

**PUBLIC ACCOUNTS COMMITTEE  
(1978-79)**

(SIXTH LOK SABHA)

**HUNDRED AND THIRTY-FIFTH REPORT**

**D.C. ELECTRIC TRACTION**

**MINISTRY OF RAILWAYS**

[Paragraphs 9 and 10 of the Report of the  
Comptroller and Auditor General of India for the  
year 1975-76, Union Government (Railways)]



*Presented in Lok Sabha on 30-4-1979  
Laid in Rajya Sabha on 30-4-1979*

**LOK SABHA SECRETARIAT  
NEW DELHI**

*April, 1979/Vaisakha, 1901 (Saka)*

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CORRIGENDA TO 135TH REPORT OF PUBLIC ACCOUNTS  
 COMMITTEE PRESENTED TO LOK SABHA ON 30.4.1979.

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## CONTENTS

	PAGE
COMPOSITION OF THE PUBLIC ACCOUNTS COMMITTEE . . . . .	(III)
INTRODUCTION . . . . .	(V)
REPORT . . . . .	
Chapter I—D.C. Electric Locomotives (WCG <sub>2</sub> ) . . . . .	1
Chapter II—Central Railway—Mercury Arc Rectifiers. . . . .	39
APPENDICES . . . . .	77

### \*PART II

Minutes of the sitting of the Public Accounts Committee held on:—

8-11-1978  
9-11-1978  
10-11-1978  
27- 4-1979

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\*Not printed. One cyclostyled copy laid on the Table of the House and five cyclostyled copies placed in the Parliament Library.

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(1978-79)

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3. Shri T. R. Ghai—*Senior Financial Committee Officer.*



## INTRODUCTION

I, the Chairman of the Public Accounts Committee as authorised by the Committee, do present on their behalf this Hundred and Thirty-Fifth Report of the Public Accounts Committee (Sixth Lok Sabha) on paragraphs 9 and 10 of the Report relating to D.C. Electric Traction included in the Report of the Comptroller and Auditor General of India for the year 1975-76, Union Government (Railways).

2. The Report of the Comptroller & Auditor General of India for the year 1975-76, Union Government (Railways) was laid on the Table of the House on 13th June, 1977. The Public Accounts Committee (1978-79) examined these paragraphs at their sittings held on 8, 9 and 10th November, 1978. The Committee considered and finalised the Report at their sitting held on 27th April, 1979. The Minutes of the sittings form Part II\* of the Report.

3. A statement containing conclusions and recommendations of the Committee is appended to this Report (Appendix). For facility of reference these have been printed in thick type in the body of the Report.

4. The Committee place on record their appreciation of the assistance rendered to them in the examination of this paragraph by the Comptroller and Auditor General of India.

5. The Committee would also like to express their thanks to the Chairman and Members of the Railway Board for the cooperation extended by them in giving information to the Committee.

NEW DELHI;  
April 30, 1979

Vaisakha 10, 1901 (S).

P. V. NARASIMHA RAO,  
Chairman,  
Public Accounts Committee.

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## CHAPTER I

### REPORT

#### D.C. ELECTRIC LOCOMOTIVES (WCG-2)

##### *Audit Paragraph*

1.1. Bombay-Igatpuri and Bombay-Pune sections of Central Railway were progressively provided with direct current (D.C.) electric traction since 1928-29. D.C. electric locomotives (57 numbers—41 freight type and 16 passenger type) which were in use on these sections since then had become due for replacement in 1963-64. In September 1963, the Railway Board decided to replace these 57 old D.C. locomotives during the Fourth Five Year Plan period. A formal order for the manufacture of ten 1,500 V D.C. freight type locomotives was placed on the Chittaranjan Locomotive Works by the Railway Board in October 1964.

1.2. In January 1965 the Central Railway Administration informed the Railway Board that owing to development and industrialisation in the Bombay area and the expansion of the Bombay Port and other factors, the traffic across Thull ghats (North-east line) and Bhore ghats (South-east line) was likely to be substantially heavier by the end of the Fourth Five Year Plan period than what it was then. It was, therefore, necessary to increase the line capacity on these ghat sections. It was considered by the Railway Administration that provision of locomotives capable of hauling 1,830 tonnes trailing loads in both the directions over these ghats (as against the then existing limitation of trailing loads of 1,250 tonnes during dry season and one thousand tonnes during monsoon) at speeds reaching 15 kms per hour would give an immediate increase of about 50 per cent in the line capacity for goods trains without having to increase the number of trains to be run.

1.3. The Central Railway Administration further pointed out to the Railway Board in June 1965 that keeping in view the fact that the authorised trailing loads on a neighbouring section viz., Igatpuri-Bhusaval Section, after electrification with 25,000 V A.C. traction had been specified as 2,314 tonnes in the up direction from Bhusaval to Igatpuri and 1,990 tonnes in the down direction from Igatpuri to Bhusaval, it would be desirable that the new D.C. engines for the Bombay—Igatpuri and Bombay—Pune Sections

were designed to haul the same loads to avoid stepping down/up of the loads at Igatpur. The higher trailing loads would also give substantial benefit in increasing the throughput across the ghat sections which were major bottlenecks.

1.4. Originally, the Railway Board, after due consideration of the relative merits of the BB and Co Co design locomotives, decided in 1965 to adopt the four-axled BB monomotor bogie design for locomotives for 1,500 V D.C. operation. One of the important considerations was that the production of BB design A.C. locomotives was already established at Chittaranjan Locomotive Works and the manufacture of D.C. locomotives of BB design would present no problem. However, in December 1966, the Railway Board decided to change over to six-axled Co Co design for the locomotives on the following considerations, amongst others:

- (i) The BB design motor would require considerable modification necessitating change in the bogie. This would, in turn, require prototype trials to prove the designs before bulk production commenced. With this appreciation the Chittaranjan Locomotive Works estimated that a prototype BB could be delivered in about 3 years time and bulk production could start only after 4 years. This schedule would be totally unsuitable as the requirements of Central Railway were urgent.
- (ii) For the Co Co design the Research, Designs and Standards Organisation had proposed to adopt established traction motors and proved ALCO bogies. This would enable the Chittaranjan Locomotive Works to start out-turn in about 2½ years' time and complete about 25/27 locomotives by March 1970.
- (iii) The overall foreign exchange commitment for the BB design would more than for the Co Co design (the foreign exchange content of a BB design locomotive being about Rs. 1.20 lakhs more than that of a Co Co design locomotive). The total cost of BB design was, however, less by about Rs. 2.3 lakhs per locomotive.
- (iv) A fleet of 57 Co Co locomotives was expected to give about 30 per cent additional throughput as compared to the BB design.

Accordingly, the Railway Board, during 1964—68, placed orders on the Chittaranjan Locomotive Works for the manufacture of 57

D.C. electric locomotives (WCG-2) of Co. Co design on priority basis. The production was scheduled to be started within 2½ years and an outturn of 25/27 locomotives was to be reached by March 1970.

1.5. The design for the locomotive was finalised by the Research, Designs and Standards Organisation and made available to the Chittaranjan Locomotive Works in 1967. As per the specifications, the locomotive was required to fulfil the following, amongst other operating requirements:

- (i) haul a trailing load of 3,660 tonnes 'BOX' wagons' at a balancing speed of 80 kms. per hour on level;
- (ii) starting and hauling a load of 1,830 tonnes at a balancing speed of 33.5 kms per hour on 1 in 100 gradient; and
- (iii) assisted by a similar banking locomotive, starting and hauling a load of 1,830 tonnes at a speed of 15 kms per hour on 1 in 37 gradient.

In other words, it was expected that the locomotive with a single banker would be capable of hauling a trailing load of 1,830 tonnes in ascending and descending directions on both ghat sections viz., Kalyan—Pune and Kalyan—Igatpuri.

1.6. Three prototypes of the locomotives were manufactured in January, March and June 1971 and trial tests on these were conducted by Central Railway in March, April and July 1971. It was found that this locomotive was capable of hauling 1,600 tonnes mixed loads on Kalyan—Vasind portion of Kalyan—Igatpuri section (actual compensated gradient being 1 in 87.5 instead of 1 in 100) at a speed of 51 kms per hour as against the designed capacity of 1,830 tonnes at speed 33.5 kms per hour and when assisted by a similar banking engine was capable of hauling a load of 1,250 tonnes only at a speed of 33 kms per hour in the ghat section of Kasara—Igatpuri (the actual compensated gradient being 1 in 33.5 instead of 1 in 37) against the designed capacity of 1,830 tonnes at speed 15 kms per hour. The additional capacity created by this increase in speed for running additional number of trains was, however, not considered advantageous as this would necessitate procurement of 16 additional locomotives and execution of additional line capacity works.

1.7. In March-April 1972, the Research Designs and Standards Organisation conducted "rating, performance adhesion and continuous rating speed tests" on one of the three prototypes with a trailing load of 1,083 tonnes and found that the percentage of running adhesion ranged between 15.30 and 20 with continuous slipping on certain portions against the designed adhesion value of 23.2 per cent.

1.8. Although the performance of the prototypes was not satisfactory, series production of locomotives was undertaken and by September 1972, ten locomotives were delivered to Central Railway. Year-wise outturn and cost of production of the locomotives delivered to Central Railway are indicated below:

Year	No. of locomotives	Cost of locomotives (provisional)
		(rupees in lakhs)
1970-71 . . . . .	3 prototypes	87.63
1971-72 . . . . .	6	1,64.79
1972-73 . . . . .	14	3,77.97
1973-74 . . . . .	14	3,98.86
1974-75 . . . . .	13	4,71.86
1975-76 . . . . .	4	1,20.00
TOTAL . . . . .	54	16,21.11

1.9. Though the decision to adopt Co Co design was based *inter alia* on the considerations that there would be a saving in foreign exchange to the extent of Rs. 1.20 lakhs per locomotive (foreign exchange content was assessed at Rs. 2.79 lakhs in the case of a BB design locomotive and Rs. 1.59 lakhs in the case of a Co Co design locomotive) and the Chittaranjan Locomotive Works would be able to start outturn in about 2½ years and complete about 25/27 locomotives by March 1970, the actual expenditure on foreign exchange per locomotive was Rs. 3 lakhs as more components than contemplated originally had to be imported and there had been considerable delay in the actual production as would be evident from the table above.

1.10. The Railway Board stated (January 1977) that it was not considered desirable to wait for ideal conditions to prevail for the

series manufacture to commence at the need for replacing old locomotives was pressing. It further stated that the hauling capacity of "the locomotives continues to be the same as that of the prototype. As regards the major equipments like traction motors, M.A. sets (motor alternator sets), high speed circuit breakers etc., there has been significant improvement in the performance as a result of certain modifications which have been carried out and efforts are continuing" for further improvements.

1.11. During 1968-69 to 1973-74 estimates for works costing Rs. 8.14 crores were sanctioned for (i) strengthening the power distribution system by augmenting the capacity of the overhead equipment and sub-stations to meet additional traction power requirement including that for the new WCG-2 Co Co design locomotives (Rs. 2.65 crores); (ii) replacement of 2,500 KW rotary converters on age-cum-condition basis by 3,000 KW rectifiers to augment the capacity of the converting plant (Rs. 3.98 crores); (iii) extension/provision of loops to hold 65/70 wagons at all stations in the two sections as against 45 wagons (Rs. 1.38 crores); and (iv) additional facilities at the locomotive shed, Kalyan, to facilitate inspection of 57 Co Co locomotives (Rs. 0.13 crore). These works were undertaken between 1969 and 1974 and have been executed to the extent of 70 to 100 per cent. The expenditure booked up to May 1976 was Rs. 12.90 crores, of which Rs. 5.27 crores were in respect of replacement works which would have been undertaken even otherwise on age-cum-condition basis.

#### *Performance of Locomotives*

1.12. The new locomotives (four numbers) were brought into use for the first time in April 1972 in Kalyan—Igatpuri and Kalyan—Lonavia Sections and by the end of March 1975/March 1976, 43/54 locomotives were in service. Since these locomotives could not haul the loads for which they were originally designed, lower hauling loads (permissible load) based on actual experience of the working of these locomotives were fixed by the Railway Administration which is considered by the Research, Designs and Standards Organisation to be the capability of the 'present design'. The original designed capacity and the hauling capability of each of these locomotives are mentioned below:

#### *Design/hauling capacity*

Plain section (Wadi Bandar-Kalyan) . . . . .	2250 tonnes (four-wheeled wagons)
Ghat-section (Kalyan-Igatpuri and Kalyan-Pune)	1830 tonnes in 1 in 100 gradient 1830 tonnes in 1 in 37 gradient assisted by one similar banking locomotive.

Permissible load (with reference to the actual capability of the design)

<b>Plain section (Wadi Bandar-Kalyan)</b>	<b>Down (ascending) and up (descending) direction :</b>	<b>2000 tonnes.</b>
<b>Ghat sections (Kaiyan-Igatpuri Kalyan-Pune)</b>	<b>Down (ascending) direction.</b>	<b>1250 tonnes with one banker. 1600 tonnes with two bankers.</b>
	<b>Up (descending) direction :</b>	<b>1600 tonnes with one banker.  1800 tonnes with two bankers.</b>

1.13. The actual gradient on Kalyan—Vasind portion of Kalyan--Igatpuri section is 1 in 87.5 compensated for curvature. Similarly, the actual gradient on Kasara—Igatpuri section is 1 in 33.5 duly compensated for curvature. However, on the advice of the Central Railway Administration that these two sections have gradients of 1 in 100 and 1 in 37 respectively the design parameters as adopted by the Research, Designs and Standards Organisation were gradients of 1 in 100 and 1 in 37 in these sections respectively. This is stated by the Research, Designs and Standards Organisation to be one of the factors for the poor performance of the locomotives.

1.14. The other reasons for the unsatisfactory performance of the locomotives stated by the Railway Administration were less locomotive axle load, stalling and lack of adequate hand brake power.

1.15. The performance of the equipments provided on these locomotives was found by the Railway Administration to be "far from satisfactory" which made the locomotives "very much unreliable". The traction motors, relays, motor alternators and the high speed circuit breakers installed on these locomotives were found to be causing maximum defects.

1.16. It may also be mentioned that regenerative braking equipments which were considered necessary by the Research Designs and Standards Organisation, are yet to be provided in the locomotives so far manufactured and supplied.

1.17. The availability of the WCG-2 locomotives and their utilisation during the years 1972-73 to 1975-76 were as under:—

	1972-73	1973-74	1974-75	1975-76
1. Average number of locomotives in service during the year. . . . .	11.8	23.75	37.25	50.183
2. Average number of locomotives effective (fit for use) . . . . .	6.03	18.5	29.8	40.9
3. Average number of locomotives in use				
Goods services	5.56	16.12	25.4	35.5
Other Services	0.22	2.09	3.53	5.17
4. Average number of locomotives—spares . . . . .	0.25	0.20	0.76	0.04
5. Engine kms.*per day per locomotives in use				
Goods services‡.	193	198	185	179
Other services.. . . .	69	132	160	217
All services.	189	188	180	184

1.18. In January 1975 the Railway Board appointed a Committee of Technical Officers for finalising modifications in order to improve the performance reliability of these locomotives. In its report of February 1975, the Committee recommended a full time team of engineers to assist the investigation by the Research, Designs and Standards Organisation, but such a team was not constituted till August 1975. However, the Research, Designs and Standards Organisation observed in August 1975 that "this class of locomotive.....is fundamentally unsuited for use as a reliable banker due to limitations imposed by the present type of traction motor as well as its control system as inbuilt in this design of locomotive."

1.19. In May 1972, the Central Railway Administration considered that in order to move the traffic anticipated in 1973-74 over the ghat sections and in view of the lower performance of the new WCG-2 Co Co design locomotives, it was essential that a system of double banking should be planned so that maximum advantage of the increased loads can be secured. The Railway Administration approached the Railway Board for provision of 10 locomotives on

\*No target of engine kilometres per day per engine in use has been prescribed for WCG-2 locomotives. In respect of D.C. locomotives (WCM, WCG and WGP etc.) the target laid down by the Railway Board in August, 1972 was 200 kms. per day.



additional account for double banking. This was accepted by the Railway Board originally. Subsequently, in March 1975, the manufacture of 10 WCG-2 locomotives was held in abeyance as a locomotive of this design was not considered by the Railway Board as a reliable and suitable banker and it was decided to evolve indigenous design of a new banker.

1.20. As stated above, it was anticipated that the provision of these new locomotives would give an immediate increase of about 50 per cent in the line capacity for goods trains without having to increase the number of trains to be run in view of increased hauling capacity from 1,250 tonnes to 1,830 tonnes. It will be seen from the table below that on the Kalyan—Igatpuri section the increase in traffic had to be cleared by running additional trains while on the Kalyan—Pune section there has been no decrease in the number of trains run even though the traffic has been practically static.

1	Average number of wagons cleared per day	Average number of trains run per day
1	2	3
<b>Kalyan—Igatpuri</b>		
1968-69 .	522	11.8
1973-74 .	621	14.4
1974-75	608	14.1
1975-76	702	14.9
<b>Igatpuri—Kalyan</b>		
1968-69 .	557	11.1
1973-74 .	606	12.3
1974-75 .	615	12.5
1975-76	721	13.6
<b>Kalyan-Pune</b>		
1968-69 .	323	7.6
1973-74 .	340	8.1
1974-75 .	293	7.2
1975-76 (Kalyan-Lonavla .	335	8.0
1975-76 Lonavla-Punc. . . . .	323	7.2

1	3	3
Pune-Kalyan.		
1968-69 .		357 7.0
1973-74 .		392 8.2
1974-75 . . . .		370 7.8
1975-76 Pune-Lonavla		363 7.0
1975-76 Lonavla-Kalyan . . . .		391 7.4

1.21. In would thus be seen that:

- (a) the loads hauled by the locomotives on these sections are very much less than their designed hauling capacity;
- (b) these loads have been hauled in the Ghat Sections by deploying two bankers instead of one banker only as envisaged in the design of the locomotives; and
- (c) there does not appear to have been any material increase in the capacity enabling the running of trains with heavier loads.

1.22. The Railway Board stated (January 1977) that "the short-fall in performance has been due to (a) the actual compensated gradient on the Kalyan—Vasind section being 1 in 87.5 and not 1 in 100 and on the Kasara—Igatpuri Ghat section being 1 in 33.5 and not 1 in 37; (b) non-realisation of the anticipated running adhesion characteristics (18.5 per cent average as against 23.2 per cent assumed for design purpose) which were based on the data available on WDM-2 locomotives with same without trimount Co Co bogie, in the locomotives in the ghat section with combination of severe grades and curves and unfavourable traction conditions, wet tunnel entrances etc.; and (c) the locomotive and train resistances being higher than standard values assumed in the design." It also stated that the locomotives turned out later were built with maximum axle load upto 22.5 tonnes as the prototype tribals indicated the desirability of increasing the designed axle load of 22 tonnes to 22.5 tonnes. The deficiency in regard to hand brake power was subsequently overcome by suitable modifications. The Board further stated that the performance of the WCG2 locomotives is

being constantly reviewed and remedial measures to improve the performance have been worked out. Consolidated efforts have also been made through the medium of Technical Study Group under the guidance of the Research, Designs and Standards Organisation since August 1975 to have a systematic study of the locomotive equipment defect to minimise line failures”.

[Paragraph 9 of the Report of the Comptroller and Auditor General of India for the year 1975-76 Union Government (Railways)].

1.23. The Railway Board decided in September, 1963, to replace 57 old D.C. locomotives (41 freight type and 16 passenger type) on Bombay-Igatpuri and Bombay-Pune sections of Central Railway during the Fourth Five Year Plan period. These locomotives were procured during 1928-29. Enquired about the desirability of replacing these locomotives, the Chairman, Railway Board during evidence stated:—

“Normally these locos have a codal life of 35 years. On that basis the planning was done. The replacement programme had to be drawn up. Previously this was 40 years. They were to be replaced and it was decided to replace them.”

1.24. The Committee enquired if during the 35 years of their codal life these locomotives have had any trouble. The Chairman Railway Board stated:—

“Plenty of trouble.”

1.25. Asked about the nature of these troubles, the witness replied:—

“The design itself was old and antiquated. This was an antiquated design of 1928. The transmission of traffic and maintenance became quite a problem. It is no doubt of course that they were robust locomotives but these problems arose.”

1.26. To another query, the Chairman Railway Board stated:

“They worked well and still they are working.”

1.27. The Committee wanted to know the necessity of replacing these locos if they were working well. The witness replied:—

“Normal replacement is on age-cum-condition basis. Our replacement policy is always on age-cum-condition basis.

That is what our policy is. Merely because they have attained the age, we don't really replace them. We start planning them for replacement at that age."

Elaborating the point further, he added:—

"The normal practice of the requirements of replacement is on the codal life. When it reaches the codal life, we start planning them out and it cannot be purchased at one time. So it is a rolling stock programme. We started including them in 1963 when they had finished 35 years of life. The condition at that time was that we cannot carry on for two or three years more. So there was a plan for replacement. And that plan was continued and since the delay was there, other problems came much later."

1.28. The Committee asked if it was decided by the Railway Board to change all of them within a short period of time. The witness replied:—

"We do not. But the policy is that after 35 years it has to be changed gradually."

