Report of the Comptroller and Auditor General of India

for the year ended March 2007

Union Government (Commercial)

Public Sector Undertakings

Implementation of Phase I of Delhi Mass Rapid Transit System by Delhi Metro Rail Corporation Limited

No. PA 17 of 2008

(Performance Audit)

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PREFACE

A reference is invited to the prefatory remarks in Report No. CA 9 of 2008 – Union Government (Commercial) of the Comptroller and Auditor General of India where a mention has been made that reviews of the performance of companies/corporations by the Comptroller and Auditor General of India (CAG) are contained in separate audit reports including stand alone performance audit reports.

The Audit Board mechanism was restructured during 2005-06 under the supervision and control of the CAG. The Board, which is permanent in nature, is chaired by the Deputy Comptroller and Auditor General (Commercial) and consists of senior officers of the CAG office. Two technical experts are inducted as special invitees, if necessary. The Board approves the topics recommended for performance audit. It also approves the guidelines, audit objectives, criteria and methodology for conducting major performance audits. The Board finalises the stand alone performance audit reports after discussions with the representatives of the ministry and management.

This stand alone Report reviewed various activities relating to implementation of the Mass Rapid Transit System (Phase I) of Delhi Metro Rail Corporation Limited. The Report was finalised by the Audit Board with the assistance of Shri Arvind Kumar, Additional Member (Retired) Railway Board and Shri Satyender Kumar, Chief Engineer (Signals), Northern Railways, the two technical experts appointed by the Government of India (the Ministry of Urban Development) as special invitees.

This Report as set out in the succeeding chapters is based on test check of records of the company and the discussions held with the management.

The cases mentioned in the Report are among those which came to notice in the course of audit conducted during the period from March 2007 to December 2007.

OVERVIEW

In order to mitigate the growing traffic and transport problems in Delhi, the Government of National Capital Territory of Delhi (GNCTD) [formerly known as the Delhi Administration] commissioned RITES Limited in 1988-89 to study the feasibility of introducing an Integrated Multi-modal Mass Rapid Transit System for Delhi. In 1990, the RITES recommended a Mass Rapid Transit System (MRTS) comprising rail corridor, metro corridor and dedicated busway for a total network of 198.50 Kilometres (Kms). The Central Cabinet in July 1994 gave go-ahead in principle for the MRTS for Delhi and directed the GNCTD to take up the preparation of a Detailed Project Report (DPR). The RITES finalised (May 1995) the DPR for a 55.30 Kms MRTS comprising rail and metro corridors, to be completed by March 2005. The Union Cabinet sanctioned the Delhi MRTS Phase I (Project) of 55.30 Kms in September 1996 at a total cost of Rs. 4859.74 crore (April 1996 prices).

For implementation and operation of the Project, Delhi Metro Rail Corporation Limited (the company) was registered (May 1995) under the Companies Act, 1956. The first section of Line 1 was commissioned in December 2002, while the last section of Line 3 became operational in November 2006. The revised approved cost of the Project was Rs. 10571 crore (September 2005). A performance audit covering various activities relating to implementation of the MRTS (Phase I) was conducted between March 2007 to December 2007. A team from the Indian Institute of Technology Delhi was engaged as technical consultants to assist in examination of certain technical matters relating to this performance audit.

The MRTS Phase I Project has been widely spoken of as a success story in project implementation. The project from its very inception faced many challenges, some conventional and some city and project centric. It goes to the credit of the company that it managed to override these constraints and completed the project successfully.

Under the unique administrative model evolved by the Government of India, the company has not been put under the direct control of any administrative ministry. This model presents ambiguity relating to the issues of (i) coordination and control by the executive government and (ii) the proper forum for legislative accountability. There were also no independent Directors on the Board of Directors of the company.

The highest daily average ridership attained by the company was 21 *per cent* of the original projections and 29 *per cent* of the revised figure. The shortfall in ridership was mainly due to higher fare structure, lack of proper connectivity and lack of feeder bus system.

The company adopted the broad gauge in Phase I as per the decision of the Group of Ministers. However, it was not ensured that the associated systems were planned and implemented to meet the stated objectives of adopting the broad gauge as envisaged by the Group of Ministers in August 2000.

The company has not provided Automatic Train Operation on all lines to ensure safer operation of trains. Noise levels were beyond the permissible limits and there were

premature wear and cracking in the wheel and floor of the rolling stock raising doubts on the stipulated 30 years' design life.

General consultant for the Project was appointed based on a system where the best bid was selected on 'technical quality' basis and not on 'technical quality cum cost' basis. Out of 13 'design and construct' contracts reviewed in audit, estimates were revised or approved after opening of financial bids in 7 cases.

On the request of the company, the Japan Bank for International Cooperation allowed negotiation simultaneously with the first two lowest bidders in two contracts, which was not in accordance with the loan agreement. There were procedural shortcomings in processing of bids, as a letter indicating discount of 13 *per cent* on the contract price, allowing a bidder to become the lowest evaluated tenderer in one contract, did not find any mention in the tender opening register.

There were cases of granting advances (Rs. 38.72 crore) not provided in the contracts, short-recovery from contractors (Rs. 18.28 crore), payment of inadmissible claims (Rs. 6.92 crore) and avoidable payment (Rs. 28.02 crore).

The contract for manufacture, supply and commissioning of rolling stock was awarded with a condition that if the contractor failed to carry out the indigenous programme, it would be treated as default on his part attracting termination of the contract. There was, however, no provision for levy of any pecuniary penalty.

Audit analysis of quality control indicated scaling down of testing requirements, non-witnessing of tests by the company's representatives, testing of material in non-accredited laboratories and non-preservation of test reports.

The company has acquired 32.38 lakh square metre of land for Phase I but has not maintained location wise data of land used for the Project and the property development. In nine locations the company has acquired total land of 6.42 lakh square metre, which was in excess of the Project requirement by 14 to 354 *per cent*. The company finalised the lease/concession for property development at four locations based on one qualified bid received in each case and the amount realised was only 0 to 3 *per cent* over the reserve price. Apart from the restrictive clause for the land use in the allotment letters, poor response was also because of the stringent qualifying criteria fixed for the bid process.

