

**ESTIMATES COMMITTEE
1963-64**

FORTY-FOURTH REPORT

(THIRD LOK SABHA)

MINISTRY OF RAILWAYS

Chittaranjan Locomotive Works



**LOK SABHA SECRETARIAT
NEW DELHI**

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ESTIMATES COMMITTEE
(1963-64)

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Shri Avtar Singh Rikhy—*Deputy Secretary.*

*Elected w.e.f. 16th August, 1963 *vice* Dr. K. L. Rao ceased to be a member of the Committee on his appointment as a Minister.

INTRODUCTION

I, the Chairman, Estimates Committee, having been authorised by the Committee to submit the report on their behalf, present this Forty-fourth Report on the Ministry of Railways—Chittaranjan Locomotive Works.

2. The Committee took evidence of the representatives of the Ministry of Railways on Chittaranjan Locomotive Works on the 4th and 5th November, 1963. They wish to express their thanks to the Chairman, Member (Mechanical), and Additional Member (Finance) and other Officers of the Railway Board and the General Manager, Chittaranjan Locomotive Works for placing before them the material and information that they wanted in connection with the examination of estimates.

3. The Report was considered and adopted by the Committee on the 11th February, 1964.

4. A statement showing an analysis of the recommendations contained in the Report is also appended to the Report (Appendix IX).

ARUN CHANDRA GUHA,
Chairman,
Estimates Committee.

NEW DELHI-1;
February 14th, 1964/Magha 25, 1885 Saka.

I. INTRODUCTORY

The Estimates Committee in their 32nd Report, First Ideal Location. Lok Sabha—on Important Projects of Ministry of Railways—have dealt at length with the circumstances leading to the establishment of the Chittaranjan Locomotive Works and commended its ideal location from the point of view of availability of raw materials, water supply, drainage and climate.

2. Since 1st November, 1950 when the first W.G. locomotive was driven out of the assembly line by the President, efforts have been made to diversify its production and to expand its capacity.

3. The Chittaranjan Locomotive Works were originally planned for an out-turn of 120 average size steam locomotive units equivalent to 96 W.G. locomotive plus 50 spare boilers per annum mainly working on a single shift. This capacity was subsequently raised at an estimated cost of Rs. 2·3 crores approximately—chargeable to capital to stabilise production at 200 average size locomotives per year. This scheme, which included the extension of the covered area of the shops along with installation of additional machinery, construction of 1,000 units of staff quarters, and supply of water from the Maithon reservoir of the Damodar Valley Corporation, has practically been completed. Stabilisation Scheme.

II. STEAM LOCOMOTIVES

Production
of Locomo-
tives and
Boilers.

4. From commencement of production till the end of 1962-63, a total of 1519 steam locomotives, 19 D.C. electric locomotives and 1372 boilers have been manufactured in Chittaranjan Locomotive Works. The annual figures type-wise are indicated below:—

Year	Locomotives				D.C. Electric
	W.G.	W.P.	W.T.		
1950-51	7	..	..	..
1951-52	17	..	..	..
1952-53	33	..	..	..
1953-54	64	..	..	..
1954-55	98	..	..	..
1955-56	129	..	..	..
1956-57	156	..	..	..
1957-58	164	..	..	..
1958-59	164	..	+ 1	..	
1959-60	164	..	+ 9	..	
1960-61	173	..	..	..
1961-62	171	..	..	+ 5	
1962-63	163	6	..	+ 14	
	1503	6	10	19	= 1538

Year	Boilers			XD
	WG/WP	WT		
1952-53	11	..	..
1953-54	30	..	..
1954-55	70	..	..
1955-56	107	..	..
1956-57	120	..	..
1957-58	142	..	..
1958-59	158	+ 2	+ 2	
1959-60	166	+ 8	+ 4	
1960-61	178	..	+ 2	
1961-62	182	..	+ 5	
1962-63	181	..	+ 4	
	1345	+ 10	+ 17	= 1372

5. During 1963-64 (till January, 1964) the production of locomotives and boilers has been as under:—

	Locomotives		Electric		Total
	WG	WP	DC	AC	
1963-64 (up to Jan. '64)	97	47	2	1	147
	Boilers				
	WG/WP	XD			
1963-64 (up to Jan. '64)	147	5			152

The manufacture of boilers was started in 1952-53.

6. The Committee understand that the requirement of Broad Gauge steam locomotives for the Third Plan period has been assessed as 840. The output from Chittaranjan Locomotive Works, as mentioned above, indicates that the target would be fully achieved. *The Committee are glad that the out-turn of Chittaranjan Locomotive Works is in accord with its capacity and the Plan target.*

7. The Committee had also asked for details of orders placed on Chittaranjan Locomotive Works for the manufacture of locomotives category-wise during the last five years and the information furnished by the Ministry of Railways is detailed below.

Orders for
Locos on
Chittaran-
jan.

Year	Steam			Electric		
	WG	WP	WT	WL	DC	AC
1959-60	210	36	..	..	10	..
1960-61	107	50	20	..	11	32
1961-62	93	33	..	24	..	25
1962-63	143	73	..	..	..	37 : 2
		MG AC locomotives				

NOTE.—No orders were placed during 1958-59. Orders for 290 WGs were placed on 23rd October, 1956.

The Committee find that while the Chittaranjan Locomotive Works have been able to execute the orders for the manufacture of W.G. locomotives, there has been a time-lag of several years between the placement of order and the commencement of production in the case of WP, WT and WL locomotives. This is dealt with in the subsequent paragraphs.

8. The first order for the manufacture of 36 WP locomotives was placed on the Chittaranjan Locomotive Works on the 16th May, 1959. Till 28th March, 1962 orders for 192 WP locomotives were placed on the Chittaranjan Locomotive Works.

Manufacture
of WP Locos.

Production of WP locomotives was started towards the middle of 1962 and the first locomotive ran successful trial in February, 1963.

The Committee desired to know the reasons for the time-lag of nearly three years in the commencement of production after placing of orders for WP locomotives. The Ministry of Railways have furnished the following explanation in response thereto:—

“With a new type of locomotive, the production of which is undertaken for the first time, a longer period, namely, about 36 months, is required for the development, from trade inside the country, of the various new components, fittings,

WP locomotive is used to haul passenger trains on the main line.

steel castings, etc. and for proving and establishing such supplies and supply sources. In the factory itself, a longer period is required for the designing and manufacture of new jigs, fixtures, gauges, dies, patterns and tooling necessary for the manufacture and assembling of the locomotive.

In the case of WP locomotives, the orders for which were placed on Chittaranjan Locomotive Works for manufacture for the first time in May, 1959, approximately this period has been taken.

The design, development and manufacture of tooling had to be done currently with maintaining the level of production of locomotive (W.G.) in the factory. The nature of the fresh work that had to be done embraced the following aspects:

- (1) The tooling and design of over 1,500 items had to be done involving over 4,500 processes which had to be studied in detail, planned and organised for execution.
- (2) Certain numbers of special qualities of steel had to be procured such as in the case of bar frames which require High Tensile Steel and which is different to the type of steel normally used for WG bar frames.
- (3) Jigs, fixtures and gauges which are vital to the manufacture of the components required for the locomotive numbered over 650 and were of varying sizes and types. Each had to be designed and manufactured in advance of the commencement of production.
- (4) Dies and patterns for steel, non-ferrous and ferrous items, over 50 in number, had to be designed, manufactured, checked and proved to ensure that the required standards were achieved. Some of these patterns like those for the cylinder involve long cycle of manufacture.
- (5) No less than 45 steel castings of about 10 tons total weight per locomotive had to be developed from trade inside the country to feed the requirements of this locomotive. The indigenous supplies of steel castings already having been committed to other branches of industry considerable efforts were essential to ensure supplies to meet the needs of production. The patterns for most of these castings

had to be made in Chittaranjan to suit the specific and diverse methods adopted by the different manufacturers."

The Committee consider that the time-lag of nearly three years in the commencement of supply of W.P. Locomotives after the placement of order was unduly long. As the Chittaranjan Locomotive Works have now gathered sufficient experience and expert knowledge of manufacture of steam locomotives, every effort should be made by them to reduce the time-lag between the receipt of order for manufacture of new locomotive and its execution and delivery.

9. Production of WP locomotives in Chittaranjan Locomotive Works, has been planned as under:— Delivery of
W.P. Locos.

1962-63	.	6	
1963-64	.	75	
1964-65	.	84	
1965-66	.	64	(including 37 WPs for which orders are expected to be placed shortly).

The production of WP locomotives in 1962-63 was 6. The target for production from April, 1963 to August, 1963 was 27 WP locomotives against which only 22 WP locomotives have been turned out during this period.

Asked about the reasons for the shortfall, the representative of the Ministry has stated, during evidence, that difficulties are being experienced in getting steel castings in accordance with the schedule of production for WPs. TELCO are, however, expected to supply adequate quantities of castings in future. Arrangements are also being made for getting these castings from other indigenous manufacturers. It is hoped that over the Plan period it would be possible to manufacture the requisite number of WP locomotives. In the meantime, production will be maintained by manufacturing additional WGs and the adjustment will be made later on by manufacturing less WGs and more WPs in order to complete the requisite number of each type.

As WP and WG** locomotives have distinct uses, and are not precisely inter-changeable, the Committee would stress that every effort should be made to produce the requisite number of locomotives of each type during each year, as originally scheduled.*

WP is meant for hauling passenger traffic.

WG is meant for hauling goods traffic.

**Manufactures
of WT
Locomo-
tives.**

10. Orders for manufacture of WT* locomotives have been placed on Chittaranjan Locomotive Works as under :-

Date of order	No.	Remarks
(i) 16-4-1955	10	Prototype
(ii) 14-4-1960	30	Reduced to 20 on 16-10-1962.
(iii) 17-5-1961	47	} Order withdrawn on 16-10-62 and substituted by orders for 92 WGs and 24 WLS.
(iv) 31-5-1962	59	

Production on the prototype order for 10 WTs was started in the latter half of 1958 and completed in 1959-60. Production of the other 20 WT locos has not yet been commenced.

The Committee desired to know the reasons for cancelling the orders for supply of 106 WT locomotives which had been placed in 1961 and 1962. In reply, the Ministry of Railways have stated as under:—

“Initially it was anticipated that during the Third Plan 136 WT locomotives would be required for traffic requirements, the break-up of which was 44 WTs on replacement account and 92 on additional account.

The WT locomotive is designed as a shunting, suburban and branch line passenger steam locomotive. On a subsequent review of the traffic requirements taking into consideration the developing trend of traffic, it was decided that the replacement requirements of 44 locomotives could be more suitably met by 20 WT locomotives and 24 WL locomotives. Accordingly it was decided that 20 WTs and 24 WLS should be planned for manufacture in Chittaranjan Locomotive Works.

With regard to the 92 locomotives on additional traffic account, on re-examination it was considered that it would be more suitable to order these locomotives as 92 WG locomotives so that the WG locomotives could be placed on main lines goods services, withdrawing older types of locomotives from such services and relegating them to shunting and branch line traffic requirements. This arrangement was considered to be more advantageous from the overall operational point of view. Accordingly, the earlier proposal of ordering these locomotives as WTs was changed to 92 WGs.

With the above arrangements, the requirements are expected to be adequately met and the order for

* WT locomotive is designed as a shunting suburban and branch line passenger steam locomotive.

WT locomotives on Chittaranjan Locomotive Works against Third Plan's requirements would now be only 20."

The Committee note from the above reply of the Ministry that the older locomotives are proposed to be relegated to shunting and branch line traffic requirements. The Committee desired to know in this context the relative economics of utilising WG and WT locomotives for suburban, branch line and shunting operations. The reply received from the Ministry of Railways is reproduced in Appendix I. It has been stated *inter alia* therein that :

Suburban : WG locomotive is essentially a goods locomotive for main line operation. It is unsuitable for suburban traffic on account of technical and other considerations. It is also a tender locomotive which cannot be turned round at terminus stations where turning facilities are not usually provided.

WT locomotive is a powerful tank locomotive designed for suburban services and is suitable for operation in either direction.

Branch Line : Regarding branch line traffic, the tracks on branch lines are generally not capable of taking the heavy axle load of a W.G. locomotive. For such services and where turning facilities are provided at the terminus, lighter axle load locomotives are now used. Moreover, the trains on branch lines do not contain more than 10 coaches. The WG locomotive is unduly heavy and more powerful than necessary for such trains.

Shunting : The WG locomotive, although designed as a main line unit, can be used on shunting service but the fuel consumption would be very high since the load factor on a shunting locomotive is of a low order and the standby losses on a large grate area would affect fuel economy. The WT locomotive is a medium duty shunter capable of hauling loads upto 1600 tons in goods yards other than hump yards."

The Ministry of Railways reply concludes by saying that "In this context an economic comparison between WG and WT locomotives for the suburban and branch line operations would not be realistic. . . . An economic comparison between WG and WT locomotive for shunting services will also not be realistic." *The Committee are somewhat at a loss to understand how the Railways propose by relegate the older locomotives to meet "shunting and branch line traffic requirements" when admittedly an economic*

comparison cannot be made between WG and WT locomotives. They would suggest that the position may be carefully reviewed by the Ministry of Railways having the regard to the need for employing an economic locomotive for suburban, branch line and shunting operations.

Cost of
Manufacture
of WG
Locomotive.

11. The average unit cost per WG loco turned out in 1962-63 was Rs. 4.31 lakhs excluding proforma dividend and Rs. 4.77 lakhs including proforma dividend. The figures for 1962-63 and those for the preceding years are shown below for comparison:—

(Figures in thousands of Rs.)

Year	No. of locos	Labour	Cost of materials	Over heads	Total excluding proforma dividend	Proforma Dividend	Total including proforma dividend
1950-51	7	4	657	52	713	128	841
1951-52	17	19	375	353	747	128	875
1952-53	33	25	302	467	794	128	922
1953-54	64	22	316	237	605	119	724
1954-55	98	15	389	129	533	73	606
1955-56	129	17	286	135	438	62	500
1956-57	156	16	265	126	407	48	455
1957-58	164	18	250	141	409	45	454
1958-59	164	19	254	136	409	48	457
1959-60	164	20	257	133	410	47	457
1960-61	173	21	243	143	407	46	453
1961-62	171	23	238	152	413	46	459
1962-63	163	23	243	165	431	46	477

The Ministry of Railways have stated that the cost of production of WG locomotive progressively came down to the figure of Rs. 4.07 lakhs in 1956-57 when the production was stabilised. The cost during the years 1957-58 to 1960-61 shows only a minor variation *vis-a-vis* the lowest cost reached in 1956-57. As regards the increase in cost of manufacture of Rs. 24,000 in 1962-63 as compared to 1960-61, the reasons therefor as furnished by the Railways are reproduced in Appendix II.

The Ministry of Railways have in conclusion stated that:—

“In all industrially advanced countries, the rate of increase in the price of finished goods is approximately 3 to 5 per cent. per year. Chittaranjan Locomotive Works have been straining to keep down the cost of production by absorbing the various increases in prices by higher productivity. A stage of productivity has been reached where it is no longer possible to hold the cost

line under the impact of increase due to governmental action and general increase in prices of raw materials and components.”