1.29. Elaborating the point further, Member (Mechanical) Railway Board stated:

"We have a very large holding of locomotives. Because of this, the replacement in one year of about 50 or 60 is not at all unusual. In this case the Electrical Directorate will work out and see when the locomotives will fall due for replacement. They will initiate action thereafter. The design will be worked out, in consultation with the Planning Committee, the Standards Committee and the RDSO."

1.30. Pointing out that in 1963-64 itself these locomotives had become old, outlived their codal life and were in bad condition, the Committee enquired as to how these locomotives were being used. The Chairman, Railway Board replied:

"Our replacement policy has been on age-cum-condition basis. The condition was deteriorating."

1.31. The Committee pointed out that to keep these very old Engines in operation, Railway Board would have spent a lot of money on their maintenance. To this query, the witness replied:—

"...we had a major rehabilitation programme to keep them going. The cost was about Rs. 65 lakhs in totality on maintenance in the period 1965-67, if I remember right."

1.32. The Committee desired to have yearwise figures of maintenance cost from 1963-64 onwards for the succeeding ten years in order to have an idea of financial loss incurred due to delays in bringing new locos into operation. The Railway Board in a note have stated:

“Accounts of the expenditure on repairs and maintenance of Diesel Locomotives in the electrified sections of Bombay Division have not been maintained separately.”

1.33. The Audit Para points out that the Central Railway Administration informed the Railway Board that owing to the development and industrialisation in the Bombay area and the expansion of the Bombay Port and other factors, the traffic across Thullghats (North-east line) and Bhore ghats (South-east line) was likely to be substantially heavier by the end of the Fourth Five Year Plan period than what it was then. It was therefore necessary to increase the line capacity on these ghat sections.

1.34. Audit Para further states that the Railway Administration considered that provision of locomotives capable of hauling 1830 tonnes trailing load in both the directions over these ghats (as against the then existing limitation of trailing loads of 1250 tonnes during dry season and 100 tonnes during monsoon) at speeds reaching 15 kms. per hour would give an immediate increase of about 50 percent in the line capacity for goods trains without having to increase the number of trains to be run. In this connection, the Committee desired to know the quantum of traffic which was anticipated to move on the two ghat sections at the end of Fourth Five Year Plan (1973-74). The Railway Board in a note have stated:

“These 57 locomotives were procured on replacement account against 41 EF and 16EA locomotives. This opportunity was also taken to design and manufacture locomotives with which it was anticipated that the trailing loads would also increase and consequently higher traffic levels could be handled with the same number of trains. Procurement of these locomotives was not related to increase in the number of trains.”

1.35. It is however, noticed from the Works Machinery and Rolling Stock Programmes of Railways for 1975-76 and 1976-77 that Budget provisions for—

1. Construction of a third line on North East Ghat Section between Kasara and Igatpuri including augmentation of

power supply and distribution system-Central Railway; and

in the total requirements of the Five Year Plan and as and

2. Construction of a third line on South East Ghat Section between Karjat and Lonavla (28.54 km.) Central Railway have been made. These works estimated to cost Rs. 17.50 crores and Rs. 21.7 crores respectively have been undertaken to meet the shortfall in transport capacity.

1.36. The actual quantum of traffic materialised at the end of Fourth Plan (in 1968-69) and subsequent years on these two ghat section is given below:

Year	Kalyan-Igatpuri-Kalyan Section Wagons per day	Trains per day
1968-69	522	11.8
1973-74	621	14.4
1974-75	615	14.1
1975-76	721	14.9
1976-77	877	16.3
<i>Kalyan-Lonavala-Kalyan Section.</i>		
1968-69	323	7.6
1973-74	392	8.2
1974-75	370	7.8
1975-76	391	8.0
1976-77	416	8.9

1.37. The Committee enquired if the expected increase in the line capacity had been achieved and utilised fully. The Railway Board in a note have stated:

“These locomotives have complied with the anticipated design performance except for starting and hauling 1830 tonne load on 1 in 37 rising grade in ghats. As such, in as much as the hauling capacity on the ghats has not been fully materialised, the expected increase in the line capacity has also not been fully achieved.”

1.38. Pointing out that in 1968-69 the number of trains per day on Kalyan-Igatpuri and Kalyan-Lonavala sections were 11.8 and 7.6 respectively and the number of trains per day on these sections

during the period 1973-74 to 1977-78 ranged between 14.1 to 16.3 and 7.8 to 8.9 respectively, the Committee desired to know whether the running of increased number of trains after commissioning of the new locos was necessitated by the shortfall in their hauling capacity compared to the designed hauling capacity. The Ministry of Railways in a note have stated:

“Yes, on the Ghat Sections”

1.39. Asked if in this case the objective of increasing through put without increase in the number of trains has not materialised.

“Yes, on Ghat Sections”

1.40. The Committee enquired if besides replacement of old engines, planning for future traffic density was also taken into account. The Chairman, Railway Board during evidence stated:—

“It was partially taken into consideration. Whatever planning was done, there are two aspects of it. Whenever we do replacement, we consider them taking into account some important factors. One is asset to asset factor, then the second factor is the development or the improvement effect of it and we do take the improvement effect of these things also. We do calculate the needs of the various services by taking both these factors into consideration and the total number is decided after that as to how much we need for a particular amount of traffic both passenger and goods.”

1.41. The Committee desired to know the procedure followed in planning rolling stock programme. The witness replied:—

“We have what we call a rolling stock programme which is a triennial programme. We project it three years ahead. Each of the railways send their requirements of replacement account to us much earlier. The Railway Board has a Planning Directorate which caters to the planning of the future traffic. Both of them are combined and we come to know the additional amount. Then we decide how much is the number of rolling stock required. After that we project as to how much depreciation reserve fund can take and how much is the additional fund can take. Then we request the Planning Commission to include these in the total requirements of the Five Year Plan and as and

when the allotment of money is made, to the extent possible both additional and replacement we try to balance in the Railways itself. Sometimes we are not able to meet the full replacement programme—many a time it has happened—because of the non-availability of full replacement.”

1.42. Elaborating the point further, the Member Mechanical, Railway Board stated during evidence:—

“In regard to design, I would only mention that we have a number of committees. There is a Motive Power Committee. There is an Electrical Standards Committee and there is a Loco Standards Committee. The Chairman of these Committees attend the annual R.D.S.O. meeting. The Motive Power Committee has a number of Directors of the Railway Board. They go into the various features of the design so that the particular specification is finally evolved for ordering the locomotives. These are in the best interest of the railways.”

1.43. The Audit Para states that the Railway Board had originally after the consideration of the relative merits of BB and Co Co design locomotives decided in 1965 to adopt the four-axled BB mono-motor bogie design for locomotives for 1500V D.C. operation. However, in December 1966, the Railway Board decided to change over to six-axled Co Co design for the locomotives. The Committee desired to know the specific considerations for adopting Co Co designs to BB designs. The Railway Board in a note have indicated the following considerations for change over to six-axled Co Co design:—

1. “The BB design Motor would require considerable modifications necessitating change in bogie. This would in turn require prototype trials to prove the design before bulk production commenced. With this appreciation, the Chittaranjan Locomotive Works estimated that a prototype BB could be delivered in about 3 years time and bulk production could start only after 4 years. This schedule



would be totally unsuitable as the requirements of Central Railway were urgent.

2. For the Co Co design, the Research Designs and Standards Organisation had proposed to adopt established Traction Motors and proven ALCO bogies. This would enable the Chittaranjan Locomotive Works to start out-turn in about 2½ years time and complete about 25/27 locomotives by March 1970.
3. The overall foreign exchange commitment for the BB design would be more than for the Co Co design the foreign exchange content of a BB design locomotive being about Rs. 1.20 lakhs more than that of a Co Co design locomotive. The total cost of BB design was, however, less by about Rs. 2.3 lakhs per locomotive.
4. A fleet of 57 Co Co locomotives was expected to give about 30 per cent additional throughput as compared to BB design."

1.44. It would be seen that one of the prime considerations for Railway Board to prefer Co Co design of locomotives in comparison to BB design was that its production would start in about 2½ years whereas BB design would take 4 years and that outturn of 25/27 locomotives was to be reached by March 1970 and that Central Railways requirements were urgent. However, Chittaranjan Locomotive Works took nearly four years to produce prototype since the design was finalised by the Research, Designs and Standards Organisation in 1967. The Committee desired to know the reasons for delayed production. The Member, Mechanical, Railway Board during evidence stated:—

"In regard to delay, I would only clarify that firstly there was some delay in supply of equipment from Bhopal. In the manufacture of locomotives serious limitations are there. It is a very time-consuming process. For a year and a half the RDSO took to issue what we call key drawings. Then the Chittaranjan took another year and a half to work out the working drawings. Then the order for long lead items and various raw materials and the manufacturing time all these things took another 2 years or so."

Continuing further he added:—

"This is the time when the prototypes go into service in the normal course. Then the manufacturer would like the

prototype to be used and proved in service at least for three years. He has to get all the feed-back from the RDSO and the necessary modifications carried out. Then only the series production starts. Our experience is that many a time we had to face financial constraints and lack of resources. Then we would like to have a proper feed back so that the prototype could be modified."

1.45. The Railway Board informed the Committee that orders for 57 locomotives (WCG2) of Co Co design were placed on the following dates:

Sl. No.	Date	No. of locomotives
1.	24-10-1964	10
2.	17-3-1967	10
3.	17-1-1968	30
TOTAL		57

1.46. Explaining the reasons for delay in production of the locomotives, the Railway Board in a note have stated:—

"The delay in production of locomotives was due to delay in supply of equipment from M/s Bharat Heavy Electricals Limited, Bhopal, as given below:

Sl. No.	Equipment for	Promised by BHEL	Actual Delivery	Delay in month
1.	1st Loco set	August 1968	Feb. 1970	18 months.
2.	2nd Loco set and onwards	January 1969 and at the rate of 2 loco sets per month onwards	Sept. 1970 only one loco set	20 months
3.	27th Loco set	Feb. 1971	March 1973	25 months
4.	57th loco set	Feb. 1973	June 1976	40 months".

1.47. The Committee enquired if the original production schedule of locomotives was fixed in consultation with the BHEL. The Railway Board in a note have stated:—

"The original production schedule of DC electric Locomotives was original on the delivery commitments for supply of Traction Equipment as promised by BHEL."

1.48. The Committee further enquired if the reasons for delayed supply by BHEL of various components and Equipments have been investigated. The Railway Board in a note have stated:—

"The reasons for the delayed supplies from BHEL have been gone into. Delay in locomotive production was due to

delay in supplies of equipments from BHEL on account of slippage in developing equipments like Motor Alternator Set, Frequency Regulator, Electro-Pneumatic Contractors, High Speed Circuit Breakers, Master Controllers, Reverser and Traction Braking Inversers, etc. on their end. It may be brought out that these equipments were being developed/manufactured by BHEL in the country for the first time in collaboration with foreign firms."

1.49. The Committee desired to know if the use of traction motors as were being manufactured by BHEL, Bhopal and which had already been proved on Diesel Electric Locomotives (WDM-2) was one of the important considerations for deciding on manufacture of Co Co design of locomotives and if so how the supply of these traction motor sets from BHEL was delayed. The Railway Board in a note have stated:

"Yes, adoption of indigenously available Traction Motor of Diesel Electric Locomotives was one of the important reasons for deciding on manufacture of this design of locomotives.

In addition to Traction Motors, BHEL had also to design, develop, manufacture and supply other major equipments like Motor Alternator Set, High Speed Circuit Breaker, Master Controller, Electro Pneumatic Contractors, etc. Since these items were being indigenised for the first time, BHEL had difficulties in meeting the promised targets for supply of complete Sets of Traction Equipments including Traction Motors. It may be clarified, for manufacture of each locomotive complete Sets of Electrics as indicated above are needed."

1.50. The Committee have been told that the Railway Board held meetings with BHEL authorities at several occasions to expedite the supply of equipments. Asked if any penal charges have been recovered from BHEL for the belated deliveries of traction motor equipments, the Railway Board in a note have stated:—

"No liquidated damages were recovered for the delayed supplies as the terms and conditions governing the Contract with BHEL do not provide for this."

1.51. The Committee desired to know the anticipated performance capability and the actual performance of Co Co design locomotives. The Railway Board in a note have furnished the following details:

COMPARISON OF ANTICIPATED V/S ACTUAL PERFORMANCE CAPABILITIES OF WCG<sub>2</sub> LOCOMOTIVES:

Sl. No.	Anticipated Performance Capability			Actual Performance					Remarks.
	Load (t)	Speed	Gradient compensated.	Remarks.	Load (t)	Speed Km/h.	Gradient compensated.		
1		3	4	5	6	7	8	9	
1	*3660 (Box) or 2250 (4-W)	80	Level	Hauling.	3660 (Box) or 2250 (4-W)	80	Level	No difficulty experienced on level.	
2.	*1830 (Box) or (4-W)	33	1/100 rising grade.	Start and Haul.	1830 (Box) 1600 (t) (4-W)	51	1/87.5	Start and haul in all weather conditions.	
3.	*1830 (Box) or (4-W)	40	1/100 falling grade.	Holding by single locomotive on regeneration.	1830 (4-W)	40	1/87.5 Down.	Holding by single locomotive on regeneration.	
4.	*1830 (Box) or (4-W)	15	1/97 rising grade.	Start and haul assisted by one WCG <sub>2</sub> banker.	1250 (4-W)	33	1/33.5	Start and haul assisted by one WCG-2 banker.	
5.	*1830 (Box) or (4-W)	20	1/37 falling grade.	Holding by two locomotives on regeneration.	1830 (4-W)	20.5	1/33.5 Down.	Holding by two locomotives on regeneration.	

\*Anticipated design performance is fully met within service.

@Anticipated design performance deficient.

1.52. The Committee enquired as to why the actual capability of the locomotives was much less than the designed specifications and the operating requirements in plain sections as well as in ghat sections. The Committee also desired to know the extent to which shortfall in actual capacity could be attributed to the defect in design or to the adoption of incorrect data relating to gradient in the section namely 1 in 37 and 1 in 100 instead of actual gradient of 1 in 33.5 and 1 in 87.5. The Ministry of Railways, in a note, have stated:

- “(a) In plain sections, the actual performance fully meets the designed specifications and operating requirements.
- (b) The actual capabilities of the locomotive vis-a-vis designed specifications and the operating requirements on the ghats fall short due to:
- (i) the actual compensated grades on Kasara-Igatpuri section being more severer than that assumed at the time of design.
  - (ii) non-realisation of the anticipated running adhesion characteristics of the locomotives in the ghat sections with combination of severe grades, curves, unfavourable track conditions, wet tunnel entrances, etc.
  - (iii) the locomotive and train resistance being higher than standard values assumed in the design.

The various parameters used in working out the design of WCG-2 locomotives in regard to adhesion characteristics, locomotive and train resistance, have been generally satisfactory in deriving the performance anticipation for other locomotive designs, such as WDM-2, FAM-4, WCAM-1, etc. These parameters have also been generally proved for WCG-2 locomotives working on the main line (other than ghat sections). In the context of critical working condition in the ghat sections, however, it has been found during trials done in 1972 and 1975, that more adverse values than those taken earlier were actually encountered.

There is no shortfall in the designed capacity of the locomotive on 1 in 100 gradient. The actual load that can be started is 1600 t 4 W due to the severer gradient of 1 in 87.5.

The reduction in the haulage capacity of the locomotive on account of only the actual gradient of 1 in 33.5 may be of

the order of 230 t. The remaining shortfall viz. 1830-230-1250—350t is attributable to non-realisation of anticipated adhesion characteristic and locomotive and train resistances being higher on the ghats under practical day to-day working conditions.”

1.53. In a subsequent note furnished to the Committee, the Railway Board have stated:—

“So far as the Locomotive is concerned, on level Section, it is capable of hauling 3660 Tonnes Box or 2250 Tonnes 4-Wheelers. Permissible load is limited to 2,000 Tonnes due to Yard limitations/Loop capacity. The maximum permissible load on the Semi-Ghat Sections is limited to 1600 Tonnes to match the maximum permissible load on Ghat Sections so that no adjustment of load is called for at Kasara. Whenever full Box Loads become available and the same can be handled in various yards of Bombay Division, as well as Bankers of higher haulage capacity become available, it will be possible to use higher haulage capacity of 3660 Tonnes loads on flat sections.”

1.54. The Committee desired to know the assumptions made in regard to design characteristics like gradients, curves and field conditions and also the basis on which these assumptions were based. The Railway Board, in a note furnished to the Committee, have stated:

“The following assumptions were made:

- (i) The ruling gradient assumed was 1:37 as advised by Central Railway to RDSO.
- (ii) With regard to the adhesion characteristics on curved track no test data were available. It was considered that normal adhesion realised in day-to-day operation with WDM-2 locomotives would also be achievable on the Ghat Section with WCG2 locomotives.
- (iii) Tractive resistance characteristics for freight stock as adopted for calculations for other sections were assumed. The actual working level of adhesion could only be fixed for given motive power based on practical trials. At the design stage, it was only possible to envisage the performance of WCG2 loco based on the

available data for WDM2 locos with similar trimount bogie.

- (iv) No data was available to estimate the effects of adhesion by curves and unfavourable track conditions in respect of the Ghat Section. The expected adhesion of WCG2 locomotive was considered at that time as adequate for the haulage of the stipulated loads."

1.55. Asked as to who supplied the material for these assumptions, the Railway Board in a note have stated: .

"Except the ruling gradient, which were advised by Central Railway, data with regard to adhesion, train resistance characteristics, etc. were obtained from earlier tests conducted by RDSO on other sections."

1.56. The Committee enquired if the loops/yards cannot be improved upon to accommodate designed and actual hauling capacity of WCG2 locomotives. The Chairman, Railway Board during evidence stated:

"It will be a major thing. On the Bombay Section, that will be a problem. Again, the Bombay operations are slightly different in the sense that we were worried about the trains coming down into Bombay. More loaded traffic used to come to Bombay and 50 per cent of the empties used to go back out of Bombay to other areas."

1.57. Asked whether it was not economical to improve the loops, the witness replied: "Yes."

1.58. Asked if 2000 tonnes capacity is considered optimum, the witness replied:—

"Again the critical section happens to be ghats."

1.59. The Committee enquired whether Railway Board are satisfied with 2000 tonnes capacity in the level section, the Chairman, Railway Board replied in the affirmative.

1.60. The Committee were given to understand that the actual gradient on Kalyan-Vasind portion of Kalyan-Igatpuri section is 1 in 87.5 compensated for curvature. Similarly, the actual gradient on Kasara-Igatpuri section is 1 in 33.5 duly compensated for curvature. However, on the advice of the Central Railway Administration that these two sections have gradients of 1 in 100 and 1 in 37 respectively the design para-meters as adopted by the Research, Designs and

Standards Organisation were gradients of 1 in 100 and 1 in 37 in these sections respectively. This is stated by the Research, Designs and Standards Organisation to be one of the factors for the poor performance of the locomotives.

1.61. Pointing out that the locomotives were required for Ghat section operation and design aspects of the locos required for the purpose were subject matter of examination by the RDSO and Railway Board for considerable time, the Committee desired to know as to how did the design inadequacy come about. The Railway Board in a note have stated:

“The shortfall in performance has been due to:—

- (a) the actual compensated gradient on Kasara-Igatpur section being more severe than that assumed at the time of design.
- (b) non-realisation of the anticipated adhesion characteristics which were based on the data available on WDM-2 locomotives with the same Trimount Co Co bogie, of the locomotives due to the Ghat Section with combination of severe gradient curves and unfavourable track conditions, wet tunnel entrances, etc. the locomotive and train resistance being higher than standard values assumed in the design.
- (c) For other locomotive designs, however, *viz.*, WDM2, WAM4, WCAM1 etc. the various assumptions made with regard to adhesion characteristics and locomotive and train resistances have been generally found satisfactory in working out the performance anticipations for these locos. In the context of critical working conditions in the Ghat Section however, it had been found during prototype trials that more adverse values than those assumed were actually encountered in practice for day-to-day operation which has resulted in the reduction of the practical loads that could be hauled on this section.”

1.62. It would however be seen that General Manager (W) wrote to Director General (D), Research, Designs and Standards Organisation, Lucknow *vide* No. W683-Y|IV|dated 15 April, 1967 (Annexure I) stating that “the grades in Thull Ghat and Bhere Ghat sections of Bombay Division are not compensated for curvature”.



Asked to clarify the point the Chairman, Railway Board during evidence stated:—

“We accept it. Even this would not have made any difference. The point is this. This loco was designed basically with what we have or what we had and what we knew.”

1.63. The Committee desired to know as to when the Railway Board came to know that actual gradient is 1 in 37. The Railway Board in a note have stated:

“Central Railway had all along been aware that the ruling gradient was 1: 37.”

1.64. If it was so, the Committee enquired as to how Railway Board would justify assumption of less severe grades than actually existing at the time of finalisation of the design of the locomotives. The Railway Board in a note have stated:—

“...RDSO had been aware that on the Ghat Section, there were curves. But at the design stage assumptions were based on the data available. It may, however, be mentioned that normally the effect of basing the design on uncompensated gradients gets covered by the inbuilt margin in the design calculations. Since the Ghat conditions turned out to be severer in actual practice, this assumption was belied.”

1.65. The Committee desired to know the reasons for non-realisation of anticipated adhesion characteristics. The Railway Board in a note have stated:

“Against adhesion co-efficient (Running) of 23.2 per cent, the actual obtained with the WCG-2 bogie on the Ghat Section was of the order of 18.9 per cent. The assumption was on the basis of widely used Curtiss-Kniffler formula which had been successfully used on other locomotive designs. Thus, there was no reason to anticipate any deviation on this section. There was also no other available data.”

