manufacturing the specialised items listed above, there will be need for additional casting and forging facilities.

48. The Detailed Project Report and project now under construction at Ranchi cover the 80,000 tonnes stage. There is provision for expansion to 165,000 tonnes, but no details have been worked out.

49. The planned development of machinery output at Ranchi is expected to be as follows:

Year	Output (tonnes)	
1963-64	1,800	} includes structurals
1964-65	16,000	
1965-66	22,500	
1966-67	20,000	
1967-68	35,000	
1968-69	50,000	
1969-70	65,000	
1970-71	80,000	

The output in the foundry forge plant is expected to be as follows:

Year	Output (tonnes)
1964-65	1,275
1965-66	9,650
1966-67	28,000
1967-68	50,160
1968-69	73,290
1969-70	89,260
1970-71	111,430
1971-72	120,040
1972-73	124,221 (full planned output)

Thus, Ranchi will reach its full output, for its present facilities, only at the end of the Fourth Plan. Even in developed countries, plants of this kind take many years to reach full output. Ranchi is a large plant by any standard. Under our conditions, where design and specialised skills, co-ordination between steel expansion and manufacturing programmes at Ranchi and elsewhere, and productivity are still to be built up, our efforts will have to be concentrated on these aspects.

50. It would also appear that when Ranchi is enlarged, this should not be by way of a straight expansion of its present production programme, but by way of extension, qualitatively and quantitatively, in the heavier and larger range of equipment, so that the heavy duty production machines, presses, cranes etc. are utilised to the fullest extent. For this top range of equipment, Ranchi should be our only source, and we need not plan on capacity elsewhere for many years to come.

51. What we may now do is to undertake detailed preliminary studies as to what extent production of the heavier and larger range of equipment could be stepped up at Ranchi, and what items of equipment could, in consequence, be taken out. The feasibility of establishing separate centres of production for the items so taken out should also be studied. With reference to the weight and size range of the component parts, total requirements and methods of production involved, excavators and other earth handling equipment, oil extracting equipment, and mechanical handling equipment could be among such items. It should be noted that some component parts in the top weight or size range comprised in such items will still have to be manufactured only at Ranchi. In other words, the proposed centres will not be completely self-sufficient, and Ranchi will have to be complementary to them. Accordingly, the production programme of these centres and Ranchi will have to be co-ordinated, and for this purpose, they should probably be under the H.E.C.

52. If these preliminary studies justify the feasibility of such an approach, our next step should be to prepare detailed proposals for the new centres and the detailed project report for extension of Ranchi on this basis. The implementation of the projects should be carried out in such a way that there will be balanced utilisation of capacity at these places. It may be possible that additional production of the relatively smaller items at the new centres is established first and the full extension of Ranchi taken up towards the latter part of the Fourth Plan, by when Ranchi will have reached over 50 per cent of capacity.

53. In a matter of this complexity and significance, no conclusions can be drawn till detailed studies are completed. Such studies can hardly be undertaken by any group consisting of part-time personnel. Probably, the assistance of Russians, who know the capacity and potential of Ranchi best, should be sought. The Planning Group recommends that these suggestions be given serious consideration by Government, and, if they are found acceptable, the necessary detailed studies may be initiated forthwith.

54. There are certain other items for which a project or programme approach may be needed, in the light of likely requirements and past progress, namely:

- (1) Tractors and earthmoving equipment.
- (2) Presses.
- (3) Furnaces.
- (4) Hydraulic equipment.
- (5) Textile machinery.

The Group has, however, not been able to formulate any specific proposals on these.

55. The Group is conscious that the projects and programmes outlined in this report and which the Group has carefully selected with reference to their importance and priority, add up to a substantial

total. The Group is convinced that, if pursued vigorously and implemented during the remaining years of the Third Plan and the first two years of the Fourth Plan, these will strengthen the heavy engineering base of the country and take the economy to higher levels of development in the years to come.

56. As for industries in the private sector for which advance licensing will be necessary, to meet requirements in the first two years of the Fourth Plan, the Group understands that this is under the consideration of the Planning Commission, in consultation with the concerned Ministries and the Department of Technical Development. In any case, this is a matter where short term reviews and adjustments will be necessary.

57. It is the intention of the Group to submit further supplementary reports, for advance or urgent action, if any items of importance, come to its notice, in the course of further studies.

ANNEXURE I

1. Additional Secretary, Department of Heavy Industries, Ministry of Steel and Heavy Industries—*Chairman*.
(Shri T. Swaminathan, Addl. Secretary).
(Shri N. Subrahmanyam, Addl. Secretary).
2. Senior Industrial Adviser (Chemicals) (Dr. G. P. Kane).
3. Senior Industrial Adviser (Engineering) (Dr. B. D. Kalelkar).
4. A representative of the Ministry of Commerce and Industry (Shri K. B. Rao, Officer on Special Duty).
5. A representative of the Ministry of Food and Agriculture [Shri C. S. Sridharan, Deputy Adviser, Soil Conservation (Engg.)].
6. A representative of the Ministry of Railways (Shri M. N. Bery, Director, Planning).
7. A representative of the Ministry of Defence [Shri S. S. Jauhari, Director (Production), Shri B. R. Sethi, Director (Production)].
8. A representative of the Ministry of Irrigation and Power (Shri K. P. S. Nair, Member, C.W. & P.C.).
9. A representative of the Ministry of Mines and Fuel (Shri N. N. Kashyap, Joint Secretary).
10. A representative of the Department of Iron and Steel (Shri G. Ramanathan, Deputy Secretary).
11. A representative of the Planning Commission [Shri N. C. Shrivastava (Adviser), Dr. D. Swarup, Chief (Industry and Minerals Division)].

ANNEXURE II

MANUFACTURING AND MINING INDUSTRIES PROGRAMME OF DEVELOPMENT 1960—70

1. As desired by the Sub-committee of Machinery Planning Group, a set of tables as worked out in the Perspective Planning Division, are presented to provide provisional estimates of

- (a) the capacity in 1960-61 and targets for 1965-66 and 1970-71 in respect of major manufacturing and mining industries;
- (b) the total investment on plant and machinery during the Fourth Plan period for achieving the contemplated targets and for the maintenance, replacement of the aged plants;
- (c) the total cost of plant and machinery, its break-up into several district groups, and group-wise requirements for 1960—71.

2. The targets of capacity have been derived from the general strategy of development designed to achieve a rate of growth of about 7 per cent per annum in the national income during the Fourth Plan period. The pattern of development corresponds to the strategy outlined in the Third Plan and aims at maintaining a rate of growth of this order in the subsequent period with net foreign assistance reduced to a much smaller quantum, if not eliminated altogether by 1970-71.

3. No attempt is being made in this paper to explain the rationale of individual targets. It will take too much space to do so. The industrial targets have, however, been formulated to ensure an adequate balance of supply and demand for commodities as the economy moves to higher levels. The consistency between saving and investment targets and the need for balance in foreign trade have also been kept in view.

4. After fixing the targets for 1970-71 a view has been taken as to how the gap between the capacities existing at 1965-66 and those required by 1970-71 will be achieved. To meet the gap, existing units would be expanded to the extent necessary to benefit by economies of scale. It is assumed that new units would be set up with a view to achieving lowest cost production and would, therefore, be located properly and have optimum scale of operation. The calculations of needed total investment and/or plant and machinery have been based on these assumptions.

Certain norms (cols. 10, 11 of Table 1) have been worked out showing the relationship between investment per unit of output of major industries separately for increase in output arising from (a) substantial expansion of existing units and (b) newly established units. These have been applied to the marginal addition to capacity contemplated for the Fourth Plan (cols. 12—14 of Table 1).

The probable annual requirements of plant and machinery for the year 1970-71 are estimated by assuming a certain rate of growth for individual industries in the Fifth Plan period. For these industries in which the rate of growth will continue at the same or higher rate than in the Fourth Plan it has been assumed that the last year requirements will be 25 per cent of the total Fourth Plan period demand. For industries in which the addition to capacity in the Fifth Plan will be more or less the same as in the Fourth Plan the yearly demand in 1970-71 is assumed as 20 per cent of the total Fourth Plan period requirements.

In formulating the targets for industrial plant fabricating industries care has been taken to include the requirements of such equipment only which a factory can conveniently and economically manufacture. General items of machinery and materials e.g., motors, pumps, compressors, instruments, machine tools etc. are deducted from the total plant value in order to estimate the output value of plant fabricating enterprises. Table 2 seeks to give a rough estimate of the current replacement cost of plant and machinery installed. Installed cost of plant and machinery has been calculated by deducting the cost of land, building and associated civil works from the total fixed investment. The replacement requirements for the year 1970-71 are related to the average life of the plant and the growth in stock of particular plant over its life span. Replacement on account of industrial units to be established during the Fourth Plan period has been left out as being new equipment, actual replacement is likely to be very small.