The Committee desired to know how the price of WG locomotive compared with the price which used to be paid for its import. It has been stated in evidence that the landed price of an imported locomotive including customs duty was about Rs. 5·35 lakhs and about Rs. 4·85 to Rs. 5·25 lakhs excluding the customs duty. The Committee also desired to know how WG locomotive manufactured in Chittaranjan compared in operating performance running and maintenance cost with WG locomotive imported from abroad. The Ministry of Railways have stated in reply that :—

“No actual comparative study has been made. Experience as well as observations made by our engineers incharge of operations and maintenance, however, indicate that the performance, reliability and efficiency of the Chittaranjan built locomotives compare favourably with those of their counter-parts of imported origin.

The manufacture of locomotives in Chittaranjan has been established following the best traditions and practices in the locomotive manufacture in a modern factory with the technical assistance and collaboration of a leading steam locomotive firm in U.K., namely North British Locomotive Co. Ltd. The technique methods of manufacture, material standards, manufacturing tolerance and inspection all follow the same high standards and specifications as generally earlier followed in the case of similar locomotives of imported origin and no relaxation whatsoever has been permitted in any of these details in the Chittaranjan manufactured locomotives and the high standards have been scrupulously maintained so that we have every reason to believe that the steam locomotive manufactured at Chittaranjan is of a standard comparable to that of an imported locomotive in all respects.”

The Committee are glad to note that the Chittaranjan manufactured locomotives compare not only in performance but also in price favourably with the locomotives which used to be imported from abroad. The Railways can justifiably be proud of having brought down the cost of manufacture from Rs. 7·94 lakhs in 1952-53 to Rs. 4·31 lakhs in 1962-63. The Committee have no doubt that strenuous effort would continue to be made to keep down the cost of manufacture of new locomotives W.P., W.T., etc. which have lately been taken up for manufacture.

Improvements in Design, Manufacturing Process etc.

12. The Committee desired to know the improvements that have been effected in the locomotives manufactured at Chittaranjan during the last three years under the following headings :—

- (i) improvements in design;
- (ii) improvements in the manufacturing process;
- (iii) improvements in maintenance; and
- (iv) safety.

The reply received from the Ministry of Railways is reproduced in Appendix III.

The Committee also desired to know whether there have been any instances of manufacturing defects in Chittaranjan locomotives. The Committee are informed that there have been sporadic complaints during certain periods mainly on two aspects—

- (i) defective rivetting of boiler joints.
- (ii) ridging of steam chest liners and heavy wear in these liners.

With regard to the former, besides taking remedial action for tightening up the inspection and manufacturing technique, the design of the boiler has also been changed from rivetted construction into welded design, using butt welding of circular and longitudinal seams at the barrel joints. With regard to the latter, centrifugally cast liners are used now instead of sand cast liners to reduce the incidence of this defect.

Other minor defects as reported from time to time in respect of boiler seams, seatings and stays etc.; leaky and minor defects of other loco components, have received due attention and remedial measures taken there and then to minimise, if not eliminate, the occurrence of such defects on subsequent builds. The Committee understand that though no detailed figures to show the effect of improvements in design and in manufacturing processes on the cost of locomotives have been maintained separately, the data regarding reduction of man-hours in the manufacture of a locomotive indicates that 776 man-hours have been saved per locomotive on this account.

The Committee are glad to find that the Chittaranjan Locomotive Works are fully alive to the need for continuously improving the design and manufacturing processes with a view to effecting not only reduction in cost but also improving efficiency.

Fuel Economy.

13. The Committee desired to know the improvements effected in design to achieve economy in consumption of fuel. The Ministry of Railways have stated in reply that:—
 “Indian coals have high volatile content and in order to obtain maximum heat released from the coal

burnt, it is necessary to provide adequate supply of air for complete combustion of the volatile gases released from the fire bed. Preliminary trials indicated that improvement in combustion can be achieved if air is admitted in sufficient quantity at the right location. The proposed design meets these requirements by admitting air through the ducts over the fire brick arch. It is expected that this will result in improved steam generation and efficiency of the locomotive will be enhanced thereby."

It is also proposed to take the following measures to reduce fuel consumption :—

- (i) Fitting of Giesel Oblong Ejector on smoke box to improve fuel consumption and cylinder efficiency. Manufacture of components is in progress at present for trial in 12 WG and 12 WP boilers.
- (ii) At present thermal insulation is provided only on that part of the boiler back within the cab mainly as a protection to the engine crew. Trials indicate that complete insulation of the boiler results in a fuel economy of 2 per cent. approximately. Design of complete boiler insulation was evolved for certain standard locomotives bearing in mind the need for prolonged life of the insulation. It is expected that this modification will reduce the fuel bill of railways and will reduce steaming time. The implementation of this design is at present held over on account of paucity of foreign exchange for the asbestos insulation fibre.

The representative of the Ministry of Railways has stated in evidence that the work on the design for over-fire air arrangement for improving combustion efficiency has been taken in hand but has not yet been actually incorporated in the steam locomotives being manufactured.

As regards fitting of Giesel Oblong Ejectors on smoke boxes of locomotives, the work is in hand and these are expected to be fitted on to 12 WG and 12 WP locomotives shortly. If the trials are successful, the measures would be extended to other locomotives.

Asked about the cost of asbestos required for the complete boiler insulation of a steam locomotive, the representative of the Ministry has stated that the value of asbestos required for a locomotive will be about Rs. 5,500 out of which Rs. 800 represent the component of foreign exchange required for imports. It is estimated that the overall saving resulting from complete boiler insulation will be about Rs. 2000 to Rs. 2500 per locomotive per year. The difficulty in going ahead with the measure is not its cost

which is low but the release of foreign exchange for its import content. It is hoped that a local firm may undertake the manufacture of this insulation material when the experiment may be resumed.

The Committee suggest that limited quantities of insulation materials may be imported and the necessary field trials carried out, so that the efficacy and economics of the insulation are established. They have no doubt that if field trials demonstrably prove that a substantial economy would be effected in fuel consumption, the Government would either allow imports of the requisite insulation material, involving a nominal cost of Rs. 800 - per locomotive, or ensure its indigenous manufacture.

As the Railways continue to have a large number of steam locomotives and have also expert knowledge and experience of their manufacture, the Committee would stress that measures for effecting fuel economy should be intensified further. In this context, they would suggest that the active help of the Central Fuel Research Institute, Dhanbad, may also be taken.

Replacement
of Overaged
Locomotives.

14. In the Third Five Year Plan the Railways have provided for the replacement of 614 overaged locomotives. During evidence the representative of the Ministry of Railways has stated that although 614 locomotives have been put down for replacement, it is likely that only 500 locomotives may be taken off from service, as all the remaining are needed for traffic.

The Committee are informed that the actual condemnation and withdrawal of a locomotive is done on condition-cum-obsolescence basis.

The Committee would stress that every locomotive which is due for superannuation be fully examined also from the point of view of safety, maintenance costs and operating expenses and should be retained in service, if its use is not uneconomical.

III. ELECTRIC LOCOMOTIVES

15. In July, 1959, the Railway Board placed an order for the manufacture of 10 D.C. electric locomotives on Chittaranjan Locomotive Works. Another order for 11 D.C. locomotives was placed in 1960-61. The Chittaranjan Locomotive Works started work on the manufacture of these locomotives in August 1960 and have completed the supplies by August, 1963. This would be sufficient to meet the requirements of the Railways for D.C. locomotives for the Third Plan period.

D. C. Electric Locomotives.

16. During 1961-62, the Railway Board indicated to the Chittaranjan Locomotive Works that they would have to develop capacity for manufacture of 6 A.C. Electric locomotives per month in addition to the normal out-turn of steam locomotives. On the basis of the Project Report, prepared by the Chittaranjan Locomotive Works, the Railway Board have sanctioned Rs. 2.26 crores for developing manufacture of electric locomotives in the Chittaranjan Locomotive Works. The Committee are informed that the work on the Electric Loco Project is progressing according to schedule. 35% of the plant and machinery have been procured and construction of 10 to 15 per cent of factory buildings completed. The Project is expected to be completed as scheduled.

A. C. Electric Loco Project.

17. The first A.C. Electric locomotive has been turned out by the Chittaranjan Locomotive Works on the 16th November, 1963. This was assembled in Chittaranjan Locomotive Works from the parts received by them in a knocked down condition. From the material furnished by the Ministry to the Study Group of the Committee, they find that the production of A.C. locomotives in the Chittaranjan Locomotive Works was originally planned as under:—

Production of A. C. Electric Locomotives.

- | | |
|---|---|
| (i) Production of A.C. Freight locomotives. | Expected to commence in May/June 1963 and 12 locos to be completed by December, 1963. |
| (ii) Production at the rate of 3 per month | January to June 1964. |
| (iii) Production at the rate of 4 per month | July to December 1964 |
| (iv) Production at the rate of 5 per month | January to June 1965 |
| (v) Production at the rate of 6 per month | July 1965 onwards. |

It has been stated during evidence, by the representative of the Ministry of Railways, that two locomotives would be produced per month till the middle of 1964*.

*The revised target for production of electric locomotives is 10 by the end of arch. 1964 and this is expected to be reached.

The Committee find that originally the target was to develop capacity for manufacture of three locomotives per month from January to June, 1964.

The Committee find that the demand for Broad Gauge A.C. locomotives for the Third Five Year Plan has been assessed as 244 out of which only 107 are at present programmed to be manufactured in Chittaranjan Locomotive Works, the balance (137) to be imported from abroad.

The Committee would stress that every effort should be made to increase the output of A.C. locomotives in Chittaranjan Locomotive Works to meet the demand to the maximum extent possible. The Committee would, in fact, suggest that as steam locomotives are on the way out all over the world, it would but be appropriate that from now onwards a long-term and well-planned scheme for the conversion of Chittaranjan Locomotive Works to the manufacture of electric locomotives (both Broad Gauge and Metre Gauge) is drawn up and implemented to make India self-sufficient in electric traction.

It has been stated during evidence that the cost of electric locomotive* is about the same as of imported locomotive. One of the senior officers who was deputed to assist the North British Locomotive Co., United Kingdom in preparing the Project Report for undertaking manufacture of A.C. locomotives in Chittaranjan has estimated that "the total approximate cost of manufacturing an electric loco will work out to Rs. 10 lakhs, a figure very much below the cost of an imported locomotive." The Committee have no doubt that as in the case of steam locomotive, no effort would be spared to bring down the cost of manufacture of electric locomotives in Chittaranjan below the cost of an imported electric locomotive.

Agreement with M/s. Group for manufacture of electric locomotives.

18. For the manufacture of A.C. locomotives in the Chittaranjan Locomotive Works, the Government entered into an Agreement with Messrs. Group on 3-11-1962. According to the terms of Agreement, the Group will render information and assistance to Chittaranjan Locomotive Works for the manufacture of the mechanical parts and assembly of the locomotives manufactured in the Chittaranjan Locomotive Works. The Group will also afford facilities for training, free of charge, to the Indian engineers and other personnel in design offices and workshops on design, manufacture and erection of locomotives.

Development of indigenous sources for manufacture of equipment for electric locomotives.

Ans. It is noted from the Agreement entered into by the Government with the Group that the latter have not granted them the right for the manufacture of certain electrical equipment whose value in terms of total cost of

The cost. of A.C. locomotive is estimated at Rs. 12 lakhs.

electrical equipment works out to 39·8 per cent. It was stated during evidence that the right could not be given by the Group as "they were dependent on other suppliers for that". The items concerned are as follows:—

- "(i) High-voltage tap-changer and Air Blast Circuit-breaker;
- (ii) Rectifier and Pantograph;
- (iii) Non-specific traction materials such as standardised products, cables and batteries; and
- (iv) Equipment not manufactured by the Group or containing components bought by the Group from Sub-suppliers such as measuring instruments, heating, lighting, ventilation, transformer cooler, push buttons, filter, small auxiliary compressor, small relays, earthing devices."

The Agreement, however, provides* that the Group will ensure the indigenous manufacture of high-voltage tap-changers to the maximum extent possible within three years of the signing of the Agreement. The Agreement also provides that in case the manufacture is not started in India either by Brown Boveri & Co. Ltd. or in collaboration with an Indian firm, the Group will render necessary technical assistance for their manufacture in a designated railway workshop. *The Committee would stress that the Railways should keep a close watch over developments for the manufacture of high-voltage tap-changers in the country either in the public or private sector.*

* The relevant clause II(c) from Agreement is reproduced below:—

- (i) To ensure indigenous manufacture to the maximum extent possible within three years of signing this Agreement of high voltage tap-changer (used in the locomotives) of Brown Boveri and Co. Ltd., design either by their partners Brown Boveri & Co. Ltd., or in collaboration with an Indian firm, or
- To grant to the Government manufacturing rights and all the necessary technical assistance, if the manufacture of high voltage tap-changer as aforesaid is not started within two years under conditions similar to those in this Agreement to enable manufacture of the said item in a railway workshop provided the designated railway workshop is not in any respect collaborating with a competitor of Brown Boveri & Co. Ltd.
- (ii) To give all necessary purchase and testing specifications etc. in respect of all the equipments and materials under items II(b) (ii) to (iv) to enable their purchases by the Government.
 - (iii) To supply information and specifications for materials under item (iv)* of clause II(b) as may be available with them to enable Government to develop indigenous manufacture.

They would also suggest that for the remaining items, the Railway Board should constitute a small expert body consisting of representatives of Railways, International Trade, Heavy Electricals and the industry to locate urgently the indigenous sources for the manufacture and supply of equipment.

Payments to Group for improvements in Design.

20. The Committee note from clauses II(d) and V(a) of the Agreement* that while Government have to communicate to the Group the improvements effected in the material manufactured in India under the Agreement and the Group have the right to utilise the improvement free of charge, the Government have undertaken to pay a lumpsum amount to the Group for development and improvement made available by the Group within a period of two years prior to the expiry of the period of the Agreement.

In response to a question the representative of the Ministry stated during evidence that—

“The Group had agreed to place at our disposal the technical know-how which has to be developed during the next few years and they have accordingly related the amount payable. In case of new developments in the concluding years of the agreement, they will not have been adequately compensated either by way of a lumpsum payment or other benefits. It had therefore to be agreed to in the contract that the Government of India will have to purchase those developments and improvements made by the Group during the period of the concluding two years, which would not have been adequately exploited by the company so as to compensate them for the cost of developments. And we had not succeeded in getting them agree to our terms.”

*The relevant clauses II(d) and V(a) are reproduced below:—

II(d): On the expiry of the period of this Agreement, the Government will have the right to continue manufacture of the equipments covered by this agreement without being required to make any extra payments to the Group, save in respect of items of development and improvement made available to the Government within a period of 2 years prior to the expiry of the period of the agreement for which, in addition to the current fees during the period of the Agreement, a reasonable lumpsum payment shall be negotiated, provided however, such lumpsum payment shall not exceed an amount calculated on the basis of 3 per cent or 2½ per cent, whichever rate may be applicable at that time for the consultation fee, of the Indian costs of production of such item for such quantity of electrical equipments as produced by the Government during the period of two years preceding the year in which such item has been made available to the Government.

V(a): The Government shall communicate to the Group the improvements effected in the material manufactured in India under this Agreement and the Group will have the right to utilise these improvements free of charge

A further written note received on the subject from the Ministry is reproduced in Appendix IV.

It is understood that the Railways have not so far passed on any suggestion for effecting improvement in electric locomotive to the Group.