1.66. Asked if there was no mechanism for cross checking of the data adopted for design purposes, the Railway Board have stated:

“Till the WCG—2 locomotive was designed,, all other locomotives working on the section were of imported design

which had not been tested for ratings ,performance, adhesion etc. As such no specific data pertaining to this section was available regarding the actual working conditions, adhesion, train resistance, etc., for cross checking.”

1.67. The Committee enquired if the Railway Board have ascertained how this incorrect data regarding gradients, adhesion characteristics and locomotives and train resistance has been adopted, the Railway Board have replied:—

Tractive resistance characteristics for freight stock as adopted for calculations for other sections/locomotives were assumed. The actual working level of adhesion could only be found for given motive power based on practical trials. At the design stage, it was only possible to envisage the performance of WCG—2 locos based on the available data for WDM—2 locos with similar sections. The best available standard data available at that time was adopted.”

1.68. The Committee pointed out that severe grades, curves, unfavourable track conditions, wet tunnel entrances etc. which have been attributed as reasons for startfall in actual capabilities of the locomotives were not a new phenomenon. The Committee enquired as to how these aspects could not be visualised by the RDSO: The Railway Board in a note have stated:

“RDSO had visualised all possible factors based on the recorded or published data available at the time. The fact has, however, to be recognised that the extent of impact of certain factors can only be realised during extensive recorded trials, with bogies, connection of motors and other features like Vernier Control fitted on the locomotive.”

1.69. The Committee desired to know as to how these aspects were not fully taken care of while designing the new locomotives. They also asked if the Railway Board|RDSO would venture on designing of a new locomotive without upto date and adequate data on these aspects. In reply the Railway Board in a note have stated as under:—

“In undertaking a completely indigenous design for the first time, a large number of assumptions and estimates have to be made regarding design parameters and site conditions. It will take very long time to verify all such

assumptions and estimates by practical tests and trials. Subsequent practical tests and service performance may, in many cases, indicate that the data earlier assumed need modifications. Design and development, all over the world, is an evolutionary process in which each completed design provides additional back-ground data for undertaking new designs. In this particular case, RDSO have obtained considerable new data from the performance tests of WCG—2 locomotives. Similar data were not available when these locomotives were designed. The data now collected and the experience now gained would be fully made use of in future designs.”

1.70. The Committee enquired that when in 1971 onwards three prototypes of these locomotives were put on trial whether their shortcomings with regard to the uncompensated gradient were not discovered, Director Standards (Elec.), RDSO, stated during evidence:

“...I would like to submit that in the first three locomotives, when the trials were carried out at that stage itself it was found that the original expectations of the hauling capacity did not materialise and it was certainly clear even then that the entire 1830 load tonnes could not be achieved.

Asked as to why this could not be achieved, the witness replied:

“There were several factors and one of them was the variation in the gradient. There were two factors one was the curvature not being taken into account and the other being the uncompensated gradient was more.”

1.71. He further informed the Committee that the fact that actual gradient was  $1/35$  whereas anticipated gradient was  $1/37$  had been discovered when the survey was made.

1.72. The Committee desired to know as to why this fact was not mentioned to Audit when audit comments were received. In reply, the witness stated:

“I think that was an omission but cumulative effect was mentioned.”

The audit para states that the other reasons or the unsatisfactory performance of the locomotives as indicated by the Railway Administration were less locomotive axle load, stalling and lack of adequate hand brake power. In this context the Committee desired

to know as to why the locomotives suffered from these deficiencies and when these were noticed. The Railway Board in a note have stated:

"The actual axle loads were short by about 0.5 t from the designed axle load of 22 t. This difference is due to tolerances on the nominal values. Generally the practice is to make good the shortfall in weight by ballasting. This has been done and the shortfall already rectified on most of the locomotives.

**Stalling:** The stalling condition arises out of brake binding or other excess load on the locomotive beyond the calculated or practical values or fall in adhesion during starting. This has since been controlled and the incidences of stalling greatly reduced.

**Lack of adequate hand brake power:** The specifications required for provision of loco parking brakes only for locomotive was fully equipped. However, subsequently, additional requirements of holding the train on the gradient required increase in the hand brake power. The above requirements were noticed as soon as the first lot of locomotives was received for trials. It must be emphasised that the hand brake power was not a deficiency during design or manufacture but was considered as an additional feature required to meet the operating needs."

1.74. Asked if the Railway Board have examined the reasons for unsatisfactory performance of the locomotive, the Railway Board have in a note stated:—

"The Railway has investigated the reasons for unsatisfactory performance and the remedial measures taken and the shortfalls in the axle load on the locomotives rectified by ballasting, providing adequate new braking, and by improvement in training of driving staff."

1.75. The availability of WCG2 locomotives and their utilisation during the years 1972-73 to 1975-76 were as under:

	1972-73	1973-74	1974-75	1975-76
1	2	3	4	5
	6			
1. Average number of locomotives in service during the year.	11.8	23.75	37.25	50.83
2. Average number of locomotives effective (fit for use).	6.03	18.5	29.8	40.9
3. Average number of locomotives in use goods services.	5.56	16.2	25.4	35.7

1	2	3	4	5	6
	Other services . . . . .	0.22	2.09	3.53	5.17
4.	Average number of locomotives spares. . .	0.25	0.20	0.76	0.04
5.	Engine kms. per day per locomotive in use				
	Goods Services. . . . .	193	198	185	179
	Other Services. . . . .	69	132	160	217
	All Services. . . . .	189	188	180	184

1.76. The target of engine kilometres per day per engine in use has not been prescribed for WCG-2 locomotives. In respect of D.C. locomotives (W.C.M., WCG and WCP etc.) the target laid down by the Railway Board in August 1972 was 200 kms per day.

1.77. It was noticed/seen that the incidence of failures in WCG-2 locomotives was very large during the period 1972-73 to 1975-76. In January 1975 the Railway Board appointed a Committee of Technical Officers for finalising modifications in order to improve the performance reliability of these locomotives. In its report in February, 1975, the Committee recommended a full time team of engineers to assist the investigation by the Research, Designs and Standards Organisation, but such a team was not constituted till August 1975. The progress made in various modifications on WCG2 locomotives is given in Annexure II.

1.78. The Committee pointed out that in designing the locomotive WCG2 it was anticipated that in very steep gradients only one locomotive would be required as banker whereas two locomotives were being used as bankers now in spite of the modifications/improvements made in the locomotives. The Chairman, Railway Board during evidence stated:—

“Our contention is that even today however best we might improve the locomotive—we are unable to find a solution to the banking problem. That is why, we told you that, in that aspect, the expectations of the original design did not, come up. Unless it is a totally new locomotive with more number of axles and much more powerful engines and motors, we will not be able to do the banking service. It became clear at that time itself. There was no point in our holding up the production because of this. The second point is, our distress in Bombay was very great. These locomotives were already over-aged; they had already attained the age of 35 years...”

1.79. It would be seen from the audit para that Research, Designs and Standards Organisation in 1975 had observed that "this class of locomotives... is fundamentally unsuited for use as a reliable banker due to limitations imposed by the present type of traction motor as well as its control system as in-built in this design of locomotive. In this connection the Committee desired to know as to how the present requirements of banking locomotives were met and how the future requirements of reliable and suitable banker would be met. The Railway Board in a note have stated:

"Primarily the requirements of banking services is met by WCG-2 locomotives. The day-to-day shortfall of bankers is met by using diesel electric locomotives. Since WCG-2 locomotives are basically not suitable for banking duty, for future requirements of bankers, a Project Report covering designing and indigenous manufacture of bankers has been prepared and is under consideration."

1.80. The Committee pointed out that the use of diesel electric locomotives as bankers on electrified sections must have been at the cost of some other non-electrified sections where these would have normally been used otherwise. In this connection, the Committee desired to know if this diversion of WDM-2 locos did not adversely affect the working of concerned non-electrified sections and whether any train had been cancelled on this account resulting in loss of revenue. The Railway Board in a note have stated:—

"WCG-2 locomotives are basically not suitable for banking duties. In view of this, assistance by way of diverting a few diesel electric locomotives for use on the Ghat Sections had to be resorted to in any case. Though no trains were cancelled on this account, but had they not been diverted to banking services, they would have been utilised for running additional trains."

1.81. The Railway Board further informed the Committee that five diesel electric locomotives were used for banking services on Karjat-Lonavla Section and none was used on Kasara-Igatpuri section.

1.82. The Committee have been informed that the modifications on all locos are expected to be completed by 1982. Asked about the cost of carrying out these modifications, the Railway Board have stated:—

"No separate accounts have been maintained for these modifications as these are being carried out both in the sheds

and the shops as part of the regular repair and maintenance work.”

1.83. The Committee desired to know the average estimated as well as actual cost of new D.C. Electric locomotives. The Railway Board in a note have stated:—

“The average estimated cost per locomotive for 57 DC Electric Locomotives (WCG-2) was Rs. 23.67 lakhs.

The actual batch cost of the locomotive excluding proforma charges are as under:—

S. No.	Year	Batch of locos.	Cost in lakhs of Rs.
1.	1970-71	3 D. C. Locos.	87.63
2.	1971-72	6 D. C. Locos.	164.76
3.	1972-73	14 D. C. Locos.	377.97
4.	1973-74	14 D. C. Locos.	398.86
5.	1974-75	13 D. C. Locos.	471.86
6.	1975-76	4 D. C. Locos.	152.44
7.		3 D. C. Locos.	124.14
		57 D. C. Locos.	Total Cost 1777.69
			Average cost of one loco. Rs. 31.187 (lakhs).

Foreign Exchange figures estimated and actual used are:

- (i) Estimated foreign exchange per locomotive (in 1966) was Rs. 1.59 lakhs;
- (ii) Bharat Heavy Electricals, Limited, Bhopal, have advised that approximate foreign exchange per set of DC loco for their portion, works out to Rs. 4.5 lakhs. Also taking into account foreign exchange of Rs. 23,700/- per loco released to CLW for the first 27 locos and Rs. 54,477/- per loco for the remaining 30 locos, total foreign exchange per loco utilised by CLW and Bharat Heavy Electricals limited Works out to approximately Rs. 4.9 lakhs.

Separate records for additional expenditure incurred in rectification of defects other than normal repair and maintenance have not been maintained. The extra equipment required for rectification of defects other than normal repairs and maintenance was supplied free of cost by Chittaranjan Locomotive Works and M/s. BHEL/

other Sub-Contractors. The regular maintenance staff was utilised in effecting rectification of defects."

1.84. It would be seen from above that the actual cost (average) of new locomotives had gone upto Rs. 37.187 lakhs against the estimated cost of Rs. 23.67 lakhs. The Committee desired to know the reasons for such substantial increase in cost. The Railway Board in a note have stated:

"An estimation of the average cost of DC loco @ Rs. 23.67 lakhs was done in 1969 but reported to Board in 1970. The weighted average cost worked out to Rs. 31.23 lakhs. The weighted average cost for the first order was Rs. 27.93 lakhs, for the second order it was Rs. 27.20 lakhs and for the third order, it was Rs. 34.61 lakhs. Comparison between the estimated cost and actual cost as per first batch cost report to begin with, was not done as it was not the practice. The difference was mainly due to material costs. The increase in the unit cost from year to year shows a more or less comparable position i.e. upto 27th locomotive. There was however, sizeable increase in the unit cost of the locos beyond 27th locomotive corresponding to the year of manufacture of 1973-74 to 1976-77. This is due to adjustment of escalation charges."

1.85. It would be seen that one of the consideration to adopt Co Co design in preference to BB design was that there would be a foreign exchange saving of Rs. 1.20 lakhs per locomotive in the case of the former. The foreign exchange content for the Co Co design was estimated at Rs. 1.59 lakhs and for the BB design at Rs. 2.79 lakhs per locomotive. However, the foreign exchange actually used for Co Co design locomotives was Rs. 4.90 lakhs. The increase of Rs. 3.31 lakhs has been explained as due to progressive increase in prices and Bharat Heavy Electricals Ltd. having not been able to completely indigenise certain components.

1.86. Audit Para states that during 1968-69 to 1973-74 estimates for works costing Rs. 8.14 crores were sanctioned for (i) strengthening the power distribution system by augmenting the capacity of the overhead equipment and substations to meet additional traction power requirement (including that for the new WCG-2 Co Co design locomotives) (Rs. 2.65 crores); (ii) replacement of 2,500 KW rotary convertors on age-cum-condition basis by 3,000 KW rectifiers to augment the capacity of the converting plant (Rs. 3.98 crores); (iii)



extension/provision of loops to hold 65/70 wagons at all stations in the two sections as against 45 wagons (Rs. 1.38 crores); and (iv) additional facilities at the locomotive shed, Kalyan, to facilitate inspection of 57 Co Co locomotives (Rs. 0.13 crore). These works were undertaken between 1969 and 1974 and have been executed to the extent of 70 to 100 per cent. The expenditure booked up to May 1976 was Rs. 12.90 crores, of which Rs. 5.27 crores were in respect of replacement works which would have been undertaken even otherwise on age-cum-condition basis.

1.87. The Committee desired to know if all the works mentioned above had been completed and what was the expenditure. In reply the Railway Board have furnished the following statement showing the sanctioned/estimated and the actual expenditure alongwith the progress on the three works.

**Works carried out for increasing loads of goods trains on Bombay Division of Central Railway**

S. No.	Description of work	Original Cost (Rs. in crores)	Revised cost (Rs. in crores)	Expenditure upto March '77 (Rs. in crores)	Progress	Reasons for wide variation between the sanctioned/estimated and the actual expenditure
1	Strengthening of power distribution system	2.65	4.87	4.78	90%	The increase in expenditure is due to general inflation in the cost of sub-stations and track cabin equipments during 1969-75.
2	Replacement/augmentation of power converting Plant	3.98	6.38	5.80	92%	Out of 12 sub-stations the work on 11 sub-stations has been completed. The increase in expenditure is due to the general inflation in the cost of sub-station equipment.
3	Extension of loops to hold more wagons	1.38	2.22	2.02	94%	Work on 16 out of 17 stations has been completed. The increase in expenditure is due to the general inflation in the cost of Engineering materials.

1.88. One of the reasons for manufacturing heavier type D.C. locomotive was that the trailing loads should match the authorised trailing loads on a neighbouring section namely Igatpuri-Bhusawal section electrified with A.C. system. Pointing out that as it had not been possible to haul heavier loads with the WCG-2 locomotives, the Committee enquired whether the loads suffered detention at Igatpuri and desired to know the figures of such detentions during 1975-76 and 1976-77. The Railway Board in a note have stated:

“Authorised trailing loads on Igatpuri-Bhusawal Section are:

1. Igatpuri-Bhusawal (Dn Direction): 1800 tonnes.
2. Bhusawal-Igatpuri (Up Direction): 2000 tonnes (4 wheel-ers) 2200 tonnts (Boxes).

With the introduction of WCG-2 locos, Up loads towards Bombay are being worked through without any reduction of load. However, in the Down direction, due to limitations of practical adhesion on ghat sections, the loads are either 1600 tonnes with double bankers or 1250 tonnes units single banker. This necessitates stepping up of loads at Igatpuri. Average detention to Down loads at Igatpuri was as under:—

Year	Average Detention
1974-75	6 hrs. 15 mts.
1975-76	5 hrs. 52 mts.
1976-77	6 hrs.

1.89. Clarifying the position further, the Railway Board in a subsequent note have stated:

“Based on the trials conducted by RDSO, haulage of 2000t mixed loads/2200t Box loads in the Up direction from Igatpuri to Kalyan with 3 WCG2 locos has become possible. Therefore, there is no need to adjust the loads at Igatpuri in the Up direction.”

1.90. The Committee enquired if Railway Board had made any attempt to quantify the financial implication of the loss on account of detention at Igatpuri. The Railway Board have stated:—

“Since detention of Rolling Stock depends on many variables like change of traction, waiting for Crew, Carriage and

wagon examination, density of traffic, it may not be possible to quantify load detentions in financial terms. In any case, in view of (i) above, this does not arise for stock in Up direction i.e. coming from Bhusaval to Igatpuri."

1.91. Fifty Seven old D.C. Electric Locomotives (41 freight type and 16 passenger type) in use on Bombay-Igatpuri and Bombay-Pune sections of Central Railway procured during 1928-29 were due for replacement in 1963-64. The Railway Board decided in September, 1963 to replace them as they were "giving plenty of trouble; the design had become very old and transmission of traffic and maintenance had become a problem". According to the Chairman, Railway Board, the condition of these locomotives at that time (1963) when Railway Board started phasing them out was so bad that they could not carry on for 2-3 years more. To keep them going on, Railways had to spend Rs. 65 lakhs on their maintenance during 1965-67 alone. The Committee are informed that "in this case the Electrical Directorate had worked out as to when the locomotives would fall due for replacement. The action was initiated thereafter. The design was worked out in consultation with the Planning Committee, the Standards Committee and the RDSO". The Committee are distressed to note that in the instant case the Railway Board did not initiate action in advance to plan for the replacement of these old locomotives and waited for their attaining the codal life (i.e. 35 years). The Committee fail to understand as to why undue stress was laid on codal life alone when their condition was deteriorating and replacement policy was "on age-cum-condition basis". The absence of reasonable foresight as should normally be expected and the inaction on the part of Railway Board for not resorting to advance planning for replacement had led to direct and indirect avoidable losses to the Railways which cannot be fully quantified. The Committee feel prudence required that Railway Board should have initiated steps much earlier than September 1963 to finalise the design of new replacing locomotives. It was all the more necessary considering that the manufacture of locos is a very time consuming process. In the instant case the RDSO took an year and a half to issue key drawings. Then the Chittaranjan Locomotive Works took another year and a half to work out the working drawings. Then the order for long lead items and various raw materials and the manufacturing time took another 2 years or so. Thereafter the manufacturer wanted the prototype to be used and proved in service at least for three years. It had to get all the feed-back from the RDSO and to carry out necessary modifications. The Committee consider that all the modalities involved in the production of new locomotives were not carefully gone into while

planning production of these locomotives keeping in view the urgent need or replacement of overaged and obsolete locos. The Committee hope that the Railway Board would learn a lesson from this.

1.92. The Railway Board placed orders on Chittaranjan Locomotive Works for manufacture of 57 D.C. electric locomotives (WCG-2) during 1964—68. The design for the locomotives was finalised by the RDSO and made available to CLW in 1967. Three proto-types of the locomotives were manufactured in January, March and June 1971, and trial tests on them were conducted by Central Railway Administration in March, April and July 1971. The performance of these locomotives in ghat sections fell short of designed capabilities because of (i) the actual compensated gradients on the Kasara-Igatpuri section being much severer than what had been assumed at the design stage, (ii) non-realisation of the anticipated running adhesion characteristics of the locomotives in the ghat sections with combination of severe grades, curves, unfavourable track conditions, wet tunnel entrances etc. and (iii) the locomotive and train resistances being higher than standard values assumed in the design. Even though it had become known in the trials that the originally designed hauling capacity had not materialized, series production was undertaken without making study of the steps necessary to achieve the desired hauling capacity and carrying out necessary modifications. By the end of 1976-77, 57 locomotives had been produced at the cost of Rs. 17.78 crores. Besides the shortfall in their haulage capacity, these locomotives also turned out to be not suitable for banking services in the Ghat Section. As a result, five diesel electric locos costing Rs. 1.56 crores have been diverted from other sections for working as bankers on the Ghat Section. The additional running cost only on this account was Rs. 94 thousand during the years 1976-77 and 1977-78. This running cost would be a recurring expenditure.

1.93. The designed haulage capacity of these locos was expected to give an increase of about 50 per cent in the line capacity for goods trains. But the actual performance fell short of the designed capacity, and as a result the expected increase in line capacity could not be generated with the introduction of these locos. The Railway Board did not give to the Committee any estimate of the extent of loss in the line capacity expected to be achieved. But the basic objective of increasing the line capacity was to avoid an increase in the number of trains to be run for coping with the additional traffic which in turn would necessitate a third line being laid which is a costly alternative because of the failure to achieve the requisite hauling capacity. The line capacity has to be increased by providing a third line on North

East Ghat Section between Kasara and Igatpuri, and on South East Ghat Section between Karjat and Lonavla at the estimated cost of Rs. 17.50 and Rs. 21.74 crores respectively.

1.94. The Committee consider it a grave lapse that the assumptions made particularly with regard to severe grade and curves, unfavourable track conditions and wet tunnel entrances etc. proved erroneous. This was not a new phenomenon and the RDSO should have with ordinary prudence known the critical working conditions in the Ghat Section. It is strange that the RDSO ventured into designing a new locomotive for ghat sections without verifying and updating the data, and without giving due consideration to the same. The lapse was compounded by a cynical disregard of the results of the trials. These deficiencies in the initial stage cost Railways heavily, though the exact quantification of the loss has not been furnished to the Committee by the Railway Board. It has altogether vitiated the financial projection of the projected increase in line capacity with WCC2 Locos and necessitated an early laying of the third line involving heavy investment.

1.95. The Committee are of the opinion that howsoever urgent the need of the new locomotives might have been to replace the old obsolete locomotives, production of faulty or inadequately equipped locomotives should not have been undertaken. This reflects poorly on the technical proficiency of the Engineering wing of the Central Railway and of the RDSO.