The average annual replacement requirements for 1966-71 is the mean of the annual requirements for the year 1965-66 and 1970-71 and five times this mean gives the estimate of total replacement requirement in the Fourth Plan.

Table 3 presents an approximate breakdown, by value of specified type of plant and machinery required for the Fourth Plan capital investment programme of different industries. The value of the plant and machinery stands for the ex-works cost of the equipment. For this purpose the cost of erection, transport charges and other expenses, such as duty, insurance fee etc. have been deducted from the investment on plant and machinery. These figures have been cross checked, wherever data were available, with the physical quantity of equipment required and its cost for any particular enterprise.

This information has been put together in an approximate form by using (a) the structure of plant and machinery investment by groups of equipment for different industries in percentage terms set out in Table 4 and (b) the investment on plant and machinery for the Fourth Plan for different industries as given in Table 2. Similar analysis has been extended to plant and machinery requirements of electricity generation, transmission and distribution and of railway and motor transport during the Fourth Plan.

The main purpose of this study is to enable a start being made of systematic planning for the establishment of manufacturing facilities for various plant, machinery and equipment required to support

the contemplated industrial growth. The tentative estimates presented in this paper are based on the results of a number of detailed studies done in the Perspective Planning Division of the Planning Commission, within the context of a unified approach. This has the advantage of assuring internal consistency of targets and throwing up order of magnitude which are realistic.

An important consideration in machinery and equipment production planning on a somewhat long-term basis is that of the extent of specificity and the level of aggregation which must be taken into account. Obviously from the point of view of efficient production, taking advantage of economies of scale and specialisation of product, it is necessary to breakdown the requirements of machinery into groups and/or components of more or less similarly constructed equipment requiring same or similar manufacturing facilities, technical know how and skills, irrespective of the final use to which the equipment or part is put. This it is more meaningful to disaggregate equipment by these groups, which are homogeneous from the point of view of production rather than to think in terms of planning production of equipment by its use in different industries except for items which are specific to that industry.

With this basic consideration in mind, it is desirable to plan production capacities in machine building and engineering industries in such a way as to provide maximum flexibility which should permit efficient response to changes in demand for products or a group of products.

It is to draw attention to this whole range of problems that the present exercise has attempted a detailed breakdown by nineteen groups on the basis of whatever material was available. This work needs to be greatly strengthened and can be advanced significantly further only if a much larger group of technical experts extends their serious co-operation.

ANNEXURE

CLASSIFICATION OF PLANT AND MACHINERY ITEMS BY 19 GROUPS

(AS ADOPTED IN TABLE 3)

1. Equipment specific to industry, *e.g.* textile machinery.
2. Process equipment, *e.g.* pressure vessels and cylinders, distilling and fractioning eq., filters, driers, heat exchangers, reactors, autoclaves, crystalizers and solidifiers etc. etc.
3. Process machinery—*e.g.* grinding and crushing eq., mixing eq., screening eq., centrifugals etc. etc.
4. Pumps, compressors, blowers, exhausters, fans etc.
5. Boilers and large heat exchangers, *e.g.*, condensers, air preheaters, economizers etc.
6. Machine tools—cutting and forming, foundry and forging eq., tools, fixtures and dies.
7. Mat. conveying eq. *e.g.* cranes, conveyors, elevators and allied structurals.
8. Mat. handling eq., fork lift trucks, pallot lift, industrial fractors, furnace chargers, metal handlers, industrial shovels and allied eq.
9. Structurals including tanks, industrial furnaces etc.
10. Pipes, valves, fittings etc.
11. Rotating electrical machinery, *e.g.* motors generators.
12. Non Rotating electrical machinery *e.g.* transformers, switch gear.
13. Electrical material, *e.g.*, cables, wires, insulators etc.
14. Prime movers—*e.g.*, I.C. engines, turbines.
15. Industrial Refrigeration and airconditioning equipment.
16. Transport equipment *e.g.* locomotives, wagons, trucks etc.
17. Instruments, testing equipment, laboratory equipment.
18. Misc. Ind. machinery.
19. Misc. material, *e.g.* refractories.

Note.—Alterations in investment figures have not been made as a result of change in capacity targets.

Table 1 : Production capacity in 1960-61 planned for 1965-66 and proposed for 1970-71 and estimated fixed investment in manufacturing and mining industries in the Fourth Plan (1966-71)

Sl. No.	Industries	Metric unit	Capacity						Fixed investment per unit (Rs.)			Fixed investment during Fourth Plan (Rs. million)				
			60-61	65-66	70-71	added during IV Plan			unit	NU	SE	NU	SE	total	replac- ment	grand total
						total	new unit (NU)	expansion (SE)								
(o)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Iron ore mining	thou. tons	10,700	32,000	70,000	38,000	20,000	18,000	ton.	13	10	260	180	440	..	..
2	Coal mining	"	60,000	97,000	180,000	83,000	63,000	20,000	"	50	38	3,150	760	3,910	..	..
3	Coal washeries (raw coal washed)	"	11,000	21,000	80,000	59,000	50,000	9,000	"	20	16	1000	144	1,144	..	..
4	Soft coke (low temp. carbonization)	"	..	2,000	3,000	1,000	500	500	"	133	80	67	40	107	..	..
5	Nayveli lignite integrated proj.															
	1. Brkquetting & carbonization plant	"	..	380	600	320	..	220	"	..	237	..	52	52	..	..
	2. High temp. carb. plant	"	..	1,000	1,000	..	..	..	"	..	..	..	..	..	..	..
6	Hard coke (by-product process)	"	620	1,160	5,000	3,840	2,800	1,040	"	90	60	252 4,729	62 1,238	314 5,967	.. 1,390	.. 7,360
7	Petroleum refining	"	6,000	17,000	30,000	13,000	7,000	6,000	"	150	75	1,050	450	1,500	..	..
8	Lubricating oils	"	..	100	800	700	600	100	"	700	500	420	50	470	..	..
9	Crude oil	"	..	6,000	14,000	..	..	..	"	..	..	1,470	500	2,000 3,970	.. 400	.. 4,370
10	Steel (Ingot)	"	6,000	89,000	19,000	10,100	5,140	4,960	"	1,610	1,005	8,275	4,985	13,260	..	..
11	Alloy tool and spl. steel (ingot)	"	..	200	500	300	..	300	"	5,000	3,000	..	900	900	..	..
12	Aluminium	"	18	125	250	125	50	75	"	10,000	7,500	500	560	1,060	..	..
13	Others (inclgd. copper, zinc lead etc.)	"	..	..	..	..	..	..	"	..	..	8,775	6,445	450 15,620	1,880	.. 17,500

14	Fertilizers—N ₂	thou. tons	240	1,000	2,000	1,000	900	100	ton.	2,600	2,000	2,340	200	2,540	..	..
15	Fertilizers—P ₂ O ₅	"	57	500	1,250	750	600	150	"	500	300	300	45	345	..	..
16	Caustic soda—chemical	"	27	50	80	30	30	..	"	500	400	15	..	15	..	..
17	Caustic soda—electrolytic	"	100	350	620	270	100	170	"	1,500	1,250	150	213	363	..	..
18	Soda ash	"	270	530	800	270	220	50	"]	700	230	154	12	166	..	..
19	Sulphuric acid	"	526	1,750	3,700	1,950	1,700	250	"	120	90	204	23	227	..	..
20	Dye-stuffs	"	8	11	16	5	..	5	"	30,000	20,000	..	100	100	..	..
21	Drugs and pharmaceuticals	Rs. million	200	500	800	300	100	200	Rs. thou.	750	500	75	100	175	..	..
22	Intermediates	thou. tons	..	25	40	15	..	15	ton	4,400	3,500	..	52	52	..	..
23	Plastics	"	15	85	250	165	100	65	"	5,000	4,000	500	260	760	..	..
24	Auto tyres	mill. nos.	1·6	3·7	7·5	3·8	2·0	1·8	No.	135	90	270	162	432	..	..
25	Cycle tyres	"	15	39	60	21	16	5	"	4	3	65	15	80	..	..
26	Synthetic rubber	thou. tons	..	50	140	90	90	..	ton	5,000	..	450	..	450	..	..
27	Paper and paper board	"	410	800	1500	700	500	200	"	2,250	1,700	1,125	340	1,465	..	..
28	Newsprint	"	30	150	240	90	..	90	"	2,400	1,350	..	122	122	..	..
29	Cement	"	9,200	15,000	26,000	11,000	9,000	2,000	"	125	75	1,125	150	1,275	..	..
30	Glass and glass ware	"	380	600	1,000	400	..	400	"	560	400	..	160	160	..	..
31	Ophthalmic glass	tons	..	300	450	150	..	150	"	87,000	70,000	..	10	10	..	..
32	Refractories	thou. tons	820	1,800	2,800	1,000	400	600	"	200	45	80	27	107	..	..
33	Others	thou. tons	..	..	..	..	..	..	..	..	..	6,853	1,991	9,844	1,980	11,820
34	Sugar	"	2,250	3,500	4,500	1,000	500	500	"	725	600	362	300	662	580	1,240
35	Cotton yarn	"	950	1,020	1,360	340	180	160	"	2,646	2,095	476	335	811	..	..
36	cotton cloth	mill. metres	4,845	5,300	6,400	1,100	550	550	th. met.	437	164	240	90	330	..	..
37	Rayon and staple fibre	th. tons	45	100	170	70	40	30	ton.	15,000	11,000	600	330	930	..	..
38	Chemical pulp	"	..	120	250	130	..	130	"	2,000	1,500	..	195	195	..	..
												1,316	950	2,266	920	3,190
39	Steam Locomotives	Nos.	900	250	100	..	..	..	No.	..	..	..	..	..	..	..