The Committee are not convinced with the reasons advanced by the Government. In this connection, they would like to state that the Agreement concluded with the American Locomotive Co. for the manufacture of diesel locomotive makes the following provision:—

“Alco hereby undertakes during the period of this Agreement to communicate without additional cost to the Government through the General Manager any technical improvement relating to their designs of Diesel locomotives which Government has acquired, and processes of manufacture of components, assemblies and such methods of time study and production and material control as may be developed in its works from time to time pertaining to such designs provided that the foregoing undertaking shall not apply to any information which Alco is under legal obligation to any third party not to disclose. Similarly the General Manager shall take reciprocal action with Alco as regards any developments at Diesel Locomotive Works in respect of locomotives of Alco designs acquired by the Government.”

The Committee feel that it would have been more equitable if a provision regarding free exchange of information of improvements between the Group and the Government could have been provided on the same lines as done in the Agreement with the American Diesel Locomotive Company to cover the full 8 year period of the Agreement without excluding the last two years. They would also emphasise that in future agreements it may be ensured that the exchange of information of improvements effected is done on reciprocal basis and on equitable terms.

21. The manufacture of electric components listed in Schedule 'B' to the Agreement concluded by the Railways with the Group is to be undertaken by Heavy Electricals Ltd., Bhopal on behalf of the Government. It is expected that the Chittaranjan Loco Works will be producing 10 electric locomotives in 1963-64, 31 electric locomotives in 1964-65 and 66 in 1965-66. Against this production schedule Heavy Electricals will be supplying traction motors, transformers and inductive shunts only for 10 locomotives in 1964-65 and 26 locomotives in 1965-66.

*Supply of
Electric
Traction
Motors and
Transformers
by Heavy
Electricals.*

The Committee understand that most of the drawings required for the manufacture of traction motors and transformers have been passed on by Messrs Group to Heavy

Electricals and further negotiations are going on between them for importing the necessary components for manufacture. Heavy Electricals have not, however, started so far the actual manufacture of these components.

During evidence the representative of the Ministry of Railways stated that a Senior Electrical Engineer has been posted by the Chittaranjan Locomotive Works to watch the progress of manufacture of components to be supplied by the Heavy Electricals. The Railways do not, however, know whether the Heavy Electricals would be able to meet in full their requirements of components.

The Committee would stress that the manufacture of A.C. freight loco-motors and A.C. loco-transformers etc. should be undertaken by the Heavy Electricals without delay so that the requirements for the manufacture of electric locomotives are met indigenously as far as possible. The Committee would also suggest that to avoid uncertainty, a detailed schedule may be drawn up for the manufacture and supply of these components by Heavy Electricals to the Chittaranjan Locomotive Works.

IV. STEEL FOUNDRY

22. On the 21st January, 1960, the Government of India entered into an Agreement with Messrs F. H. Lloyd and Company Limited of U.K. for the setting up of a Steel Foundry of the capacity of 7,000 tons in the Chittaranjan Locomotive Works. *Agreement for setting up of Steel Foundry.*

23. The establishment of steel foundry in the Chittaranjan Locomotive Works was thought of to meet on an economical and efficient basis the requirements of steel castings etc. for the manufacture of locomotives and other rolling stock.

24. Global tenders were invited by the Government in March, 1957 for technical collaboration for setting up the steel foundry. 15 quotations from firms of various countries were received in response to the tenders. The collaboration fee demanded by these firms is indicated in the statement at Appendix V. The quotations were examined by a Tender Committee, consisting of three Directors of Railway Board, who recommended only four offers [namely, from Poland (S. No. 6 of Appendix V) Germany (S. No. 9 of Appendix V) United Kingdom (S. No. 11 of Appendix V) Canada (S. No. 14 of Appendix V)] which appeared to be reasonable in price and generally satisfactory in other aspects for making further enquiries. Enquiries, including inspection of these firms abroad by Railway's Inspecting Officers revealed that none of these tenderers could satisfy the essential pre-requisite of adequate knowledge of modern steel foundry practices. While the enquiries were in progress, Messrs Komatsu Manufacturing Company of Japan, submitted, entirely on their own accord, a revised offer quoting collaboration fee of Rs. 14,95,236 against their original quotation of Rs. 48.31 lakhs. Meanwhile an offer was also received from Messrs F.H. Lloyd and Company U.K. for Rs. 33,33,333 though they had not submitted any quotation in response to the original tender enquiry. This offer was reduced to Rs. 13,33,333 subsequently by a Director of the firm who visited India and studied the situation on the site.

25. When Messrs Komatsu Manufacturing Company of Japan, were asked whether they were prepared to revise their offer they quoted ultimately a fee of Rs. 12,38,094 plus inspection and commission of Rs. 69,000 making virtually a quotation of Rs. 13,07,094 against the Lloyd's quotations of Rs. 13,33,333. In view of this small difference the Railway Board thought that "the merits of the tenderers could

appropriately be considered mainly on the basis of relative technical superiority. For setting up a steel foundry of this capacity and turnover, it is of the highest importance to ensure that the castings produced are of the best quality with lowest possible rejections. The Japanese firm had steel foundry business from 1921 and had also been favourably reported on by the Additional Member, Mechanical after his visit to Japan in May, 1958. Messrs Lloyd and Company however, had a much longer standing, having started in 1875 and had considerable experience with the quality and range of production in respect of steel castings for Chittaranjan Locomotives."

The Committee are further informed that having regard to experience, technological advancement and training facilities, as well as the advantage of a common language, the facility of which would not have obtained to the same extent in respect of the Japanese tenderer a decision was taken by the Railway Board in favour of Messrs Lloyd and Company. Moreover, there was an advantage from the point of view of foreign exchange in respect of the tender of Messrs Lloyd and Company over the tender of the Japanese firm to the extent of Rs. 1,16,191.

The Estimates Committee while taking note of the steel foundry project in their Thirty-Second Report (May, 1956) had observed: "The Committee hope that the proposal will be finalised without undue delay." The Committee, however, find that the agreement with the collaborators was signed after nearly three years in January, 1960 only. Considering the patent need for setting up the foundry, the Committee feel that the collaboration arrangement should have been finalised with greater sense of urgency.

*Decision
to raise
capacity
from 7000 to
10,000 tons.*

26. The Committee are informed that in March, 1961, the Government decided to increase the capacity of the foundry from 7,000 tons to 10,000 tons per annum for the following reasons:

"The requirement of steel castings on the Railways was gradually increasing and lot of difficulties were being experienced in their procurement due to shortage of capacity for the manufacture of steel castings in the country. It was, therefore, decided that instead of setting up the steel foundry with a capacity of 7,000 tons per annum and expanding it at a later date to 10,000 tons per annum, it was advisable to set up the foundry with an initial capacity of 10,000 tons per annum, particularly in view of the fact that no gap was visualised between the requirements as originally anticipated at the time of originally planning and issuing global tenders for this project and the current requirements. This

decision also meant that the foundry would be set up with an improved layout of the machinery and plant with no likelihood of some of the items of machinery and plant having to be shifted for operational needs with the increase in the covered area as would have been necessary as per the original planning."

During evidence the Committee has been informed that when the steel foundry for 7,000 tons were planned the Diesel Locomotive Works Varanasi was not in the picture. The components required for the diesel locomotives were specialised items which were not similar to the items required for general run of casting. It has been added that the additional 3,000 tons manufacture were for more complicated items like Co-Co bogies for diesel locomotives.

27. The Committee desired to know whether any tender had been called on global basis for increasing the capacity of the foundry from 7,000 tons to 10,000 tons. The Ministry of Railways have stated in reply that "the proposal to cover the increased capacity of the foundry had necessarily to be dealt with by the collaborators with whom Chittaranjan had already entered into an agreement for setting up the Steel Foundry... Tenders were not called for consultancy services and technical collaboration for increasing the capacity of the Steel Foundry. The collaboration terms to cover the enlarged scope of the Project were, therefore, settled by negotiation with Messrs F. H. Lloyd."

The representative of the Ministry stated during evidence that Messrs. F. H. Lloyd had originally quoted £3,05,000 as fee for setting up Steel Foundry of 10,000 tons capacity. This fee was considered too high and, therefore, it took some time to hold the discussions with them and bring it down to £1,45,000. The details of the Supplemental Agreement are understood to have been finalised by correspondence and the formal agreement has been signed in November, 1963. *Apart from the fact that unduly long time has been taken in negotiating and signing the Supplemental Agreement with Messrs. F. H. Lloyd and Company, Limited, the Committee are not able to appreciate the need for it as they find that the original agreement with the Company specifically provided that :*

"(a) the drawings, specifications layout of the foundry buildings and services, etc. shall be such as will enable to manufacture therein on an efficient and economical basis approximately 6,000 tons annum of good quality steel castings of all sizes, shapes and specifications required for locomotives and other rolling stock and also approximately 1,000 tons/annum of austenitic

manganese steel castings for railway track use, all these with necessary heat treatment, quenching facilities, etc.

- (b) the drawings, layouts, etc. shall also be such as would permit of convenient expansion for the manufacture of approximately 10,000 tons/annum."

As already noted in para 25, there was an initial delay of three years in finalising the Agreement with M/s F. H. Lloyd & Co. Ltd. to start the Steel Foundry. If this period had been put to effective use the Steel Foundry of 7,000 tons capacity would already have been completed by 1961 and then it should have been possible for the Railways to raise on their own the capacity to 10,000 tons.

The Committee, therefore, feel that an additional supplemental payment of £45,000 (Rs. 6 lakhs) to the collaborators for increasing the capacity to 10,000 tons was not altogether unavoidable.

Disproportionate Increase in Recurring Annual Expenditure.

28. The estimated annual recurring expenditure on the steel foundry with 7,000 and 10,000 tons capacity is indicated below :

	7,000 Tons capacity	10,000 Tons capacity
	(Figures in lakhs of Rs.)	
(a) Labour	13.00	26.62
(b) Stores	37.38	82.78
(c) Energy consumption	8.00	10.00
(d) Maintenance of plant and machinery including cost of spares	10.00	18.00
(e) Depreciation of building plant and machinery	14.35	23.00
(f) Interest (Dividend at 4 per cent of capital of 3.7 and 6.31 crores)	14.80	25.24
(g) Factory, Administrative and Township overhead	22.47	32.43
TOTAL	120.00	218.07

The percentage of increase of expenditure under some of the important heads for the foundry of 10,000 tons capacity as compared to 7,000 tons is as follows :

Labour	100%
Stores	Over 120%
Depreciation of building, plant and machinery	Over 61%

There will be thus a steep and disproportionate increase in the recurring annual expenditure on the steel foundry with 10,000 tons capacity as compared to 7,000 tons capacity.

The Ministry of Railways have furnished the following explanation about the increase in the annual recurring expenditure :

"The annual recurring expenditure on the 10,000 tons capacity foundry is out of proportion to the

increased outturn against labour and material and against Depreciation and Interest on account of inclusion of Co-Co bogies in the production programme. At the same time it is pointed out that the total value of the manufactured castings is much more and gives a more favourable return on outlay than the 7,000 tons/annum project i.e. the return on capital outlay of Rs. 6.31 crores is 15 per cent as against 11 per cent on Rs. 3.7 crores after allowing for the interest charges in both cases. Besides this advantage, there would be a saving of foreign exchange to the extent of Rs. 1.1 crores per annum as no other indigenous foundry can manufacture the intricate and heavy Co-Co bogie castings."

The Committee also note that in the 7,000 tons capacity foundry, the estimated cost of production per ton is Rs. 1,715 whereas in the 10,000 capacity foundry, the cost per ton is estimated at Rs. 2,180. It was stated that one of the main reasons for this increase is the provision for casting of Co-Co bogies required for diesel locomotives which cost as much as Rs. 6,000 per ton.

The Committee are not convinced with the explanation advanced above and would like the Ministry of Railways to carefully review the reasons for this disproportionate increase and to see what economy can be achieved.

29. The agreement with Messrs. F.H. Lloyd and Company Limited provides that "the designs and specifications shall be such as would enable the most economical outlay in the construction thereof and shall as far as possible take the due note of indigenous resources of materials". It has been stated during evidence that out of the total cost of Rs. 3.1 crores for plant and machinery Rs. 90 lakhs will be spent on import of specialised items of machinery and plant from abroad, the rest of the equipment being obtained indigenously. It is added that even in respect of some of the specialised items of equipment required to be imported, the Railways had tried to explore with the manufacturers the chances of manufacturing it indigenously. The desire is that only the essential parts for which the technical "know-how" is not available in the country should be imported.

Utilisation of Indigenous resources for installation of Foundry.

While the Committee are glad to note the efforts being made by the Railways to increase the indigenous contents in the installation of the steel foundry, they also note that the imported contents of the machinery would constitute about 29 per cent. of the total outlay on plant and machinery. They would suggest that every effort should be made to further reduce the quantity and value of imported components and to locate indigenous sources of manufacture of equipment, in consultation with the Ordnance

Factories who have previous experience in installation of such foundries and the Department of Technical Development.

**Essential
Raw
Materials
required for
Steel
Foundry.**

30. The Committee note from the Report of the Indian Productivity Team on Foundry Industry (1961) which visited various foundries in India, Sweden, U.S.A. and Japan, that the Indian Foundries suffer from lack of adequate and regular supplies of a number of essential materials such as :—

- (i) Foundry pig iron Gr. I and II, graded scrap for steel melting and low phosphorous pig iron for the malleable iron industry.
- (ii) Processed raw materials like high quality silica sand, bonding materials, core oils and binders etc.
- (iii) Inadequate development of auxiliary industries to supply according to specification the various items for the foundry industry such as chaplets, moulding boxes, pins and bushes, etc.
- (iv) The high ash content of coke which necessitates the employment of high fuel ratio as well as the difficulties experienced in getting adequate supplies of coke in different regions of the country.
- (v) Lack of adequate pattern-making capacity, especially metal patterns and core boxes for mechanised foundries for mass-produced items.
- (vi) Lack of easy availability of foundry equipment and machineries from indigenous sources.
- (vii) High inventory of foundry raw materials and spare parts due to the difficulties in getting regular supplies.
- (viii) Lack of trained technical personnel both at supervisory and non-supervisory levels.

The approximate annual consumption of the important raw materials for the steel foundry in the Chittaranjan Locomotive Works, when it goes into full production is estimated as under :

	Tons
(a) Steel scrap	14,500
(b) Silica sand	15,000
(c) Graphite electrodes	120
(d) Lime stone	900
(e) Ferro Silicon	96
(f) Ferro Manganese	96
(g) Fluospar	140

(h) Bontonite	1,900
(i) Petroleum coke	120
(j) Iron ore	120
(k) Pig Iron	120
(l) Aluminium	12
(m) Silica Manganese	96

The Committee desired to know the arrangements made by the Railways for ensuring supply of these raw materials for the foundry. The Committee have been informed by the Ministry of Railways that necessary arrangements in this behalf have been made as per details indicated in Appendix VI. The Committee are glad to note that arrangements for ensuring supply of raw materials for the foundry have been made and that no difficulty is apprehended in this behalf.

31. The Committee understand that the estimated recurring annual expenditure on account of stores for a production level of 10,000 tons of steel castings per annum would be Rs. 82.78 lakhs. Of these raw materials, the Chittaranjan Locomotive Works would be importing materials worth Rs. 6,59,270 according to the present estimates. The quantities of material required along with their cost are given below :

Imported Raw Materials required for Steel Foundry.