1.96. One of the reasons advanced for delay in production of locomotives was delayed supply of equipments by Bharat Heavy Electricals Limited, Bhopal. The Committee find from the following table that there was substantial delay on the part of Bharat Heavy Electricals Limited, Bhopal in supplying the critical components and equipments.

Sl. No.	Equipment for	Promised by BHIEL	Actual delivery	Delay in month.
1.	1st Loco set	August 1968	Feb. 1970	18 months.
2.	2nd Loco set and onwards.	January 1969 and at the rate of 2 loco sets per month onwards.	Sept. '1970 only one loco set.	20 months.
3.	27th Loco set.	Feb., 1971.	March 1973	25 months.
4.	57th Loco set.	Feb. '1973	June 1976.	40 months.

The Committee take a serious view of the abnormal delay which ranged between 18 to 40 months. They find it difficult to draw any consolation from the fact that since these equipments were being developed and manufactured by BHEL in the country for the first time, in collaboration with foreign firms, the former had difficulties in meeting the delivery schedule particularly when they (BHEL) were the pioneers in the manufacture of electric equipments and the process of manufacture of the type of equipment required were not entirely new to them. Moreover, they had the advantage of foreign collaboration in this regard. The Committee would like to be reassured that the reasons for delay have been identified for taking remedial measures for future.

1.97. The Committee note that no penal charges have been recovered from Bharat Heavy Electricals (I) Limited, for not maintaining the delivery schedule of traction motor equipments. It has been stated that "the terms and conditions governing the contract with BHEL do not provide for this". The Committee are perturbed to note as to how such an important clause has been left out of the contract resulting in delayed supplies of vital equipments and consequential heavy losses to the Railways. The Committee would like the Railway Board to investigate into the matter to find out why penalty clause for any delay in delivery of equipment by the BHEL was not provided for in the terms and conditions of the contract.

1.98. The Committee note that the average number of locomotives in service has increased substantially from 11.8 in 1972-73 to 50.83 in 1975-76 and the average number of locomotives effective (fit for use) has also increased from 6.03 in 1972-73 to 40.9 in 1975-76. However, the engine Kms. per day per locomotive in use (all services) has declined from 189 in 1972-73 to 184 in 1975-76. The Committee further note that the target of engine kilometres per day per engine has not been prescribed for WCG2 locomotives. However, in respect of D.C. locomotives. (WCM, WCG and WCP etc.) the target laid down by the Railway Board in August 1972 was 200 Kms. per day. The Committee regret that the engine Kms. per day per WCG2 locomotive is much below that of the D.C. locomotives and has declined over the years. The Committee would like to know the measures being taken by the Railway Board to check the declining average kilometrage of WCG2 locomotives. The Committee would also like the Railway Board to lay down target kilometrage for WCG2 locos.

1.99. The Committee note that the average cost of WCG2 locomotives was estimated at Rs. 23.67 lakhs in 1969 and it was intimated to Railway Board in 1970. However, they observe that the cost of 3 locomotives manufactured in 1970-71 was Rs. 87.63 lakhs which comes to Rs. 29.21 lakhs per locomotive. The Committee are perturbed to note that the actual cost increased to the extent of Rs. 5.54 lakhs per locomotive during the period of one year. The Committee would like to know the reasons for such a wide variation in the estimated and actual cost of WCG2 locomotives in such a short period.

## CHAPTER II

### Central Railway-Mercury arc rectifiers

#### Audit Paragraph

2.1. Rectifiers are used for conversion of A.C. (alternating current) electric supply into D.C. (direct current) supply required for running of electric trains. The rail traction on the North-east Kalyan-Igatpuri Section and the South-east Kalyan-Pune Section of Central Railway have D. C. electric systems.

2.2. In September 1962, the Railway Administration decided to replace the existing two rotary converters (of 2,500 KW capacity) at the Lonavla sub-station by two mercury arc rectifiers of 3,000 KW capacity for the following reasons:—

- (i) the rotary converters had exceeded their normal life of 25 years;
- (ii) they were often giving trouble due to wearing out of parts; spare parts were not available as the equipment had become obsolete;
- (iii) to augment the capacity of the converting plant; and
- (iv) to meet the power demands to cope with the anticipated increase in traffic during the Third Five Year Plan.

2.3. After going through the various formalities of preparation of and sanction to estimates, invitation of tenders, etc., the Railway Administration placed orders in December 1967 on a firm of Bombay for the supply of two mercury arc rectifiers (of 3,000 KW capacity) at Lonavla sub-station. The supply and erection was required to be completed by April 1970. The entire equipment ordered was received at Lonavla by early 1972; hundred per cent payment for supply of equipment and 20 per cent for erection, amounting to Rs. 33.31 lakhs (including foreign exchange element of Rs. 22.60 lakhs), was made to the firm between July 1968 and January 1972. However, the erection of the equipment has not been commenced so far (January 1977).



2.4. Meanwhile, to cater to the additional requirement of power for the increased traffic expected during the Third Five Year Plan, orders were placed in June 1967 on the same firm of Bombay for supply and erection of one mercury arc rectifier (of 3,000 KW capacity) at each of the two new sub-stations being set up at Thull Ghat (North-east line) and Upper Bhore Ghat (South-east line). The two mercury arc rectifiers were installed at these sub-stations in June 1972 at a cost of Rs. 74.29 lakhs (including foreign exchange element of Rs. 31.41 lakhs), as booked upto the end of August, 1976.

2.5. Further, to meet the additional requirement of power for the traffic expected during the Fourth Five Year Plan period and also keeping in view the schemes for running D.C. electric locomotives (WCG-2 type) on the ghat sections (c.f., paragraph 9) it was proposed, amongst others, to provide an additional rectifier set of 3,000 KW capacity each, at Upper Bhore Ghat and Thull Ghat sub-stations (over and above one mercury arc rectifier provided earlier) as second unit as standby. The proposals were approved by the Railway Board in 1969 and 1968 respectively. Accordingly, orders for supply and erection of two silicon rectifiers were placed on the National Government Electric Factory, Bangalore, in October 1970, at a cost of Rs. 35.60 lakhs (inclusive of foreign exchange element of Rs. 4.26 lakhs). The erection of silicon rectifier units at Upper Bhore Ghat and Thull Ghat sub-stations started in April 1976 and is in progress (January 1977). The expenditure booked upto August 1976 was Rs. 21.13 lakhs.

2.6. The final location of the four mercury arc rectifiers (two acquired in 1972 for Lonavla sub-station and in storage there and two installed at Thull Ghat and Upper Bhore Ghat sub-stations in 1972) had been under examination by the Railway Administration the Research, Designs and Standards Organisation and the Railway Board, as indicated below:

- (i) In June 1973, the foreign collaborators of the National Government Electric Factory indicated that the silicon rectifiers were not designed to operate in parallel with the mercury arc rectifiers already installed at the Ghat sub-stations in June 1972. Thereupon the Railway Administration approached the Railway Board in November 1973 to the effect that the two mercury arc rectifiers already acquired for Lonavla sub-station should be diverted for installations at the Ghat sub-stations since these sets are identical to the sets already installed there and

that the two silicon rectifiers to be acquired for the Ghat sub-stations should be diverted for installation at Lonavla sub-station. The proposal was examined in consultation with the Research, Designs and Standards Organisation and the Railway Board advised the Railway Administration in September 1974 that no change need be made in the distribution of the equipments, that is, the mercury arc rectifiers should be installed at Lonavla sub-station and silicon rectifiers at the two Ghat sub-stations as per the original contract.

- (ii) In November 1974, the firm which had supplied and installed the mercury arc rectifiers at Upper Bhore Ghat and Thull Ghat sub-stations advised that the design of these rectifiers did not foresee the requirements of connecting the silicon rectifiers to be installed at these stations. The Railway Administration, therefore, again approached the Railway Board in March 1975 for acceptance of the earlier proposal of diverting the two mercury arc rectifiers acquired for Lonavla sub-station to the Ghat sub-stations and silicon rectifiers ordered for Ghat sub-stations to Lonavla sub-station.

2.7. As directed by the Railway Board in April 1975, the matter was re-examined by a Technical Committee including an expert from the Research, Designs and Standards Organisation. The Committee recommended, in May 1975, that four sets of arc rectifiers (two already installed at the two Ghat sub-stations in June 1972 and two awaiting installation at Lonavla sub-station) be ultimately diverted for installation on the Diva-Bassein Road Railway Electrification Project, which had been sanctioned; four numbers of 3,000 KW silicon rectifiers were to be procured for the Diva-Bassein Road Railway Electrification Project and diverted for installation at Thull Ghat, Upper Bhore Ghat and Lonavla sub-stations. The two silicon rectifiers already ordered on the National Government Electric Factory as second standby were also to be installed at the two Ghat sub-stations. The orders of the Railway Board on the recommendation about ultimate diversion of the four mercury arc sets to Diva-Bassein Road Railway Electrification Project are awaited (January 1977).

2.8. As a result, an expenditure of Rs. 35.13 lakhs (including foreign exchange element of Rs. 22.60 lakhs upto March 1976) on the proposed erection of two mercury arc rectifiers at Lonavla sub-station has remained unfruitful (January 1977).

2.9. The firm on which order for installation of mercury arc rectifiers at Lonavla had been placed claimed reimbursement of insurance charges (Rs. 68,552) incurred by it to cover storage risks during the period from 1st January 1972 to 31st December, 1974. There being no specific provision in the contract agreement with the firm, the claim has not so far (January 1977) been admitted by the Railway Administration. The firm did not renew the insurance policy on the two mercury arc rectifiers to cover risk since 1st January 1975 and disowned responsibility for any loss. Additional expenditure would also be incurred if the mercury arc rectifiers already installed on the Ghat sub-stations in 1972 and the mercury arc rectifiers stored at Lonavla were diverted to Diva-Bassein Road Railway Electrification Project.

2.10. It may also be mentioned that 98 items of components of the mercury arc rectifiers including the rectifier tank stored at Lonavla had been used by the Railway Administration to carry out repairs to the mercury arc rectifiers at Thull Ghat and Upper Bhore Ghat sub-stations. Consequently, the rectifiers at Lonavla are not complete in all respects.

2.11. The Railway Administration stated (January 1977) that the mercury arc rectifiers procured for Lonavla sub-station had not been installed there in view of (i) lower priority assigned to the work of replacement of rotary converters by rectifiers. (ii) advisability of adjacent new sub-station at Upper Bhore Ghat getting stabilised before taking up the replacement work and (iii) the equipments being deficient in certain parts which had been cannibalised and used for repairs to the sets installed at the Ghat sub-stations. It also stated that the diversion of mercury arc units to Diva-Bassein Road Railway Electrification Project was tied up with the procurement of new silicon rectifier equipments for this project and final decision in this regard would be taken after detailed examination of optimum power supply arrangements required for the project, availability of funds, etc.

2.12. As stated earlier, the replacement of the existing rotary converters at Lonavla on age and condition basis had been taken up by the Railway Administration as early as 1962 and this was not related to the setting up of the new sub-station at Upper Bhore Ghat to cater for the additional power requirement for the enhanced traffic anticipated during the Third Five Year Plan. As regards the mercury arc rectifier equipment, the Research, Designs and Standards Organisation had, in July 1974, indicated that the 'mercury arc rectifier sets are also fast becoming technologically obsolete.' Further,

the firm which supplied the mercury arc rectifiers had informed the Railway Administration in February 1972 that due to recent fast development of semi-conductor type rectifiers, its Swiss principals had taken a decision to stop the manufacture of mercury arc rectifiers by the end of 1974.

2.13. In this context, it is not known how the deficiency of components of the rectifiers stored at Lonavla would be made good. It is also not clear whether installation of equipments, which have been considered as 'obsolete', would meet the requirements adequately.

[Paragraph 10 of the Report of the Comptroller and Auditor General of India for the year 1975-76—Union Government (Railways)].

2.14. Rectifiers are used for conversion of AC (alternating current) electric supply into DC (direct current) supply required for running of electric trains. Each electric sub-station receives the electric power by way of AC at 100,000 volts and converts it into 1500 volts DC. To do this job the first equipment that was developed in the electrical industry was the rotary machine with a rotating element inside it. It gets the feed from one side by way of AC. The rotating piece in the element is called the rotor. It does the job of converting AC into DC; and then DC is taken out. With the help of certain other ancillary equipment, it becomes fit for use on 1500 volts DC. The rotary converter is a rotary machine with a rotating element inside it. The mercury arc rectifier is not a machine with a rotating element inside, but it is a steel tank, and in some cases a glass bulb containing mercury. And the energy is led into this tank through the anodes. It is an inherent property that current will only travel from the anode to the mercury, and not in the reverse direction. This property of passage of electric current through mercury vapour is made use of in the mercury arc rectifier. So, it succeeds in the job of rectifying AC into DC. In these cases also we receive the energy in the form of the same 100,000 volts AC. However, in the case of mercury arc rectifier energy leaves at a lower voltage and therefore transformer comes into picture. It transfers 100,000 volts into a lower voltage which is fed into the mercury arc rectifier. After a number of decades, the rotary converters gave way to mercury arc rectifiers; and the latter to silicon one.

2.15. The difference between the rotary converter and mercury arc rectifier is that former is a heavy bulk rotary machine with its inherent losses of energy, wear and tear and all the mechanical consequences of having a big rotating mass. As against that, the efficiency of the mercury arc rectifier is much superior without any moving part. It is a static piece of equipment.

2.16. Asked about the differences between the silicon rectifier and mercury arc rectifier, the Advisor Electrical, Railway Board during evidence stated:

“The advantages are still more in the case of silicon rectifier. It is still more efficient and it does not have a tank. In the mercury arc rectifier there is a tank which has to be kept maintained at a high degree of vacuum; and compared to that, the silicon rectifier is still more compact. It is very handy and the loss of energy is even less. That is the best one.”

2.17. The Chairman, Railway Board added; “Today that is best. Technically is so fast changing.”

The Central Railway Administration decided in September 1962 to replace the existing two rotary converters (of 2500 KW capacity) at the Lonavla sub-station by two mercury arc rectifiers of 30,000 KW capacity for the following reasons:

1. the rotary converters had exceeded their normal life of 25 years;
2. they were often giving trouble due to wearing out of parts; spare parts were not available and the equipments had become obsolete;
3. to augment the capacity of the converting plant; and
4. to meet the power demands to cope with the anticipated increase in traffic during the Third Five Year Plan.

2.18. The Committee have learnt from Audit that the work of replacement of rotary converter sets by rectifier units at Lonavla sub-station was included in the Final Works Programme of 1963-64. The detailed estimate of Rs. 14,05,713 (involving foreign exchange of Rs. 7.32 lakhs) was sanctioned by the General Manager, Central Railway in November 1963. The Railway Board was requested in October 1964 to release the foreign exchange. The Board's approval thereto was received by the Railway in January, 1965. Tenders were invited in March 1965 and were opened in July, 1965. The Railway Administration placed orders in December 1967 on a private company M/s. Raje Industrial and Engineering Combine Pvt. Ltd., Bombay who were Indian Agents of a Swiss firm M/s. S.A. DES ATELIERS DE SECHERON, GENEVA for the supply of imported equipments for two mercury arc rectifiers of 3000 KW capacity for Lonavla sub-station to be obtained from their foreign suppliers. The contract was rectified by the Swiss authorities and Indian Governments in:

May/July, 1968 as required under the licensing condition of Swiss Credit. The supply and erection was to be completed by April, 1970. The entire equipment was received at Lonavla by early 1972. Full payment for the supply of equipment and twenty per cent for erection, amounting to Rs. 33.31 lakhs (including foreign exchange element of Rs. 22.60 lakhs) was made to the firm between July 1968 and January, 1972. However, according to the Audit para the erection of equipment had not commenced till January 1977. Since the entire requirement ordered for Lonavla sub-station had been received thereby early 1972. The Committee desired to know the reasons for the delay in the erection of equipment. The Railway Board in a written note have stated:—

“It is true that the entire equipment ordered for the Lonavla sub-station was received by early 1972. While it is a fact that the complete equipment erection has not been carried out at Lonavla, almost all the major constituent assemblies obtained against Lonavla sub-station Contract have been utilised either at Lonavla or at other sub-stations as under:

Equipment		Place	Date
2.2 KV Panel		Lonavla.	Oct. '72
Feeder Breaker	I	Thull Ghat	March, '75.
Feeder Breaker	II	Not erected.	
Machine Breaker	I	Thull Ghat	March, '75.
Machine Breaker	II	Not erected.	
Rectifier	I	Upper Bhore Ghat	Aug. '75.
Rectifier	II	Not erected.	
Transformer	I	Thull Ghat	Sept. '74
Transformer	II	Thull Ghat	Feb. '76.

The reasons for the delay in installing these equipment upto the dates indicated above are as under:

Erection of the equipments at Lonavla was deferred till the earlier equipment installed at Upper Bhore Ghat was proved to be stable in service including their inversion characteristics. In Nov.'74 the original suppliers confirmed that the equipment cannot work satisfactorily in inverter mode and offered some refund which is under consideration. Between Sept. '74 to Feb. '76, there were some incidents at Thull Ghat and Upper Bhore Ghat sub-stations causing damages and necessitating major constituent assemblies being replaced from those available and awaiting erection at Lonavla. In this period one transformer also

got damaged due to wagon derailment. In all these cases, Lonavla equipments were utilised to keep the two sub-stations going."

2.19. The Committee enquired if the working of the section had been affected by non-installation and non-commissioning of the rectifiers for over a decade and whether the traction power requirement of the section served by Lonavla sub-station had been met. The Railway Board in a written note have stated:—

"The working of the section has not been affected due to non-installation of the mercury arc rectifiers at Lonavla. This is because now substations at Upper Bhore Ghat and Karla had been commissioned. The existing rotary converter units at Lonavla were kept going. This was facilitated by the release of equipment from other rotary sub-stations which had been replaced."

2.20. The Audit Para states that to cater to the additional requirement of power for the increased traffic expected during the Third Five Year Plan, orders were placed in June 1967 on the same firm of Bombay for supply and erection of one mercury arc rectifier (of 3,000 KW capacity) at each of the two new sub-stations being set up at Thull Ghat (North-east line) and Upper Bhore Ghat (South-east line). The two mercury arc rectifiers were installed at these sub-stations in June 1972 at a cost of Rs. 74.29 lakhs (including foreign exchange element of Rs. 31.41 lakhs), as booked upto the end of August 1976.

2.21. The Committee asked when orders for four mercury arc rectifiers, two for Lonavla and one each for Upper Bhore Ghat and Thull Ghat, were placed whether there was any planning for other ghats also. The Adviser Electrical, Railway Board during evidence stated:—

"There were three separate orders and all the three featured in one works programme for 1964-65. They were sanctioned in 1963-64 and carried forward to 1964-65."

2.22. The Committee note that the completion time for the manufacture and supply at site, erection and setting to work satisfactorily of the equipment for mercury arc rectifiers as stipulated in the contract was as under:

(a) Delivery ex-work . . . . .	15 months.
(b) Shipping clearance and delivery at site. . . . .	4 months.
(c) Period for erection and commissioning. . . . .	4½ months.

2.23. The Committee desired to know as to when the equipments were ordered for Lonavla, Thull Ghat and Upper Bhore Ghat sub-stations and when the deliveries were stipulated. In reply, the Railway Board in a written note have stated:—

“Supply and erection of Mercury Arc Rectifier sets for Upper Bhore Ghat, Thull Ghat and Lonavla Sub-Stations were processed practically simultaneously as indicated below:

	Upper Bhore Ghat.	Thull Ghat	Lonavla
Date of issue of Tender	28-1-65	28-1-65	29-3-65
Date for opening tenders	29-6-65	29-6-65	30-7-65
Date for issue of letter of acceptance.	30-6-67	30-6-67	30-6-67
Date of executing agreements.	16-12-67	16-12-67	5-12-67
Date of Agreement becoming effective	11-7-68	11-7-68	6-5-68
Original completion date	25-6-70	25-8-70	20-4-70

2.24. According to Audit during the year 1965 tenders were invited for Upper Bhore Ghat, Thull Ghat II, Lonavla, Kalyan and Kurla. The type of rectifiers (whether Mercury Arc Rectifiers or Silicon) were not indicated in the tender. All these tenders were opened on 29-6-1965, 29-6-1965, 30-7-1965, 15-1-1966, and 15-10-1965 respectively. In respect of the first 3 tenders the offers received were mainly for supply of Mercury Arc Rectifiers; out of 5 offers for Lonavla 3 were for Mercury Arc Rectifiers one for silicon and another not indicated; out of 4 offers for Upper Bhore Ghat and Thull Ghat II, two were for Mercury Arc Rectifiers no particulars given for one, and another offer received late and not considered. In respect of Kalyan tender, however, opened on 15-1-1966 all the 15 offers received were for Silicon rectifiers. In respect of Kurla also opened on 15-10-1965 the offers were mainly for Silicon rectifiers as seen from some notings on C.E.E.(C)'s file (The tender file of Kurla was not readily available). This would show that Silicon rectifiers had started taking the field by the end of 1965. Further the acceptance of the offers by Central Railway for Silicon rectifiers for Kalyan (on M/s. Siemens) and Kurla (on M/s. N.G.E.F.) in 1968 would show that Central Railway Administration were satisfied with the efficiency of these Silicon rectifiers.