Sl. No.	Industries	Metric unit	Capacity						Fixed investment per unit (Rs.)			Fixed investment during Fourth Plan (Rs. million)					
			60-61	65-66	70-71	Added during IV Plan			Unit	NU	SE	NU	SE	Total	Replacement	Grand total	
						Total	New unit (NU)	Expansion (SE)									
(o)	I	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
40	Diesel locomotives	Nos.	..	150	300	150	..	150	No.	..	450,000	..	70	70	..	..
41	Electric locomotives	"	..	70	200	130	..	130	"	..	550,000	..	70	70	..	..
42	Wagons	Thou. Tons	26	45	60	15	15	..	..	4,000	..	60	..	60	..	..
43	Railway coaches	Nos.	1,300	1,400	2,200	800	..	800	No.	..	200,000	..	160	160	..	..
44	Motor cars	Thou. Nos.	20	30	45	15	..	15	No.	..	4,500	..	68	68	..	..
45	Jeeps and station wagons	"	5	10	15	5	..	5	"	..	4,500	..	22	22	..	..
46	Commercial vehicles	"	28	60	150	90	..	90	"	..	12,500	..	1,125	1,125	..	..
47	Ancillaries, components & parts including foundry and forge	Rs. million	..	..	..	..	..	..	..	..	..	..	..	500	..	..
48	Motor cycles & scooters	Thou Nos.	23	60	150	90	..	90	"	..	300	..	27	27	..	..
49	Bicycles	"	2,200	2,200	3,500	1,300	..	1,300	"	..	25	..	33	33	..	..
50	Merchants ships	Thou. GRT	80	60	120	60	15	45	GRT	9,000	5,000	135	225	360	..	..
51	Metric diesel engine	Thou. HP	..	75	200	125	..	125	HP	..	240	..	30	30	..	..
52	Aircraft, completed & components	Rs. mill.	200	Rs. thou.	195	1,830	2,625	250	2,875
53	Generators :																
	1. Steam	Thou. KW	..	1,000	2,600	1,600	600	1000	KW	150	90	90	90	180	..	..
	2. Hydro	"	..	850	1,700	850	..	850	"	125	75	..	64	64	..	..
54	Elec. motors :																
	1. (below 150 : KW)	"	859	2,775	18,000	5,225	..	5,228	"	50	25	..	130	130	..	..
	2. (above 150 : KW)	"	..	500	2,000	1,500	..	1,500	"	140	100	..	150	150	..	..

55	Transformers :																
	1. (upto 33 KV)	Thou. KVA	1,400	4,200	8,500	4,300	..	4,300	KVA	20	15	..	65	65	..	..
	2. (above 33 KV)	"	..	2,000	16,500	14,500	..	14,500	"	35	25	..	362	362	..	..
56	Capacitors	Rs. mill	..	3	65	62	..	62	Rs. Thou	800	600	..	37	37	..	..
57	Switchgears	"	40	180	600	420	..	420	"	1,100	800	..	336	336	..	..
58	Turbines :																
	1. Steam	Thou. KW	..	1,000	2,600	1,600	600	1,000	kw	250	150	150	150	300	..	..
	2. Hydro	"	..	850	1,700	850	..	850	"	125	80	..	68	68	..	..
59	A.C.S.R. conductors (incl. AA. conductors)	Thou. tons	20	55	125	70	..	70	Ton	400	260	..	18	18	..	..
60	VIR & plastic coated wires	Mill. Meters	420	700	1400	700	200	500	Thou. Met.	164	110	33	55	88	..	..
61	Winding wires	Th. tons	77	30	60	30	..	30	ton	2,110	1,750	..	52	52	..	..
62	Bare copper conductors	"	20	10	5	..	..	..	..	..	..	..	..	..	..	..
63	Paper insulated cables	Kilo. Meter	1,420	7,200	16,000	8,800	3,200	5,600	Kilo. m.	6,700	4,350	21	24	45	..	..
64	Dry core cables	"	1,500	4,000	8,000	4,000	2,000	2,000	"	24,850	21,750	50	44	94	..	..
65	Coaxial cables	"	480	480	650	170	..	170	"	24,850	21,750	..	4	4	..	..
66	Electric fans	Th. nos.	1,740	2,800	4,500	1,700	850	850	No.	17	10	14	9	23	..	..
67	House service metres	"	760	2,500	2,500	..	..	..	..	..	..	..	..	..	..	..
68	Lamps	Mill. nos.	50	76	125	49	..	49	Th. Nos.	400	250	..	12	12	..	..
69	Tubes	"	2.4	7	30	23	..	23	..	400	250	..	6	6	..	..
70	Radio receivers	Th. Nos.	560	900	1,500	600	..	600	No.	28	25	..	15	15	..	..
71	Storage batteries	Tnou. Nos.	760	900	2,000	1,100	..	1,100	Nu.	40	25	..	28	28	..	..
72	Dry batteries	Mill. Nos.	450	450	650	200	..	200	thou. no.	90	35	..	13	13	..	..
73	Refrigerators	Th. Nos.	28	56	120	64	..	64	no.	..	650	..	42	42	..	..
74	Air conditioners	"	50	50	100	50	..	50	"	..	700	..	35	35	..	..
75	Water coolers	"	10	20	30	10	..	10	"	..	700	..	..	..	..	..
												358	1,816	2,174	50	2,230	

Sl. No.	Industries	Metric unit	Capacity						Fixed investment per unit (Rs.)			Fixed investment during Fourth Plan (Rs. million)				
			60-61	65-66	70-71	Added during IV Plan			Unit	NU	SB	NU	SB	Total	Replace-ment	Grand Total
						Total	New unit (NU)	Expans-ion (SE)								
(*)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
76	Iron castings	"	600	1,200	4,000	2,800	1,600	1,200	Ton.	1,500	1,000	2,400	1,200	3,600	..	..
77	Steel castings	"	40	200	600	400	250	150	"	2,000	1,500	500	225	725	..	..
78	Forgings	"	40	200	800	600	400	200	"	3,000	2,000	1,200	400	1,600	..	..
79	Structural fabrication	"	500	1,100	2,200	1,100	600	500	"	500	300	300	150	450	..	..
80	Gear cutting (reduction gear units)	Tons	1,000	5,000	15,000	10,000	10,000	..	"	6,000	..	60	..	60	..	..
81	Cranes	Th. Tons	8	42	70	28	8	20	"	2,500	1,500	20	30	50	..	..
82	Ball & roller bearings	Mill Nos.	2	11	37	26	15	11	Th. Nos.	15,000	10,000	300	165	465	..	..
83	Precision instruments	Rs. Mill.	40	200	700	500	300	200	Rs. Thou.	400	300	120	60	180	..	..
84	Surgical instruments	Th. Pieces	..	2,500	5,000	2,500	..	2,500	Piece	11	8	..	20	20	..	..
85	Machine tools	Rs. Mill.	80	500	1,000	700	400	300	(Rs. Thou.)	2,000	1,500	800	450	1,250	..	..
86	Diesel engines (excl. for transport eqpt.)	Nos.	48	72	140	68	..	68	No.	800	500	..	34	34	..	..
87	Power driven pumps	"	128	180	300	120	30	90	"	1,800	1,200	54	108	162	..	..
88	Air compressors	Rs. Mill.	25	75	200	125	100	25	(Rs. Thou.)	600	400	60	10	70	..	..
89	Power boiler (incl. -coal prepara-tion etc.)	"	..	200	600	400	..	400	"	..	1,000	..	400	400	..	..
90	Industrial boilers	Rs. Mill.	40	100	300	200	100	100	Rs. Thou.	830	700	83	70	153	..	..
91	Heavy plate & vessels works	Thou. Tons.	..	30	70	40	30	10	Ton	2,000	1,500	60	15	75	..	..
92	Chemical drugs & pharmaceutical machinery	Rs. Mill.	..	90	450	360	270	90	Rs. Thou.	600	500	162	45	207	..	..