- (i) Graphite electrodes of electric arc melting furnace—Total consumption per year is estimated at 300 tons at a cost of Rs. 2,050 per ton.
- (ii) Iron powder for powder washing machine used for removal of excess metal in castings at locations which are not easily accessible by normal mechanical metal removing tools. The total consumption per year is estimated at 7 tons at a cost of Rs. 1,900 per ton.
- (iii) Fluorspar—Material used in the electric arc furnace. Total estimated consumption is 42 tons per year at a cost of Rs. 535/- per ton.
- (iv) Copper quality graphite electrodes for Arc Air equipment for removal of metal from castings. Total estimated consumption is 12,000 electrodes at a cost of Rs. 8,500/-

The Ministry's representative stated during evidence that according to the present reckoning the above materials would have to be imported for a period of two years. After that it is hoped that the parties developing the indigenous manufacture of graphite electrodes and copper-coated graphite electrodes would establish manufacture in the country which would be sufficient to meet the requirement of the Chittaranjan Locomotive Works.

As regards Fluorspar the Committee are informed that the Bhilai Steel Plant have located some source and that samples have been called for by the Chittaranjan Locomotive Works.

The Committee note that the value of imported raw materials will be about 7.96 per cent of the total value of raw materials to be used in the Steel Foundry. They would stress that every effort should be made to procure these raw materials in the country within the next two years so that foreign exchange expended on their imports can be saved.

Training of
Personnel
for Steel
Foundry

32. The Agreement with Messrs. F. H. Lloyd contains the following provision for the training of personnel required for the Steel Foundry:

“FHL shall submit a scheme of the training proposed to be given in their Works. FHL shall undertake to train at their own Works free of cost upto forty selected Indian personnel. The categories of such personnel, the trade or the line of their training and the duration in respect of each person would be such as are mutually agreed upon.

The training of Indian personnel by FHL will cover the field of designing, producing, finishing, machining, drawing, estimating, production planning and methods, selection and treatment of sand, pattern designing and making, core making, moulding, melting, pouring, risering, laboratory control, estimating and costing methods.”

The Committee are informed that 3 officers, 7 supervisors and 2 artisans have already been trained in the manufacture of steel castings. A further batch of one officer, 10 supervisors and one artisan is in the U.K. for training. The Ministry's representative also stated that in the Supplementary Agreement being signed* with F. H. Lloyd and Company, the number of men to be trained in the U.K. had been increased from 40 to 60. It is expected that the trainees would return from the United Kingdom before the Steel Foundry goes into production. The training covers all aspects of working of the foundry. The period of training varied from 4 months to one year depending upon the subject to be studied by the trainee.

It is understood that a good number of persons are also being trained in the Ordnance Factories under the Ministry of Defence and the steel foundries in the private sector. *As this is the first steel foundry being set up on the Railways, the Committee would stress that every care should be taken to see that the requisite number of*

*Since signed in November, 1963.

staff are got trained well in advance, so that later on, no difficulties are experienced in manning the project. They have no doubt, that the Railways would take full advantage of the provisions in the Agreement to provide training to their personnel particularly in the fields of designing and finishing and in the methods of estimating and costing.

33. The Indian Productivity Team on Foundry Industry have commended in the following terms the high degree of automisation obtaining in the Foundries in Sweden, U.S.A. and Japan : Mechanised
Steel
Foundry.

“.....more than 40 Swedish foundries are fully mechanised with centralised sand preparation, machine moulding, continuous pouring, mechanised shake-outs, etc. and half of the castings produced come from such mechanised foundries.”

* * *

“The best example of material handling efficiency was noticed at the Fort foundry where major tonnage of charge material arriving in open wagons is directly charged into the cupolas. Within an hour or so, the charged material arrives in the shop in the form of finished castings.”

* * *

“Automatic moulding machines are very popularly used. Modern foundries in Japan impressed us by the high standard of building construction, layout, plant facilities and material handling etc.”

Asked about the extend to which the operations in the Steel Foundry in Chittaranjan would be mechanised, the representative of the Ministry of Railways stated that the entire sand handling process would be mechanised.

The Committee are also assured that the most modern practices obtaining in steel foundries on the Continent and in the United Kingdom are being incorporated in the foundry in the Chittaranjan Locomotive Works.

As the Steel Foundry, being installed at Chittaranjan Locomotive Works, is stated to be modern and fully mechanised, the Committee have no doubt that Government would keep a watch to ensure that the cost of casting in the Foundry compares favourably with the cost of casting in advanced countries.

V COMPONENTS AND STORES

**Imported
components
for Steam
Locomotives.**

34. The imported components which are at present used in the manufacture of WG and WP locomotives are given below with their values:

Description	WG Value per locomotive	WP Value per locomotive
	Rs.	Rs.
(i) Manganese Steel Liners	840	840
(ii) Fabric Liners	385	385
(iii) Eccentric Rod Roller Bearings	135	135
(iv) Roller Bearings—		
WG (a) Roller bearings for front truck Rs. 1000		
(b) Raw material for roller bearings for hind truck and tender manufactured indigenously Rs. 1500	2500	8259
WP (a) Roller bearings for front bogie coupled wheels and hind truck Rs. 7059		
(b) Raw material for tender roller bearings manufactured indigenously Rs. 1200		
(v) Raw material for Asbest Mattresses	240	240
(vi) Cast Steel Front Bogie for WP		19500
TOTAL	4100	29359

The Ministry of Railways were asked by the Committee to indicate the steps which had so far been taken to develop the manufacture of the above components indigenously to obviate imports. The reply received from the Ministry of Railways is reproduced in Appendix VII. The Committee note therefrom that efforts are being made to develop manufacture of all these components indigenously. The question of developing indigenous capacity for manufacture of two of the principal components, namely, roller bearings and cast steel front bogie for WP is discussed later in this Chapter.

Asked what help is given by the Railways to the Indian manufacturers who show interest in undertaking the production of components and other equipment which are being imported at present, the representative of the Ministry stated in evidence that assistance in different forms is extended to such manufacturers. They are supplied with drawings, specifications and technical "know-how" if possible. They are also helped in procuring raw materials

which are in short supply. Besides, there are certain committees which are functioning as a liaison between the Railways and manufacturers with a view to locating indigenous capacity.

The Committee are informed that as a result of all these concerted efforts the percentage of indigenous purchases of stores made by Railways has risen from 82.5 per cent in 1959-60 to 91.81 per cent in 1961-62. This would be clear from the following table:—

Year	Total purchases made by Railways	Purchases made from indigenous sources	(Rs. in crores)	
			Percentage of purchases made from indigenous sources to total purchases	Percent
1959-60	197.41	162.87		82.5
1960-61	177.87	158.08		88.9
1961-62	208.00	191.10		91.81
1962-63	266.99	228.89		85.73

Note.—The reduction in percentage in 1962-63 as compared to 1961-62 is essentially due to the import of diesel locomotives etc. of the value of Rs. 17.64 crores in 1962-63 against only Rs. 69 lakhs during 1961-62.

The Committee are glad to know the welcome increase in the percentage of purchases made from indigenous sources by the largest national undertaking in the country. They hoped that efforts will be continued to reduce the imported components still further.

35. The annual requirements of roller bearings for Chitranjan Locomotive Works are approximately 6,000 dependent on the out-turn in the particular year. The anticipated requirements during 1964-65 for the expected out-turn are given below:—

Roller Bearings.

Description	For 90	For 72	For 6	Total	Remarks
	WG locos	WP locos	WT locos	for 168 locos	
<i>Steam Locomotives</i>					
Front Truck or Bogie	180	288	12	480	Partly roller bearing and partly bronze axle boxes
Coupled Wheel	400	864	48	1312	
Hind Truck or Bogie	360	288	48	696	
Return Crank	180	144	12	336	
Tender Axle boxes	1440	1155	..	2592	
TOTAL	3600	2736	120	5416	

A. C. Electric Locomotives

	For 32 locomotives in 1964-65.	
Bearings for Gear		64
Bearings Swivel type	Do.	64
Bearings with angler ing, trans- mission	Do.	256
Taper roller bearing for main gear wheel	Do.	256
		640

Roller bearings suitable for use on rolling stock have so far been manufactured indigenously only by Messrs National Engineering Industries, Jaipur. These roller bearings have been used for the hind truck and tender wheels of W.G. locomotives manufactured at Chittaranjan Locomotive Works.

Bearings for the front truck and coupled wheels are obtained by import from Messrs S.K.F. Ball Bearing Co., Sweden.

Bearings for Return Crank of steam locomotives are of imported origin and are obtained from Messrs Timken Roller Bearing Company, United Kingdom.

Bearings for the electric locomotives are imported partly from S.K.F. and partly from Timken. These bearings are purchased according to the specifications given by M/s Group

It may be mentioned that Messrs National Engineering Industries require release of a certain amount of foreign exchange for the import of race rings and raw material for the manufacture of roller bearings. The firm has recently been granted licence for the manufacture of race rings and it is anticipated that they would be able to establish production in this line in about 18 months time.

36. The Committee desired to know the experience of the Railways regarding the use of indigenous roller bearings on the hind truck and tender axles boxes on locomotives. The Ministry of Railways have stated in reply—

“With regard to hind truck and tender axle boxes, their design and make of bearings were applied extensively on Chittaranjan Locomotives till recently, but there have been a number of reports of unsatisfactory service and failures of these bearings on the Chittaranjan’s WGs in service in the last year or so and we had per force to stop the further application of this design and make of bearings for the current builds of steam locomotives, pending a review of the adequacy of the

*M/s. Group are technical collaborators for the manufacture of Electric Locomotives.

designs, which has been raised with M/s National Engineering Industries who are working on the project in collaboration with M/s Hoffman of U.K. in order to get out more robust and fool-proof designs for the hind truck and tender application."

It is also understood that the National Engineering Industries in the early stages made front truck bearings for WGs but its design was found to be unsatisfactory in service and its extended application had to be discontinued.

In response to another question the Ministry of Railways have furnished the following table to indicate the comparative cost of bearings obtained from S.K.F. and National Engineering Industries for steam locomotives:

Type of bearing	SKF	NEI
	(cost/ locomotive	(cost/ locomo
	Rs.	Rs.
(1) Front truck (bearings and axle boxes)	4297	4197
(2) Hind truck (bearings and axle boxes)	3170	2760
(3) Tender (bearings and axle boxes)	11536	12160

The Committee note that not only the performance of ball bearings supplied by the Indian firm for the tender axle boxes of locomotives has been unsatisfactory but that their price is considerably higher than imported SKF ball bearings. The Committee would stress that every effort should be made to improve the indigenous quality of ball bearings and reduce their price.

37. The Committee understand that the question of developing adequate manufacturing capacity within the country for meeting the requirements of roller bearings for rolling stock is receiving the attention of the Government. A meeting was held at the end of September, 1963 with ball and roller bearing manufacturers, who had shown an interest in undertaking the manufacture of roller bearings for Railway use. The manufacturers expressed their keenness to enter into this field and agreed to submit definite proposals by about the middle of December, 1963. It may be mentioned that the National Engineering Industries, Jaipur, who are already manufacturing roller bearings for Railway rolling stock have already submitted a scheme for expanding their capacity to about 57,000 axle box sets per annum. The Andhra Pradesh Industrial Deve-

lopment Corporation have also finalised a collaboration agreement with a Japanese firm for the manufacture of ball and roller bearings and expect to reach a production of 24,000 axle box sets per annum in the first phase which could be doubled later on.

It is expected that the requirements of roller bearings for Railway use may be of the order of about 90,000 to 1,00,000 axle box sets per annum by the end of the Third Plan period.

The Committee would stress that concerted measures should be taken early to develop indigenous capacity for manufacture of roller bearings required for rolling stock which is now largely built within the country. As roller bearings play a pivotal role in machinery, the Committee cannot too strongly emphasise the need for maintaining the highest standard in its manufacture.

**Cast Steel
Front Bogie
for WP.**

38. This is a specialised and intricate casting of a large size, incorporating the Contact Resistance Centring Device, for the manufacture of which technique and methods are still not available in India. Chittaranjan Locomotive Works had placed an order, over three years ago, for 36 sets of these bogies on the Tata Locomotive and Engineering Company (TELCO) Steel Foundry. The Steel Foundry of Messrs. Telco have only very recently supplied one casting as a prototype which is under test. It is further understood that Telco are not very keen to proceed with this order. It may, therefore, become necessary to develop production of this casting ultimately at the Chittaranjan Locomotive Works Steel Foundry, which is being set up. The Chittaranjan Steel Foundry, which is expected to commence production by the end of this year, is planning to take up the manufacture of this bogie casting, as early as possible. Towards this end, orders for a certain number of these castings have been placed on M/s. Lloyd & Company, U.K.,—technical collaborators for the Steel Foundry—so that the technique and methods and patterns developed by them could be made available to the Chittaranjan Locomotive Works Steel Foundry. This order has been taken in hand for execution by Messrs. Lloyds during the time the Indian technical personnel are under training in their works in U.K., thus enabling them to gain intimate knowledge.

The Committee are glad to note that measures have already been initiated to manufacture cast steel front bogie for WPs in Chittaranjan Steel Foundry. They hope that it would be manufactured indigeously, as early as possible, so as to save a substantial amount of foreign exchange which is being spent at present on its import.

**Surplus
Stores.**

39. The Committee note that the total surplus stores have come down from Rs. 21,03,000 on 31-3-62 to

Rs. 12,10,000 on 31-3-63 and that there has been considerable reduction in this behalf in metals and small tools and hand tools excluding machines, as would be evident from the following table:

(Figures in thousand of rupees)

Particulars	Surplus Stores	
	Balance on 31-3-1962	Balance on 31-3-1963
(i) Metals	646	102
(ii) Small tools and hand tools excluding machines	957	634

The Committee would stress that remedial measures should be taken to ensure that stores are not accumulated in excess of the estimated requirements.

VI. GENERAL

**Investment
on Town-
ship.**

40. The investment pattern between township and workshops for the manufacture of steam locomotives, the Steel Foundry Project and the Electric Locomotive Project is indicated in the statement given below :—

(Figures in thousand of Rs.)

	Township	Workshops	Total
(i) Steam, Locos Project (including stabilisation scheme)	77785 (% to total investment 45·9)	91851 (% to total investment 54·1)	169636
(ii) Steel Foundry Project (estimated)	8000 (% to total investment 12·7)	55000 (% to total investment 87·3)	63000
(iii) Electric Loco Project (estimated)	5170 (% to total investment 22·9)	17430 (% to total investment 77·1)	22600
	90955 (% to total investment 35·6)	164281 (% to total investment 64·4)	255237

The Committee are glad to note that the percentage of investment on workshop would increase from 54·1 per cent. to 64·4 per cent. on completion of the Steel Foundry and Electric Loco Projects and that there would be corresponding reduction on township which would come down from 45·9 per cent. to 35·6 per cent.

It has been stated during evidence by a representative of the Ministry of Railways that the township share of cost entering in a locomotive is Rs. 25,000.

The Committee feel that in order to reduce total capital investment and to ensure that it does not unduly add to the cost of production. Government may consider the advisability of developing the surrounding villages of new projects for the housing of industrial workers. Not only will this have the merit of reducing capital investment but will also help to provide the much needed leaven for effecting social and economic progress in the villages.