2.25. In reply to another query the Railway Board have stated:

“Equipment for Upper Bhore Ghat Sub-station was received on by June 1971 at site, and was installed and commissioned in June 1972 as rectifier only.”



2.26. The note of the Railway Board further states that in February 1968, the Contractor was advised to commission the three sub-stations in the following order:

- (i) Upper Bhore Ghat
- (ii) Thull Ghat
- (iii) Lonavla

2.27. It would be seen that two mercury arc rectifiers one each at Upper Bhore Ghat and Thull Ghat were installed in June 1972 and no rectifiers had been installed at Lonavla till January 1977 though the completion dates for the three were 25 June 1970, 25 August, 1970 and 20 April, 1970 respectively. The Committee desired to know the reasons for delayed completion of sub-stations. The Adviser Electrical, Railway Board during evidence stated:—

“Firm asked for extension. Such extension was granted.”  
He added:

“This correspondence took place between the Central Railway and the firm. There are several extensions.”

2.28. The Committee desired to know the details of such extensions. The Railway Board in a note have furnished the following details:—

*Reasons for granting Extension*

1. The original dates of completion for the three works as per contracts were as under:—

Upper Bhore Ghat. . . . .	25-6-1970
Thull Ghat. . . . .	25-8-1970
Lonavla . . . . .	20-4-1970

2. The contractor was advised *vide* letter No. 1626 B|LP. 13|TR 8A dated 20-2-68 that the priority for execution of the works were as under:

1. Upper Bhore Ghat Sub-station
2. Thull Ghat Sub-station and
3. Lonavla Sub-station.

**3. First Extension:**

First extension to the completion period was asked for by the Contractor *vide* their letter No. RIEC|55|65|658|117 dated 28-4-1970.

The date upto which extensions were asked for and granted are shown below.

Sub-station	Extension asked by the firm upto	Extension granted by the Rly. upto
1. Upper Bhore Ghat.	. Feb. '71	30-11-70.
2. Thull Ghat.	. June '71	30-11-70
3. Lonavla	. Dec. '71	28-2-72

#### 4. Second Extension

Second Extension was asked by the firm *vide* letters No. S.O. 1801|02|03|ADV dated 21-9-1971, S.O. 1802|03|ADV dated 4-11-1971 and S.O. 1801|02|03|ADV dated 17-11-1971. The date upto which extensions were asked or and granted are shown below :

Sub-station	Extension asked by the firm upto	Extension granted by the Rly. upto
1. Upper Bhore Ghat.	. 31-3-72	31-3-72
2. Thull Ghat.	. 31-3-72	31-3-72
3. Lonavla	. 30-9-72	30-9-72

#### 5. Third Extension:

A request for third extension was made by the firm upto 31-5-1972 for sub-station at Upper Bhore Ghat and Thull Ghat *vide* letter No. S.O. 1802-03|ADV dated 23-2-1972. Extensions for these sub-stations were granted on 23-4-72 upto 31-5-1972.

2.29. Asked about the reasons advanced by the Supplier for seeking extensions, the Railway Board have furnished copies of letter from M/s Raje Industrial & Engineering Combine Pvt. Ltd. dated 26 April, 1970 and form Hindustan Brown Boveri Dated 21 September, 1971 and 23 February, 1972 which are placed at Annexure III.

2.30. It would be seen that M/s. Raje Industrial and Engineering Combine and Hindustan Brown Boveri in their letters have *inter alia* stated:

- (i) "Order for 11 items for the outdoor yard for the sub-stations at Upper Bhore Ghat and Thull Ghat was placed with us on 25-9-69 in response to our letter No. 4520 dated 25-5-67 i.e. after a delay of 16 months, and without the completion of the erection of the eleven items, the commissioning and completion of the remaining equipment cannot be made and hence there are delays also on account of this situation.

- (ii) Your final layout drawing for the outdoor yard for Upper Bhore Ghat was received by us with your letter No. W. 828 B. LP. 13 TR. 8 of 20-1-70, we will be able to prepare our final yard drawing for the two sub-stations for your approval. In terms of our offer dt. 27-5-67, based on which you placed your order on 26th September, 1969 the delivery period of these items will commence from 12|14 months after the receipt of the first advance payment and approval of our yard drawing which is under preparation. There is delay on this account as well.
- (iii) We have still to receive the final Civil Engineering drawing or Thull Ghat sub-station and yard.
- (iv) We have still not received from you the sub-station steel structures, to enable us to commence the erection of these structures and other relevant outdoor equipment. Consequently there will be delay in completion of the sub-station work on this account.
- (v) The trenches in the outdoor yard are still not ready consequently withholding our work for control cabling and compressed air piping.
- (vi) We also make note that the transformer track at Upper Bhore Ghat sub-station is still not complete.
- (vii) Your recent proposal to shift the location of the D.C. Breaker cubicles from the already approved location, has resulted in the extra civil engineering works, which are still in progress. We will be able to commence this erection only after the civil engineering works are completed.
- (viii) In our letter to the Chief Engineer (Construction), dated 25 August, 1971, we have pointed out to you the delays in respect of our payments. This position is still not changed. In our letter of 25th August, 1971 we also advised you that the delays in the payments can affect the progress of the erection work. It is hoped that in future our payments will be made promptly to ensure speedy erection progress.
- (ix) In view of your operational requirement of Lonavla sub-station work to be taken only after the completion of

Thull Ghat and Upper Bhore Ghat sub-stations, we request you to amend the completion date for Lonavla sub-station tentatively as 31st December 1972, provided the permission is given to us to commence the erection work immediately after completion of Upper Bhore Ghat sub-station and that the work at Lonavla sub-station is permitted to be carried out uninerruptedly and that all the necessary civil engineering works are completed well in advance."

2.31. Pointing out that the contract was with M/s. Raje Industrial and Engineering Combine Pvt. Ltd., Indian agents of M/s. Secheron, Switzerland the Committee desired to know how the Hindustan Brown Boveri came into the picture. The Adviser Electrical, Railway Board during evidence stated:

"..In August, 1970, Secheron merged with another firm International Brown Boveri. They had their collaborator or agent in India by way of Hindustan Brown Boveri. In August, 1970, the document was drawn up. Raje ceased to be in picture. Hindustan Brown Boveri took up its responsibility."

2.32. The Committee enquired about the consideration on which Railway Board agreed to charge the supplier. The witness replied:

"They started dealing through Hindustan Brown Boveri. They had come into the picture."

2.33. The Committee asked as to why after accepting the tenders Railway Administration agreed or such change. The witness replied:

"If bulk of the equipment comes from a party who is now merged with somebody else, we do recognise such a situation."

2.34. The Committee pointed out that no new consideration had arisen and there was no special advantage then why did the Railway Administration oblige the firm. The witness stated:

"Not obliged, we agreed."

2.35. Subsequently the Railway Board in a note have explained the position as under:

“M/s. Raje Industrial Engineering Combine Ltd. informed the Railway on 6.3.70 that their Principals, M/s. Secheron, Switzerland, had become a member of the Brown Boveri Group of Companies Switzerland, whose collaborators in India are M/s. Hindustan Brown Boveri Ltd. and requested for approval for transferring the contracts to M/s. Hindustan Brown Boveri. It was advised by the Railway on 28-3-70 that a tripartite agreement would have to be executed between M/s. RIEC, M/s. HBB and Railway Administration providing for RIEC continuing to be liable notwithstanding the transfer. RIEC did not agree (letter dt. 8-4-70) to this special provision for continuous liability. In a further letter dated 11.5.70, RIEC brought out that M/s. HBB alone would now be able to co-ordinate the technical service with M/s. Secheron and deal with the contractual matters expeditiously. In consultation with and after vetting by the Legal Adviser to the Government of India, Ministry of Law, Bombay, a tripartite Agreement was executed on 5-8-1970, transferring the contractual liability totally to M/s. HBB.”

2.36. It would be seen that contracts provide that equipments would be shipped by the supplier within 15 months from the date of contract. In this connection, the Committee desired to know the dates on which equipments were shipped for the three sub-stations. The Railway Board in a note have furnished the following details:

1	2	3	4	5	6	7
Sub-Station	Port of shipment	Name of ship	Date of shipment (as per Bill of lading)	Date of arrival of ship in India (as per Bill of entry)	Date of arrival of equipment at site	Particulars of goods
1. Upper Bhoze Ghat .	Hamburg	S. S. Abbeckerk	25-11-70	11-1-71	March '71	Rectifier equipment Rect. Transformer 1500 V. HSCBs control panel etc. (Secheron make)
	Gdansk .	S. S. Vishva Usha	30-11-70	13-2-71	3-6-71	2' 2 KV Switchgear (Secheron supply, Elektrim make).
	Gdansk .	S. S. Kapitan Kosko	28-12-70	5-3-71	3-6-71	110 KV MOCB C. T. P T etc. (Elektrim make)
2. Thull Ghat .	Rotterdam .	S. S. Lelykerk	2-11-70	17-12-70	22-2-71	Rectifier equipment Rectifier transformer control panel 1500 V DC HSCBs (Secheron make)
	Gdansk	S. S. Vishva Usha	30-11-70	13-2-71	3-6-71	2' 2 KV switch gear (Secheron supply, Elektrim make)
	Gdansk .	S. S. Kapitan Kosko	28-12-70	5-3-71	3-6-71	110 KV MOCB CT & PT etc. (Elektrim make)
3. Lonavla .	Marseille	S. S. Eugeni S. Embirices	24-10-69	8-12-69	Feb. 70.	Two MAR Tanks (Secheron make)
	Gdansk .	S. S. Vishva Usha	30-11-70	13-2-71	20-4-71	2' 2. KV Switchgear (Secheron supply Elektrim make)
	Rotterdam .	S. S. Jaldharti	15-2-71	19-3-71	23-4-71	Rectifier equipments. (See her make)

2.37. It would be seen from above that equipments were not shipped in time as stipulated in the contract. According to the delivery time schedule provided in the contract equipments had to be shipped within 15 months from the date of agreement becoming effective, which was 11.7.68 for Upper Bhore Ghat and Thull Ghat and 6.5.68 for Lonavla, against this, the last equipments in the case of Upper Bhore Ghat and the Thull Ghat were shipped on 28.12.70 and for the Lonavla station on 15.2.71. The Committee enquired in such situation what remedial steps could be invoked. The Chairman Railway Board during evidence stated:—

“We have to invoke the damage clause as well as the penalty clause in this contract.”

2.38. Pointing out that the firm had made a breach of contract, the Committee desired to know if any damage was realised from the firm. The witness replied:

“This has been extended.”

The Member, Electrical added:—

“We have not taken any legal action of that nature. We have waited and they have asked for an extension.”

Clarifying the point, he further added :—

“I think in all these cases, I might clarify that we have been looking upon the execution of the contract from start to finish and concern ourselves with the final completion of the contract without breaking up the total period into shipment period, transit time and clearance.”

2.39. It would be seen that the supplier initially asked for extension through their agents *vide* letter No. RIEC/55.65.65B117 dated 26.4.1970 upto February, 71 June, 1971 and December 1971 for Upper Bhore Ghat, Thull Ghat and Lonavla sub-stations though according to terms of the contract the delivery of equipment at site was to be completed within 19 months i.e. by February, 1970 for Thull Ghat and Bhoreghat sub-stations and by December 1969 for Lonavla sub-stations. However in spite of the fact that extension was granted, the supplier failed to execute the contract in time. The Committee enquired as to what action was taken against the supplier for not fulfilling his contractual obligations in time, the Chief Electrical Engineer Central Railway during evidence stated:

“We must have sent reminders.”

Elaborating the point further the witness stated:

“Another aspect which would be worth keeping in our mind is whether the Central Railway were prepared to receive the equipment. The contract provided for the supply and erection of equipment of a certain nature. The contract also provided that the Railways from their side would provide certain steel parts, sub-station building, foundation work etc. To the extent I have verified, the Central Railway were not ready till the grant of first extension.”

2.40. Asked as to the nature of functions Railway Administration was required to perform with respect to receiving the equipment at sites, the Railway Board in a note have stated:—

“...there had been some delay in completion of sub-station buildings, switchyard structures, transmission line etc. at Upper Bhore Ghat and Thull Ghat. As these works were not ready as originally programmed, the erection of mercury arc Rectifier sets at Lonavala also got delayed. In respect of these three contracts, the following items of work were to be carried out by the Railway to enable the contractors to complete their portion of works:—

(a) Upper Bhore Ghat Sub-Station :

	Actual comple- tion Date of Rly's works	Date HBB started to work at site
(i) Construction of sub-station buildings including lifting bay/provision of approach road and retaining wall against boulder falling . . . . .	June, 71	April, 71
(ii) Laying of Rly. siding . . . . .	March, 71	Nov. 71
(iii) Foundation of switchyard structures . . . . .	Nov., 71	Do.
(iv) Foundation for transformers, Mercury Arc Rectifier tanks, control panels & High Speed circuit Breakers etc. . . . .	Do.	Do.
(v) Provision of cable trenches, both inside the sub-station building and in the switch yard . . . . .	Nov., 71	Do.
(vi) Supply of switchyard structures . . . . .	July, 71	Do.
(vii) Provision of 110 KV transmission line . . . . .	March, 71	April, 72



(b) *Thull Ghat sub-station :*

	Actual completion date of Rly's work	Date HBB started to work at site
(i) Construction of sub-station building including lifting bay . . . . .	July, 71	June, 71
(ii) Laying of Railway siding . . . . .	Feb., 71	June, 71
(iii) Foundations of switchyard structures . . . . .	Sept., 71	Oct., 71
(iv) Foundation for transformers, Mercury arc Rectifier tanks, control panels and High Speed Circuit Breakers etc. . . . .	Do.	Do.
(v) Provision of cable trenches, both inside the substation building and in the switchyard . . . . .	Do.	Do.
(vi) Supply of switchyard structures	July, 71	Nov., 71
(vii) Provision of 110 KV transmission line	April, 72	May, 72

(c) *Lonava'a sub-station :*

(i) Dismantling and removal of old rotary converters and transformers . . . . .	} In progress (Dec., 78)	The erection of Mercury Arc Rectifier has been taken up departmentally as the contractor has requested to be relieved of this responsibility.
(ii) Foundations and cable trenches to suit Mercury Arc Rectifier sets and associated modification to the building . . . . .		

2.41. The Committee enquired if there was any contractual obligation linked with either the shipment or the clearance in India of the equipments with the Railway Administration making arrangements for their reception. The Chief Engineering Electrical, Central Railway stated during evidence :

"No, Sir. The delay is on our part."

2.42. Elaborating the point further, the witness added :

"He could have done it. There was no linkage; but when he asked for extension, these were our consideration."

2.43. Pointing out that the Railway Administration granted extensions in July, 1970 for Thull Ghat and Upper Bhore Ghat upon

30 November, 1970 and for Lonavla upto 28 February, 1971 the Committee desired to know whether the extensions were for shipment or for completion. The witness replied :

“For completion.”

2.44. The Committee desired to know the steps taken by Railway Administration on the expiry of extended time on 30 November, 1970 when the supplier could not ship any equipment. The witness replied :

“I except that we have again given them reminders.”

The Chief Engineer (Electrical), Central Railway in reply to another query informed the Committee that in September, 1971, the suppliers had asked for another extension and by that time, the bulk of the requirements had been received and erection was under way and certain erection was in progress.

2.45. The Committee enquired as to when the balance payment of 90 per cent of contract money was made to the firm. In reply the Railway Board in a note have furnished the following details:

2.46. The dates of the balance 90 per cent payment for Secheron equipment for the 3 sub-stations are given below:—

Sub-Station	Date of payment	Amount Rs.	Details of materials
Upper Bhore Ghat	16-1-71	10,72,918.40	Rectifier transformer tanks etc.
Upper Bhore Ghat	3-3-71	74,344.00	SCE & 2.2. kv switch gear etc.
Thull Ghat	30-12-70	10,63,615.40	Rectifier transformer, tanks, HSCB etc.
Thull Ghat	3-3-71	74,344.00	2.2 kv Switch gear etc.
Lonavala	27-3-71	16,43,490.53	Rectifier transformer, tanks, spares etc.
Lonavala	27-3-71	1,84,283.16	2.2 kv. Switch gear etc.

2.47. The Committee pointed out that these payments had been made when there was no contract under the law subsisting. The Adviser, Electrical Railway Board during evidence maintained:—

“I do not think we informed the firm that since they had defaulted we terminated the contract.”

2.48. It may however be seen that clause 18 of the contract provides:—

“Time for completing work by the date or extended date for completion shall be deemed to be an essence of the contract. If the contractor fails to carry on, execute and complete work to be done by him under this contract within the completion period and if completion period is not exceeded for causes beyond the control of the contractor, the contractor agrees to accept the reduction in the FOB plus erection price at the rate of half per cent per week of delay in the completion period provided that the total damages for delay in the completion period do not exceed 5 per cent of the FOB.”

2.49. The Committee asked that when payments were made in March, 1971 did the Railway Administration take into account, the delay in the execution of the contract and whether the above clause of the contract was invoked. The Adviser, Electrical, Railway Board stated during evidence:—

“No. Because we did not decide that we shall implement this clause.”

2.50. Asked about the reasons for not implementing this clause, the witness stated:—

“In our normal work contract, we implement this liquidated damage on the primary consideration that had the contractor fulfilled his obligations, we would have been able to make use of the equipment and by not sticking to the schedule, we have run into some monetary loss where we ourselves are not in a position to accept or erect or give facilities for erection. We find that there is no reason for implementing this clause.”

2.51. The Committee desired to know if the Railway Administration even pointed out to the supplier that he was bound to pay penalty for delay. The witness replied:

“I would not be able to say that. An extension was asked for.”

2.52. Clarifying the point, the Chief Engineer (Electrical), Central Railway stated:

“It has not been claimed.”

2.53. In a subsequent note the Railway Board have stated:

"These extensions were granted without imposing any penalty as the grounds on which the extensions were sought for were considered reasonable."

2.54. Asked as to why penalty was not claimed, the Adviser Electrical stated:—

"We had reached the stage of end of February. In the meanwhile, shipments had not taken place; and having heard about all the shipments, we had made payments."

2.55. In a subsequent note, the Railway Board have stated:

"Each 90 per cent payment was made on production of the shipment documents, certificates of inspection of the competent authority and a Bank Guarantee for an equivalent amount."

2.56. In reply to a query from the Committee, Adviser Electrical, Railway Board stated during evidence:—

"Inspections were carried out in January, 1970 for part of the equipment; we have certified in March, 1970 for part of the equipment. Inspections were carried out at the factory."

2.57. In a subsequent note furnished to the Committee the Railway Board have stated:—

"The inspections for Secheron Mercury Arc Rectifier equipment and 1500 volts D.C. breakers for Upper Bhore Ghat, and Lonavla were carried out on 16-1-1970 and 22-7-1970. The Electric equipment (for Upper Bhore Ghat and Thull Ghat sub-stations only) was inspected in two lots in November, 1969 and April, 1970."

2.58. However, the equipments for Upper Bhore Ghat and Thull Ghat were shipped during 1970 and for Lonavla during October, 1969, November, 1970 and February, 1971.

2.59. Explaining the reasons for delays between inspection and shipments, the Railway Board in a note have stated as under:—

#### A. Secheron equipment

- (i) The inspection for Secheron Equipment viz. rectifier equipment and 1500 V DC breakers for Upper Bhore Ghat, Thull Ghat and Lonavla were carried out on 15th January, 1970 and 22-7-1970.

- (ii) The import licences for all the three contracts issued in March, 1968, were initially valid only for 3 months. They were revalidated upto Sept., 1969 for Upper Bhore Ghat Nov., 1969 for Thull Ghat and Dec., 1969 for Lonavla. (The three contracts became effective from July, 68, July, 68 and May, 68 respectively after the approval of Indian & Swiss Govts.)
- (iii) In Nov., 1969, in respect of Lonavla contract, the contractor advised the Railway that by then manufacture had not been completed and therefore requested revalidation of the licence for a further period of one year. They also stated that the list of items (to be included in Import Licence) required some revision.
- (iv) The Import Licence was, however, amended and revalidated upto 20th April, 1970, the then contractual completion date. This Import Licence duly revalidated upto 20-4-70 was, however, received by the firm just after expiry of this validity and hence was required to be again revalidated.
- (v) Similarly, for Upper Bhore Ghat and Thull Ghat contracts, the Import Licences were revalidated (in December, 1969 & Feb., 1970) upto June, 1970 and August, 1970 respectively.
- (vi) At about the same time (March, 1970), RIEC proposed that all the three contracts be transferred from M/s RIEC to M/s HBB. This transfer became effective from 5-8-1970.
- (vii) The three import licences for all the three contracts were therefore arranged to be transferred to the name of HBB and revalidated upto 30-11-70 for Upper Bhore Ghat & Thull Ghat and upto 28-2-1971 for Lonavla. These licences were received by HBB in October, 1970.
- (viii) Shipment for Upper Bhore Ghat was done on 25-11-70 and 30-11-70

.. .. Thull Ghat 2-11-70 and 30-11-70  
 .. .. Lonavla 24-10-69, 30-11-70 and 15-2-71

**B. Elektrim Equipment (for Upper Bhore Ghat & Thull Ghat only)**

- (i) 2 Import Licences for Elektrim equipment were issued to the contractor in Nov., 1967 which expired on 14-11-68. They were later got revalidated upto 10-12-69.
- (ii) The Import Licence which expired on 10-12-69 was got extended (on 15-12-69) by one year, upto 10-10-70 for Upper Bhore Ghat and upto 10-12-70 for Thull Ghat.
- (iii) M/s RIEC requested on 6-8-70 to transfer the Import Licences in favour of M/s HBB's name since all the 3 contracts had then (5-8-70) been transferred to HBB. M/s. HBB received the Import Licence duly transferred on 15-12-70.
- (iv) M/s RIEC requested Ministry of Shipping on 29-10-69 to issue necessary instructions to M/s Schenkar & Co., Hamburg, regarding shipping arrangement (one lot of equipment was then being offered for inspection) from Marseilles.
- (v) Ministry of Shipping asked Railway on 14-11-1969 for 3 copies of contract document together with cargo particulars of the equipment to be shipped on a prescribed proforma. The proforma and copies of contract etc. were sent to the Ministry of Shipping on 22-1-70.
- (vi) In Maq, 70, M/s Schenkar & Co. advised the Shipping Coordination Officer that M/s Elektrim desire that their equipment would be shipped from Gdansk.
- (vii) The Ministry of Shipping advised Central Railway on 19-6-70 that if the port of shipment viz. Marseilles, had to be changed to Gdnask, in term of Indo-Polish Shipping Service Trade, the shipping would have to be co-ordinated by the Indo-Polish Shipping Service, Bombay and not through M/s Schenkar & Co., Hamburg. The Shipping Coordination Officer advised the Indo-Polish Shipping Service, Bombay on 12-8-70 to arrange shipment of equipment from Gdansk.
- (viii) The shipment of all equipment, inspected in two lots in Nov., 1969 and April, 1970, was done in December, 1970 from Gdansk.