93	Metallurgical & other heavy equipment (Hathia)	Thou Tons.	..	80	240	160	80	80	Ton	6,000	20,000	430	160	640	..	..
94	Coal & other mining machinery	"	..	45	90	45	..	45	"	8,000	6,000	..	370	270	..	..
95	Cotton textile machinery	Rs. Mio	120	250	500	250	100	150	Rs. Thou.	500	400	50	60	110	..	..
96	Cement machinery	"	10	45	160	115	70	45	"	750	400	52	18	70	..	..
97	Sugar machinery	"	100	120	150	30	..	30	"	750	500	..	15	15	..	..
98	Paper machinery	"	40	80	250	170	70	100	"	750	500	52	50	102	..	..
99	Printing machinery	"	20	30	100	70	50	20	"	1,000	750	50	15	65	..	..
100	Jute machinery	"	25	25	35	10	..	10	"	..	400	..	4	4	..	..
101	Dairy machinery	"	3	25	50	25	..	25	"	200	150	..	4	4	..	..
102	Building & road constructional machry.	"	16	46	90	44	20	24	"	600	500	12	12	24	..	..
103	Crawler tractors	Nos.	..	600	1,200	600	..	600	No.	..	75,000	..	45	45	..	..
104	Dumpers & scrapers	"	..	600	1,200	600	..	600	"	..	75,000	..	45	45	..	..
105	Showels	"	..	125	250	125	..	125	"	..	75,000	..	9	9	..	..
106	Road rollers	"	800	800	1,500	700	..	700	"	..	3,000	..	2	2	..	..
107	Tractors	Thou. Nos.	..	12	25	13	..	13	"	3,200	2,500	..	32	32	..	..
												6,815	4,123	10,938	510	11,448		
Grand Total											30,873	19,193	54,066	7,960	62,026			

TABLE 2: Estimated investment on plant & machinery in manufacturing and mining industries India 1966-71

(Rs. million)

Sl. No.	Industries	upto 65-66	fixed investment during IV plan			upto 70-71	Plant & machinery as % of fixed investment		investment on plant & machinery					investment on plant & machinery (1970-71)			
			new unit (NU)	sub- stantial expansion (SR)	total		NU	SE	upto 1965-66	during IV plan		stock upto 70-71	New require- ment	replac- ement	Total		
										NU	SE					total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Iron ore mining	400	260	180	440	840	73	85	300	190	153	343	643	86	32	118	
2	Coal mining	4,610	3,150	760	3,910	8,520	60	75	2,880	1,890	570	2,460	5,340	492	267	759	
3	Coal washeries	420	1,000	144	1,144	1,564	60	75	250	600	108	708	958	142	19	161	
4	Soft coke (low temp. carbonization)	265	67	40	107	372	65	90	170	44	36	80	250	20	5	20	
5	Neyveli lignite integrated project. Bri- quetting & carbonization plant	140	..	52	52	192	75	90	105	..	47	47	132	12	3	15	
6	High temp. carbonization plant	250	..	..	..	250	75	..	190	..	..	..	190	..	..	..
7	Hard coke (by product process)	100	252	62	314	414	65	75	65	164 2,888	46 960	210 38,48	275 ..	48 794	8 334	50 1,130	
8	Petroleum refining	1,800	1,050	450	1,500	3,300	65	90	1,170	682	405	1,087	2,257	272	90	362	
9	Lubricating oils	120	420	50	470	590	50	75	60	252	38	290	350	123	..	123	
10	Crude oil	1,530	..	..	2,000	3,530	75	90	1,150	.. 934	.. 443	1,500 3,077	2,650 ..	375 770	27 117	402 887
11	Steel	12,575	8,275	4,985	13,260	25,835	65	90	8,900	5,379	4,486	9,865	18,765	2,466	375	2,841	
12	Alloy coal and special steel	2,080	..	900	900	2,980	65	75	1,350	..	675	675	2,025	168	40	208	
13	Aluminium	1,200	500	562	1,062	2,262	65	75	800	325	422	707	1,547	149	62	211	
14	Others (inclgd. copper, zinc, lead etc.)	470	..	..	400	810	65	..	270	.. 5,704	.. 5,583	260 11,547	530 ..	65 2,848	21 498	86 3,346
15	Fertilizers (N ₂ +P ₂ O ₅)	2,765	2,640	245	2,885	5,650	55	65	1,250	1,452	159	1,611	2,861	403	143	546	

16	Castic Soda	520	165	213	378	898	68	75	365	112	160	272	637	68	32	100	
17	Soda Ash	310	154	12	166	476	65	90	210	100	11	111	221	28	16	44	
18	Sulphuric Acid	190	204	23	227	417	85	90	165	173	21	194	359	48	18	66	
19	Dyestuffs	320	..	100	100	420	75	90	240	..	90	90	330	18	1313	31	
20	Intermediates	110	..	52	52	162	75	90	85	..	47	47	132	9	5	14	
21	Drugs & Pharmaceuticals	350	75	100	175	525	50	75	190	38	75	113	303	28	6	34	
22	Plastics	405	500	260	760	1,165	75	90	315	375	234	609	924	152	28	180	
23	Auto-tyres	500	270	162	432	932	75	90	375	202	146	348	723	87	14	101	
24	Cycle-tyres	150	65	15	80	230	75	90	165	48	14	62	167	12	3	15	
25	Synthetic rubber	250	450	..	450	700	60	75	150	270	..	270	420	68	8	76	
26	Paper & paper board	1,785	1,125	340	1,465	3,250	80	90	1,445	900	306	1,206	2,651	302	106	408	
27	Newsprint	330	..	122	122	452	65	75	219	..	92	92	307	23	12	35	
28	Cement	1,835	1,125	150	1,275	3,110	65	85	1,205	731	128	859	2,064	215	103	318	
29	Glass & glassware	350	..	160	160	510	66	75	235	..	120	120	355	24	11	35	
30	Refractories	380	80	27	107	487	50	65	170	40	18	58	228	12	11	23	
31	Others	1,000	..	..	1,000	2,000	70	..	700	..	..	700	1,400	175	50	225
											4441	1,621	6,762	..	1,672	579	2,251
32	Sugar	2,123	362	300	662	3,187	80	95	2,030	290	285	575	2,604	115	130	245	
33	Cotton yarn	2,890	476	335	811	3,701	80	95	2,310	381	318	699	3,009	140	90	230	
34	Cotton cloth	2,258	240	90	330	2,585	80	98	1,810	192	88	280	2,090	56	53	119	
35	Rayon & staple fibre	1,320	600	3,30	930	2,250	75	85	1,030	450	280	730	1,762	182	88	270	
36	Chemical pulp	200	..	195	195	395	75	90	150	..	175	175	325	44	10	54	
										1,023	861	1,884	..	422	251	673	
37	Steam locomotives	100	..	..	..	100	65	..	65	..	..	..	65	..	..	..
38	Diesel locomotives	120	..	70	70	190	58	67	60	..	47	47	107	12	1	13	
39	Electric locomotives	20	..	70	70	90	50	65	5	..	45	45	50	11	1	12	
40	Wagon	140	60	..	60	200	60	60	80	36	..	36	116	9	1	10	

TABLE 2: *Estimated investment on plant & machinery in manufacturing and mining industries India 1966—71*

(Rs. million)

Sl. No.	industries	upto 65-66	fixed investment during IV plan			upto 70-71	Plant & machinery as % of fixed investment		investment on plant & machinery					investment on plant & machinery (1970-71)			
			new unit (NU)	sub- stantial expansion (SE)	total		NU	SE	upto 1965-66	during IV plan		stock upto 70-71	New require- ment	replac- ement	Total		
										NU	SE					total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Iron ore mining	400	260	180	440	840	73	85	300	190	153	343	643	86	32	118	
2	Coal mining	4,610	3,150	760	3,910	8,520	60	75	2,880	1,890	570	2,460	5,340	492	267	759	
3	Coal washeries	420	1,000	144	1,144	1,564	60	75	250	600	108	708	958	142	19	161	
4	Soft coke (low temp. carbonization)	265	67	40	107	372	65	90	170	44	36	80	250	20	5	20	
5	Neyveli lignite integrated project. Bri- quetting & carbonization plant	140	..	52	52	192	75	90	105	..	47	47	132	12	3	15	
6	High temp. carbonization plant	250	..	..	..	250	75	..	190	..	..	..	190	..	..	..
7	Hard coke (by product process)	100	252	62	314	414	65	75	65	164 2,888	46 960	210 3848	275 ..	48 794	8 334	50 1,130	
8	Petroleum refining	1,800	1,050	450	1,500	3,300	65	90	1,170	682	405	1,087	2,257	272	90	362	
9	Lubricating oils	120	420	50	470	590	50	75	60	252	38	290	350	123	..	123	
10	Crude oil	1,530	..	..	2,000	3,530	75	90	1,150	.. 934	.. 443	1,500 3,077	2,650 ..	375 770	27 117	402 887
11	Steel	12,575	8,275	4,985	13,260	25,835	65	90	8,900	5,379	4,486	9,865	18,765	2,466	375	2,841	
12	Alloy coal and special steel	2,080	..	900	900	2,980	65	75	1,350	..	675	675	2,025	168	40	208	
13	Aluminium	1,200	500	562	1,062	2,262	65	75	800	325	422	707	1,547	149	62	211	
14	Others (inclgd. copper, zinc, lead etc.)	410	..	..	400	810	65	..	270	.. 5,704	.. 5,583	260 11,547	530 ..	65 2,848	21 498	86 3,346
15	Fertilizers (N ₂ +P ₂ O ₅)	2,765	2,640	245	2,885	5,650	55	65	1,250	1,452	159	1,611	2,861	403	143	546	