Performance Audit of the implementation of Phase I of Delhi Mass Rapid Transit System by Delhi Metro Rail Corporation Limited

HIGHLIGHTS

- Under the unique administrative model evolved by the Government of India, the company has not been put under direct control of any administrative ministry. This model presents ambiguity relating to the issues of (i) coordination and control by the executive government and (ii) the proper forum for legislative accountability.

(Para 2.1)

- There is no regular monitoring from a designated administrative ministry, and the main agency to provide oversight is the Board of Directors (BOD) itself. The BOD, however, did not have independent Directors in accordance with the DPE's guidelines.

(Paras 2.2)

- The company has not prepared a Corporate Plan to chart out its goals and strategies for achievement of business development, diversification, technology upgradation, and customer satisfaction.

(Paras 2.4)

- The highest daily average ridership attained by the company was 21 *per cent* of the original projection and 29 *per cent* of the revised figure. The shortfall in ridership was mainly due to higher fare structure, lack of proper connectivity and lack of feeder bus system.

(Para 2.5)

- The company adopted the broad gauge in Phase I as per the decision of the Group of Ministers. However, it was not ensured that the associated systems were planned and implemented to meet the stated objectives of adopting the broad gauge as envisaged by the Group of Ministers in August 2000. According to the management's estimates, the adoption of the broad gauge had resulted in an additional cost of Rs. 260 crore, besides additional energy consumption of Rs. 2.26 crore per annum.

(Para 3.2)

- Due to non-consideration of certain facts by the general consultant while making recommendation in 1999, the company could not decide initially to implement 25 kV AC traction system for the underground corridor, which led to additional expenditure of Rs. 26.59 crore.

(Para 3.3.2)

- The company has not provided Automatic Train Operation on all lines to ensure safer operation of trains. Noise levels were beyond the permissible limits and

there were premature wear and cracking in the wheel and floor of the rolling stock raising doubts on the stipulated 30 years design life.

(Paras 3.4.2 and 3.6.2)

- The company has not manualised the procurement guidelines for each stage relating to pre-qualification, short listing of vendors, estimation, bids evaluation, award and execution of domestically funded contracts.

(Para 4.5.1)

- The selection of general consultant was not based on a system where the best bid was selected on the basis of technical quality cum cost basis. It is not clear how the reasonableness of the awarded price was ensured under such a system.

(Para 4.6)

- Out of 13 'design and construct' contracts reviewed in audit, estimates were revised or approved after the opening of financial bids in seven cases (award value Rs. 3314.50 crore). Out of these seven cases, in three cases (award value Rs. 3097.89 crore), even financial concurrence was not obtained before the approval of estimates by the competent authority.

(Para 4.7.1)

- On the request of the company, the Japan Bank for International Cooperation allowed negotiation simultaneously with the first two lowest parties in two contracts, which was not in accordance with the loan agreement.

(Para 4.7.2.2)

- A letter indicating discount of 13 *per cent* on the contract price, allowing a bidder to become the lowest evaluated tenderer in one contract, did not find any mention in the tender opening register, indicating procedural shortcomings in processing of bids.

(Para 4.7.2.3)

- In four contracts, relaxations in commercial and technical terms were allowed after the opening of financial bids while negotiating with the lowest bidder (s). This practice was non-equitable as the other pre-qualified bidders were denied the opportunity to revise their bids in view of the change in commercial and technical terms.

(Para 4.7.4)

- In six cases, advances amounting to Rs. 38.72 crore not contemplated in the agreements were sanctioned to the contractors.

(Para 4.8.1)

- For effecting recoveries from a contractor towards exemption of duties on the supply of equipment, the company applied the rates applicable on the date of

import/supplies, which were lower as compared to the rates prevailing on the date of submission of bids. This resulted in short-recovery of Rs. 14.41 crore towards excise duty and customs duty. In another case, the company did not recover Rs. 3.47 crore from a contractor for replacing a part of cement by fly ash for structural concrete.

[Paras 4.8.2 (a) and (b)]

- The company made payment amounting to Rs. 6.92 crore against contractors' claims in eight contracts which were not admissible as per the contract agreement.

(Para 4.8.3)

- The contract for design, manufacture, supply and commissioning of rolling stock was awarded with a condition that if the contractor failed to carry out the indigenous programme, it would be treated as a default on his part attracting termination of the contract. There was, however, no provision for levy of any pecuniary penalty and accordingly, no penalty could be imposed on the contractor for non-utilisation of indigenous material.

(Para 4.8.4)

- As the company did not allow the contractor to demobilise the welding plant, the welding plant remained idle for five months. Accordingly, the company had to pay the contractor an amount of Rs. 1.43 crore.

(Para 4.8.5)

- Audit analysis of quality control indicated scaling down of testing requirements in four contracts, non-witnessing of tests by the company's representatives in some cases of eight contracts, testing of material in non-accredited laboratories and non-preservation of test reports.

(Para 5.2)

- The company has acquired 32.38 lakh square metre of land for the Project but has not maintained location wise data of land used for the Project and the property development. In nine locations it was observed that total land acquired was 6.42 lakh square metre, which was in excess of the Project requirement by 14 to 354 *per cent.*

(Para 6.2.2)

- The company finalised the lease/concession for property development at four locations based on one qualified bid received in each case and the amount realised was only 0 to 3 *per cent* over the reserve price. Apart from the restrictive clause for the land use in the allotment letters, poor response was also because of the stringent technical criteria fixed for the bid process.