2.60. Drawing attention to the observations made in the audit para that sub-station at Lonavla had not been erected till 1977 and that contract provided for supply and erection of equipment, the

Committee desired to know the amount paid for erection of equipment at Lonavla. The Chief Engineer Electrical, Central Railway during evidence stated:—

“Certain advance for erection was required to be paid; 20 per cent erection charges were to be paid in advance.”

He further added:

“The foreign exchange portion was required to be paid in advance. Total amount was about Rs. 65,000 only in the case of Lonavla, of which 20 per cent i.e. Rs. 13,000 was paid in foreign exchange. We have not paid the balance.”

2.61. The equipment for Upper Bhareghat and Thullghat was received in June 1971. However, the equipment were erected there by the end of May 1972. The Committee desired to know the reasons for it. In reply the witness stated:—

“Our sub-station work was not ready.”

The Chairman Railway Board further added:

“It seems to be Railway’s fault. We will find out the circumstances.”

2.62. The Committee pointed out that three extensions were granted to supplier without any consideration and no penalty was charged. In view of these facts the Committee enquired if prices of equipments were reduced. The Chairman Railway Board stated:

“We will check it up. Liquidated damages are levied on the final settlement of the Bill.”

2.63. The Committee desired to know if bank guarantee was renewed in this case. The Chief Engineer, Electrical, Central Railway during evidence stated:

“It was renewed upto December 1973 for Lonavla.”

2.64. A copy of the Bank Guarantee Bond furnished by the Railway Board is placed at Annexure IV. It would be seen therefrom that Bank Guarantee constituting Security deposit provides for fulfilment by the contractor of the terms and conditions contained in the contract. However, the Railway Administration did not consider to invoke this Performance Guarantee.

2.65. The Audit Para states that to meet the additional requirement of power for the traffic expected during the Fourth Five Year Plan period and also keeping in view the schemes for running D.C. electric locomotives (WCC-2 type) on the Ghat sections. It

was proposed, amongst others, to provide an additional rectifier set of 3,000 KW capacity each, at Upper Bhore Ghat and Thull Ghat sub-stations (over and above one mercury arc rectifier provided earlier) as second unit as standby. The proposals were approved by the Railway Board in 1969 and 1968 respectively. Accordingly, orders for supply and erection of two silicon rectifiers were placed on the National Government Electric Factory, Bangalore, in October 1970, at a cost of Rs. 35.60 lakhs (inclusive of foreign exchange element of Rs. 4.28 lakhs). The erection of silicon rectifier units at Upper Bhore Ghat and Thull Ghat sub-stations started in April 1976 and is in progress (January 1977). The expenditure booked upto August 1976 was Rs. 21.13 lakhs.

2.66. The final location of the four mercury arc rectifiers (two acquired in 1972 for Lonavla sub-station and in storage there and two installed at Thull Ghat and Upper Bhore Ghat sub-sections in 1972) had been under examination by the Railway Administration, the Research, Designs and Standards Organisation and the Railway Board, as indicated below:—

“In June 1973, the foreign collaborators of the National Government Electric Factory indicated that the silicon rectifiers were not designed to operate in parallel with the mercury arc rectifiers already installed at the Ghat sub-station in June, 1972. Thereupon, the Railway Administration approached the Railway Board in November 1973 to the effect that the two mercury arc rectifiers already acquired for Lonavla sub-station should be diverted for installation at the Ghat sub-section since these sets are identical to the sets already installed there and that the two silicon rectifiers to be acquired for the Ghat sub-stations should be diverted for installation at Lonavla sub-station. The proposal was examined in consultation with the Research, Designs and Standards Organisation and the Railway Board advised the Railway Administration in September 1974 that no change need be made in the distribution of the equipments, that is, the mercury arc rectifiers should be installed at Lonavla sub-station and silicon rectifiers at the two Ghat sub-stations as per the original contract.

In November 1974, the firm which had supplied and installed the mercury arc rectifiers at Upper Bhore Ghat and Thull Ghat sub-stations advised that the design of these rectifiers did not foresee the requirements of connecting the silicon rectifiers to be installed at these stations. The



Railway Administration, therefore, again approached the Railway Board in March 1975 for acceptance of the earlier proposal of diverting the two mercury arc rectifiers acquired for Lonavla sub-station to the Ghat sub-stations and silicon rectifiers ordered for Ghat sub-stations to Lonavla sub-station.

2.67. The Committee desired to know whether silicon rectifiers could not be operated in parallel with mercury arc rectifiers. The Adviser Electrical, Railway Board stated during evidence:

"It is could it is alright. But if it could not that also does not matter.

He further added:—

"The general philosophy is in any sub-station we can use mercury arc rectifiers alongwith a silicon rectifier. But these two in this case are not capable of being parallel."

2.68. The Committee desired to know as to how an equipment provided as standby could be used in parallel to meet the additional power requirements and whether it was not desired that the standby should be such as could be used in parallel with the main unit in case of necessity. The Railway Board in a note have stated:

"Additional power requirements in a section are normally provided in two stages. In the first stage only one rectifier set is provided in a new sub-station (normally erected at the site of existing track cabin) the site to reduce the voltage drop in the section and bring the line voltage within the acceptable requirements of the locomotives operating in the section. In the case of a defect of failure or during periods of shut down for maintenance of the rectifier at the new sub-station, the old sub-stations meet the traffic requirements though with unacceptable voltage drop. When load increases further, a second unit is added at the new sub-station which ensures that this sub-station is always available even in case of one unit being shut off for defects/maintenance purposes. Normally only one of these two units is operated, the second unit acting as a standby.

In the first instance, a single unit was proposed at each Thull Ghat and Upper Bhore Ghat Sub-stations (originally Track Cabins) to meet the traffic foreseen in the Third Plan. When the anticipated power requirement increased, to meet the traffic forecast in IV Plan a second unit

was proposed at these sub-stations to act as a system standby under normal operation.

Although the Central Railway Administration felt that the additional set has to be used in parallel in case of outages in the neighbouring sub-stations, parallel operation is not really needed upto the present level of traffic movements. In fact the experience in the past several years has shown that parallel operation has not had to be resorted to at any of the sub-stations in the non-suburban section even once."

2.69. According to the Audit, the matter was re-examined by a Technical Committee including one expert from the R.D.S.O. The Committee recommended in May 1975 that the four sets of mercury arc rectifiers (two already installed at the two Ghat sub-stations in June, 1972 and two awaiting installation at Lonavala sub-station) be ultimately diverted for installation on the Diva-Bassein Road Railway Electrification Project, which had been sanctioned.

2.70. Asked if the recommendations of the Technical Committee had been implemented, the Railway Board have stated:—

"The recommendation is basically in two parts, namely;

- (i) To erect the sets at Lonavala; and
- (ii) to ultimately divert the sets to Diva-Bassein section. The implementation of the first part of the recommendation i.e. erection of the sets at Lonavala is being undertaken the first step being to repair the damaged equipment at Upper Bhor Ghat and Thull Ghat and release the Lonavala equipment.

The second part of the recommendation of ultimately diverting the Lonavala sets to Diva-Bassein section would be considered later particularly after review of the system of electrification of Diva-Bassein section (DC or AC) and the estimate of the work is sanctioned and funds allotted.

It has now been decided that electrification of Diva/Bassein Road Section is to be done at 1500 Volts. D.C. and the power supply is to be obtained at 22 K.V. from Maharashtra State Electricity Board. The diversion of these sets to Diva/Bassein Section is no longer feasible without major modifications in the Transformers."

2.71. The Committee enquired if the delay in the installation of rectifiers immediately after their acquisition in 1972 and after Railway Board's order of September, 1974 has not resulted in idling of

assets worth Rs. 35 lakhs from 1972 onwards. The Railway Board in written note have stated:—

“The installation of the equipment at Lonavala was initially deferred till 1974, to watch the stability of the sets installed at Upper Bhore Ghat and Thull Ghat. Further from September, 1974 the several constituents of the equipment had to be utilised at various places.

The equipment procured for Lonavala, which have been diverted to other stations, are being released after repairs to the equipment at Upper Bhore Ghat and Thull Ghat.”

2.72. The Committee desired to know as to when the supply from Upper Bhore Ghat sub-station became stabilized. The Railway Board in a note have stated:—

“The supply from Mercury Arc Rectifier set in the Rectifier mode at Upper Bhore Ghat stabilised by early 1974. However, the operation of Mercury Arc Rectifier sets in the inversion mode was not successful and it was finally confirmed by the suppliers in Nov. 74 that the equipment is not workable in inversion mode. The suppliers accordingly offered to take back the inversion equipment of these sets and refund the price. This offer is under consideration.”

2.73. The Committee enquired if the equipment procured for Lonavala and used elsewhere has been released and whether it is in good working condition capable of being erected elsewhere. The Railway Board in a note have stated:—

“The present position of various equipments is as follows:—

Feeder-breakers—In good working order-released-capable of being erected.

Main-breakers—In good working order-released-capable of being erected.

Rectifier I—In good working order-not released-working at Upper Bhore Ghat.

Transformer I—Not in good working order-to be rewound.

Transformer II—In good working order—Not released, working at Thull Ghat.”

2.74. The Audit Para pointed out that 98 items of components of the mercury arc rectifiers including the rectifier tank stored at

Lonavala had been used by the Railway Administration to carry out repairs to the mercury arc rectifiers at Thull Ghat and Upper Bhoze Ghat sub-stations.

2.75. The Committee enquired if the equipment used up at other sub-stations had been procured for replacement and desired to know the steps taken by the Railway Administration in that direction. The Adviser Electrical, Railway Board during evidence stated:—

“Immediately we called for the equipment from the firms.”

2.76. Asked to specify the time, the Chief Engineer Electrical Central Railway stated during evidence:—

“In 1977 we have asked them”.

2.77. In a note, the Railway Board have indicated the latest position as under:—

“Quotations for replacements have been received and are under consideration. Foreign Exchange Control in the quotation ceases to about Rs. 1,20,000. No expenditure has been incurred so far.”

2.78. The Committee enquired as to why there was a delay of three years, the Adviser Electrical, Railway Board stated during evidence:—

“There has been a delay in this regard from the Central Railway to invite tenders and make up the loss.”

2.79. The Committee asked as to what happened when tenders were invited. The Chief Electrical Engineer, Central Railway stated during evidence:

“They said that the erection work would not be done by them. They also took back the inversion equipment.”

2.80. He further added that inversion equipment was not commissioned and the suppliers were not able to commission it in a stable manner.

2.81. The Committee desired to know whether mercury arc rectifier which had the advantage of having inverse equipment over silicon rectifier, was ever used, the Adviser Electrical Railway Board stated:

“It was tried out as experimental measure, but it was not proved stable.”

He added:

"Therefore, it has not been successfully used and they have also admitted that they were prepared to take the equipment back."

2.82. Drawing attention to the fact that though silicon rectifier was cheaper and better in many respects yet the mercury arc rectifiers had the inversion capacity which the silicon did not have and though the Railway Administration never used this advantage, the Committee desired to know as to why the Railway Administration preferred mercury arc rectifier. The witness replied:

"When the decision was taken, this was the state of the art."

2.83. Drawing attention to the observations made in the Audit Paragraph that the Research, Designs and Standards Organisation had in July 1974 indicated that the 'mercury arc rectifier sets are also fast becoming technologically obsolete and that the firm which had supplied mercury arc rectifiers had informed the Railway Administration in February, 1972 that due to recent fast development of semi-conductor type rectifiers, its swiss principals had taken a decision to stop the manufacture of mercury arc rectifiers by the end of 1974, the Committee desired to know as to why the Railway Administration proceeded with the order.

The witness replied:

"Because the order had been placed two years earlier."

2.84. The Committee enquired whether the Railway Administration sought legal advice while granting extensions. The Chairman, Railway Board stated during evidence:

"There was no thinking of cancelling at that stage..... because the order was already placed."

2.85. Pointing out that in this case, time was essence of the contract and the party which makes default in such cases becomes liable for penalty and contract can be cancelled, the committee desired to know as to why it was not considered worthwhile to take legal advice. The witness stated:

"We never thought of it."

The Chief Electrical Engineer, Central Railway added:

"No doubt the contract could have been cancelled. But it was so considered. Normally we do not cancel the contract on such grounds."

2.86. The Committee desired to know as to when the use of silicon rectifiers was introduced in Railway traction and when the technological obsolescence started in the use of mercury arc rectifiers in Railway traction. The Ministry of Railways in a written note have state:

"Use of silicon rectifiers was introduced in Railway Traction sub-stations on Central Railway for the first time in 1971. Technological obsolescence in regard to use of mercury arc rectifiers in Railway traction sub-stations may be said to have started in the period 1969-70. In almost all cases, the transition from old to new technology is gradual and the two technologies run parallel for some considerable time."

2.87. Asked whether the Railway Board was not aware of technological advancements in the field of rectifiers. The Committee also desired to know as to how Railway Administration chose the mercury arc rectifiers which are becoming technologically obsolete. The Railway Board in a note have stated:

"Railway Board was aware of the technological developments in the field of rectifiers. The time the mercury arc rectifiers were chosen i.e. in 1965, when the tenders were issued and 1967 when the letter of acceptance was issued for Lonavala, Upper Bhore Ghat and Thull Ghat, the only established technology for the kind of equipment required was the mercury arc rectifiers.

It was in September 1969 that the Railway Board decided that in future only Silicon rectifiers should be installed at D.C. traction sub-stations."

2.88. The Committee enquired that when the Railway Administration knew that mercury arc rectifiers had become obsolete why the contract was not cancelled then. The Adviser Electrical Railway Board stated during evidence:—

"Normally if we order out an equipment from that point onwards even if there are technological developments we do not cancel contracts."

He further added:—

"The mercury arc rectifiers was not obsolete for us. We had not accepted silicon rectifiers as a dependable, thing on the day we ordered the mercury arc rectifiers."

2.89. The Chairman, Railway Board further conceded during evidence:—

“A lot of mishandling has happened in this case and we are quite unhappy about it. We have ordered an internal enquiry into it and we will certainly follow it up.”

2.90. Asked as to why there was not novation of the contract the witness replied:—

“...we could have done it. But, as we looked at it, many of the equipment was shipped before the silicon Rectifier became stabilised.”

2.91. The Committee pointed out that effective date of contract was in 1968 and according to Railway Board's own opinion obsolescence started setting in from 1967 to 1970. The witness replied:—

“As the obsolescence was over a gradual period, the Board decided that from September, 1969 onwards all equipment ordered should be silicon. The equipment which we had ordered on Raje by way of mercury arc rectifiers were meant to function as inverter while silicon rectifiers as established from September, 1969 are not capable of this inversion function.”

2.92. The Committee desired to know as to how the Railway Administration proposed to make good the deficiency of components of rectifiers stored at Lonavala. The witness replied:—

“... we will be placing orders shortly.”

2.93. The Audit para stated that the firm on which order for installation of mercury arc rectifiers at Lonavala had been placed claimed reimbursement of insurance charges (Rs. 68552/-) incurred by it to cover storage risks during the period from 1st January, 1972 to 31st December, 1974. The Committee desired to know the contractual obligations in regard to payment of insurance charges incurred by the supplying firm to cover storage risks. The Railway Board in a note have stated:—

“Clause 16.9 of the contract in this context is reproduced below:—

“All incidental charges, such as sea freight, insurance customs duty, clearing and forwarding charges to the lifts etc. as actually incurred by the Contractor will be paid by the Purchaser to the Contractor on production of necessary and proper documents.”

**Claim for storage insurance for period 1-6-71 to 31-12-71 amounting to Rs. 27274.66 p. has been passed. Claim for subsequent period i.e. 1-1-72 to 31-12-74, put in by the contractor have not been admitted."**

2.94. The Committee asked whether the storage insurance charges amounting to Rs. 27274.66p for the period 1-6-1971 to 31-12-1971 paid to the contractor were actually payable to them according to the contract and if not, had any legal opinion been obtained in this regard before making the payment. The Railway Board in a note have stated:—

"Initially, reimbursement of storage insurance, charges was claimed by the contractor (in March, 1972) under clause 16.9 of the contract. The amount was defined as "Insurance at Lonavala from 1-6-71 to 31-12-71" The claim was admitted and paid in October, 1972. When another claim was made (in April, 1973) for the subsequent period 1-1-72 to 31-12-72, the amount was defined as "Storage Insurance at Lonavala from 1-1-72 to 31-12-72." A view emerged that the clause 16.9 did not cover storage insurance charges. Hence this claim has not been admitted and the payment of Rs. 27,274.66 already made is proposed to be recovered as it is not admissible. No legal opinion was obtained before making the payment in October, 1972."

2.95. There has been inordinate delay in planning and executing replacement of the two rotary convertors at Lonavala. The Central Railway Administration decided in September 1962 to replace the then existing two rotary convertors of 2,500 KW capacity at Lonavala sub-station by two mercury rectifiers of 3,000 KW capacity for the reasons that—

- (i) the rotary convertors had exceeded their normal life of 25 years;
- (ii) they were often giving trouble due to wearing out of parts; spare parts were not available and the equipments had become obsolete;
- (iii) to augment the capacity of the converting plant; and
- (iv) to meet the power demands to cope with the anticipated increase in traffic during the Third Five Year Plan.

2.96. The detailed estimates of works were sanctioned by Central Railway Administration in 1963. Tenders were invited in March



1965 and the orders were placed in December 1967. Though supply and erection were stipulated to be by April 1970 according to the contract, the entire equipment was received at Lonavala only by early 1972. The equipment worth Rs. 35 lakhs had been idling since 1972, and its erection still remains to be completed.

2.97. The agreements for installation of mercury are rectifiers at Lonavala, Upper Bhore Ghat and Thull Ghat were executed in December 1967, with completion dates as April, June and August 1970 respectively. However, within two months of the execution of the agreements the Railway Administration advised the firm in February 1968 to give priority for the completion of the work in the following order:

- (1) Upper Bhore Ghat
- (2) Thull Ghat
- (3) Lonavala

2.98. The change in priority by which Lonavala sub-station was relegated from 1st position to 3rd position shortly after execution of the agreement suggests that the equipment worth Rs. 35 lakhs ordered for this work was not as urgently needed as originally contemplated.

2.99. Again the mercury are rectifiers acquired for Lonavala were allowed to be cannibalised for carrying out the repairs to the mercury are rectifiers installed at Upper Bhore Ghat and Thull Ghat. This further indicates that the acquisition of the mercury are rectifiers for Lonavala was unnecessary.

2.100. The fact that replacement of the rotary convertors, though considered to be urgent in 1962, still remains to be undertaken even after a period of 16 years and the overaged rotary convertors continue to be in operation and the mercury are rectifiers acquired for replacement were allowed to be cannibalized, would lead to the inevitable conclusion that the whole project was conceived without relation to actual needs of the Railway.

2.101. There has been serious technical failure in providing silicon rectifiers at Upper Bhore Ghat and Thull Ghat sub-stations as second unit as 'stand by' (in addition to mercury are rectifiers already installed there) since silicon rectifiers are not designed to operate in parallel with the mercury are rectifiers and thus augment the rectifier capacity, when required.

2.102. The Railway Board approved proposals in 1968 and 1968 for the installation of an additional rectifier of 3,000 KW at Upper Bhore Ghat and Thull Ghat stations as second unit and also as 'stand by' to meet the additional requirement of power for traffic capacity during the Fourth Five Year Plan. Accordingly, the orders for supply and erection of two silicon rectifiers were placed on the National Government Electric Factory, Bangalore in October 1970 at a cost of Rs. 35.60 lakhs. However, in June 1973 the foreign collaborators of this firm indicated that the silicon rectifiers were not designed to operate in parallel with the mercury are rectifiers already installed at the Ghat sub-stations in June 1972. It was this lapse which necessitated the proposal that four sets of mercury are rectifiers (two already installed at the two Ghats in June, 1972 and two awaiting installation at Lonavala) be ultimately diverted to Diva-Bassein Section which had been sanctioned four silicon rectifiers. (Incidentally the diversion of these sets to Diva-Bassein Section is no longer feasible). The Committee is unable to understand as to how the Railway Board and the Railway Administration failed to see the technological incompatibility of the two types of rectifiers, while sanctioning the proposal in 1968-69.