16	Castic Soda	.	.	.	.	520	165	213	378	898	68	75	365	112	160	272	637	68	32	100
17	Soda Ash	.	.	.	.	310	154	12	166	476	65	90	210	100	11	111	221	28	16	44
18	Sulphuric Acid	.	.	.	.	190	204	23	227	417	85	90	165	173	21	194	359	48	18	66
19	Dyestuffs	.	.	.	.	320	..	100	100	420	75	90	240	..	90	90	330	18	1313	31
20	Intermediates	.	.	.	.	110	..	52	52	162	75	90	85	..	47	47	132	9	5	14
21	Drugs & Pharmaceuticals	.	.	.	.	350	75	100	175	525	50	75	190	38	75	113	303	28	6	34
22	Plastics	.	.	.	.	405	500	260	760	1,165	75	90	315	375	234	609	924	152	28	180
23	Auto-tyres	.	.	.	.	500	270	162	432	932	75	90	375	202	146	348	723	87	14	101
24	Cycle-tyres	.	.	.	.	150	65	15	80	230	75	90	165	48	14	62	167	12	3	15
25	Synthetic rubber	.	.	.	.	250	450	..	450	700	60	75	150	270	..	270	420	68	8	76
26	Paper & paper board	.	.	.	.	1,785	1,125	340	1,465	3,250	80	90	1,445	900	306	1,206	2,651	302	106	408
27	Newsprint	.	.	.	.	330	..	122	122	452	65	75	219	..	92	92	307	23	12	35
28	Cement	.	.	.	.	1,835	1,125	150	1,275	3,110	65	85	1,205	731	128	859	2,064	215	103	318
29	Glass & glassware	.	.	.	.	350	..	160	160	510	66	75	235	..	120	120	355	24	11	35
30	Refractories	.	.	.	.	380	80	27	107	487	50	65	170	40	18	58	228	12	11	23
31	Others	.	.	.	.	1,000	..	..	1,000	2,000	70	..	700	..	..	700	1,400	175	50	225
													4441	1,621	6,762	..	1,672	579	2,251	
32	Sugar	.	.	.	.	2,523	362	300	662	3,187	80	95	2,030	290	285	575	2,604	115	130	245
33	Cotton yarn	.	.	.	.	2,890	476	335	811	3,701	80	95	2,310	381	318	699	3,009	140	90	230
34	Cotton cloth	.	.	.	.	2,258	240	90	330	2,585	80	98	1,810	192	88	280	2,090	56	53	119
35	Rayon & staple fibre	.	.	.	.	1,320	600	3,30	930	2,250	75	85	1,030	450	280	730	1,762	182	88	270
36	Chemical pulp	.	.	.	.	200	..	195	195	395	75	90	150	..	175	175	325	44	50	54
													1,023	861	1,884	..	422	251	073	
37	Steam locomotives	.	.	.	.	100	..	..	..	100	65	..	65	..	..	..	65	..	..	..
38	Diesel locomotives	.	.	.	.	120	..	70	70	190	58	67	60	..	47	47	107	12	1	13
39	Electric locomotives	.	.	.	.	20	..	70	70	90	50	65	5	..	45	45	50	11	1	12
40	Wagon	.	.	.	.	140	60	..	60	200	60	60	80	36	..	36	116	9	1	10

(Rs. million)

S. No.	Industries	Upto 65-66	Fixed investment during IV plan			Upto 1970-71	Plant & machinery as % of fixed investment		Investment on plant & machinery			Stock upto 1970-71	Investment on plant & machinery (1970-71)				
			New unit (NU)	Substantial expansion (SE)	Total		NU	SE	Up to 1965-66		Total		New requirement	Replacement	Total		
									NU	SE						NU	SE	Total
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
41	Railway coaches	250	..	160	160	410	65	75	150	..	120	120	370	30	5	35	
42	Motor cars	165	..	68	68	233	75	80	125	..	54	54	179	11	4	15	
43	Jeeps & station wagons	55	..	22	22	77	75	80	40	..	18	18	58	4	1	5	
44	Commercial vehicles	785	..	1,125	1,125	1,910	75	80	610	..	900	900	1,510	225	30	255	
45	Ancillaries, components & parts incldg. foundry & forge	425	..	..	500	925	65	..	275	..	..	325	600	1	12	93
46	Motor cycles & scooters	30	..	27	27	57	65	80	20	..	22	22	42	6	1	7	
47	Bicycles	90	..	33	33	123	65	75	60	..	25	25	85	5	2	7	
48	Merchants ships	500	135	225	360	860	70	80	330	94	180	274	604	55	12	67	
49	Marine diesel engines	30	..	30	30	60	65	85	20	..	26	26	46	6	1	7	
50	Aircraft completed & components . . . . .	..	..	..	100	100	55	..	..	..	..	55	..	..	..	20
											130	1,437	1,947	..	455	72	550
51	Generators																
	Steam	150	90	90	180	330	55	70	80	49	63	112	192	28	..	28	
	Hydro	110	..	64	64	174	55	70	80	..	45	45	105	11	..	11	
52	Electric motors																
	(150 KW.)	120	..	130	130	250	60	70	70	..	91	91	161	23	2	25	
	(150 KW.)	70	..	150	150	220	60	70	40	..	105	105	145	26	1	27	

53 Transformers

(upto 33 kw)	.	.	.	110	..	65	65	175	60	70	60	..	45	45	105	11	1	12
(" 33 kw)	.	.	.	70	..	362	362	432	60	70	40	..	253	253	293	63	3	66
54 Capacitors	.	.	.	2	..	37	37	39	60	70	1	..	26	26	27	7	..	7
55 Switch gears	.	.	.	170	..	336	336	506	60	70	110	..	235	235	345	59	3	62
56 Turbines—																		
Steam	.	.	.	250	150	150	300	550	80	85	200	120	127	247	447	62	..	62
Hydro	.	.	.	100	..	68	68	168	75	80	75	..	54	54	129	14	..	14
57 A.C.S.R. conductors (in.)																		
A ₁ A ₂ conductors)	.	.	.	20	..	18	18	38	60	70	13	..	13	13	26	3	..	3
58 VIR and plastic cotted wires	.	.	.	120	33	55	88	208	50	60	59	16	33	49	108	12	1	13
59 Winding wires	.	.	.	60	..	52	52	112	60	70	40	..	36	36	76	9	1	10
60 Bare copper conductors	.	.	.	20	..	..	..	20	65	75	..	..	..	..	..	..	..	..
61 Paper insulated cables	.	.	.	45	21	24	45	90	60	80	28	13	19	32	60	8	1	9
62 Dry core cables	.	.	.	90	50	44	94	184	60	80	67	30	35	65	132	16	1	17
63 Coaxial cables	.	.	.	15	..	4	4	19	60	80	3	..	3	3	6	1	..	1
64 Electric fans	.	.	.	50	14	9	23	63	70	80	30	10	7	17	47	4	..	4
65 House service meters	.	.	.	140	..	..	..	140	60	80	83	..	..	..	83	..	1	1
66 Lamps	.	.	.	45	..	12	12	57	60	75	25	..	9	9	34	2	..	2
67 Radio receivers	.	.	.	25	..	15	15	40	60	85	17	..	13	13	30	3	..	3
68 Tubes	.	.	.	6	..	6	6	12	60	75	3	..	4	4	7	1	..	1
69 Storage batteries	.	.	.	35	..	28	28	63	60	75	21	..	21	21	42	4	..	4
70 Refrigerators	.	.	.	40	..	42	42	82	70	80	30	..	34	34	64	7	..	7
71 Air-conditioners	.	.	.	40	..	35	35	75	70	80	30	..	28	28	58	6	..	6
72 Dry batteries	.	.	.	30	..	13	13	43	60	75	17	..	10	10	27	2	..	4
73 Water coolers	.	.	.	15	..	7	7	22	70	80	10	..	6	6	16	1	..	1