41. The Chittaranjan Locomotive Works was the first large Railway undertaking to introduce a scheme of payment by results with effect from 16th December, 1954. This was preceded by studies in time and motion carried out scientifically with the help of foreign experts and later vigorously pursued under the guidance of officers who had studied the subject in a Locomotive Building firm in England. The scheme was gradually extended and by March, 1956, 3,000 men out of a total of 3,825 workers/staff in the Workshop had been brought within its scope. Studies have also been initiated to extend the scheme to workers in Mill-Wright Shop, Heat Treatment Shop, Transport Shop and Electric Repair Shop.

Payment by Results.

42. The increase in output following the introduction of the incentive system of wage payment since 1954-55 is reflected in the table below :

Commendable Increase in Productivity.

Year	Total WS Staff	No. under Incentive	Production	
			Locos.	Boilers
1954-55	3154	1046	98	30
1955-56	3580	3000	129	107
1956-57	4393	3070	156	120
1957-58	4571	3398	164	142
1958-59	4621	3530	165	162
1959-60	4801	3573	173	178
1960-61	4833	3760	173	180
1961-62	4999	3820	171 + 5	187
1962-63	5232	3942	169 + 14	186

From the foregoing it will be seen that with the increase in strength of about two-thirds, the locomotive out-turn has been stepped up from 98 to 183 i.e., 86.5 per cent, the boilers manufactured have gone up from 70 to 186 i.e., 166 per cent. Incidentally, this alone is not the full picture, because as against the imported content of over Rs. 1 lakh per locomotive in the year 1953-54, the synthetic figure for the imported content as it stands today for a WG locomotive is of the order of Rs. 4,000. Also the cost of direct stores has been brought down from Rs. 3.75 lakhs in 1951-52 to about Rs. 2.40 lakhs in the last three years by undertaking more manufacture and fabrication of components in the factory itself instead of purchasing them as finished stores from trade.

The productivity (as indicated by the reduction in total man-hours per locomotive before and after introduction of the piece work system) has increased as indicated below:—

	1954	1956	1961-62
(a) Average man-hours direct and indirect per loco prior to introduction of piece work	87800		
(b) Average total man-hours per locomotive after introduction of piece work		58900	
(c) Average total man-hours per loco for 1961-62			54000
(d) Percentage increase in productivity in 1954 base		33%	38.5%

The Committee also understand that the average piece work earnings by the workers expressed as a percentage of the hours saved to hours worked are as under from 1956-57:

	Percent
1956-57	25.6
1957-58	30.4
1958-59	31.9
1959-60	34.5
1960-61	38.94
1961-62	41.53
1962-63	43.17

The Committee are glad that the incentive system of wage payment has proved a demonstrable success in Chittaranjan. They hope that the system would be extended not only to other large railway workshops but also to sheds, carriage and wagon establishments and in fact, to all operations which admit of such extension so that the productivity on the Railways, as a whole, is increased.

Suggestion Scheme.

43. The 'Suggestion Scheme' in its present form was introduced in the Chittaranjan Locomotive Works in the year 1956. Since then Chittaranjan Locomotive Works have received 410 suggestions mainly for effecting improvements in design. Out of these 107 suggestions have been accepted for implementation. There are two committees which consider all suggestions/inventions received from the staff for increasing efficiency and effecting economy in time, labour and material. The procedure for submission of a suggestion by a worker and its consideration by the committee are stated below:—

"A worker under Incentive Scheme upto the rank of Mistry can put up a suggestion which will result in reducing cost of manufacture. This suggestion could either be sent directly to the Production Engineer, who is the Chairman of the Suggestions

Committee, or put in a Suggestion Box. The suggestion is then considered by a Committee, of which Workers' representatives are also members.

Suggestions are also welcomed from all ranks of staff for increasing efficiency and economising time, labour and material or improved working conditions. These suggestions are first scrutinised by the Suggestions Committee and if found useful, are forwarded to the Suggestion and Invention Committee of the Administration of which the Chief Mechanical Engineer is the Chairman. In case, any suggestion has financial benefits, the Committee recommends suitable rewards to the person making the suggestion."

The value of the award is fixed on the importance of the suggestion and on the basis of actual saving that would accrue as a result of the suggestion over a period of six months. In case of a suggestion emanating from an indirect worker where the exact saving in time cannot be assessed, an *ad hoc* reward is given. Maximum awards so far given are mentioned below:—

	Maximum award	Minimum award
To persons covered by the Incentive Scheme	Rs. 508 88	Rs. 4'12
To persons other than those covered by the Incentive Scheme	Rs. 1000.00	Rs. 300

The Committee understand that in the U.S.A., Sweden, Japan etc. the big plants have suggestion schemes. In Japan these are also called proposal systems, and are extremely well organised in larger plants such as Hitachi, Kubota, Mitsubishi and Daihatsu, etc. In most of these plants, new ideas from employees have contributed in no small measures to the success of the business. Experience has proved that suggestion programmes result in considerable savings, promote employee initiative, build up worker loyalty and improve employer-employee relations.

The Committee suggest that the system of suggestions may be reviewed in the light of experience and the latest practices followed in this behalf in advanced countries, so as to adopt the most effective means of publicity and reward to stimulate workers' constructive suggestions to improve efficiency and reduce cost of manufacture.

Training Facilities.

44. The Technical School provides for a steady flow of skilled technicians and technically trained supervisory staff for the Chittaranjan Locomotive Works. This Institution also caters for technical training to other Railways and other Ministries of the Government of India.

Broadly speaking, there are two types of Apprentices, Apprentice Mechanics and Trade Apprentices. At present over 300 Apprentices are undergoing training. Workers are also drawn from unskilled/semi-skilled group for training under the "Accelerated Training Scheme." The total cost of the Technical School, the Basic Training Workshop and the four hostels for Apprentices is approximately Rs. 20 lakhs. In addition to receiving free technical training and free accommodation in the hostels, the Apprentice Mechanics are paid Rs. 110 and the Trade Apprentices Rs. 80 as monthly stipend.

The number of Apprentice Mechanics, Trade Apprentices and trainees under accelerated training scheme, on rolls of the Technical School on 1st April 1962 and 1st April 1963 are given below:—

Category	No. on Roll on 1-4-62	No. recruited during 1962-63	Wastage during 1962-63	No. absorbed against working posts during 1962-63	No. on Roll on 1-4-63
Apprentice Mechanics 'A' 5 Yrs. Course	58	11	2	2	65
Apprentice Mechanics 2½ yrs. course	18	6	2	2	20
Apprentice Mechanics (Intermediate Stage) 2 Yrs. Course	18	28	..	6	40
Trade Apprentice Course 3½ Yrs.	356	143	26	161	322
Trainees under accelerated training Scheme (3 months Course)	..	83	..	..	83

Evening Classes for Workmen.

45. The object of the Evening Classes for Workmen is to provide essential technical education to workers for their future advancement. The training is given after workshop hours. These facilities help unskilled workers to become semi-skilled/skilled artisans. These classes are held at present to impart training in the following courses:—

- (i) Mechanical and Electrical Trade proficiency.
- (ii) B.O.A.T. Examination.

During the year 1962-63, 133 workers attended the courses with the results indicated in the table below:—

	No. attended	No. appeared for Exam.	No. passed
(i) Evening Classes in Mechanical and Electrical Trade proficiency	43	26	23
(ii) Evening Classes for appearing in B.O.A.T. Examination	90	44	6
			38 (Partly)

The Committee are glad to note that there is a provision for evening classes for the staff who desire to qualify themselves technically in their spare time after working hours. The Committee commend this experiment and suggest that it may be introduced in other large workshops which have sizeable concentration of employees who show enthusiasm to better their technical skill.

46. The Railways have been awarding, out of the Staff Benefit Fund, 1000 scholarships annually for technical education of the children of Railway employees. In 1961-62 the total number of scholarships, including those continuing from the previous years, was 2,537 entailing an expenditure of about Rs. 9 lakhs.

Scholarships
for
Technical
Education.

Under this scheme, 12 fresh scholarships to the children and dependents of Railway employees of Chittaranjan Locomotive Works, were awarded for prosecution of studies in technical courses and Degree Courses in Pure Science. Besides 18 scholarships granted in previous year were renewed.

The Committee would commend the financing of such schemes for advancing technical education of employees' children from the Staff Benefit Fund or equivalent fund of large national undertakings.

47. The Committee are glad to note that there is close liaison between the Ministry of Railways and the Ministry of Defence about the production of defence equipment as necessary in the Railway Workshops like Chittaranjan Locomotive Works.

Production
Defence
Purposes.

As the Railways have got large workshops and expert knowledge in the field, the Committee have no doubt that every assistance would be rendered by them in undertaking manufacture of defence requirements particularly during the period of emergency.

NEW DELHI;
The 14th February, 1964.
Magha 25, 1885 (Saka).

ARUN CHANDRA GUHA,
Chairman,
Estimates Committee.

APPENDIX I

Vide para 10

Relative economics of utilising W.G. and W.T. locomotives for shunting, suburban and Branch-line traffic operations.

The main design features of W.G. and W.T. locomotives are given below:—

	W. G.	W. T.
(i) Wheel Arrangement	2-8-2	2-8-4
(ii) Tractive Effort (in pounds)	38,890	30,600
(iii) Axle load (in tons)	18.5	18
(iv) Coupled wheel diameter (in inches)	61.5	67.0
(v) Grate area (in sq. ft.)	46.0	38.0
(vi) Adhesive weight (in tons)	73.6	69
(vii) Weight in working order (in tons)	174.0	120.0
(viii) Cost in lakhs of rupees of manufacture in C.L.W.	W.G. 4.3 (62-63)	W.T.*4.06 (59-60)

Suburban.—W.G. locomotive is essentially a goods locomotive for main line operation. It is unsuitable for suburban traffic on account of technical and other considerations. It is also a tender locomotive which cannot be turned round at terminus stations where turning facilities are not usually provided.

W.T. locomotive is a powerful tank locomotive designed for suburban services and is suitable for operation in either direction.

Branch line.—Regarding branch line traffic, the tracks on branch lines are generally not capable of taking the heavy axle load of a W.G. locomotive. For such services and where turning facilities are provided at the terminus lighter axle load locomotives are now used. Moreover, the trains on branch lines do not contain more than 10 coaches. The W.G. locomotive is unduly heavy and more powerful than necessary for such trains.

Conclusion.—In this context, an economic comparison between WG and WT locomotives for the suburban and branch line operations would not be realistic.

Shunting.—The WG locomotive, although designed as a main line unit, can be used on shunting service but the fuel consumption would be very high since the load factor on a shunting locomotive is of a low order and the standby losses on a large grate area would affect fuel economy. The WT locomotive is a medium duty shunter capable of hauling loads upto 1600 tons in goods yards other than hump yards.

*If however, bulk production of W.Ts is undertaken the cost is likely to be less, say approximately 3.5 lakhs of rupees.

Conclusion.—An economic comparison between WG and WT locomotive for shunting services would also not be realistic.

The consumption rates of coal on WG and WT class of engines are indicated below:—

	Kgs/1000 GTKM	KGs/engine Kilometre	Kgs/Shunting hour
W.G.			
Goods service	31.1	52.6	..
Shunting Service		30.0	240
W.T.			
Suburban Service	70	36.5	..
Shunting Service	Not utilised on shunting service.		

As WT locomotives have not been utilised on shunting services or on branch lines, their economics/fuel consumption are not comparable with those of a WG class locomotive.

Although the consumption rate for a WG class locomotive hauling a heavy load at a comparatively slower speed will give the consumption rate in Kilograms/engine kilometre higher than in kilograms/1000 GTKM the rate of consumption in the case of a passenger/suburban passenger type of locomotive (WT) hauling comparatively lighter loads at faster speeds would show a reverse characteristic i.e. the consumption rate in kilograms/engine kilometre will be lesser than that in kilograms/1000 GTKM.

WT class locomotives which are only 10 in number at present are purely confined to suburban services and have so far not been used on branch line or on shunting services and, therefore, their economics/fuel consumption are not comparable with those of WG class locomotives on shunting services.

APPENDIX II

Vide para 11

Cost of production of WG locomotives for 1960-61 to 1962-63

The comparative cost of manufacture of WG locomotives for the years 1960-61 to 1962-63 under main heads is as under:—

(Cost in thousands of Rs.)

Years	Direct labour	Direct Material	Overheads	Total
1960-61	20.96	243.37	142.63	406.96
1961-62	22.39	238.26	152.00	412.65
1962-63	23.39	242.43	164.78	430.60

Brief reasons for increase of Rs. 24,000 in the cost of labour, material and overheads during 1962-63 compared to 1960-61 are as under:—

(a) The increase in the cost of Direct-labour by Rs. 2.43 thousand is largely due to:—

(i) Undertaking fabrication of more components in the workshop in lieu of purchase items in a finished condition which resulted in an increase of 1200 man-hours per loco. for major items only.

(ii) Increase in labour rates due to annual increments, implementation of Authorised Scales of Pay, revision of rates of Dearness Allowance in early 1962-63 and introduction of Night Duty Allowance from 1-8-1962 offset by reduction in labour content due to increased productivity.

(b) The decrease by Rs. 930/- in the cost of material is due to undertaking manufacture of certain components in the shops instead of purchase from indigenous and/or imported sources, particularly the latter. In this connection it should be noted that the average foreign exchange expenditure per WG loco. which was Rs. 57 thousand in 1960-61 has now been brought down to Rs. 17 thousand per loco. This, however, is not the full picture as this difference of Rs. 930/- is despite an increase in the average cost of steel by Rs. 50/- per metric tonne representing approximately Rs. 4,500/- per loco and the increase in the price of Pig Iron by Rs. 25/- per metric tonne, representing approximately Rs. 250/- per loco. There is also the upward revision of customs and excise duty although the impact of this is of no great significance.

(c) The increase in overheads by Rs. 22.15 thousand is due to increase in the cost of Indirect labour, Indirect Stores, Departmental and other Indirect expenses as follows:—

- (i) Increase of Rs. 3.83 thousand in Indirect labour was due to increase in the labour cost for similar reasons as stated against Direct labour and also the increase in total Indirect man-hours on account of strengthening of the Maintenance Organisation for machines and plants. A Reconditioning Section of fair strength has been started to attend to machinery which has upto now run about 12 to 13 years of intensive double shift working.
- (ii) Increase of Rs. 1.97 thousand in Indirect Stores was due to levy of excise duty, increase in the prices of consumable stores and increase in the cost of replacement spares for maintenance of machines.
- (iii) Increase of Rs. 3.79 thousand in Departmental Expenses was due to general increase in the wages of staff of all departments on account of annual increments, implementation of Authorised Scales of Pay, additional D.A., upgrading of ministerial posts, certain casual labour being brought on to authorised scales of pay (involving practically double the amount for each employee), extra expenditure on C.L.W. schools on account of increase in teachers due to upgrading of the schools and extra number of students and extra expenditure on account of water charges to DVC etc.
- (iv) Increase of Rs. 3.58 thousand in other indirect expenses was due to increase in freight and handling, increase in expenditure on maintenance and improvements of the colony.
- (v) Rs. 2.58 thousand due to increased contribution to DRF.
- (vi) There was an adjustment of Rs. 5.98 thousand per loco due to undercharges manufacture, undercharges overhead in 1962-63 as compared to 1960-61.
- (vii) Less credit to the extent of Rs. 0.42 thousand.

Note.—The overhead expenses have been analysed on the ratio of the direct man-hours per WG loco, to the total direct man-hours for the years.