(Para 6.3)

RECOMMENDATIONS

1. ***There is a need to develop a suitable mechanism at the national level for projects of this nature so that accountability issues are not placed at unreasonable risk in the interests of expediency.***

2. ***Considering the importance of the Board of Directors (BOD) in the unique administrative structure, the Government of India may take a lead and work out an arrangement with the Government of National Capital Territory of Delhi for appointing independent Directors on the BOD of the company.***

3. ***The company should prepare a formal Corporate Plan to chart out its goals and strategies for the achievement of business development, diversification, technology upgradation, marketing and customer satisfaction. The company should adopt the guidelines of the Department of Public Enterprises, the Department of Economic Affairs and the Central Vigilance Commission to strengthen corporate governance***

4. ***The company should generate and sustain ridership by utilising the surplus capacity available during off-peak hours and through measures that provide and offer better facilities to commuters.***

5. ***The Government of India needs to analyse reasons for and effects of non-achievement of the objectives of adopting the broad gauge as envisaged by the Group of Ministers in August 2000. The company needs to document all factors which were involved in deciding on the broad gauge so that pros and cons of adopting any gauge by future projects are adequately identified.***

6. ***The company should consider installation of the Automatic Train Operation system on all lines to ensure safer operation of trains.***

7. ***The company should carry out tests under standard conditions and take corrective action if coaches experience higher levels of noise. As premature cracks in wheels are linked with safety issues, the company should carry out in-depth analysis and work out a technical solution.***

8. ***The company should create a knowledge database relating to inputs required for all its activities to facilitate decision making. To help develop a qualified technical human resource base, the company may like to partner institutions of higher learning.***

9. ***The good practices adopted by the company for traffic management, safety and environment should be documented to enable their sharing and adoption by other or similar construction projects.***

10. ***The company should formulate and manualise the procurement guidelines for each stage relating to pre-qualification, short listing of vendors, estimation, bids evaluation, award and execution of contracts.***

11. ***In case it is possible to give a clear definition of inputs required from the consultants, appointment should be based on a system where the best bid is selected on the basis of both technical quality as well as financial cost.***

12. ***The company should evolve a system of finalising the cost estimates before inviting financial bids to maintain transparency and to ensure reasonableness of the offers received.***

13. ***The company needs to further strengthen its system of processing of bids to bring in more accountability, transparency and fairness***

14. ***To enforce utilisation of indigenous material by a contractor, explicit penalty clause should be incorporated in the contract agreement to serve as an adequate deterrent to the contractor.***

15. ***In order to keep records of test conducted, the company needs to lay down a preservation life for test reports. It also needs to evolve a mechanism for testing materials through accredited laboratories.***

16. ***The company should clearly indicate the land needed for the project as well as the area demarcated for property development at each location while requisitioning land. Surplus land that cannot be used for the intended purpose, should be surrendered. Surplus revenue from property development activities of the Phase I should flow back to the Consolidated Fund of India.***

CHAPTER I

Introduction

1.1 Need for Mass Rapid Transit System in Delhi

1.1.1 In order to mitigate the growing traffic and transport problems in Delhi, the Government of National Capital Territory of Delhi (GNCTD) [formerly known as the Delhi Administration] commissioned RITES Limited in 1988-89 to study the feasibility of introducing an Integrated Multi-modal Mass Rapid Transit System for Delhi. In 1990, RITES recommended a Mass Rapid Transit System (MRTS) comprising Rail corridor, Metro corridor and dedicated Busway for a total network of 198.50 Kilometres (Kms).

1.1.2 The Central Cabinet in July 1994 gave go-ahead in principle for the MRTS for Delhi as per the RITES Feasibility Report and directed the GNCTD to take up the preparation of a Detailed Project Report (DPR) for the MRTS. DPR for construction of a 55.30 Kms MRTS comprising rail and metro corridors was finalised by RITES in May 1995, which was envisaged to be completed in March 2005.

1.1.3 Till 1995, more than 70 metropolitan rail systems existed in the world and Kolkata Metro, India's first and Asia's fifth, was commissioned on 24 October 1984. Though the construction of Kolkata Metro was marred by inordinate delays and caused considerable public inconvenience, it provided many valuable inputs for planning and execution of the Delhi MRTS.

1.2 Approval of MRTS Phase I

1.2.1 The Union Cabinet sanctioned implementation of the Delhi MRTS Phase I (Project) of 55.30 Kms in September 1996 at a total cost of Rs. 4859.74 crore (April 1996 prices). As per the Cabinet sanction, three lines as shown in Table-1 were planned to be constructed.

Table 1

Planned Routes and Corridor of Delhi MRTS Phase I

Line No.	Route	Corridor Type	Length (Kms)
1	Shahdara- Nangloi	Elevated (17.70 km) At grade (7.30 km)	25.00
2	Vishwavidyalaya- Central Secretariat	Underground	11.00
3	Subzi Mandi- Holombi Kalan	Elevated (4.45 km) At grade (14.85 km)	19.30
Total			**55.30**

1.2.2 The Project as actually constructed, however, comprised routes and types of corridors as shown in Table 2 below:

Table 2

Constructed Routes and Corridor of Delhi MRTS Phase I

Line No.	Route	Corridor Type	Length (Kms)
1	Shahdara-Rithala	Elevated (17.50 km) At grade (4.50 km)	22.00
2	Vishwavidyalaya-Central Secretariat	Underground	11.00
3	Dwarka subcity-Indraprastha	Elevated (29.93 km) Underground (2.17 km)	32.10
Total			**65.10**

1.2.3 The first section of Line 1 was commissioned in December 2002, while the last section on Line 3 became operational in November 2006. The map indicating the routes as envisaged in the original approved DPRs vis-à-vis actually constructed is shown in ***Annexure I***. The revised approved cost of the Project was Rs. 10571 crore (September 2005).

1.2.4 The supervisory levels for the implementation of the Project as approved by the Cabinet in July 1994 were as under:

- A Group of Ministers* was constituted to take policy decisions and to review the progress of the Project from time to time. The Lieutenant Governor of Delhi was made a permanent invitee to the Committee. This Group of Ministers was to be chaired by the Prime Minister or such Minister as he might nominate.
- The Empowered Committee constituted under the Chairmanship of the Cabinet Secretary with six♥ Secretaries, Chairman Railway Board, Chief Secretary GNCTD and representative from the Prime Minister's Office. This Committee was empowered to consider various issues arising from time to time with reference to funding and implementation of the Project.
- Incorporation of the Delhi Metro Rail Corporation Limited as a company under the Companies Act 1956 to execute and operate the Project.