2.103. The Committee was informed during evidence that one of the technical reasons for preferring the mercury are rectifiers instead of silicon rectifiers was that the mercury are rectifier can function as inverter while silicon rectifier was not capable of inverter function. But it is surprising to note that supplier of mercury are rectifier confirmed in November 1974 that the equipment cannot satisfactorily work in inverter mode and that they were to make a refund part of the amount on that account. This is another serious failure in not taking precaution in choosing the proper equipment resulting in the purpose for which the equipment was preferred was not served.

2.104. There is evidence before the Committee to show that the Railway Administration was aware of the development of silicon rectifiers. Audit have informed the Committee that during the year 1965 tenders were invited by the Central Railway Administration for Upper Bhore Ghat, Thull Ghat II, Lonavala, Kalyan and Kurla for the supply of rectifiers. The type (whether mercury are of silicon) was not indicated in the notice for tenders. In the case of tender for Kalyan, opened on 15-1-1966, all the 15 offers were for silicon rectifiers. Similarly, in respect of tenders for Kurla opened on 15-10-1965, the offers were mainly for silicon rectifiers. This leads to the conclusion that the Central Railway was in the know of the

new technology of silicon rectifiers even at the time of entering into contract in December 1967 for erection of mercury arc rectifiers at Upper Bhore Ghat, Thull Ghat and Lonavla. The silicon rectifiers were also acceptable to the Railway, as they placed order for Kalyan and Kurla in 1968.

2.105. The Railway had also positioned highly qualified senior officers with substantial establishment maintained in London, Bonn and Switzerland who were to advise the latest technological developments to them. The Railway Board obviously, had not taken advantage of their presence abroad to keep themselves abreast of these merging technology of silicon rectifiers. The Committee, therefore, cannot appreciate why the Railway Administration preferred mercury arc rectifiers for Lonavla and for Upper Bhore Ghat and Thull Ghat.

2.106. Again it was open to the Railway Administration to have rescinded the contract for mercury arc rectifiers, when the firm failed. In fact, the delivery dates were extended on three different occasions without justification and on these occasions the contracts could have been terminated.

2.107. There have been inordinate delay both on the part of the firm in supply and erection of the equipment and on the part of the Railway in carrying out works preliminary to installation and erection of the equipment.

2.108. The contracts stipulated that the equipments would be delivered ex-works within 15 months from the date of approval of the contracts (by the Government of India and Swiss Confederation or the date of the receipt of the import licence whichever is later) which was 11th July 1968 for Upper Bhore Ghat and Thull Ghat and 6th May 1968 for Lonavla. However, the supplier did not ship the equipment by the stipulated dates. The first consignment of equipment was made only on 2nd November 1970 from Rotterdam Port i.e. after delay of more than a year. The Committee do not at all appreciate the Railway Board's assertion that they "were looking upon the execution of the contract from start to finish and concerned themselves with the final completion of the contract without breaking up the total period into shipment period, transit time and clearance." The Committee are of the view that if break-up of the time schedule as provided in the contract was not to be adhered to, there was no need of providing it in the contract.

2.109. Again, the Committee find that total completion time provided in the contracts was 23½ months-based on the following:

- (a) Delivery ex-work—15 months
- (b) Shipment, Clearance delivery at site—4 months
- (c) Period for erection and Commissioning—4½ months.

2.110. However, the contractor failed to fulfill these delivery schedules. The equipments started arriving at site during and after February 1971 though originally these should have been erected by April 1970, June 1970 and August 1970 in the case of Lonavala, Upper Bhore Ghat and Thull Ghat sub-stations respectively.

2.111. The Committee further note that the contractor was granted extensions of time, as and when asked for and against the own interest of the Railway. This makes the conduct of the Railway Administration rather patently suspect since after the grant of first extension for supply of equipment was not completed by the contractor and Railway Administration benevolently agreed to second and third extensions even though as per clause 18 of the three contracts, "time for completing work by the date or extended date for completion shall be deemed to be an essence of the contract."

2.112. From the evidence obtained by the Committee it is not clear whether there was any avoidable delay in shipment of the equipment. The Committee would like the Railway Board to investigate and report whether there was any delay on the part of the Railway Administration in moving the Shipping authorities to nominate the port of shipment and the carrier in time as per the stipulated shipment schedule and if so the reason therefor.

2.113. Further, the contracts provide for damages @ ½ per cent per week of delay in the completion period provided that the total damages for delay in the completion period would not exceed 5 per cent for FOB value of the contract plus erection price. However, no damages were claimed for delay of more than 24 months and 22 months for Upper Bhore Ghat and Thull Ghat Sub-stations work respectively. In the case of Lonavala sub-station delay is of more than 7 years and the contractor has backed out of his obligation to erect the equipment. It is ironical that the Railway Administration did not consider it appropriate to initiate any action against the contractor though they could, as Chairman, Railway Board had to admit during evidence "invoke the damage clause as well as the penalty clause in this contract."

2.114. Under the contracts for Upper Bhore Ghat and Thull Ghat sub-stations, the Railway Administration were required to complete certain items of work viz construction of sub-station buildings including provision of approach road and retaining wall, laying of Railway siding, foundation for transformers, mercury arc rectifier tanks, control panels and highspeed circuit breakers, provision of cable trenches, supply of switch yard structures etc. The completion of these items lagged far behind the original completion dates of these sub-stations, and were completed only during 1971. One of the reasons for delayed erection of Upper Bhore Ghat and Thull Ghat sub-stations was that the Central Railway failed to complete these works according to the schedule. The Committee are not satisfied with the explanation that delay in finalising designs for RCC work and layout at site was due to hilly terrain and difficulty in transporting materials due to non-availability of approach road and also due to heavy monsoon. All these factors were not new to the Railway Administration and could have been well thought of at the planning stage. The Chairman, Railway Board conceded during evidence that "it seems to be Railway's fault." He had agreed to investigate.

2.115. From the above facts the following serious lapses occurred in the case:—

- (1) Unjustified acquisition of mercury arc rectifiers for Lonavla at a capital of Rs. 35 lakhs.
- (ii) Installation of silicon rectifiers alongwith mercury arc rectifiers at Upper Bhore Ghat and Thull Ghat, which were technologically incompatible.
- (iii) Failure to cancel the order for mercury arc rectifiers of Lonavala, when it was known that mercury arc rectifiers had been technologically superseded, even though several opportunities offered themselves to do so on the failure of the supplier on many occasions to effect delivery by the stipulated dates. No wthe mercury arc rectifiers will not be able to render service satisfactorily due to non-availability of spares.

2.116. The Committee desires that these lapses should be probed into by a high powered committee for the purpose of fixing responsibility.

## APPENDIX I

(Vide para 1.62)

No. W683.Y/IV

15-4-1967

Chaitra 1889

The Director General (D),  
Research, Designs & Standards  
Organisation, LUCKNOW-5.

SUB: *Gradients in Ghat Section.*

Ref: R.D.S.O's telegram No. SD. DEL. L. 11 dated 23-3-1967.

The grades in Thull Ghat and Bhoze Ghat sections of Bombay Division are not compensated for curvature. The details of radius and length of such curves on 1 in 37 graded section are furnished in the enclosed statement as desired.

*Statement showing the Details of Curves on 1 in 37 Grade in Thull Ghat (Kms. 125.2 to 131.6) which are not Compensated.*

### UP ROAD

Sr. No	Locations		Radius	Degree	Cant	Left or Right	Length of curve in M.
	From	To					
1	A125/6-1/2	125/31-1/2	1270'	4.50	3"	L	164.13
2	125/32	126/3	1637'	3.40	2-1/2"	R	62.25
3	126/3-1/2	126/11-3/4	1637'	3.40	2-1/2"	R	61.83
4	126/12	126/16-1/4	1920'	2.40	2"	L	43.12
5	126/18-3/4	126/25-3/4	12920'	2.40	22"	R/L	46.37
6	125/26	T/4A CH-O	1920'	2.40	2"	R	112.07
7	T/4 CHO	TEA CH 800	1640'	3.40	2-1/2"	R	146.87
8	T5A CH500	T/6A BB End	1640'	3.40	2"	L	88.32
9	T/6A CH1100	131/1-1/2	1640'	3.40	2"	R	109.10
10	131/1-3/4	131/-33/4	1637'	3.40	2"	R	43.12

Sr. No.	Location		Radius	Degree	Cantt	Left or Right	Length of Curves in Metre
	From	To					
11	131/4-1/2	131/19-1/2	1645'	3.40	2"	L	143.32
12	131/19-1/2	131/22-1/2	1640'	3.40	2"	R	34.74
13	T/9 CH 125	132/2-1/2	1637'	3.40	2"	R	80.67
14	132/3-1/4	132/20	1637'	3.40	2"	R	91.74
15	132/21	132/25-1/4	1640'	3.40	2"	R	68.23
16	133/4-1/2	133/8-1/2	1920'	30	2"	L	64.09
17	133/8-3/4	133/19-1/2	1270'	4.50	3"	L	116.03
18	133/21-1/2	134/4-1/2	1910'	30	2"	L	51.96
19	134/4-1/2	134/13-1/2	1910'	30	2"	R	97.67
20	134/20-3/4	135/11-3/4	1910'	30	BB 1" BSL 2"	R	247.13
21	135/13	135/19-3/4	3820'	1.50	1"	L	64.92

*Bhor Ghat S.E. Line*

*Curve No.*

1	11T No. 7A CH7	TNo 8A CH 6	332 84M	5.240	3.5	L	567
2	KM 109/1	110/1	635.20 M	2.740	2"	R	378
3	41 KM/121/0	121/18	317.60	5.490	3.5"	R	208
4	42 KM/121/18	T 25	437.39	40	3.5"	R	340

Statement showing the details of Curves on 1 in 37 Grade in THULL GHAT (Kms. 125.2 to 134.6) which are not compensated.

DN ROAD

Sr. No.	Locations		Radius	Degree	Cant	Left or Right	Length curves in M.
	From	To					
1.	125/6½	125/31½	1270'	4.50	3"	L	166.10
2.	125/3½	126/3	1637'	3.40	2"	R	63.00
3.	126/3	126/11½	1627'	3.40	2½"	R	61.83
4.	126/12	126/16½	1920'	2.40	2"	L	43.12
5.	126/17½	126/20	1920'	2.40	2"	L	48.36
6.	126/26	T/4ACHO	1637	3.40	2½	R	119.10
7.	129/13	129/20	1920'	2.40	2"	L	99.97

Sl. No.	Locations		Radius	Degree	Cent	Left or Right	Length curves in Mts.
	From	To					
8.	129/20x	T/5 CH 1150	1640'	3° 4'	2"	R	124' 24
9.	T/6 CH 816	130/10x	1655'	3° 4'	2"	R	64' 09
10.	130/15x	131/1x 3	1645'	3° 4'	2"	R	73' 20
11.	131/1x	131/3x	1637'	3° 4'	2"	R	43' 12
12.	131/4x	131/19x	1645'	3° 4'	2"	L	143' 43
13.	131/19x	131/22	1640'	2° 4'	2"	R	34' 74
14.	T/9 CH 125	132/2x	1637'	3° 4'	2"	R	80' 67
15.	132/4x	132/19x	1645	3° 4'	2"	R	85' 61
16.	132/21x	132/25x	1640	3° 4'	2"	L	68' 23
17.	133/4x	133/8x	1910'	3'	2"	R	34' 09
18.	133/8x	133/19x	1270'	4° 5'	3"	L	166' 03
19.	133/21x	134/4	1910'	3'	2"	L	51' 96
20.	134/4x	134/13x	1910'	3'	2"	R	97' 67
21.	134/20x	135/11x	1810'	3'	BB 1" BSL 2"	R	247' 13
22.	135/13	135/19x	3820'	1° 5'	1x	L	64' 9 2



## APPENDIX II

(Vide para 177)

### *Progress of Modifications on WEG 2 Locomotives.*

S. No.	Equipment	Total No. of modifications	Progress
1.	Pantograph . . . .	4	Completed on all the locos.
2.	Control circuit . . . .	7	Do.
3.	Relay and Equipment . . . .	7	Do.
4.	H. T. contactor panel . . . .	7	6 modifications completed on all the locos. 1 modification completed on 10 locos.
5.	Cabling work	2	Completed on all locos
6.	Cab and body . . . .	18	12 modifications completed on all locos 6 modifications will be taken under POH, so far completed on 2 locos.
7.	Underframe and bogie.	12	6 modifications completed. 6 modifications will be taken under POH and completed on 2 locos.
8.	E. P. Contactor (BHEL)	6	4 modifications completed on all locos. 2 modifications completed on 30 locos.
9.	Current Balance Relay . . . .	1	Completed on all locos.
10.	High Speed Circuit Breaker. (HSCB)	1	Completed on all locos.
11.	Reverser and C T F	1	Completed on all locos.
12.	Master Controller.	4	3 modifications completed on all locos. 1 modification completed on 1 loco.
13.	Traction Motor. . . .	9	7 modifications completed on all locos. 2 modifications completed on 2 locos.
14.	M. A. Set (BHEL)	8	5 modifications completed on all locos. 3 modifications completed on 10 locos. completed on all locos.
15.	Chief Electrical Engineer/ Central Railway Rheostatic/Regenerative Braking.	1	completed on 22 locos.
16.	Separate Excitation. . . .	1	modification dropped.

### APPENDIX III(a)

(Vide Para 2.29)

Copy of letter No. RIEC/55/63/65B/117 dated 26-4-1970 from M/s. Raja Industrial & Engineering Combine Private Ltd., addressed to the GM(Elec.) BB VT.

Dear Sir,

Sub: 1. Contract No. W. 828.B|LP-13|TR-2 dt. 5-12-67 (final effective date 6-5-68) for supply, erection, testing and setting to work of 2 units of 3000 KW rectifier sets in traction sub-station at Lonavla.

5. Contract No. W 828.B|LP-13|TR-7 dt. 16-12-67 (final effective date 11-7-68) for supply, erection, testing and setting to work of one unit of 3000 KW rectifier set in traction sub-station at Thull Ghat.

3. Contract No. W. 828.B|LP-13|TR-8 dt. 16-12-67 (Final effective date 11-7-68) for supply, erection, testing and setting to work of one unit of 3000 KW rectifier set in traction sub-station at Upper Bhore Ghat.

Ref: Your letter No. W. 828.B|LP-13|TR-24 of 13-4-70

In accordance with the terms of the contracts, the completion dates for the above three contracts should be as follows:

Contracts for sub-station at.	Date of receipt of import licence by the contractor.	Date of advice of approval of contract by two Govts., to the Contractor	Completion date.
1. Lonavla	8/3/1968	6/5/1968	20/4/1970
2. Upper Bhore Ghat.	7/3/1968	11/7/1968	25/6/1970
3. Thull Ghat.	19/3/1968	11/7/1968	25/8/1970

However, in view of the following facts, we request you to amend the completion dates suitably.

(1) In your letter No. F|828|LP|13|TR-24 dated 20th February, 1968, you indicated priority for the completion of the sub-station work in the following chronological manner, irrespective of contractual conditions:—

- (i) Upper Bhore Ghat.
- (ii) Thull Ghat.
- (iii) Lonavla.

(2) In accordance with the clause 16.5 of the terms of payment for polish supply for the sub-stations at Upper Bhore Ghat and Thull Ghat, M/s. Elektrim is entitled to receive an advance of 20 per cent payment towards FOB value of the equipment and spares after signing of the final contract and on receipt of Bank Guarantee by your office from a polish Bank in Poland. The final contract was signed on 11-7-68 and we having furnished the bank guarantee from Bank Handlevy in May 69, the payment should have been received by M/s. Elektrim within 30 days i.e. in June 69. Even till date, this payment has not been received by M/s. Elektrim due to certain lengthy and cumbersome procedure required by State Bank of India, Calcutta, for the transfer and it is obvious that this payment has caused certain delay in the manufacture of the equipment at Elektrim works in Poland.

(3) Order for 11 items for the outdoor yard for the sub-stations at Upper Bhore Ghat and Thull Ghat was placed with us on 25-9-69 in response to our letter No. 4520 dated 25-5-67 i.e. after a delay of 16 months, and without the completion of the erection of the eleven items, the commissioning and completion of the remaining equipment cannot be made and hence there are delays also on account of this situation.

(4) Your final layout drawing for the outdoor yard for Upper Bhore Ghat was received by us with your letter No. W. 828. B. LP. 13-TR-8 of 20-1-70 and based on this drawing sent to us on 20-1-70,, we will be able to prepare our final yard drawing for the two sub-stations for your approval. In terms of our offer dt. 27-5-67, based on which you placed your order on 26th Sept. 69 the delivery period of these items will commence from 12/14 months after the receipt of the first advance payment and approval our yard drawing which is under preparation. There is delay on this account as well.

(5) We have still to receive the final Civil Engineering drawing for Thull Ghat sub-station and yard.

Taking the above fact into consideration, we would request you to amend the completion dates accordingly. As our Principals are anxious to complete the sub-stations as soon as possible, they have advised us to deliver the indigenous equipment for the sub-stations at sites so as to match the following estimated completion dates:—

Upper Bhere Ghat	February, 71.
Thull Ghat	June, 71.
Lonavla	December, 71.

Awaiting your confirmation, we remain,

Yours faithfully,  
for Raje Industrial & Engineering  
Combine Private Limited.,

Sd/-  
(P. R. RAJE)  
*Managing Director.*

### APPENDIX III (b)

Copy of letter No. 5.01801|02|03|ADV dated 21-9-71 from M/s HBB Ltd., Brown Boveri House, 264-265, Dr. AB Road, RD-25 LD to the CG(Elec) RD VT.

SUB: *Lonavla Thull Ghat and Upper Bhore Ghat Sub-station.*

Ref.: Your letter Nos. V.820.B|LP-13|TR-7 and BA dated 23rd July 1970 and W.528.B|LP-13|TR-8A dated 24th November, 1970.

Dear Sir,

With reference to your above letters, the completion dates for the above three contracts have been amended as follows:

S.No.	Contract for substation	Completion Date.
1.	Lonavla . . . . .	28-2-1971
2.	Upper Bhore Ghat. . . . .	30-11-1970
3.	Thull Ghat. . . . .	30-11-1970

It is regretted that it was not possible for us to meet the above mentioned completion dates for the following reasons:

1. *Structure:*

We have still not received from you the sub-station steel structures, to enable us to commence the erection of these structures and other relevant outdoor equipment. Consequently there will be delay in completion of the sub-station work on this account.

2. *Civil Engineering Works :*

The trenches in the outsider yard are still not ready consequently withholding our work for control cabling and compressed air piping. We also make note that the transformer treak at Upper Bhore Ghat sub-station is still not complete.

### 3. *Modification to D.C. Switch Gear:*

At the time of the inspection by your representative of the steel cubicles of D.C. Switch Gear, in our Boroda Works, your representative advised us some modifications in cubicles. These modifications are being effected and have resulted in the delay on the delivery of these cubicles to the respective sites.

### 4. *Shift in the location of D.C. Switch Gear :*

Your recent proposal to shift the location of the D.C. Breaker cubicles from the already approved location has resulted in the extra civil engineering works, which are still in progress. We will be able to commence this erection only after the civil engineering works are completed.

### 5. *Monsoon and road approach:*

Due to heavy monsoons in the month of July, August and September at Lonavla and Igatpuri, as well as due to road approach being almost closed for the lorry service, the speed of the erection work was adversely affected.

### 6. *Payment :*

In our letter to the Chief Engineer (Construction), dated 25th August 1971. we have pointed out to you the delays in respect of our payments. This position is still not changed. In our letter of 25th August 1971 we also advised you that the delays in the payments can effect the progress of the erection work. It is hoped that in further our payment will be made promptly to ensure speedy erection progress.

For your ready reference, we enclose an upto date list of pending bills, which we request you to settle without any delay.

### 7. *Completion dates for Upper Bhore Ghat and Thull Ghat sub-stations:*

You will please appreciate that the above-mentioned facts have resulted in delays in the completion of works. Assuming that (i) the structures are delivered to us at Upper Bhore Ghat and Thull Ghat sub-station latest by 30th September 1971, (ii) all the outdoor trenches and the transformer track are completed latest by 15th October 1971, (iii) payments are promptly effected by you and (iv) monsoon is not going to

effect adversely the outdoor work, then we expect to complete the erection work at Upper Bhore Ghat and Thull Ghat sub-stations by 31st December 1971. Therefore, we expect the testing and commissioning for a period of one month for each sub-station one after another.

8. *Completion of Lonavla sub-station:*

In view of your operational requirement of Lonavla sub-station work to be taken only after the completion of Thull Ghat and Upper Bhore Ghat sub-stations, we request you to amend the completion date for Lonavla sub-station tentatively as 31st December 1972, provided the permission is given to us to commence the erection work immediately after completion of Upper Bhore Ghat sub-station and that the work at Lonavla sub-station is permitted to be carried out uninterruptedly and that all the necessary civil engineering works are completed well in advance.