In all industrially advanced countries, the rate of increase in the price of finished goods is approximately 3 to 5% per year. Chittaranjan Locomotive Works have been straining to keep down the cost of production by absorbing the various increase in prices by higher productivity. A stage of productivity has been reached where it is no longer possible to hold the cost line under the impact of increase due to governmental action and general increase in prices of raw materials and components.

APPENDIX III

Vide para 12

Improvements that have been effected in the locomotives manufactured at Chittaranjan during the last three years.

Following are some of the major improvements effected in C.L.W.'s locomotives:—

(i) IMPROVEMENTS IN DESIGN:—

(a) *Revised design of front drag casting and front draw hook arrangement on modified drag casting suitable for centre buffer couplers and fitment of centre buffer couplers on the engine front end and tender hind end*—With the introduction of centre buffer couplers on an increasing scale on freight stock, the WG locomotives are being provided with suitable designs of locomotive front end casting and tender hind end casting to permit application of screw couplings in the initial phase and changeover to the centre buffer coupler as and when necessary. Designs of suitable centre buffer couplers having a transition screw coupling with draft and buffing springs have been developed for W.G. locomotives. The locomotive front and rear end castings have been re-designed and the modified castings have been fitted to locomotives being turned out of C.L.W. for the last couple of years. A start is also being made in fitting transition couplers on these locomotives.

(b) *Butt-welded longitudinal and circumferential seam of the boiler in lieu of rivetting*.—The existing design of boiler is in rivetted construction and with the trend in progress in foreign countries, it was decided to adopt welded construction which would result in limited reduction in weight and increased immunity against cracks developing in the rivetted joints of boiler plates due to caustic embrittlement occurring with feed water containing sodium salts. The welded technique together with X-ray inspection facilities available in C.L.W. encouraged the adoption of this form of construction of boilers which have proved satisfactory over the past three years. It is expected that the introduction of welded boilers would result in a slight saving in the cost of manufacture and entail reduced maintenance in running sheds and repair workshops.

(c) *Provision of high tensile steel frame for WP locomotives*.—Provision of high tensile steel bar frame for WP locos built in C.L.W. on strength considerations and to prevent cracks as reported on original WP bar frames of Cl. II steel.

(d) The compensating beam pintel fulcrum support has been replaced by pin joint support for Front Truck to afford better compensation spring gear.

(e) Modified Front Truck spring links of the adjustable type are being fitted also to afford better alignment of cross compensating beam. This will also afford each of maintenance.

(ii) IMPROVEMENTS IN DESIGN FROM THE POINT OF VIEW OF IMPROVED MANUFACTURING PROCESSES.

(a) *Superheater elements with welded on return bends in lieu of solid forged elements.*—It has been usual to provide integrally forged superheater elements manufactured by a U.K. firm holding the monopoly for supply. To facilitate indigenous manufacture, and also to develop more than one source of supply, a fabricated design of superheater element has been developed in which the return bend is welded on to the tubes forming the superheater. Superheater elements to this design are now being manufactured by two firms in India and are available as permissible alternatives to integrally forged elements.

(b) *Welding-cum-rivettted tender integrally welded to underframe.*—The tender tank of the locomotive carrying water and coal has generally been in rivettted construction and secured to the underframe by means of bolts, with a view to reducing the cost of production and maintenance in service, a partly welded and rivettted construction was proposed for trial application. In this design the bottom plate of the tank is welded to the underframe with automatic arc welding and incidentally reinforcing the underframe also. Reports in limited service indicate satisfactory performance and the design is now to be adopted on a large scale, it is expected that the cost of production would be somewhat reduced as also maintenance in service.

(c) Fabricated H.T. Radial arm bracket.

(d) Fabricated front truck radial arm.

(e) Fabricated brake hanger (leading & Inter.)

(f) Fabricated design of slide bar bracket in lieu of steel casting.

(g) Fabricated design of front drag casting in lieu of steel casting.

(h) Fabricated design of frame stay and brake shaft carrier in lieu of steel casting.

(i) Fabricated design of pony truck control spring bracket in lieu of steel casting.

(j) Build up bar frame to permit use of maximum length of slabs available from indigenous sources.

(k) Fabricated design of lubricator connection and drifting valve connection in lieu of bronze casting.

(l) Adoption of fabricated lubricator in lieu of bronze casting.

(m) Fabricated thermic syphon.

(n) Improved method of oxycutting and forging for manufacture of connecting rods and coupling rods to save material.

(o) Manufacture of brake pull rods by butt-welding process instead of forging to save material and labour.

(p) Centrifugal casting of Piston Valve liners to improve wearing qualities.

(q) Flame hardening process for class IV steel gudgeon pins and knuckle pins, to minimise wear in service.

Note—Items (c) to (i) above have been modified so as to enable fabrication to be adopted, due to shortage of steel castings in the country.

(iii) IMPROVEMENTS IN DESIGN FROM THE POINT OF VIEW OF IMPROVED MAINTENANCE—

(a) *Tender draw bar pin and safety pin to be of 2 piece design.*—The original design of slide liner over the hind truck axle box was the engine with tender were difficult to remove in running sheds owing to ingress of coal dust and moisture. The need arose, therefore, to use shorter pins. This modification will reduce man hours in running sheds while uncoupling the tender from the engine for periodical examination and attention.

(b) *Provision of dust shield on Hind Truck Axle Box guide.*—The original design of slide liner over the hind truck axle box was exposed and contamination by ash and grit of the slide liner will affect the frictional valve and thereby the stability in running of the locomotive. The provision of dust shield will minimise this contamination and would also permit examination of the liners without dropping the wheels. It is expected that this modification will reduce the contamination, ensure a proper frictional force and thereby maintain riding characteristics of the locomotive.

(c) *Thickness of inside firebox wrapper and back plate increased.*—The original design provided for a $\frac{3}{8}$ " thick firebox plates of boiler. Experience revealed reduction in thickness owing to corrosion by feed water. In order to ensure the life of the firebox, thickness was increased to $13/32$ ". It is expected that this increased thickness combined with water treatment now being introduced will prolong life of firebox between renewals and also reduce the maintenance in running sheds and repair workshops.

(d) *Reinforcement to Tender frame and modification to cantilever bracket for engine platform.*—The original underframe of the tender was reported to be dropping at the front end and also develop fracture in certain regions. Reinforcement was necessary and particularly in the context of haulage of heavy freight trains. Complementary modification to the engine platform was also necessary. It is expected that the modification will preserve the alignment even with overload of coal and also reduce the incidence of fracture in service.

(e) *Modified design for ash pan drench pipe arrangement by eliminating nozzles and relocating the drench pipe inside the ash-pan.*

(f) *Improved wash out facilities, by fitting of circular mud doors and wash out plug seats, Two-way W.O. seats at bottom corners of outer throat plate and additional wash out plugs on smoke box tube*

plates by omitting two smoke tubes. Revised location for inspection and mud holes. This modification makes for better maintenance.

(g) Modified hopper door operating rod jaw and dust cover and shaft arm.

(h) Modified design of tender rubbing block to avoid interlocking.

(i) Engine rubbing block to take wear liners.

(j) Front truck control spring bracket to be provided with adjustable bush.

(k) Securing of bornze liner on top of HT axlebox guide.

(l) Seal welding of all boiler mounting pads.

(m) Provision of rain protection plates on cab sides.

(n) Strengthen cab roof to avoid rattling.

(o) Modification to cab floor to provide access to washout plugs.

(p) Front platform modified to facilitate easy removal of FT spring saddle.

(q) Opening to be provided on front platform above front spring link of F.T.

(r) Modification of cylinder drain cock and operating gear.

(s) Revised lubricating arrangement for slide bar.

(t) Provision of plug points on running board for portable electric lamps.

(u) Relocation of engine train pipe at hind end to avoid crushing between hind cradle and hind truck frame.

(v) Modified gudgeon pins with grease holes in the plane of least stress, metal Cl. I case hardened or Cl. IV flame hardened.

(w) Revised design of Regulator handle creep prevention device.

(iv) IMPROVEMENTS IN DESIGN TO ACHIEVE ECONOMY IN CONSUMPTION OF FUEL.

Overfire Air arrangement for improving combustion efficiency— Indian coals have high volatile content and in order to obtain maximum heat released from the coal burnt, it is necessary to provide adequate supply of air for complete combustion of the volatile gases released from the fire bed. Preliminary trials indicated that improvement in combustion can be achieved if air is admitted in sufficient quantity at the right location. The proposed design meets these requirements by admitting air through the ducts over the fire brick arch. It is expected that this will result in improved steam generation and efficiency of the locomotive will be enhanced thereby.

(v) IMPROVEMENTS IN DESIGN FROM THE POINT OF VIEW OF IMPROVED SAFETY—

(a) *Fit Reinforced Screw-coupling.*—The standard screw coupling connection between the locomotive and the train has limited capacity and is liable to be stressed beyond the safe limit while starting and hauling heavy freight trains which results in train parting. This screw coupling has therefore, been redesigned using heavier sections and it is expected that the incidence of trains parting will be reduced by this change even with slightly heavier trains than in the past. Action has also been taken to apply this reinforced screw coupling on wagons.

(b) *Deletion of lubrication of hind truck yoke pin.*—The stability in running of the WG locomotive is influenced by the frictional force between the slide liners over the hind truck axlebox. Since it was observed that grease leaking from the hinge pin was contaminating the liners thereby making the functioning of the control erratic, it was decided to eliminate this periodic lubrication through the grease nipple. It is expected that by this modification the riding characteristics of the locomotive will be preserved.

(c) *Modified thin flange profile on inter and driving wheel tyres.*—The middle wheels of a main line locomotive are different from the other wheels and facilitate the negotiation of the locomotive round curves. With the prevailing sharp crossings, it is realised that these middle wheels should have a thinner lip (flange) so as to increase the clearance with the rail and facilitate a more easy negotiation. It is expected that this would result in reducing the lateral forces and disturbance thereby to the alignment of the track and also in the bending stress of the engine frame.

(d) *Fitment of roller bearings.*—When journals of Locomotives fitted with grease lubricated plain bearings run hot the chances of axle failures are greater. A change over to roller bearings was indicated and experience with roller bearing in continuous (cannon) axle boxes has established the possibility of obtaining maximum immunity against hot axles. The locomotives will also require reduced attention in running sheds and thereby will be more readily available for traffic.

Besides the improvements detailed above, action is on hand for developing the following further improvements. These improvements will reduce fuel consumption:

- (a) At present thermal insulation is provided only on that part of the boiler back within the cab mainly as a protection to the engine crew. Trials indicate that complete insulation of the boiler results in a fuel economy of 2 per cent approximately. Design of complete boiler insulation was evolved for certain standard locomotives bearing in mind the need for prolonged life of the insulation. It is expected that this modification will reduce the fuel bill of railways and will reduce steaming time.

The implementation of this design is at present held over on account of paucity of foreign exchange for the asbestos insulation fibre.

- (b) *Fitting of Giesel Oblong Ejector on Smoke Box.*—Fitting of Giesel Oblong Ejector on smoke box to improve fuel consumption and cylinder efficiency. Manufacture of components is in progress at present for trial on 12 WG and 12 WP boilers.

APPENDIX IV

Vide para 20

A Note on clauses II(d) and V(a) of the Agreement with M/s. Group for making available improvements effected in the electric locomotives in India to M/s. Group and vice versa.

Clauses II(d) and V (a) of the Collaboration Agreement with M/s. Group are reproduced below:

Clause II (d) :

“On the expiry of the period of this Agreement, the Government will have the right to continue manufacture of the equipments covered by this agreement without being required to make any extra payments to the Group, save in respect of items of development and improvement made available to the Government within a period of 2 years prior to the expiry of the period of the agreement, for which, in addition to the current fees during the period of the Agreement, a reasonable lumpsum payment shall be negotiated, provided however such lumpsum payment shall not exceed an amount calculated on the basis of 3 per cent or 2½ per cent, whichever rate may be applicable at that time for the consultation fee, of the Indian costs of production of such item for such quantity of electrical equipments as produced by the Government during the period of two years preceding the year in which such item has been made available to the Government.”

Clause V (a) :

“The Government shall communicate to the Group the improvements effected in the material manufactured in India under this Agreement and the Group will have the right to utilise these improvements free of charge.”

In the initial drafts of the Agreement with M/s. Group there was no clause pertaining to the rights of manufacture beyond the period of 8 years i.e., the duration of the agreement. However in the interest of the Railways, it was suggested by the Railway Board that a clause as given below should be added to the agreement:

“On the expiry of the period of this agreement the Government will have the right to continue manufacture of the equipments covered by this agreement without being required to make any extra payments to the Group, save in respect of patented items of development and improvement made within a period of (1 or 2) year(s) prior to the expiry of the period of the agreement, provided however such payment shall not exceed 2½ per cent of the cost of the patented item or in case where the Group are under an obligation to pay to the patent holder of such item a licence fee, the actual rate thereof”.

This suggested clause was based on Clause No. XIX(ii) of a similar agreement between HEIL and their consultants M/s. AEI slightly modified in consultation with the Law Ministry to suit our requirements. M/s. Group were not at all agreeable to this clause in the beginning as would be seen from their letter dated 27th June 1962, the relevant extract of which is reproduced:

"In the same clause, para (d), the Group object to the new wording as the delegates in February, 1961, clearly indicated that the manufacturing rights would automatically be terminated with the expiry of the contract unless an extension was mutually agreed to. I understand the Railway Board's views are different but I think you should appreciate that in a Collaboration Agreement there are two things. It is normal to think that after eight years the Indian Manufacturers may have gained sufficient experience to proceed with the manufacture without further help from their adviser, the Group, but manufacturing rights is quite a different thing. They are always due as long as the material is manufactured. Many instances could be quoted where manufacturing rights are being paid for years and years. It seem, therefore, equitable that at least a part of the fee should be paid beyond the period of eight years. The Group, are, I think, generous in offering that after the total of the fees would have reached 1.5 million Marks, no more fees whatsoever should be due by the Indian Railways."

Further to this protracted negotiations between the Railway Ministry and the Group took place and as a result thereof the new clause has been introduced in the final agreement. From this it will be seen that the additional lumpsum payment to be mutually agreed upon for improvements or developments with in the last 2 years of the agreement, is in principle meant to cover the use of new patents which may be introduced during that period. It will also be seen that in the case of HEIL agreement with AEI, the charges for the patents rights will have to be paid for all the patents subsisting whereas in the Group's case this is to cover only such of the patents as would be developed within the last two years of the agreement period.

It was argued by the Group that they had agreed to place at the disposal of Government of India technical know how as at present and as developed by them during the next few years and they have accordingly related the amount payable by the Government of India bearing this in mind. But, in the case of new developments towards the expiry of the agreement, they would not have been adequately compensated either by way of lumpsum payment or by way of sale of components/assemblies or by royalty payable on locomotives produced in India. It had, therefore, to be agreed to in the contract that the Government of India would purchase those developments and improvements made by the Group within a period of two years prior to the expiry of the agreement which were not adequately exploited by them commercially, so as to compensate them for the cost of developing the improvements.