1.2.5 The financing plan for the Project stipulated a debt equity ratio of 2:1. Annual contributions towards equity were to be made by the Government of India (GOI) and the GNCTD at the rate of Rs. 103.60 crore *per annum* each; the long term loan was to be raised on suitable terms from Japan Bank for International Cooperation (JBIC), formerly known as the Overseas Economic Co-operation Fund (OECF) at an interest rate not exceeding three *per cent per annum*; and the balance of the project cost over and above

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* ***Ministers for Finance, Home Affairs, Railways, Urban Development, Surface Transport and Environment & Forests, and Deputy Chairman, Planning Commission***

♥ ***Finance, Home Affairs, Planning Commission, Urban Development, Surface Transport and Environment & Forests***

the equity and debt finance was to be raised from property development, which was estimated at six *per cent* of the revised project cost (April 1996 prices).

1.3 Delhi Metro Rail Corporation Limited

1.3.1 Delhi Metro Rail Corporation Limited (the company) was registered (May 1995) under the Companies Act, 1956. The Managing Director (MD) and two Functional Directors joined in November 1997 and June 1998, respectively. The total paid up capital for the Project, contributed equally by the GOI and the GNCTD, was Rs. 2928 crore as on 31 March 2008.

1.3.2 Secretary, Ministry of Urban Development (GOI) is the part-time Chairman of the company and five part-time Directors each, representing the GOI and the GNCTD are also on the Board of Directors (BOD) of the company. As on 31 March 2008 the Board of Directors had a membership of 16 including six functional Directors.

1.4 Concessions provided to the company

As the Project was not considered commercially viable, the GOI provided the following concessions to it:

- Land belonging to various Government agencies was provided at inter-departmental transfer rates. The cost of land amounting to Rs. 504 crore was shared equally by the GOI and the GNCTD. It would be recovered as interest-free debt after repayment of loan raised from the JBIC.
- The long-term debt required for the Project was raised by the GOI through a loan agreement executed (February 1997) with the JBIC at concessional rate of interest and transferred to the company. The JBIC committed a loan of Rs 6359 crore to the Project which is to be repaid by the company in 30 years with a moratorium of 10 years with effect from February 1997.
- Exchange rate fluctuation risk for the period of repayment of foreign loan was to be shared between the GOI and the GNCTD, equally.
- Exemption from property tax and electricity tax.
- Exemption from import duty, excise duty, sales tax and works contract tax.
- No dividend to be paid on Government equity till the JBIC loan is fully repaid by the end of 30th year.

1.5 Audit objectives

Audit objectives were to assess that:

- selection of corridors and routes, and modifications in routes were carried out keeping in view economic viability and effectiveness of the Project;
- proper analysis of the prevailing technologies relating to various segments of the Project was carried out to obtain best possible option;
- the contract management was done with due care and economy, works were awarded in a transparent manner and at competitive cost, execution and supervision of works was carried out efficiently and the services and goods were procured timely, efficiently and economically; and

- an adequate mechanism was in existence to monitor the Project, to ensure timely completion of works and conformity of works executed with laid down specifications.

1.6 Scope of audit

The performance audit covered various activities relating to the implementation of the MRTS (Phase I). Significant issues relating to the above audit objectives were examined in 28 contracts valuing Rs. 6540.03 crore out of 100 high value contracts (for more than Rs. five crore) valuing Rs. 8900.57 crore.

1.7 Audit criteria

Audit criteria identified for the purpose of the performance audit for different activities of the MRTS (Phase I) were:

- Detailed Project Reports.
- Memorandum and Articles of Association of the company.
- Delegation of Powers.
- Provisions stipulated in the Contract Agreements.
- The JBIC guidelines in case of the JBIC funded works.
- Decisions of Cabinet, Group of Ministers and Empowered Committee.
- Agenda papers and minutes of meetings of the BOD.
- Guidelines and instructions issued by the Department of Public Enterprises and the Department of Economic Affairs.

1.8 Audit methodology

The performance audit was carried out in accordance with the CAG's Auditing Standards and Performance Audit Guidelines. The performance audit started with an entry conference with the management in March 2007. The draft Audit Report was issued to the management in February 2008. The audit findings and recommendations were presented in a meeting of the Audit Board held in May 2008 with the representatives that included all the functional Directors of the management. Replies from the management have been received and suitably incorporated in the Audit Report. The draft Audit Report was issued to the Secretary (Urban Development), the GOI and the Chief Secretary, GNCTD in July 2008; their replies have not been received as of September 2008.

A team from the Indian Institute of Technology Delhi (IIT) was engaged as technical consultants to assist in the examination of certain technical matters relating to this performance audit. The IIT examined the issues of contract management, selection of technologies and selection of routes and corridors. The results of audit together with the findings of the IIT are mentioned in Chapters II to VI of this Audit Report.

1.9 Acknowledgement

Audit acknowledges the cooperation and assistance provided by the management at all levels at various stages of the audit.

CHAPTER II

Coordination and Planning

2.1 Coordination

2.1.1 The company, jointly owned by the GOI and the GNCTD on 50:50 basis, is neither a Central PSU nor a State PSU. For the issues concerning the Central Government, Ministry of Urban Development (MoUD) has acted as the nodal ministry and likewise, the Department of Transport for the GNCTD has been providing the requisite coordination as the nodal ministry. Under the unique administrative model evolved by the GOI, the company has not been put under the direct control of any administrative ministry. The administrative model, however, presents ambiguity relating to the issues of (i) coordination and control by the executive government and (ii) the proper forum for legislative accountability. The company has also not signed any Memorandum of Understanding with the Ministry as required by the Department of Public Enterprises' (DPE) guidelines of 9 January 2007.