92 Metallurgical & other heavy equipt. (Hathia)	480	480	160	640	1120	75	80	360	360	128	488	148	122	2	130	
93 Coal & other mining machinery	475	..	270	270	745	75	80	360	..	216	216	576	54	6	60	
94 Cotton textile machinery	125	50	60	110	235	65	80	80	32	48	80	160	16	3	19	
95 Cement machinery	35	32	18	70	105	75	80	25	39	14	53	78	13	1	14	
96 Sugar machinery	75	..	15	15	90	65	75	50	..	11	11	61	3	1	4	
97 Paper machinery	60	52	50	102	162	75	80	45	39	40	79	124	20	1	21	
98 Printing machinery	30	30	15	65	95	75	80	20	38	12	50	70	12	1	13	
99 Jute machinery	20	..	4	4	24	65	80	10	..	3	3	13	1	..	1	
100 Dairy machinery	5	..	4	4	9	75	80	4	..	3	3	7	1	..	1	
101 Building & road construction machinery	45	20	17	37	82	75	80	35	15	14	29	64	7	1	8	
102 Crawler tractors	45	..	45	45	90	75	80	38	..	36	36	71	9	..	9	
103 Dumpers & scrapers	45	..	45	45	90	75	80	35	..	36	36	71	9	..	9	
104 Shovels	10	..	9	9	19	75	80	7	..	7	7	14	2	..	2	
105 Road rollers	25	..	2	2	27	..	80	20	..	2	2	22	1	..	1	
106 Tractors	40	..	32	32	72	75	80	30	..	26	26	56	5	..	5	
										4791	3290	8081	..	2002	146	2148
Total	30926	19223	54149	..	..	..	..	..	20419	15795	39074	..	9481	2142	11630
Investment on plant and machinery required for replacement	..	..	..	7960	..	..	..	..	..	..	6400	..	..	..	..
GRAND TOTAL	..	..	..	62,110	..	..	..	..	20419	15795	45474	..	9481	2142	11630

(Rs. in lacs)

Industries	Upto 65-66	Fixed investment during IV plan			Upto 1970-71	Plant & machinery as % of fixed investment		Investment on plant & machinery upto 1965-66			Stock upto 70-71	Investment on plant & machinery (1970-71)			
		New unit (NU)	Substantial expansion (SE)	Total		NU	SE	During IV plan				New requirement	Replace-ment	Total	
								NU	SE	Total					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
74 Iron castings	1725	2400	1200	3600	5325	65	75	1100	1516	900	2460	3560	615	36	651
75 Steel castings	380	500	225	725	1105	75	85	280	375	191	566	846	142	8	150
76 Forgings	565	1200	400	1600	2165	80	90	450	960	360	1320	1770	330	18	348
77 Structural	490	300	150	450	940	50	75	270	150	112	262	532	666	11	77
78 Fabrication															
79 Gear cutting (reduction gear thits) .	30	60	..	90	120	75	80	20	70	..	70	90	15	1	16
80 Cranes	20	20	30	50	70	65	80	15	13	24	37	52	9	1	10
81 Ball & roller bearings	150	300	165	465	615	65	80	100	195	135	330	430	82	4	86
82 Precision instruments	80	120	60	180	260	75	80	60	90	48	138	198	34	..	34
83 Surgical instruments	30	..	20	20	50	75	80	20	..	16	16	36	4	..	4
84 Machine tools	560	800	450	1250	1810	65	75	375	520	338	858	1,233	214	25	239
85 Diesel engines (excl. engines for transport eqt.)	55	..	34	34	89	80	85	40	..	29	29	69	7	..	8
86 Power driven pumps	290	54	108	162	452	65	85	150	35	92	127	277	32	6	38
87 Air compressors	95	60	10	70	165	80	90	75	48	9	57	132	11	9	14
88 Power boilers (including coal preparation etc.)	300	..	400	400	700	65	85	200	..	340	540	540	85	5	90
89 Industrial boilers	220	83	70	153	373	75	80	165	62	56	118	283	30	3	33
90 Heavy plates & vessels works	240	105	10	115	355	65	80	155	68	8	76	231	19	2	21
91 Chemical drugs & pharmaceutical machinery	55	162	45	207	262	75	80	40	122	36	158	198	32	..	32

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TABLE III. Requirement of plant and machinery by specified type so equipment in the

Industry	Plant of machinery		Breakdown of plant						
	total value installed	of which cost of plant and equipment-only ¹	equipment specific to the industry	prime movers exel-motors	Pro-cessing equip-ment	pro-cessing machi-nery	pumps comp-ressors blowers fans	mach-ine tools tool-jings fix-ure etc.	
1	2	3	4	5	6	7	8	9	
Iron ore mining	340	260	165	..	..	44	3	8
Coal mining	2,460	1,840	455	..	..	73	146	18
Coal washeries	700	460	..	..	..	..	..	..
Coal and lignite carbonisation etc.	340	240	..	..	..	..	..	..
Sub-total	3,840	2,800	..	..	..	..	..	..
Petroleum refining etc.	1,520	880	..	..	308	..	140	18
Crude oil	1,500	870	148	26	..	..	26	35
Sub-total	3,020	1,750	..	..	..	..	..	..
Steel	9,860	6,820	2,523	136	205	136	273	205	
Alloy tool and special steel	1,575	1,120	468	..	..	2	28	11
Aluminium	750	540	..	..	..	..	..	..
Others (Incl. copper, zinc, lead etc.)	260	180	..	..	..	..	..	..
Sub-total	12,445	8,660	..	..	..	..	..	..
Fertilisers (N ₂ + P ₂ O ₅)	1,610	980	..	..	265	49	146	..
Caustic soda	270	190	..	..	72	5	20	..
Soda ash	105	70	..	..	28	1	7	..
Sulphuric acid	170	110	..	..	30	1	5	..
Dyestuffs and intermediates	140	90	..	..	33	19	..	4
Drugs and pharmaceuticals	110	70	2	..	22	1	4	1	
Plastics	610	430	..	..	..	..	..	..
Rubber industries	680	480	90	..	..	1	77	19
Paper and paper board	1,270	970	294	..	44	90	18	5	
Cement	860	600	114	..	..	186	66	12
Glass and glassware	300	220	44	..	..	2	9	7
Refractories	60	40	..	..	..	..	..	..
Other chemicals	700	500	35	..	185	35	45	25	
Sub-total	6,885	4,750	..	..	..	..	..	..
Sugar	575	410	..	29	90	53	70	8	
Textile cotton	980	840	560	..	..	..	8	1
Synthetic	1,220	850	..	..	..	..	..	..
Sub-total	2,200	1,690	..	..	..	..	..	..

Fourth Plan (1966-71) in respect of selected major industries.

(Rs. million)

and machinery (col. 3) by types.

mate- rial hand- ling equip- ment	mate- rial con- vey- ing	boil- ers	ref- rig- era- tion	tanks struc- ture etc.	fur- na- ces	pipes val- ves fitt- ings	ins- tru- ments (in- dus- trial)	tran- sport equip- ment	motor gene- rator etc.	elec- tri- cal equip- ment	elec- tri- cal mate- rial	misc. ind- ust- rial mach- inery	mis- cella- neous	re- pla- ce- ment	grand total col. (4) plus col. (24)
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
..	5	..	..	1	..	1	..	18	..	5	3	4	3	..	..
55	601	..	..	10	..	18	36	55	..	36	200	10	127	..	..
..
..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	970	3770
18	9	26	..	26	..	157	62	10	..	22	18	18	17	..	..
9	35	..	..	35	..	421	35	9	..	9	9	44	26	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	240	1990
410	136	170	..	512	136	205	205	409	614	205	68	136	136	..	..
33	44	..	..	44	140	33	11	33	33	120	33	54	33	..	..
..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1320	998
..
45	19	60	..	60	..	78	49	10	29	10	20	20	20	..	..
4	9	24	..	2	..	11	5	2	9	5	4	11	7	..	..
1	3	12	..	1	..	3	1	1	3	2	2	3	2	..	..
..	..	70	..	23	10	12	7	1	3	..	..	3	5	..	..
2	..	..	1	6	..	10	4	1	..	1	1	4	3	..	..
1	1	2	8	1	..	8	4	1	..	0	1	4	..	..	..
..
53	10	..	..	10	20	5	10	5	..	10	14	43	24	..	..
9	36	220	..	70	..	36	18	9	27	44	10	18	18	..	..
60	56	..	..	36	..	..	6	10	42	12	2	6	12	..	..
31	..	..	..	..	88	..	7	2	..	10	2	8	10	..	..
..
10	10	10	..	40	5	45	20	5	..	20	15	15	10	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1390	6140
21	..	70	..	21	4	4	8	..	4	4	4	8	4	410	820
8	..	160	..	15	..	8	8	10	15	8	8	15	9	..	..
..	..	48	..	..	..	..	..	..	..	..	..	..	..	640	2320
..