As per Clause V(a) the Government shall communicate to the Group improvements effected in the material manufactured in India under this Agreement and the Group will have the right to utilise these improvements free of charge. This sub-clause will have to be read in conjunction with sub-clause V(b). Sub-clause V(b) stipulates that any improvements or alternative designs proposed by the Government will be examined by M/s. Group and their technical advice will be given thereupon free of charge. It should be appreciated that this is the first time that the Indian Railways have launched on the manufacture of complicated and modern AC locomotives requiring technical collaboration of the highest order available. The improvements that are likely to be effected in the material to be manufactured under this agreement are by and large likely to be restricted to modifications in the design or layout to suit Indian conditions of operation and availability of indigenous material. Such improvements achieved with the technical assistance of the Group would by themselves benefit the Indian Railways and the exploitation of such improvements by the Group if any, is not expected to embarrass the Indian Railways during the short period of currency of the Agreement i.e. 8 years.

APPENDIX V

Vide para 24

Statement showing how the offer of the Japanese firm and others who had given tenders for collaboration in setting up the steel foundry compare with the offer of Messrs. F. H. Lloyd & Co. Ltd.

The following 15 quotations were received against the global tender for technical collaboration in connection with the setting up of the steel foundry at Chittaranjan:—

Sl. No.	Name of the firm	Collaboration fee
		Rs.
1.	M/s. Iacon Private Ltd., Bombay	13·1 lacs.
2.	M/s. Criffles & Vallet, USA	26·18 lacs.
3.	M/s. Komatsu Mfg. Co. Ja- pan	48·31 lacs.
4.	M/s. Lester B. Knight Associates, Chicago USA	(a) 16·19 lacs for Design and Engineering and Supervision of Procurement, supply and installation of machinery and plant only. (b) They did not offer training facilities and Technical Advisory assistance.
5.	M/s. Masinimport, Rumania	Not furnished No scope of the services they can render for Design and Engineering, Supervision of Procurement, supply and installation of machinery and plant, Technical and Advisory assistance and training of Indian personnel, was indicated nor the terms and conditions.
6.	M/s. Cekop Plant, Export Organisation, Warsaw Poland	10·90 lacs.

Sl. No.	Name of the firm	Collaboration fee
7.	M/s. National Malleable Steel Casting Co. U.S.A.	<p>(a) 7.14 lacs. for Technical and Advisory Assistance and Training of Indian personnel only and royalties for a minimum period of 15 years against output from the proposed foundry</p> <p>(b) Their offer was incomplete as they were not interested in Design and Engineering and Supervision of Procurement, supply and installation.</p>
8.	M/s. Projecting A.B. Stockholm, Sweden.	<p>20.3 lacs. to 20.89 approx. for Design & Engg. and Supervision of procurement, supply and installation. They did not offer training facilities and technical and advisory assistance.</p>
9.	M/s. Peutche Societat Bertender Ingenieure, Germany.	<p>Indeterminable because offer is on percentage basis, viz. 8 per cent of the total cost of building plant etc.</p>
10.	M/s. Albert C. Martin Associate California Engineers.	<p>Cost 7.6 lacs against services of Design & Engineering, Supervision of procurement supply and installation and technical and advisory assistance. Training facilities not offered.</p>
11.	M/s. Campbell Gifford & Morton, England.	<p>10.12 lacs approx. against services of Design & Engineering and Supervision of procurement, supply and installation. Technical 'know-how' and training facilities not offered.</p>

Sl. No.	Name of the firm	Collaboration fee
12.	M/s. Arthur G. Mckee & Co., Cleveland, U.S.A.	(a) 15.70 lacs. for Design & Engg. only. (b) Quotations incomplete in as much as no offer has been made in respect of Supervision of procurement, supply and installation, Technical and Advisory Assistance and Training facilities.
13.	M/s. Loftus, Engineering Corp of Pittsburg, London.	20.23 lacs.
14.	M/s. W. M. Armstrong & Partners Ltd., Canada.	10.00 lacs Indeterminable but very approximate.
15.	M/s. Sumitomo Metal Industries, Osaka, Japan.	70.73 lacs.

The two Japanese firms who quoted are M/s. Komatsu Mfg. Co. and M/s. Sumitomo Metal Industries, Osaka.

It will be observed from the above that Lloyds had not quoted against the global tender issued.

APPENDIX VI

Vide para 30

Annual requirements of the Steel Foundry with regard to the important raw materials, the source from which these are to be obtained and the arrangements so far made by the Railways for their procurement:—

Approximate annual consumption of the important raw materials for the steel foundry when it goes into full production is indicated below:—

(a) Steel scrap	..	14,500 tons
(b) Silica sand	..	15,000 tons
(c) Graphite electrodes	..	120 tons
(d) Lime stone	..	900 tons
(e) Ferro Silicon	..	96 tons
(f) Ferro Manganese	..	96 tons
(g) Fluospar	..	140 tons
(h) Bentonite	..	1,900 tons
(i) Petroleum coke	..	120 tons
(j) Iron ore	..	120 tons
(k) Pig Iron	..	120 tons
(l) Aluminium	..	12 tons
(m) Silica Manganese	..	96 tons

(a) *Steel Scrap*.—The important raw materials required in large quantities are steel scrap and silica sand. The monthly arisings of steel scrap from C.L.W. itself will meet about 50/60 per cent requirements of the steel foundry when it goes into full production. The present accumulation plus the monthly arisings will last for about 3 years, after which balance of requirements of the melting scrap will be obtained from other Railways.

The Railways are one of the major users of steel and no difficulty is envisaged in the availability of steel scrap.

(b) *Silica Sand*.—The main source of supply of Silica Sand is from near Allahabad e.g. Shankergarh, Bargarh etc. There are a number of firms quarrying this sand. We have already entered into contract with two firms and they are supplying 3,000 tons each. This will carry us for about a year in the initial stage. No difficulty is envisaged in obtaining further supplies of sand from these and other reputed firms.

(c) *Graphite Electrodes*.—At present graphite electrode is being imported from America, Japan and East Germany. The present stock is adequate for about one year. It is understood that a licence has been granted for its manufacture indigenously in collaboration

with a U.S.A. firm. It is possible that within the next 3/4 years this will be available from indigenous sources and until then we will have to resort to imports from the most favourable external sources.

(d) *Lime Stone*.—There is no shortage of lime stone in the country. Orders for 600 tons have already been placed and part supplies effected. This will cover our requirements for about a year.

(e) *Ferro Silicon* & (f) *Ferro Manganese*.—Supplies of Ferro Silicon from Mysore Iron & Steel Works, Bhadravati and of Ferro Manganese from Electro Metallurgical Works, Dandeli, have already been received. No difficulty is envisaged in getting regular supplies.

(g) *Fluospar*.—Procurement action for 100 tons has already been taken and part supply received. So far, this was an imported item but it is understood that some deposits of this material have been located in India. If the quality is found satisfactory, it will be obtained indigenously.

(h) *Bentonite*.—As per tests carried out on a number of samples of this material obtained from various sources in India, no difficulty is anticipated in getting regular supplies.

Requirements of items (i) to (m) are very small and no difficulty is envisaged in ensuring regular flow of supply.

Adequate chaplets of various sizes and shapes have been ordered and part supply has been received from a Calcutta firm. Adequate supplies from the trade will be available.

Part supplies of small and medium size moulding boxes have already been received and the balance are expected within the next 4/6 months. Some of the medium and large moulding boxes will be manufactured at C.L.W. No difficulties are anticipated in arranging adequate supply found and oval bushes, pins etc.

The raw materials required are being obtained in the quantities required. Commitments in each case are regulated by considerations of anticipated market trends and the need to enlist competition for price and quality.

APPENDIX VII

Vide para 34

Steps taken to develop indigenous manufacture of components imported for steam locomotives.

(1) *Manganese Steel Liners.*—These are of alloy steel and have to be imported on account of the alloy steel industry not having been sufficiently developed in the country for the supply of this material. As the schemes for manufacture of alloy steel in new and existing steel plants fructify, the import of this item will be eliminated.

(2) *Friction Fabric Liners.*—M/s. Asbestos Magnesia & Friction Materials Ltd., Bombay, are developing facilities for the indigenous manufacture of these liners. They have applied for import of the necessary machinery, which is being processed.

(3) *Eccentric Rod Roller Bearings.*—These are tapered rollers bearings and are not being manufactured in India. Since the demand is small, it is not economical to undertake their manufacture indigenously; the cost per locomotive is only about Rs. 135.

(4) *Roller Bearings for W.G. Locos.*—Roller bearings for the front truck axle-box (costing approximately Rs. 1,000 per locomotive set) are being imported. The only manufacturer of roller bearings suitable for use on rolling stock in India are Messrs. National Engineering Industries, Jaipur. Their roller bearings are being used for the hind trucks and tenders of WG locomotives. A suitable design for the front truck has still not been finalised by the firm.

Foreign exchange to the tune of about Rs. 1,500 per locomotive is being made available to M/s. National Engineering Industries for the import of race rings and raw material required for the manufacture of roller bearings. The firm has been granted an industrial licence for the manufacture of race rings and their application for import of capital goods is now under consideration by the capital goods Committee. It is anticipated that they would be able to establish production of race rings in about 18 months. When this is done, the foreign exchange now being released is expected to be largely eliminated.

(5) *Roller Bearings for WP Locos.*—Roller bearings for the front bogie, the coupled wheels and hind truck are being imported, as M/s. National Engineering Industries have not yet developed suitable designs for these bearings. Foreign exchange of about Rs. 1,200 per

locomotive set is being released for the race rings etc. for the tender axle-box roller bearings, which are being obtained from this firm. This foreign exchange will also be eliminated when race rings are manufactured as indicated above, for WG engines.

The question of developing further capacity for the manufacture of roller bearings for rolling stock has been pursued. The Andhra Pradesh Industrial Development Corporation has been given a licence for the manufacture of ball and roller bearings in collaboration with M/s. Koys Seiko Co. Ltd. of Japan and one of the conditions of the licence is that they should also manufacture roller bearings acceptable to Railways. At a meeting held in the Industries Ministry on 23th July 1963, where representatives of most of the ball and roller bearing manufacturers were present, the necessity of developing further designs of roller bearings suitable for rolling stock as required by the Railways was stressed. So far there has not been enough progress in the development of design facilities in the ball and roller bearing industry to keep pace with the changing needs of industrial and Railway applications. The necessity for developing these design facilities was generally accepted by the manufacturers and this matter is being further pursued with selected manufacturers who showed interest in Railway roller bearings. The aim is not only to develop adequate capacity for the types of roller bearings being used on rolling stock, locomotives etc. at present, but also to encourage and ensure that the industry develops the necessary design know-how in the country itself.

It is anticipated that in the near future acceptable indigenous designs of roller bearings will be forthcoming and this import eliminated.

(6) *Foreign exchange required for Asbestos Mattresses.*—These are being supplied by Asbestos Magnesia Ltd. and the foreign exchange is mainly for asbestos fibre of a quality suitable for use in boiler mattresses. The firm have not so far been able to locate suitable indigenous supplies. On reference, the Ministry of Mines and Fuel have indicated certain other possible sources. The firm are following this up.

(7) *Cast steel front bogie for WP.*—This is a specialised and intricate casting of a large size, incorporating the Constant Resistance Centring Device, for the manufacture of which technique and methods are still not available in India. Chittaranjan Locomotive Works had placed an order for 36 sets of these bogies on the Tata Locomotive and Engineering Company (TELCO) Steel Foundry. These orders were placed over three years ago. The Steel Foundry of M/s. TELCO have only very recently supplied one casting as a prototype which is under test. It is further understood that TELCO are not very keen to proceed with this order. It may, therefore, become necessary to develop production of this casting ultimately at the Chittaranjan Locomotive Works' Steel Foundry, which is being set up. The Chittaranjan Steel Foundry, which is expected to commence production by the end of this year, is planning to take up the manufacture of this bogie casting as early as possible. Towards this end, orders for certain number of these castings have been placed on M/s. Llyod & Company, U.K., Chittaranjan Locomotive
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Works' collaborators for the Steel Foundry—so that the technique and methods and patterns developed by them could be made available to C.L.W's Steel Foundry. This order has been taken in hand for execution by Lloyds during the time our technical personnel have been under training in their Works in U.K., thus enabling our technical personnel to gain intimate knowledge and experience in the manufacturing methods of this casting. To cover the production of WP locomotives till such time as production is established at Chittaranjan, the import of 112 bogie castings (including those ordered on Lloyds) is unavoidable.

APPENDIX VIII

Statement showing Summary of Recommendations/Conclusions

S No.	Reference to Para No. of Report	Summary of Recommendations/conclusions
1	2	3
1	6	Requirement of B. G. steam locomotives for the Third Plan period has been assessed as 840. The output from Chittaranjan Locomotive Works indicates that the target would be fully achieved. The Committee are glad that the out-turn of Chittaranjan Locomotive Works is in accord with its capacity and the Plan target.
2	7	The Committee find that while the Chittaranjan Locomotive Works have been able to execute the orders for the manufacture of W G. locomotives, there has been a time-lag of several years between the placement of order and the commencement of production in the case of W. P., W. T. and W.L. locomotives.
3	8	The first order for the manufacture of W. P. locomotives was placed on the Chittaranjan Locomotive Works on the 16th May, 1959. Production was started towards the middle of 1962 and the first W. P. locomotive ran a successful trial in February, 1963. The Committee consider that the time lag of nearly three years in the commencement of supply of W. P. locomotives after the placement of order was unduly long. As the Chittaranjan Locomotive Works have now gathered sufficient experience and expert knowledge of manufacture of steam locomotives every effort should be made to reduce the time lag between the receipt of order for manufacture of new locomotive and its execution and delivery.

1	2	3
4	9	<p>The target for production of W. P. locomotives from April, 1963 to August, 1963 was 27, against which only 22 W. P. locomotives have been turned out. It is hoped that over the Plan period it would be possible to manufacture the requisite number of W. P. locomotives. In the meantime, production will be maintained by manufacturing additional W/Gs and the adjustment will be made later on by manufacturing less W/Gs and more WPs in order to complete the requisite number of each type. As WP and W/G locomotives have distinct uses, and are not precisely inter-changeable, the Committee would stress that every effort should be made to produce the requisite number of locomotives of each type during each year as originally scheduled.</p>
5	10	<p>The Committee are somewhat at a loss to understand how the Railways propose to relegate the older locomotives to meet "shunting and branch line traffic requirements" when admittedly an economic comparison cannot be made between W. G. and W. T. locomotives. They would suggest that the position may be carefully reviewed by the Ministry of Railways having due regard to the need for employing an economic locomotive for suburban branch line and shunting operations.</p>
6	11	<p>The Committee are glad to note that the Chittaranjan manufactured locomotives compare not only in performance but also in price favourably with the locomotives which used to be imported from abroad. The Railways can justifiably be proud of having brought down the cost of manufacture from Rs. 7.94 lakhs in 1952-53 to Rs. 4.31 lakhs in 1962-63. The Committee have no doubt that strenuous efforts would continue to be made to keep down the cost of manufacture of new locomotives W. P., W.T., etc. which have lately been taken up for manufacture.</p>
7	12	<p>The Committee are glad to find that the Chittaranjan Locomotive Works are fully alive to the need for continuously improving the</p>

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design and manufacturing processes with a view to effecting not only reduction in cost but also improving efficiency.