2.1.2 The subject of the administrative ministry came up for discussion by the Board of Directors (BOD) in its 31st and 32nd meetings. While the Chairman, BOD, stated that the contract for the rolling stock should be sent to the JBIC for concurrence through the administrative ministry as laid down in the guidelines of the Department of Economic Affairs (DEA), the MD was of the view that if this practice was followed, the confidentiality would be lost. The Chairman was reported to have decided to take up the matter with the DEA. However, no clarification has been sought from the DEA till date (May 2008). Thus, in the absence of any explicitly laid down administrative ministry, the company did not comply with the DEA's prescribed procedures in processing the JBIC loans which, *inter alia,* provided that the proposals relating to evaluation of bids, award of contracts, *etc.*, wherever required, as per the loan agreement should be sent by the executing agency, *i.e.*, the company to the JBIC through the administrative ministry concerned.

2.1.3 The management stated (April 2008) that the unique experiment of a joint venture had established itself as a success story and added that placing the company under one administrative ministry would give it a different connotation of being either a Central PSU or a State PSU which would not be in consonance with the 50:50 character of a joint venture and would thus be a retrograde step.

2.1.4 The project from its very inception faced many challenges, some conventional and some city and project centric. It goes to the credit of the company that it managed to override these constraints and completed the project successfully. This was made possible by the adoption of certain innovative practices like fast track decision making at every level, shaping a team with a mission, reverse time clock for monitoring the completion of every segment etc. These practices need to be adequately documented so as to benefit other/similar infrastructure projects.

2.1.5 The novel experiment of putting both Central and State Governments on equal footing gave an unprecedented level of autonomy and freedom to the company. As other metropolitan regions in the country have also decided to take up Urban Rail projects,

there is a need to develop a suitable policy at the national level for projects of this nature so that accountability issues are not placed at unreasonable risk in the interests of expediency.

2.2 Independent directors

2.2.1 The BOD has a total of 16 members with seven functional Directors (including the Managing Director) and five nominee Directors each from the two joint shareholders. The BOD delegated all powers exercisable by it to the MD with the stipulation that important decisions taken by the latter would be reported to the BOD at the next meeting. The MD in turn sub-delegated the powers in respect of works, stores, establishment, financial and miscellaneous matters to the designated officers mentioned in the Schedule of Powers. This has facilitated quick decision-making.

2.2.2 There is no regular monitoring from a designated administrative ministry, and the main agency to provide oversight is the BOD itself. The BOD, however, did not have independent Directors in accordance with the DPE's guidelines of 22 June 2007 on Corporate Governance. As a minimum of six independent Directors would be required to secure compliance with DPE's guidelines, the size of the BOD would swell to 23. Accordingly, a view may need to be taken regarding the appropriate numbers of Directors on the BOD to retain its functionality and effectiveness.

2.3 Audit committee

Audit Committee is an important instrumentality for good corporate governance and matters relating to risk management and financial reporting are generally its assigned subjects in the BOD. The company has an Audit Committee in its BOD comprising the required number of non-executive (nominee) Directors with a non-executive chairperson as required under section 292A of the Companies Act, 1956. The Committee, however, met only 17 times during the period of seven years ended 31 March 2008 with the Chairperson (nominee Director from GOI) attending only 10 of these meetings. It would be a good practice to include only non-executive independent Directors in the Audit Committee as nominee Directors usually have other responsibilities in their parent department.

Recommendation No. 1

(i) There is a need to develop a suitable mechanism at the national level for projects of this nature so that accountability issues are not placed at unreasonable risk in the interests of expediency.

(ii) Considering the importance of the BOD in the unique administrative structure, the GOI may take a lead and work out an arrangement with the GNCTD for appointing independent Directors on the BOD of the company.

2.4 Corporate plan

2.4.1 The company did not prepare a Corporate Plan as target dates were stipulated for each significant milestone in the DPR and no value addition was expected in Phase I of the Project by having a formal corporate plan. The management stated (April 2008) that guidelines of the DPE were not technically applicable to the company, being a joint

venture of the GOI and the GNCTD and added that the company was already working in the direction of developing a formal corporate plan.

2.4.2 A DPR is only meant as a tool for planning and monitoring for construction activity and can seldom serve as a surrogate corporate plan as unforeseen events may often render the initial projections invalid. Moreover, a formal duly approved Corporate Plan serves as a written guidance for all the officials of the company and promotes a favourable control environment for the achievement of corporate objectives. It is best practice to have the Corporate Plan and, unless specifically exempted, the company should also adopt the other guidelines of the DPE, the DEA and the Central Vigilance Commission (CVC) for a more robust corporate governance.

Recommendation No. 2

(i) The company should prepare a formal Corporate Plan to chart out its goals and strategies for the achievement of business development, diversification, technology upgradation, marketing and customer satisfaction.

(ii) The company should adopt guidelines of the DPE, the DEA and the CVC to strengthen corporate governance.

2.5 Projection of ridership

2.5.1 According to the DPR of 1995, 31.85 lakh passenger trips per day (*i.e.* ridership) was expected on completion of the Project in the year 2005. The subsequent DPR of 2003 projected daily ridership of 22.60 lakh. With this extent of ridership projection, benefits of speedier and safer travel for commuters, abatement of atmospheric pollution, reduction in fuel consumption, reduced accident rates and decongestion of roads were expected.

2.5.2 The highest daily average ridership attained was, however, 6.62 lakh only in November 2007, which was 21 *per cent* of the original projections and 29 *per cent* of the revised figure. The reasons for the shortfall in ridership were stated to be mainly as under:

(i) Higher fare structure of Metro in comparison to the other modes of Public Transport (Bus);

(ii) For commuters the cost barrier went beyond the cost of Metro tickets, to also include cost of travel from the residence to the Metro Station and from the Metro Station to the workplace;

(iii) Lack of proper connectivity; and

(iv) Lack of feeder bus system for adjoining area to Metro System.

2.5.3 Despite low ridership, there was congestion on the Metro during peak hours. The congestion was attributable to various factors like lower number of passenger cars, sub-optimal speed over the rail network, lower frequency of trains, and absence of differential fares during peak hours.