Yours faithfully,  
for Hindustan Brown Boveri Limited,  
Sd/-  
(A. D. VALDYA)

**APPENDIX IV**

(Vide para 2.64)

**G U A R A N T E E B O N D**

(For Security deposit)

In consideration of the President of India (hereinafter called "the Purchaser") having agreed to exempt Messrs \_\_\_\_\_ situated at \_\_\_\_\_ (hereinafter called) "the said Contractor(s)" from the demand, under the terms and conditions of an Agreement to be entered into between the Chief Electrical Engineer, Central Railway, Bombay V.T. and the said Contractors for the work of supply, erection, testing and setting to work of 2 units of traction rectifier sets \_\_\_\_\_ (3000 KW capacity) at Lonavla sub-station (hereinafter called "the said Agreement") of security deposit for the fulfilment by the said contractor(s) of the terms and conditions contained in the said Agreement, on production of a Bank Guarantee for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_), We, The \_\_\_\_\_ Bank Ltd., do hereby undertake to indemnify and keep indemnified the Purchaser to the extent of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) against any loss or damage caused to or suffered by the Purchaser by reason of any breach by the said Agreement. We, the \_\_\_\_\_ Bank Ltd., further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Purchaser under or by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till the Chief Electrical Engineer, Central Railway, Bombay V.T. Ministry of Railways certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor(s) and discharged or till the Chief Electrical Engineer, Central Railway, Bombay, certified that the terms and conditions of the said Tender conditions have been fully and properly carried out by the said \_\_\_\_\_ and accordingly discharge the guarantee subject, however, that the Government shall have no rights under this bond after the expiry



of — — — — —76 from the date of its execution. We  
 — — — — — Bank Ltd., lastly undertake not to re-  
 voke this guarantee during its currency except with the previous  
 consent of the Government in writing.\*\*

Dated the — — — — — day of — — — — —  
 for — — — — — Bank Ltd.

\*\*Our liability under this guarantee is restricted to Rs. — — —  
 which amount or any part thereof should be payable on demand  
 or on claim being made under this Guarantee. Unless such a  
 demand or claim under this Guarantee is made on before the — —  
 — — — — —, we should be discharged from all liability under  
 this Guarantee.

**APPENDIX V**  
**Statement of Conclusions/Recommendations**

S. No.	Para No.	Ministry/Deptt. Concerned	Recommendation
1	2	3	4
1.	1.91	Ministry of Railways	<p>Fifty Seven old D.C. Electric Locomotives (41 freight type and 16 passenger type) in use on Bombay-Igatpuri and Bombay-Pune sections of Central Railway procured during 1928-29 were due for replacement in 1963-64. The Railway Board decided in September, 1963 to replace them as they were "giving plenty of trouble; the design had become very old and transmission of traffic and maintenance had become a problem". According to the Chairman, Railway Board, the condition of these locomotives at that time (1963) when Railway Board started phasing them out was so bad that they could not carry on for 2-3 years more. To keep them going on, Railways had to spend Rs. 65 lakhs on their maintenance during 1965-67 alone. The Committee are informed that "in this case the Electrical Directorate had worked out as to when the locomotives would fall due for replacement. The action was initiated thereafter. The design was worked out in consultation with the Planning Committee, the Standards Committee and the RDSO." The Committee are distressed to note that in the instant case the Railway Board did not initiate action in advance to plan for the replacement of these old locomotives and waited for their attaining the codal life (i.e. 35 years). The Committee fail to understand as to</p>

why undue stress was laid on codal life alone when their condition was deteriorating and replacement policy was "on age-cum-condition basis". The absence of reasonable foresight as should normally be expected and the inaction on the part of Railway Board for not resorting to advance planning for replacement had led to direct and indirect avoidable losses to the Railways which cannot be fully quantified. The Committee feel prudence required that Railway Board should have initiated steps much earlier than September 1963 to finalise the design of new replacing locomotives. It was all the more necessary considering that the manufacture of locos is a very time consuming process. In the instant case the RDSO took an year and a half to issue key drawings. Then the Chittaranjan Locomotive Works took another year and a half to work out the working drawings. Then the order for long lead items and various raw materials and the manufacturing time took another 2 years or so. Thereafter the manufacturer wanted the prototype to be used and proved in service at least for three years. It had to get all the feed-back from the RDSO and to carry out necessary modifications. The Committee consider that all the modalities involved in the production of new locomotives were not carefully gone into while planning production of these locomotives keeping in view the urgent need for replacement of overaged and obsolete locos. The Committee hope that the Railway Board would learn a lesson from this.

The Railway Board placed orders on Chittaranjan Locomotive Works for manufacture of 57 D.C. electric locomotives (WCG-2) during 1964-68. The design for the locomotives was finalised by the RDSO and made available to CLW in 1967. Three proto-types of the locomotives were manufactured in January, March and June 1971, and trial tests on them were conducted by Central Railway Administration in March, April and July 1971. The performance of these locomotives in ghat sections fell short of designed capabilities because of (i) the actual compensated gradients on the Kasara-Igatpuri section being much severer than what had been assumed at the design stage, (ii) non-realisation of the anticipated running adhesion characteristics of the locomotives in the ghat sections with combination of severe grades, curves, unfavourable track conditions, wet tunnel entrances etc. and (iii) the locomotive and train resistances being higher than standard values assumed in the design. Even though it had become known in the trials that the originally designed hauling capacity had not materialized, series production was undertaken without making study of the steps necessary to achieve the desired hauling capacity and carrying out necessary modifications. By the end of 1976-77, 57 locomotives had been produced at the cost of Rs. 17.78 crores. Besides the shortfall in their haulage capacity, these locomotives also turned out to be not suitable for banking services in the Ghat Section. As a result, five diesel electric locos costing Rs. 1.56 crores have been diverted from other sections for working as bankers on the Ghat Section. The additional running cost only on this account was Rs. 94 thousand during the years 1976-77 and 1977-78. This running cost would be a recurring expenditure.

## 3 1.93 Ministry of Railways

The designed haulage capacity of these locos was expected to give an increase of about 50 per cent in the line capacity for goods trains. But the actual performance fell short of the designed capacity, and as a result the expected increase in line capacity could not be generated with the introduction of these locos. The Railway Board did not give to the Committee any estimate of the extent of loss in the line capacity expected to be achieved. But the basic objective of increasing the line capacity was to avoid an increase in the number of trains to be run for coupling with the additional traffic which in turn would necessitate a third line being laid which is a costly alternative because of the failure to achieve the requisite hauling capacity. The line capacity has to be increased by providing a third line on North East Ghat Section between Kasara and Igatpuri, and on South East Ghat Section between Karjat and Lonavla at the estimated cost of Rs. 17.50 and Rs. 21.74 crores respectively.

4 1.94 do do

The Committee consider it a grave lapse that the assumptions made particularly with regard to severe grade and curves, unfavourable track conditions and wet tunnel entrances etc. proved erroneous. This was not new phenomenon and the RDSO should have with ordinary prudence known the critical working conditions in the Ghat Section. It is strange that the RDSO ventured into designing a new locomotive for ghat sections without verifying and updating the data, and without going due consideration to the same. The lapse was compounded by a cynical disregard of the results of

the trials. These deficiencies in the initial stage cost Railways heavily, though the exact quantification of the loss has not been furnished to the Committee by the Railway Board. It has altogether vitiated the financial projection of the projected increase in line capacity with WCG2 Locomotives and necessitated an early lying of the third line involving heavy investment.

5. 1-95 Ministry of Railways

The Committee are of the opinion that howsoever urgent the need of the new locomotives might have been to replace the old obsolete locomotives, production of faulty or inadequately equipped locomotives should not have been undertaken. This reflects poorly on the technical proficiency of the Engineering wing of the Central Railway and of the RDSO.

6. 1-96 Ministry of Industry

One of the reasons advanced for delay in production of locomotives was delayed supply of equipments by Bharat Heavy Electricals Ltd., Bhopal. The Committee find from the following table that there was substantial delay on the part of Bharat Heavy Electricals Ltd., Bhopal in supplying the critical components and equipments.

SJ. No.	Equipment for	Promised by BHEL	Actual delivery	Delay in month
1.	1st Loco set.	August 1968	Feb. 1970	18 months.
2.	2nd Loco set and onwards.	January 1969 and at the rate of 2 loco sets per month onwards.	Sept., 1970 only one loco set.	20 months.
3.	27th Loco set.	Feb. '1971	March 1973	25 months.
4.	57th Loco set.	Feb. '1973	June 1976	40 months.

The Committee take a serious view of the abnormal delay which ranged between 18 to 40 months. They find it difficult to draw any consolation from the fact that since these equipments were being developed and manufactured by BHEL in that country for the first time, in collaboration with foreign firms, the former had difficulties in meeting the delivery schedule particularly when they (BHEL) were the pioneers in the manufacture of electric equipments and the process of manufacture of the type of equipment required were not entirely new to them. Moreover, they had the advantage of foreign collaboration in this regard. The Committee would like to be re-assured that the reasons for delay have been identified for taking remedial measures for future.

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7. 1.97

Ministry of Railways

The Committee note that no penal charges have been recovered from Bharat Heavy Electricals (I) Ltd. for not maintaining the delivery schedule of traction motor equipments. It has been stated that "the terms and conditions governing the contract with BHEL do not provide for this." The Committee are perturbed to note as to how such an important clause has been left out of the contract resulting in delayed supplies of vital equipments and consequential heavy losses to the Railways. The Committee would like the Railway Board to investigate into the matter to find out why penalty clause for any delay in delivery of equipment by the BHEL was not provided for in the terms and conditions of the contract.

8. 1.98

do.

The Committee note that the average number of locomotive in service has increased substantially from 11.8 in 1972-73 to 50.83 in 1975-76 and the average number of locomotives effective (fit for use) also increased from 6.03 in 1972-73 to 40.9 in 1975-76. However, the engine Kms. per day per locomotive in use (all services) had declined from 189 in 1972-73 to 184 in 1975-76. The Committee further note that the target of engine kilometres per day per engine has not been prescribed for WCG 2 locomotives. However, in respect of D.C. locomotives (WCM, WCG and WCP etc.) the target laid down by the Railway Board in August 1972 was 200 Kms. per day. The Committee regret that the engine Kms. per day per WCG 2 locomotive is much below that of the D.C. locomotives and has declined over the years. The Committee would like to know the measures being taken by the Railway Board to check the declining average kilometrage of WCG 2 locomotives. The Committee would also like the Railway Board to lay down target kilometrage for WCG 2 locos.

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9. 1.99

do.

The Committee note that the average cost of WCG 2 locomotives was estimated at Rs. 23.67 lakhs in 1969 and it was intimated to Railway Board in 1970. However, they observe that the cost of 3 locomotives manufactured in 1970-71 was Rs. 87.63 lakhs which comes to Rs. 29.21 lakhs per locomotive. The Committee are perturbed to note that the actual cost increased to the extent of Rs. 5.54 lakhs per locomotive during the period of one year. The Committee would like to know the reasons for such a wide



variation in the estimated and actual cost of WCG 2 locomotives in such a short period.

Ministry of Railways

10. 2.95  
and  
2.96

There has been inordinate delay in planning and executing re-  
placement of the two rotary converters at Lonavla. The Central  
Railway Administration decided in September 1962 to replace the  
then existing two rotary converters of 2,500 KW capacity at  
Lonavla sub-station by two mercury rectifiers of 3,000 KW capacity  
for the reasons that:—

- (i) the rotary converters had exceeded their normal life of  
25 years;
- (ii) they were often giving trouble due to wearing out of  
parts; spare parts were not available and the equipments  
had become obsolete;
- (iii) to augment the capacity of the converting plant; and
- (iv) to meet the power demands to cope with the anticipated  
increase in traffic during the Third Five Year Plan.

The detailed estimates of works were sanctioned by Central  
Railway Administration in 1963. Tenders were invited in March  
1965 and the orders were placed in December 1967. Though supply  
and erection were stipulated to be by April 1970 according to the  
contract, the entire equipment was received at Lonavla only by

early 1972. The equipment worth Rs. 35 lakhs had been idling since 1972, and its erection still remains to be completed.

The agreements for installation of mercury arc rectifiers at Lonavla, Upper Bhore Ghat and Thull Ghat were executed in December 1967, with completion dates as April, June and August 1970 respectively. However, within two months of the execution of the agreements the Railway Administration advised the firm in February 1968 to give priority for the completion of the work in the following order:

1. Upper Bhore Ghat.
2. Thull Ghat.
3. Lonavla.

The change in priority by which Lonavla sub-station was relegated from 1st position to 3rd position shortly after execution of the agreement suggests that the equipment worth Rs. 35 lakhs ordered for this work was not as urgently needed as originally contemplated.

Again the mercury arc rectifiers acquired for Lonavla were allowed to be cannibalised for carrying out the repairs to the mercury arc rectifiers installed at Upper Bhore Ghat and Thull Ghat. This further indicates that the acquisition of the mercury arc rectifiers for Lonavla was unnecessary.

11. 2.97  
and  
2.98

do.

12. 2.99  
and  
2.100

do.

The fact that replacement of the rotary converters, though considered to be urgent in 1962, still remains to be undertaken even after a period of 16 years and the overaged rotary converters continue to be in operation and the mercury arc rectifiers acquired for replacement were allowed to be cannibalized, would lead to the inevitable conclusion that the whole project was conceived without relation to actual needs of the Railway.

13 2.101  
and  
2.102

Ministry of Railways

There has been serious technical failure in providing silicon rectifiers at Upper Bhore Ghat and Thull Ghat sub-station as second unit as 'stand by' (in addition to mercury arc rectifiers already installed there) since Silicon rectifiers are not designed to operate in parallel with the mercury arc rectifiers and thus augment the rectifier capacity, when required.

The Railway Board approved proposals in 1969 and 1968 for the installation of an additional rectifier of 3,000 KW at Upper Bhore Ghat and Thull Ghat stations as second unit and also as 'stand by' to meet the additional requirement of power for traffic capacity during the Fourth Five Year Plan. Accordingly, the orders for supply and erection of two silicon rectifiers were placed on the National Government Electric Factory, Bangalore in October 1970 at a cost of Rs. 35.60 lakhs. However, in June 1973 the foreign collaborators of this firm indicated that the silicon rectifiers were not desig-

ned to operate in parallel with the mercury arc rectifiers already installed at the Ghat sub-stations in June 1972. It was this lapse which necessitated the proposal that four sets of mercury arc rectifiers (two already installed at the two Ghats in June 1972 and two awaiting installation at Lonavla) be ultimately diverted to Diva-Bassein Section which had been sanctioned four silicon rectifiers. (Incidentally the diversion of these sets to Diva-Bassein Section is no longer feasible). The Committee is unable to understand as to how the Railway Board and the Railway Administration failed to see the technological incompatibility of the two types of rectifiers, while sanctioning the proposal in 1968-69.

The Committee was informed during evidence that one of the technical reasons for preferring the mercury arc rectifiers instead of silicon rectifiers was that the mercury arc rectifier can function as inverter while silicon rectifier was not capable of inverter function. But it is surprising to note that supplier of mercury arc rectifier confirmed in November 1974 that the equipment cannot satisfactorily work in inverter mode and that they were to make a refund part of the amount on that account. This is another serious failure in not taking precaution in choosing the proper equipment resulting in the purpose for which the equipment was preferred, was **not served.**

There is evidence before the Committee to show that the Railway Administration was aware of the development of silicon rectifiers. Audit have informed the Committee that during the year 1965 tenders were invited by the Central Railway Administration for

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2 103

Do

15

2 104

Do.

Upper Bhore Ghat, Thull Ghat II, Lonavla, Kalyan and Kurla for the supply of rectifiers. The type (whether mercury arc or silicon) was not indicated in the notice for tenders. In the case of tender for Kalyan, opened on 15-1-1966, all the 15 offers were for silicon rectifiers. Similarly, in respect of tenders for Kurla opened on 15-10-1965, the offers were mainly for silicon rectifiers. This leads to the conclusion that the Central Railway was in the know of the new technology of silicon rectifiers even at the time of entering into contract in December 1967 for erection of mercury arc rectifiers at Upper Bhore Bhat, Thull Ghat and Lonavla. The silicon rectifiers were also acceptable to the Railway, as they placed order for Kalyan and Kurla in 1968.

The Railway had also positioned highly qualified senior officers with substantial establishment maintained in London, Bonn and Switzerland who were to advise the latest technological developments to them. The Railway Board obviously, had not taken advantage of their presence abroad to keep themselves abreast of these emerging technology of silicon rectifiers. The Committee, therefore, cannot appreciate why the Railway Administration preferred mercury arc rectifiers for Lonavla, and for Upper Bhore Ghat and Thull Ghat.

Again it was open to the Railway Administration to have rescinded the contract for mercury arc rectifies, when the firm failed. In

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fact, the delivery dates were extended on three different occasions without justification and on these occasions the contracts could have been terminated.

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There have been inordinate delays both on the part of the firm in supply and erection of the equipment and on the part of the Railway in carrying out works preliminary to installation and erection of the equipment.

The contracts stipulated that the equipments would be delivered ex-works within 15 months from the date of approval of the contracts (by the Government of India and Swiss Confederation or the date of the receipt of the import licence whichever is later) which was 11th July 1968 for Upper Bhore Ghat and Thull Ghat and 6th May 1968 for Lonavla. However, the supplier did not ship the equipment by the stipulated dates. The first consignment of equipment was made only on 2nd November 1970 from Rotterdam Port i.e., after delay of more than a year. The Committee do not at all appreciate the Railway Board's assertion that they "were looking upon the execution of the contract from start to finish and concerned themselves with the final completion of the contract without breaking-up the total period into shipment period, transit time and clearance." The Committee are of the view that if break-up of the time schedule as provided in the contract was not to be adhered to, there was no need of providing it in the contract.

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19 2-109 Mjo Railways. Again, the Committee find that total completion time provided  
& 2. 110 in the contracts was 23½ months-based on the following:

- (a) Delivery ex-work—15 months
- (b) Shipment, Clearance delivery at site—4 months
- (c) Period for erection and Commissioning—4½ months

However, the contractor failed to fulfill these delivery schedules. The equipments started arriving at site during and after February 1971 though originally these should have been erected by April 1970, June 1970 and August 1970 in the case of Lonavla, Upper Bhoré Ghat and Thull Ghat sub-stations respectively.

20 2-111 Do. The Committee further note that the contractor was granted extensions of time, as and when asked for and against the own interest of the Railway. This makes the conduct of the Railway Administration rather patently suspect since after the grant of first extension for supply of equipment was not completed by the contractor and Railway Administration benevolently agreed to second and third extensions even though as per clause 18 of the three contracts, "time for completing work by the date or extended date for completion shall be deemed to be an essence of the contract."

21 2 112 Do. From the evidence obtained by the Committee it is not clear whether there was any avoidable delay in shipment of the equip-

ment. The Committee would like the Railway Board to investigate and report whether there was any delay on the part of the Railway Administration in moving the Shipping authorities to nominate the port of shipment and the carrier in time as per the stipulated shipment schedule and if so the reason therefor.

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Further, the contracts provide for damages @  $\frac{1}{2}$  per cent per week of delay in the completion period provided that the total damages for delay in the completion period would not exceed 5 per cent for FOB value of the contract plus erection price. However, no damages were claimed for delays of more than 24 months and 22 months for Upper Bhore Ghat and Thull Ghat Sub-stations work respectively. In the case of Lonavla sub-station delay is of more than 7 years and the contractor has backed out of his obligation to erect the equipment. It is ironical that the Railway Administration did not consider it appropriate to initiate any action against the contractor though they could, as Chairman, Railway Board had to admit during evidence "invoke the damage clause as well as the penalty clause in this contract."

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Under the contracts for Upper Bhore Ghat and Thull Ghat sub-stations, the Railway Administration were required to complete certain items of work viz. construction of sub-station buildings including provision of approach road and retaining wall, laying of Railway siding, foundation for transformers, mercury arc rectifier tanks, control panels and high speed circuit breakers, provision of cable tren-



ches, supply of switch yard structures etc. The completion of these items lagged far behind the original completion dates of these sub-stations, and were completed only during 1971. One of the reasons for delayed erection of Upper Bhore Ghat and Thull Ghat sub-stations was that the Central Railway failed to complete these works according to the schedule. The Committee are not satisfied with the explanation that delay in the finalising designs for RCC work and layout at site was due to hilly terrain and difficulty in transporting materials due to non-availability of approach road and also due to heavy monsoon. All these factors were not new to the Railway Administration and could have been well thought of at the planning stage. The Chairman, Railway Board conceded during evidence that "it seems to be Railway's fault." He had agreed to investigate.

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From the above facts the following serious lapses occurred in the case:—

- (i) Unjustified acquisition of mercury arc rectifiers for Lonavla at a capital of Rs. 35 lakhs.
- (ii) Installation of silicon rectifiers alongwith mercury arc rectifiers at Upper Bhore Ghat and Thull Ghat, which were technologically incompatible.
- (iii) Failure to cancel the order for mercury arc rectifiers of Lonavla, when it was known that mercury arc rectifiers had been technologically superseded, even though several

opportunities offered themselves to do so on the failure of the supplier on many occasions to effect delivery by the stipulated dates.

(iv) Now the mercury arc rectifiers will not be able to render service satisfactorily due to non-availability of spares.

The Committee desires that these lapses should be probed into by a high powered committee for the purpose of fixing responsibility.

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