Breakdown of plant and

Industry	Plant of Machinery							
	total value installed	of which cost of plant and equipment only	equipment specific to the industry	prime movers exel-motors	pro-cessing equip-ment	pro-cessing machi-nery	pumps compressors blow-ers fans	machi-ne tools jings fix-ture etc.
1	2	3	4	5	6	7	8	9
Locomotives—diesel	50	40	1	..	..	..	•	32
Locomotives—electric	45	30	..	..	..	..	•	23
Wagon and coaches	160	120	..	..	..	..	2	97
Automobiles	1,000	720	2	..	..	..	7	587
Merchant ships	270	190	..	..	..	..	..	..
Foundry and forge for transport industry	330	230	10	..	..	15	5	..
Other transport industry	80	55	..	..	..	..	..	..
Heavy rotating machinery	460	320	26	..	..	..	3	..
Transformers	300	210	46	..	..	..	•	36
Motor	200	140	31	..	..	..	•	..
Switchgear & capacitors	240	180	5	..	..	..	2	130
Boilers (Indus. & power)	460	310	..	..	..	..	3	22
Wires, cables etc.	200	140	..	..	..	..	..	..
Electrical consumer goods	75	55	..	..	..	..	..	..
Refrigeration machinery	70	50	..	..	..	..	•	40
Sub-total	2,025	1,405	..	..	..	..	..	..
Castings & forgings	3,970	2,650	318	..	..	53	53	1,272
Structural fabrication	260	180	..	..	..	..	2	88
Machine tools	860	620	50	..	..	6	6	435
Instruments	155	120	..	..	..	..	..	76
Internal combustion engines	55	40	1	..	..	•	•	22
Pumps and compressors	180	130	3	..	..	•	1	87
Chem & pharm machinery	255	180	..	..	..	..	2	118
Metallurgical machinery	490	335	17	..	..	3	3	236
Coal mining machinery	430	290	14	..	..	6	3	200
Cotton textile machinery	80	55	2	..	..	1	1	35
Cement machinery	50	35	•	..	..	..	•	25
Sugar machinery	20	15	•	..	..	..	1	11
Paper machinery	80	55	2	..	..	1	1	37

machinery (col. 3) by types :

material handling equipment	material conveying	boilers	refrigeration	tanks etc.	stucco	furnaces	pipes valves fittings	instruments (industrial)	transport equipment	motor generator etc.	electrical equipment	electrical machinery	misc. industrial machinery	miscellaneous	replacements	Grand total Col. (3) plus col. (24)
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
•	3	..	..	•	1	•	1	1	..	..	1	..	..	..	..
2	3	..	..	•	•	..	•	•	..	..	..	1	1	..	..
2	5	..	..	1	1	1	..	1	..	2	2	4	2	..	..
14	29	..	..	2	7	7	7	7	..	14	7	36	17	..	..
..	
5	11	3	..	2	24	1	4	1	..	50	1	10	3	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	170	1555
3	6	..	..	..	3	..	33	15	..	7	6	3	6	..	..
2	2	..	..	•	6	•	8	1	13	13	4	6	6	..	..
..	1	..	..	•	3	•	4	1	1	10	3	3	3	..	..
4	22	..	..	2	..	2	13	2	2	7	4	4	11	..	..
3	25	..	..	3	12	3	..	3	..	6	6	10	10	..	..
..	
1	•	..	..	..	•	..	1	..	..	3	1	3	1	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	35	1440
80	132	..	..	80	239	26	26	53	..	80	106	132	..	..	..
14	30	..	..	13	4	2	4	4	2	7	7	2	1	..	..
12	12	..	..	6	12	6	20	6	..	12	6	25	6	..	..
..	1	..	5	2	4	1	14	1	..	2	2	10	2	..	..
2	3	..	..	1	1	•	1	•	..	1	1	1	..	..	..
5	10	•	..	1	3	1	4	1	..	5	3	3	3	..	..
13	5	..	..	9	4	2	5	2	..	7	4	5	4	..	..
7	10	..	..	3	10	3	10	3	..	7	3	10	10	..	..
6	9	..	..	5	9	3	9	3	..	3	6	9	7	..	..
2	2	..	..	1	1	1	2	1	..	1	1	3	1	..	..
1	2	..	..	•	1	1	1	•	..	1	1	1	1	..	..
•	1	..	..	•	•	•	•	•	..	•	•	1	1	..	..
1	1	..	..	..	1	1	2	1	..	1	1	3	1	..	..

Industry	Breakdown of plant and							
	Plant of Machinery		Equip-ment specific to the industry	Prime movers excl. motors	Pro-cessing equip-ment	Pro-cessing machinery	pumps compressors blowers fans	Mach-ine tool / jigs fix-tures etc.
	Total value installed	of which cost of plant and equipment only ¹						
	2	3	4	5	6	7	8	9
Constructional machinery . . .	30	20	..	..		..	..	16
Earth moving machinery . . .	80	55	5	..	..	1	1	35
Agricultural machinery . . .	30	20	1	..	..	*	*	15
Other industrial machinery . . .	515	360	7	..	..	4	4	251
Sub-total . . .	7,540	5,160	..	..	..	..	..	..
Total . . .	40,465	24,890²	5,439	191	1,282	787	1,192	4,931
Stocks upto 1965-66 . . .	10,065	27,580	6,700	240	1,490	940	1,280	3,370
Stock upto 1970-71 . . .	80,600	54,020	12,300	420	2,830	1,680	2,500	7,880
Replacement requirement . . .	7,960	4,780	750	25	500	400	150	500
Total requirement . . .	48,425	29,640	6,180	216	1,782	1,187	1,342	5,431
Power generation, transmission dis-tribution.	15,740	10,650	..	690	..	100	160	100
Transportation								
(a) Railways	10,000	9,300	50	..	..	..	20	400
(b) Roads	12,040	8,930	..	..	..	..	..	540
(c) Replacement	3,270	2,765	..	..	..	..	*	100
GRAND TOTAL	89,485	61,285	6,240	905	1,780	1,290	1,520	6,570

¹. After deducting cost of freight insurance, duties and erection cost from total value of installed plant.

² Does not include the cost of motors supplied as part of driven equipment.

³ Total, excluding Rs. 31 million as the cost of plant and machinery for which breakdown was not available.

*Amount less than Rs. one million.

(Rs. million)

machinery (col. 3) by types

Mate- rial hand- ling equip- ment	Mate- rial con- vey- ing	Boil- ers	Ref- rig- era- tion	Tanks struc- ture etc.	Fur- na- ces	Pipes val- ves fitt- ings	Instru- ments (in- dus- trial)	Tran- sport equip- ment etc.	Motor ^a gene- rator etc.	Elect- rical equip- ment	Electri- cal ma- teri- al	Misc. indus- trial mach- inery	Misce- llane- ous	Re- pla- ce- ment	Grand total Col.(3) plus col. (24)
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
*	..	..	..	*	*	..	*	1	..	1	*	1	1	..	..
1	2	..	..	1	1	1	2	1	..	1	1	2	..	..	..
15	1	..	..	1	*	*	*	1	1	*	..	1	..	..	..
18	7	..	..	14	4	4	11	4	11	7	7	7	7	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	350	5510
1,071	1,269	817	14	1,059	744	1,124	687	704	797	906	599	719	558	5,575	33,585
990	1,260	1030	20	1020	540	980	630	600	780	820	600	630	520	..	..
2,040	2,680	1,500	30	2,090	1,270	1,740	1,300	1,260	1,550	1,690	1,370	1,310	1,150	..	..
200	250	150	..	150	200	100	500	125	75	125	100	200	250	..	..
1,271	1,519	967	14	1,209	944	1,224	1,187	829	872	1,031	699	919	808	..	..
..	13 ⁰	1,160	..	1,260	..	290	530	30	670	2,620	2,720	..	190	200	10,950
10	100	..	..	400	..	5	100	8,000	..	20	150	20	25	555	9,855
..	..	..	..	..	..	..	..	8,390	..	..	..	..	..	2,210	11,140
..	10	..	..	..	..	..	5	2,650	..	..	..	..	..	..	..
1,280	1,760	2,130	15	2,870	945	1,520	1,820	19,000	1,540	3,670	3,570	940	1,020	8,540	6,553

and equipment.

manufacturing and mining industries

of total value of plant and machinery

Boilers	Refri- geration	Tanks struc- ture etc.	Fur- naces	Pipes valves fitt- ings	Ins- tru- ment (in- dus- trial)	Trans- port equip- ment	Motor gene- rator & etc.	Elec- trical equip- ment	Elec- trical mate- rial	Misc. indus- trial machin- ery	Misce- llaneous
(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
.	..	•	..	•	..	7	..	2	I	2	I
.	..	•	..	I	2	3	..	2	II	•	7
.
..
3	..	13	—7	28	7	I	..	6	2	2	2
..	..	4	..	49	4	I	..	I	I	5	3
2	..	8	2	3	3	6	9	3	I	2	2
..	..	4	12	3	I	3	3	II	3	5	3
..
..
6	..	6	..	8	5	2	3	I	2	2	2
13	..	I	..	6	2	I	5	2	2	6	4
17	..	2	..	4	2	2	4	3	3	4	3
9	..	21	9	11	6	II	3	..	..	..	5
..	I	7	..	11	5	I	..	I	I	5	3
3	12	I	..	12	6	I	..	13	I	6	..
..	..	2	2	I	4	2	..	27	3	9	5
23	..	7	..	4	2	II	3	4	I	2	5
..	..	6	..	..	I	2	7	2	•	I	2
..	40	..	5	I	..	I	I	4	5
..	..	8	I	9	4	I	..	4	3	3	2
17	..	5	I	I	2	2	I	I	I	2	I
19	..	2	..	I	I	I	..	I	I	2	I
..
..
..	2	..	2	3	..	..	3	..	..
..	3	3
..	..	I	I	I	..	I	..	2	2	3	2
..	..	•	I	I	I	I	..	I	I	•	2
I	..	2	II	•	2	•	..	22	I	4	I