2.5.4 The management stated (April 2008) that efforts to boost ridership were a continuous process and the company had already extended the operation hours, introduced feeder bus services, increased the train fleet and introduced more escalators. They added that the company achieved the average figure of carrying 10 passenger-Kms as compared to the anticipated figure of 7. The proposed increase of the network under

Phase II would give more facilities for end-to-end travel and would increase the ridership on the existing system. As regards congestion during the peak hours, the management stated (May 2008) that more trains were being brought in and that the capacity of a train could be increased from the present four cars to eight cars. With the expansion of the metro network, differential tariff structure (for peak and non-peak hours) may also be proposed to the tariff regulator.

2.5.5 The projection of ridership was independent of network under development in Phase II. The fact that transport modeling for ridership was not carried out accurately by RITES, was accepted by the company as well as the MoUD before the Empowered Group of Secretaries in 2005. Audit was informed that the company to meet its ridership projections, was considering measures like a more effective feeder bus service, increased parking facilities at stations and unified ticket for bus and metro.

Recommendation No. 3

The company should generate and sustain ridership by utilising the surplus capacity available during off-peak hours and through measures that provide and offer better facilities to commuters.

CHAPTER III

Selection of Technologies

The selection of the technologies for the Project (Phase I of the MRTS) was very important because based on them benchmarks were to be established for the subsequent phases of the MRTS as well as for the other Metro projects planned to be constructed in various parts of the country. The results of the examination of records pertaining to technologies selected and implemented for the Project conducted by audit with the assistance of IIT are narrated below.

3.1 Civil engineering

3.1.1 The major portion of the Project has been constructed on elevated viaducts (totalling 47.43 kms), which were built on single piers mostly at a height of 10 metres from the ground using the segmental construction technique. Adoption of underground corridor for Line 2 (11 kms) and a small stretch on Line 3 (2.17 kms) was necessitated due to concentration of buildings, presence of archaeological structures and two major railway yards at New Delhi and Delhi Railway stations.

3.1.2 The selection of corridors and technology used for construction of stations, viaducts, buildings, depots, tunnels and allied works was examined by the IIT and was found appropriate in general.

3. 2 Selection of gauge

3.2.1 RITES, the company and the General Consultant (GC) were in favour of adopting standard gauge (SG) for the Project as it was a proven technology in Metros across the world and had advantages of off-the-shelf availability of the rolling stock and prospects of export potential. The Group of Ministers, however, decided (August 2000) on adoption of broad gauge (BG) to achieve the following objectives:

(a) Indian Railway's ability to provide infrastructure-support for the Project;

(b) Back up support by Indian Railways at the time of disasters/accidents;

(c) Possibility of intersection and inter-operability with mainline Railways; and

(d) Development of indigenous capabilities.

3.2.2 Accordingly, the company adopted the BG in Phase I. However, it was not ensured that the associated systems were planned and implemented to meet the stated objectives as shown below:

- Elevated structures of the Metro have been designed with axle loading of 16.5 ton, which is not compatible with the Indian Railway standard of Electrical Multiple Unit (EMU), which is 20 ton.
- Metro stations have been designed for 3.20 metre wide coaches while the coach width of mainline coaches including EMU coaches of Indian Railways is 3.66 metre.

- Platform length of a Metro station is designed for trains of eight coaches whereas the number of coaches in the mainline trains and EMU are generally more than eight.
- There is no intersection between the mainline Railways and the MRTS network and at a time of crisis, the Railways cannot mobilise back-up support for the MRTS network.

3.2.3 While confirming that inter-operability and inter-connectivity with the mainline Railways was not possible, as the loading standards, moving dimensions, signal systems and operating philosophy of the Project were different, the management stated (February 2008) that the objectives were unachievable as these were based on wrong premise and high maintenance costs would result as spares relating to the BG cars were not available off-the-shelf. Based on their engineering judgment, the management had informed (December 2003) the MoUD that the adoption of the BG had resulted in an additional cost of Rs. 260 crore ***(Annexure II)***. The company also anticipated additional energy consumption of Rs. 2.26 crore *per annum* ***(Annexure III)*** due to adoption of the BG rolling stock and as such has decided to adopt the SG for all new lines in Phase II except for the extensions of the existing lines. The IIT concurred with the views of the management and confirmed that adoption of the BG would cause losses in terms of additional infrastructure required to maintain the system.

Recommendation No. 4

(i) ***The Government of India needs to analyse the reasons for and effects of non-achievement of objectives of adopting the broad gauge as envisaged by the Group of Ministers in August 2000.***

(ii) ***The company needs to document all factors which were involved in deciding on the broad gauge so that pros and cons of adopting any gauge by future projects are adequately identified.***

3.3 Electrical engineering

3.3.1 Traction system

The company draws power from three sources, *viz.,* the Northern Grid, Indraprastha Gas Turbine Plant and the mainline Railway system in case of emergency. Besides, all stations of the Metro are equipped with inverters and generators to act as back-up in emergency. All the three lines of the Project run on 25 kV AC traction system (TS).

3.3.2 Belated decision to adopt 25 kV AC system in the underground corridor

3.3.2.1 For the underground corridor, the DPR (1995) envisaged a 750 V DC TS which was subsequently changed to 1500 V DC TS with the approval of the Ministry of Railways. The GC also recommended (February 1999) adoption of 1500 V DC TS with 5800 millimetre (mm) diametre tunnel as a 25 kV AC TS for underground corridor would require a diametre of at least 6200 mm with higher cost of construction. Accordingly, the company awarded two "design and build" metro corridor contracts in February 2001 with stipulations that the minimum finished internal diametre of the tunnel should be 5600 mm and 1500 V DC TS should be used.

3.3.2.2 After the award of the contracts, the company permitted the civil contractor to use a tunnel-boring machine (TBM) which could give a minimum finished internal diametre

of 5700 mm at no extra cost. Based on this and the fact that the Heathrow Express Rail Link, commissioned in 1998 with a tunnel diametre of 5700 mm, ran on a 25 kV AC TS, the company decided to implement 25 kV AC TS for the underground corridor. So, due to non-consideration of these facts by the GC while making recommendation in 1999, the company incurred additional expenditure of Rs. 26.59 crore towards design cost for the 1500 V DC TS and extra conversion cost of 17 trains from 1500 V DC to 25 kV AC ***(Annexure IV)***.