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Cost of asbestos required for the complete insulation of a steam locomotive is about Rs. 5,500, out of which Rs. 800 represent the component of foreign exchange required for imports. It is estimated that the overall saving resulting from complete boiler insulation will be about Rs. 2,000 to Rs. 2,500 per locomotive per year. The difficulty in going ahead with the measure is not its cost which is low but the release of foreign exchange or its import content. The Committee suggest that limited quantities of insulation materials may be imported and the necessary field trials carried out, so that the efficacy and economics of the insulation are established. They have no doubt that if field trials demonstrably prove that a substantial economy would be effected in fuel consumption, the Government would either allow imports of the requisite insulation material, involving a nominal cost of Rs. 800/- per locomotive, or ensure its indigenous manufacture.

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As the Railways continue to have a large number of steam locomotives and have also expert knowledge and experience of their manufacture, the Committee would stress that measures for effecting fuel economy should be intensified further. In this context, they would suggest that the active help of the Central Fuel Research Institute, Dhanbad, may also be taken.

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The Committee are informed that the actual condemnation and withdrawal of a locomotive is done on condition-*cum*-obsolescence basis. The Committee would stress that every locomotive which is due for superannuation be fully examined also from the point of view of safety, maintenance costs and operating expenses and should be retained in service, if its use is not uneconomical.

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11	17	<p>The Committee find that the demand for Broad Gauge A.C. locomotives for the Third-Five Year plan has been assessed as 244 out of which only 107 are at present programmed to be manufactured in Chittaranjan Locomotive Works, the balance (137) to be imported from abroad.</p> <p>The Committee would stress that every effort should be made to increase the output of A. C. locomotives in Chittaranjan Locomotive Works to meet the demand to the maximum extent possible. The Committee would, in fact, suggest that as steam locomotives are on the way out all over the world, it would but be appropriate that from now onwards a long-term and well-planned scheme for the conversion of Chittaranjan Locomotive Works to the manufacture of electric locomotives (both Broad Gauge and Metre Gauge) is drawn up and implemented to make India self-sufficient in electric traction.</p>
12	17	<p>The cost of AC electric locomotive is stated to be about the same as of imported locomotive. One of the senior Officers who was deputed to assist the North British Locomotive Co., United Kingdom in preparing the Project Report for undertaking manufacture of AC locomotives in Chittaranjan has estimated that "the total approximate cost of manufacturing an electric loco will work out to Rs. 10 lakhs, a figure very much below the cost of an imported locomotive." The Committee have no doubt that as in the case of steam locomotive, no effort would be spared to bring down the cost of manufacture of electric locomotives in Chittaranjan below the cost of an imported electric locomotive.</p>
13	19	<p>From the Agreement between the Government and M/S Group, it is noted that the latter have not granted right to the Government for the manufacture of certain electrical equipment. The Agreement, however, provides that the</p>

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Group will ensure the indigenous manufacture of high-voltage tap-changers (one of the items for which right has not been granted to Government) to the maximum extent possible within three years of the signing of the Agreement. The Agreement also provides that in case the manufacture is not started in India either by Brown Boveri & Co. Ltd., or in collaboration with an Indian firm, the Group will render necessary technical assistance for their manufacture in a designated railway workshop. The Committee would stress that the Railways should keep a close watch over developments for the manufacture of high-voltage tap-changers in the country either in public or private sector.

They would also suggest that for the remaining items, the Railway Board should constitute a small expert body consisting of representatives of Railways, International Trade, Heavy Electricals and the industry to locate urgently the indigenous sources for the manufacture and supply of equipment.

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The Committee feel that it would have been more equitable if a provision regarding free exchange of information of improvements between the Group and the Government could have been provided on the same lines as done in the Agreement with the American Diesel Locomotive Company to cover the full 8 year period of the agreement excluding the last two years. They would also emphasise that in future agreements it may be ensured that the exchange of information of improvements effected is done on reciprocal basis and on equitable terms.

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The manufacture of electrical components listed in Schedule 'B' to the Agreement concluded by the Railways with M/S Group is to be undertaken by the Heavy Electricals Ltd., Bhopal on behalf of the Government. The Committee would stress that the manufacture of A.C. freight loco-motors and A.C. loco-transformers etc. should be undertaken

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by the Heavy Electricals Ltd., Bhopal without delay so that the requirements for the manufacture of electric locomotives are met indigenously, as far as possible. The Committee would also suggest that to avoid uncertainty, a detailed schedule may be drawn up for the manufacture and supply of these components by Heavy Electricals to the Chittaranjan Locomotive Works.

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The Estimates Committee while taking note of the steel foundry project, in their Thirty-Second Report (May, 1956) had observed: "The Committee hope that the proposal will be finalised without undue delay." The Committee, however, find that the agreement with the collaborators was signed after nearly three years in January, 1960 only. Considering the patent need for setting up the foundry, the committee feel that the collaboration arrangement should have been finalised with greater sense of urgency.

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The Committee are informed that in March, 1961 the Government decided to increase the capacity of the Steel Foundry from 7000 tons to 10,000 tons per annum. The collaboration terms to cover the enlarged scope of the steel Foundry Project were settled with M/s. F. H. Lloyd, the collaborators for Steel Foundry of 7,000 tons capacity by negotiation. The details of the Supplemental Agreement are understood to have been finalised by correspondence and the formal agreement has been signed in November, 1963.

As already noted in para 25 of the Report, there was an initial delay of three years in finalising the Agreement with M/s F.H. Lloyd & Co. Ltd. to start the Steel Foundry. If this period had been put to effective use the Steel Foundry of 7,000 tons capacity would already have been completed by 1961 and then it should have been possible for the Railways to raise on their own the capacity to 10,000 tons.

The Committee, therefore, feel that an additional supplemental payment of £ 45,000 (Rs. 6 lakhs) to the collaborators for increasing the capacity to 10,000 tons was not altogether unavoidable.

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18	28	The Committee find that there is a steep and disproportionate increase in the estimated annual recurring expenditure on the steel foundry with 7,000 and 10,000 tons capacity. They also note that the estimated cost of production per ton is Rs. 1,715 in the 7,000 tons capacity foundry whereas in the 10,000 tons capacity it is estimated at Rs. 2,180. The Committee would like the Ministry of Railways to carefully review the reasons for this disproportionate increase and to see what economy can be achieved.
19	29	While the Committee are glad to note the efforts being made by the Railways to increase the indigenous contents in the installation of the steel foundry ; they also note that the imported contents of the machinery would constitute about 29 per cent of the total outlay on plant and machinery. They would suggest that every effort should be made to further reduce the quantity and value of imported components and to locate indigenous sources of manufacture of equipment, in consultation with the Ordnance Factories, who have previous experience in installation of such foundries and the Department of Technical Development.
20	30	The Committee are glad to note that arrangements for ensuring supply of raw materials for the steel foundry have been made by Government and that no difficulty is apprehended in this behalf.
21	31	The Committee have been informed that certain raw materials for the Steel Foundry will have to be imported for a period of two years. Value of imported raw materials will be about 7.96 percent of the total value of raw materials to be used in the Steel Foundry. The Committee would stress that every effort should be made to procure these raw materials in the country within the next two years so that foreign exchange expended on their imports can be saved.

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- 22 32 As the Steel Foundry, being set up in Chittaranjan, is the first foundry on the Railways the Committee would stress that every care should be taken to see that the requisite number of staff are got trained well in advance, so that later on, no difficulties are experienced in manning the project. They have no doubt, that the Railways would take full advantage of the provisions in the Agreement (with their collaborator) to provide training to their personnel particularly in the fields of designing and finishing and in the methods of estimating and costings.
- 23 33 As the Steel Foundry, being installed at Chittaranjan Locomotive Works, is stated to be modern and fully mechanised, the Committee have no doubt that Government would keep a watch to ensure that the cost of casting in the Foundry compares favourably with the cost of casting in advanced countries.
- 24 34 The Committee are informed that the percentage of indigenous purchases of stores made by Railways has risen from 82·5 per cent in 1959-60 to 91·81 per cent in 1961-62. The Committee are glad to know the welcome increase in the percentage of purchases made from indigenous sources by the largest national undertaking in the country. They hope that efforts will be continued to reduce the imported components still further.
- 25 36 The Committee are informed that the design and make of roller-bearings supplied by National Engineering Industries for hind truck and tender axle boxes of locomotives was found to be unsatisfactory in service and therefore its application had perforce to be stopped. It is understood that Messrs. National Engineering Industries have been asked to get out a more robust and foolproof design of roller bearing for the hind truck and tender axle box of locomotives.

The Committee also understand that the National Engineering Industries, Jaipur, in the early stages made front truck bearings

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for WGs but its design was found to be unsatisfactory in service and its extended application had to be discontinued. Cost of bearings purchased from NEI is also higher than the price paid for the bearings imported from S. K. F. Ball Bearing Co. The Committee thus note that not only the performance of ball bearings supplied by the Indian firm for the tender axle boxes of locomotives has been unsatisfactory but that their price is considerably higher than imported SKF ball bearings. The Committee would stress that every effort should be made to improve the indigenous quality of ball bearings and reduce their price.

The Committee would also stress that concerted measures should be taken early to develop indigenous capacity for manufacture of roller bearings required for rolling stock which is now largely built within the country. As roller bearings play a pivotal role in machinery, the Committee cannot too strongly emphasise the need for maintaining the highest standard in its manufacture.

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The Committee are glad to note that measures have already been initiated to manufacture cast steel front bogie for WPs locomotives in Chittaranjan Steel Foundry. They hope that it would be manufactured indigenously, as early as possible, so as to save a substantial amount of foreign exchange which is being spent at present on its import.

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The Committee would stress that remedial measures should be taken to ensure that stores are not accumulated in excess of the estimated requirements.

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The Committee are glad to note that the percentage of investment on workshop would increase from 54.1% to 64.4% on completion of the Steel Foundry and Electric Loco Projects and that there would be corresponding reduction on township which would come down from 45.9% to 35.6%.

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- The township share of cost entering in a locomotive in Chittaranjan Locomotive Works is stated to be Rs. 25,000. The Committee feel that in order to reduce the total capital investment and to ensure that it does not unduly add to the cost of production, Government may consider the advisability of developing the surrounding villages of new projects for the housing of industrial workers. Not only will this have the merit of reducing capital investment but will also help to provide the much needed leaven for effecting social and economic progress in the villages.
- 29 42 The Committee find that with the introduction of the incentive system of wage payment since 1954-55 in the Chittaranjan Locomotive Works, the annual locomotive output has been stepped up from 98 to 183 *i.e.*, 86.5% and the boilers manufactured have gone up for 70 to 186 *i.e.*, 166% with the increase in the strength of staff of about two-thirds only. The Committee are glad that the incentive system of wage payment has proved a demonstrable success in Chittaranjan. They hope that the system would be extended not only to other large railway workshops but also to sheds, carriage and wagon establishments and in fact, to all operations which admit of such extension so that the productivity on the Railways, as a whole, is increased.
- 30 43 The Committee suggest that the present system of suggestions in the Chittaranjan Locomotive Works may be reviewed in the light of experience and the latest practices followed in this behalf in advanced countries, so as to adopt the most effective means of publicity and reward to stimulate workers' constructive suggestions to improve efficiency and reduce cost of manufacture.
- 31 45 The Committee are glad to note that in the Chittaranjan Locomotive Works, there is a provision for evening classes for the staff who desire to qualify themselves technically in their spare time after working hours

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The Committee commend this experiment and suggest that it may be introduced in other large workshops which have sizeable concentration of employees who show enthusiasm to better their technical skill.

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The Committee would commend the financing of schemes like awarding of scholarships for technical education for employees' children from the Staff Benefit Fund or equivalent fund of large national undertakings.

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The Committee are glad to note that there is close liaison between the Ministry of Railways and the Ministry of Defence about the production of defence equipment as necessary in the Railway Workshops like Chittaranjan Locomotive Works. As the Railways have got large workshops and expert knowledge in the field, the Committee have no doubt that every assistance would be rendered by them in undertaking manufacture of defence requirements particularly during the period of emergency.

APPENDIX IX

Analysis of recommendations contained in the Report

I. Classification of recommendations :

A. Recommendations for improving the organisation and working:

S. Nos. 3, 4, 6, 8, 11, 13, 14, 15, 19, 21, 22, 27, 30 and 31.

B. Recommendations for effecting economy :

S. Nos. 5, 7, 9, 10, 12, 17, 18, 23, 24, 25, 26 and 28.

C. Miscellaneous :

S. Nos. 1, 2, 16, 20, 28, 29, 32 and 33

II. Analysis of the more important recommendations directed towards economy :

S. No.	No. as per summary of recommendations	Particulars
1	9	Measures for effecting economy in fuel consumption by steam locomotives may be intensified.
2	10	A locomotive due for superannuation may be fully examined from the point of view of safety, maintenance costs and operating expenses and should be retained in service if its use is not uneconomical.
3	12	No. effort may be spared to bring down the cost of an A.C. locomotive below the cost of an imported locomotive.
4	17	If there had been no delay in finalising the initial Agreement for the Steel Foundry of 7000 tons, the Foundry would have been completed by 1961 and Railways could have raised the capacity to 10,000 tons on their own. Supplemental payment of £45,000 (Rs. 6 lakhs) to the collaborators was, therefore, not altogether unavoidable.

S. No.	No. as per summary of recommendations	Particulars
5	18	There is a steep and disproportionate increase in the estimated annual recurring expenditure on the Steel Foundry of 10,000 tons capacity as compared to 7,000 tons. Government should review reasons for the same and see what economy can be achieved.
6	28	To reduce capital investment and to ensure that the investment on township does not unduly add to the cost of production, Government may consider the advisability of developing surrounding villages of new projects for the housing of industrial workers.

26. A. H. Wheeler & Company, Private Limited, 15, Elgin Road, Allahabad.
27. Law Book Company, Sardar Patel Marg, Allahabad.
28. Goel Traders, 100-C, New Mandi, Muzaffarnagar.
29. B. S. Jain & Company, 71, Abupura, Muzaffarnagar.

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30. M. C. Sarkar & Sons (Private) Limited, 14, Bankim Chatterjee Street, Calcutta-12.
31. W. Newman & Company Limited 3, Old Court House Street, Calcutta.
32. Thacker Spink & Company (1933) Private Ltd., 3, Esplanade East, Calcutta-1.
33. Firma K. L. Mukhopadhyay, 6/IA, Banchharam Akkur Lane, Calcutta-12.

DELHI

34. Jain Book Agency, Connaught Place, New Delhi.
35. M/s. Sat Narain & Sons, 3141, Mohd. Ali Bazar, Mori Gate Delhi.
36. Atma Ram & Sons, Kashmere Gate, Delhi-6.
37. J. M. Jaina & Brothers, Mori Gate, Delhi-6.
38. The Central News Agency, 23/90, Connaught Circus, New Delhi.
39. The English Book Stall, 7-L, Connaught Circus, New Delhi.

40. Jayana Book Depot, Chapparwala Kuan Karol Bagh, New Delhi.
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47. Mehra Brothers, 50-G, Kalkaji, New Delhi-19.
48. Dhanwantra Medical & Law Book House, 1522, Lajpat Rai Market, Delhi-6.
49. The United Book Agency, 48, Amrit Kaur Market, Paharganj, New Delhi.
50. Hind Book House, 82 Jan Path, New Delhi.

51. Bookwell, 4, Sant Narankari Colony, Kingsway Camp, Delhi-9.

MANIPUR

52. Shri N. Chaoba Singh, Newspaper Agent, Ramlal Paul High School, Annexe, Imphal, Manipur.

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U. K.

53. The Secretary, Establishment Department, The High Commission of India, India House, Aldwych, LONDON, W.C.-2.

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