Industry	Plant and machinery	Equipment specific to the industry	Prime movers excl. motors	Processing equipment	Processing machinery	Pumps compressors blowers fans	Mach-ine tools tool jigs fixtures etc.	Material handling equipments	Material convey-ing
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Heavy rotating machinery	100	8	..	..	..	1	68	1	2
Transformers . . .	100	22	..	..	..	*	17	1	1
Motors	100	22	..	..	..	*	5	2	1
Switchgears & capacitors .	100	3	..	..	..	1	73	2	1
Boilers (industrial & power)	100	..	..	..	..	1	73	1	1
Wires, Cables etc. .	100	..	..	..	..	..	..	..	..
Electrical consumer goods	100	..	..	..	..	..	..	..	..
Refrigeration machinery .	100	..	..	..	..	*	80	2	*
Castings and forgings .	100	12	..	..	2	2	48	3	5
Structural fabrication .	100	..	..	..	..	1	40	8	17
Machine tools . . .	100	8	..	..	1	1	70	2	2
Instrument	100	..	..	..	..	..	63	..	1
Internal combustion engines	100	3	..	..	*	*	70		7
Pumps and compressors	100	2	..	..	*	1	67	4	9
Chemical, drugs & pharm machinery	100	..	..	..	..	1	66	7	3
Metallurgical machinery .	100	5	..	..	1	1	70	2	3
Coal mining machinery .	100	5	..	..	2	1	69	2	3
Cotton textile machinery .	100	4	..	..		2	683	4	4
Cement machinery . . .	100	*	..	..	..	*	71	3	5
Sugar machinery	100	4	..	..	..	7	72	*	7
Paper machinery	100	3	..	..	2	2	67	2	2
Constructional machinery.	100	..	..	..	..	..	80	*	..
Earth moving machinery .	100	9	..	..	2	2	64	2	3
Agricultural machinery .	100	5	..	..	*	*	75	*	5
Other industrial machinery	100	2	..	..	1	1	70	5	2

1. Represents ex-works cost of equipment.

2. Does not exclude the cost of motors supplies as part of driven equipment.

*Less than one per cent.

Boilers	Refrigeration	Tanks structures etc.	Furnaces	Pipes valves and fittings	Instruments (industrial)	Transport equipment	Motor generator etc.	Electrical equipment	Electrical material	Misc. industrial machinery	Miscellaneous
(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
..	1	..	10	2	..	2	2	1	2
..	..	•	3	•	4	•	6	6	6	3	3
..	..	•	2	•	3	1	1	7	2	2	2
..	..	1	..	1	7	1	1	4	2	2	1
..	..	1	4	1	..	1	..	2	2	1	1
..
..
..	•	..	2	..	..	6	2	6	2
..	..	3	9	1	1	2	..	3	4	5	..
..	..	7	2	1	2	2	1	4	4	1	1
..	..	1	2	1	3	1	..	2	1	4	1
..	4	2	3	1	11	1	..	4	2	8	2
..	..	2	3	•	..	•	..	2	2	2	..
..	..	1	2	1	3	1	..	4	2	2	2
..	..	5	2	1	3	1	..	4	2	1	2
..	..	1	3	1	3	1	..	2	1	3	3
..	..	1	3	1	3	..	..	1	2	3	3
..	..	2	2	2	3	2	..	2	2	4	2
..	..	•	3	3	3	•	..	3	•	2	2
..	..	•	•	•	•	•	..	•	•	7	7
..	..	2	2	2	3	2	..	..	•	5	2
..	..	•	•	..	•	3	..	5	•	5	5
..	..	2	2	2	3	2	..	2	2	3	..
..	..	5	•	•	•	5	..	•	5	..	..
..	..	4	1	1	3	1	..	2	2	2	2

ANNEXURE III

No. M.E. IND. 9(16)/63

GOVERNMENT OF INDIA

MINISTRY OF STEEL, MINES & HEAVY ENGINEERING

(Department of Heavy Engineering)

New Delhi, the 30th September, 1963.

FOURTH PLAN

PLANNING GROUP ON MACHINERY INDUSTRIES

WORKING GROUPS

Pursuant to the decision taken at the fifth meeting of the Planning Group for Machinery Industries held on the 18th September 1963, the following Working Groups, with the broad scope as shown below, are constituted:—

I—*Electrical Power Equipment.*—Equipment required for electrical power generation, transmission and distribution, including thermal boilers, and heavy electrical equipment for electrical power utilisation, including large motors and electrical traction equipment.

II—*Transport Equipment.*—Rail and road transport equipment, including railway rolling stock and commercial motor vehicles.

III—*Steel and Metallurgical Industries Equipment.*—Equipment for steel plants and other heavy equipment for metallurgical industries.

IV—*Mining and Drilling Equipment.*—Mining, drilling and other equipment for coal, mineral ore and oil industries, including beneficiation of ores, and coal preparation and washing.

V—*Fertiliser and Chemical Equipment.*—Equipment for fertiliser, petroleum refining, petro-chemicals and other heavy chemical industries.

VI—*Machine Tools.*—Machine tools, including hand tools, small tools and heavy machine tools; welding equipment; pressing equipment; and furnaces.

VII—*Industrial Machinery.*—Equipment for cement, paper, sugar and other industries.

VIII—*Textile Machinery.*—Equipment for cotton, jute, woollen, silk and artificial fibre industries.

IX—*Structurals*.—Structurals, Cranes, sluice gates and related items.

X—*Engineering Industries*.—Items common to various industries such as castings and forgings, pipes and tubes, gears, ball and roller bearings etc.

Terms of reference.—The general terms of reference of the Working Group will be—

- (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 utilisation of manufacturing capacity and programmes of production in the consuming sectors are coordinated to the fullest extent.
- (xi) To make such other recommendations as may be relevant.

Composition.—The composition of the Working Groups are being communicated separately to all concerned. In view of the urgency it has not been possible to consult all the individuals, departments and organisations concerned. It is hoped that the full cooperation of all will be extended. It is recognised that the successful completion of this task will depend not only on the individual members of the Working Groups, but also on the departments and organisations, with which they are associated. It is requested that the benefit of the work already carried out or which may need to be done in the departments and organisations may be made available to the Working Group. The Working Group may constitute sub-groups and also coopt any persons to the Working Groups or sub-groups.

Coordination.—It is essential that the work of the Working Group is coordinated, in regard to detailed scope as well as progress from time to time, with the work or other Planning Groups and Working Groups, concerned with the related consuming sector or complementary manufacturing sectors. Each of the Working Groups includes representatives of the Planning Commission and they will be of assistance in coordination and in feeding the information from other Planning and Working Groups. It is also intended that the Chairman and Conveners of the Working Groups will meet together to discuss points of common interest.

Time schedule.—It is essential that the work is completed within the strict time schedule laid down by the Planning Commission. Recommendations on the advance action to be taken is of the highest priority. It is requested that interim recommendations on advance action may be sent as and when they are ready and in any case not later than the end of November 1963. The final report of the Working Group may be sent before the end of January 1964. The Planning Group on Machinery Industries is expected to consolidate and submit its complete report to the Planning Commission before the end of March 1964.

General.—Copies of the proceedings of the Planning Group and the basic paper on Machinery Industries prepared by the Perspective Planning Division are being circulated to all concerned. Dr. B. N. Bhargava, Perspective Planning Division, Planning Commission, has also agreed to circulate a preliminary paper for the Working Group. While the main brunt of processing the work further in the Working Group will have to be borne by the Convener, any Secretarial or other assistance will be furnished by the Department of Heavy Industries (Shri I. V. Chunkath, Under Secretary, Telephone No. 34320, Room No. 178, 1st floor, Udyog Bhavan). Copies of all papers circulated and proceedings of the Working Group may kindly be communicated to the Department of Heavy Industries (Shri I. V. Chunkath, Under Secretary), Perspective Planning Division, Planning Commission (Dr. B. N. Bhargava, Director) and Industries Division, Planning Commission, Shri M. Satyapal, Director (Industry).

(Sd.) I. V. Chunkath,
Under Secretary to the Govt. of India.