3.3.2.3 The management stated that a 25kV AC TS was a proven technology with a tunnel size of 6200 mm but with such a size of tunnel the Project cost would have increased by Rs. 100 crore. Further, the height of the Heathrow rolling stock was 4015 mm against the specified height of 4250 mm. Adoption of the 25 kV AC TS in the underground corridor was made possible because the contractor could give finished tunnel of 5700 mm internal diametre. The reply is not tenable because 25 kV AC TS in a tunnel diametre of 5700 mm was in use since 1998. Further, the IIT opined that the option of adopting 25 kV AC TS could have been explored at the initial stage of planning.

3.4 Signals & Telecommunication

3.4.1 Signalling system is used to control traffic and to ensure safe operation of trains. The parameters of the system used in the Project have been worked out keeping in mind the smaller headway of train operations and consequent safety requirements. The three main co-ordinates of Signal & Telecommunication (S&T) systems are Automatic Train Protection (ATP), Automatic Train Supervision (ATS) and Automatic Train Operation (ATO). Apart from these features the company has adopted computer based Solid State Interlocking (SSI) system for safe passage of trains.

3.4.2 Based on their study, the IIT opined that:

(i) The ATP, the ATO, the ATS and the SSI are essential safety technologies and must be used on all lines of the Metro. While the ATP and the ATS have been provided for all three lines, the ATO has been provided only in Line 2. The management stated that introducing the ATO on large scale at the first stage itself would have been an unacceptable risk due to lack of experience in India and the Kolkata Metro experience for introduction of the ATO was not successful. In Phase II, the ATO was being implemented on all the new lines. The reply is not tenable because the ATO was not a new technology.

(ii) The S&T works should be tendered separately for competitive bidding and better participation by indigenous bidders.

(iii) A new technology of Communication Based Train Control (CBTC) is under development for metro application. Such systems envisage headway of train operation from 5 minutes to under 60 seconds and are economically feasible. It is suggested that the CBTC may be considered for adoption in future metro lines as soon as the technology is fully developed.

Recommendation No. 5

The company should consider installation of the Automatic Train Operation system on all lines to ensure safer operation of trains.

3.5 Automatic fare collection system

For fare collection, the company has installed an automatic fare collection (AFC) system which offers smart card format for regular travelers and single/return journey contact-less tokens for occasional passengers. All fare collection equipment are connected to a local area network, controlled by a station server which is further linked to a central computer at the operational control centre through optic fibre. The IIT found the AFC system to be suitable, safe and economical. They, however, suggested acquiring the source code for the AFC system in the interest of long term software maintenance and for making necessary changes in the system. The management assured (April 2008) that it will encourage the use of open source service software wherever feasible.

3.6 Rolling stock

3.6.1 The company has procured 3.2 metre wide lightweight fully vestibuled, air-conditioned stainless steel cars designed for fast acceleration-deceleration with advanced features like the ATP, regenerative braking, automatic door operation and inter-communication facility between the driver and passengers. Though one of the prime objectives behind adoption of the broad gauge was the availability of the BG rolling stock technology in the country, these customised cars for the broad gauge tracks had to be imported from a foreign consortium. The management stated that the initial import of these cars was inescapable because facilities for design and manufacture of modern metro rolling stock planned to be used were not available in the country. However, the contractor tied up with a local manufacturer and progressively produced coaches indigenously. Though the indigenisation of the BG rolling stock was one of the prime considerations, it is seen that even in Phase II of the project, the BG coaches were still being imported.

3.6.2 The IIT observed the following deficiencies in these cars:

(a) Noise tests conducted by the IIT on cars on 6 February 2008* by using state of the art instrumentation and measurement systems revealed (***Annexure V***) that the noise levels were beyond the permissible limits on all the lines under various conditions despite the fact that the trains were not run at full operating speed of 80 Kms per hour. The management stated (April 2008) that as the tests were carried out under actual conditions, the noise level measured by the IIT was bound to give erroneous results and thus could not be accepted. Further, only one parameter of the noise was beyond the permissible limit.

(b) The IIT observed premature wear and cracking in the wheel and floor of the rolling stock raising doubts on the stipulated 30 years design life unless appropriate corrective steps are taken. The management stated (May 2008) that cracks in wheels were experienced in varying degrees world wide and the company had engaged an independent consultant to determine the cause. Admitting a few cases of cracks in the floor of the rolling stock, the management stated that the supplier had been advised to carry out strengthening of floors.

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* ***It was not possible to stick to perfect conditions as the measurements were taken during normal running hours.***

(c) During collision analysis of train, the IIT observed that simulation time was short/inadequate and conclusions were apparently drawn on the basis of only a couple of simulations. The management replied (May 2008) that in case of collision, the deformation of the coach is normally completed in a few hundred milliseconds and carrying out LS dyna simulation for 2.25 seconds was, therefore, considered quite adequate. The IIT did not agree with the reply as maximum stress was not adequately revealed in simulation of 2.25 seconds.

Recommendation No. 6

The company should carry out tests under standard conditions and take corrective action if coaches experience higher levels of noise. As premature cracks in wheels are linked with safety issues, the company should carry out in-depth analysis and work out a technical solution.

3.7 Ventilation and air-conditioning

For the comfort of the passengers, trains and all underground stations are air-conditioned and tunnels are ventilated. The IIT observed that:

- The cooling load calculation procedures adopted for air-conditioning was generally in line with the industrial practice.
- An assessment of various air conditioning technologies for train and station air-conditioning was not carried out.
- It is possible to improve upon the energy savings by rationalising the inside design conditions, while maintaining similar levels of comfort. The management stated (May 2008) that various options of air conditioning were explored based on the studies of RITES and IIT, Delhi; and in hindsight many things could be reviewed in a different way. However, there was nothing on record to show that various options were explored for air conditioning.
- The operation and maintenance of the centralised Building Management System may be looked into carefully to ensure its proper operation at all times to get the anticipated energy savings and also to take care of emergency situations. Further, the study of load patterns may help in deciding the design and selection of upcoming high voltage air conditioning plants. The management has noted (April 2008) the suggestion.
- A well documented comparison of systems and operational methodologies adopted by various Metros in the world would help in evolving better system designs.

3.8 Emergency evacuation and fire fighting arrangement in trains

During a live demonstration of train operations, arranged for Audit and the IIT on the midnight of 3 November 2007, emergency evacuation arrangements were found to be in place. Similarly, adequate fire fighting arrangements in the form of dousers and water sprinklers in the tunnel and platforms and fire extinguishers in the cars existed. The signage for fire extinguishers in the cars was however, not adequately displayed; and the

fire alarms in Rajiv Chowk station were not kept operational. The management assured (April 2008) to take corrective action.

Recommendation No. 7

The company should create a knowledge database relating to inputs required for all its activities to facilitate decision-making. To help develop a qualified technical human resource base, the company may like to partner institutions of higher learning.

CHAPTER IV

Contract Management

4.1 Audit analysed the procurement of goods and services at three distinct stages as indicated below:

- Pre-tender stage involving appointment of the GC and preparation of detailed estimates;
- Tender stage involving pre qualification, preparation of tender documents, inviting and opening of tenders, evaluation of tenders and award of works; and
- Execution stage involving compliance of contract conditions relating to payments, quality assurance and timely completion of project.

4.2 Audit reviewed the process of appointment of the GC and 27 contracts valuing Rs. 6540.03 crore ***(Annexure VI)*** out of 100 high value contracts (*i.e.,* contracts for more than Rs. five crore) amounting to Rs. 8900.57 crore. Out of 27 contracts, 13 were lump sum price contracts in the nature of 'design and construct' wherein the designs were developed by the contractors. The remaining 14 contracts reviewed were based on bill of quantities.

4.3 The principal requirements of safety and environment protection were incorporated as conditions of the contract. The company has prepared Environmental Quality Management Manual which was generally followed by the contractors. The environmental monitoring was carried out by the company on regular basis. The company ensured that necessary fire protection and fire fighting facilities, like sprinkler systems, fire hose reels, raw water storage tanks, etc. were maintained at sites during construction.

4.4 The contractors were required to develop an integrated traffic management plan by making arrangements for road and pedestrian traffic at construction sites for smooth traffic operations and for safety of both construction workers and road users. Any traffic related facility (bus stop, parking, etc.) affected by construction was generally maintained or relocated. The arrangements made by the company to minimise inconvenience to the public were noteworthy.

Recommendation No. 8

The good practices adopted by the company for traffic management, safety and environment should be documented to enable their sharing and adoption by other or similar construction projects.

4.5 Manual for procurement

4.5.1 The company followed guidelines of the JBIC in case of the JBIC funded contracts. The company has, however, not documented guidelines, policy and procedures for domestically funded contracts. The management stated (April 2008) that the company had formulated General Conditions of Contract, Notice Inviting Tender, and Instructions to Tenderers, which coupled with delegation of powers to different levels of officers and

constitution of tender committees, ensured an efficient procurement system as existing in most of the government organisations. They added that many government departments have approached the company to make procurement on their behalf, which confirmed the efficacy, efficiency and transparency of its procurement system.

4.5.2 As the basic objective of a manual is to provide written guidance in a transparent manner and to make sure that actions and decisions of individual officers are not arbitrary, the company needs to manualise the whole set of guidelines for procurement at one place as a good management practice.

Recommendation No. 9

The company should formulate and manualise the procurement guidelines for each stage relating to pre-qualification, short listing of vendors, estimation, bids evaluation, award and execution of contracts.

4.6 Appointment of general consultant

4.6.1 The JBIC guidelines for the appointment of the GC provided for financial negotiations only with the first ranked technical bidder. So, the selection of the GC was not based on a system where the best bid was selected on the basis of technical quality cum cost basis. As the DPR had already prepared, it was possible for the company to define inputs from the consultant and open the financial bids of all bidders whose technical scores were beyond a bench mark, as permitted under the guidelines of other multi-lateral funding agencies in cases where it was possible to define inputs required from the consultants.

4.6.2 Financial bid of the highest ranked technical bidder *viz.,* PCI led consortium* of Rs. 347.38 crore (exclusive of taxes, duties, levies and escalation) was opened and after negotiations, the contract was awarded at a price of Rs. 208.15 crore. The reduction in price was achieved by adjustments in vehicle cost, staffing schedule, reduction of scope and reduction in daily allowances, mobilisation and demobilisation charges, overheads, fees and profit.

4.6.3 A total of Rs. 254.10 crore was paid to the GC up to June 2006. Audit analysis of the work of the GC indicated that some factors were not anticipated by the GC while forecasting the requirements of the number of cars for Phase I ***(Annexure VII).*** Similarly, certain facts were not considered by the GC while recommending 1500 V DC TS in the underground corridor, as discussed in Chapter III.

4.6.4 The management stated (April 2008) that the JBIC guidelines for negotiating with the highest technically ranked bidder were based on the principle that the best consultant should be in place to manage the Project. It is, however, not clear how the reasonableness of the price negotiated with the highest ranked technical bidder was ensured under such a system.

Recommendation No. 10

In case it is possible to give a clear definition of inputs required from the consultants, their appointment should be based on a system where the best bid is selected on the basis of both technical quality as well as financial cost.

* ***comprising of PCI (Japan), PBI (USA), Tonichi (Japan), JARTS (Japan) and RITES (India).***

4.7 Tendering Procedures

4.7.1 Preparation of estimates

4.7.1.1 Finalisation of the cost estimates before the receipt/opening of financial bids is an established best practice, which helps in ascertaining the reasonableness of the prices obtained. This could have been done by the company as a consultant (GC) had been appointed for this purpose. It was seen in Audit that out of 13 'design and construct' contracts reviewed, in 7 cases (award value Rs. 3314.50 crore), the estimates were revised or approved after opening of financial bids. Thus, tenders were invited without benchmark estimates, in the absence of which efforts undertaken to optimise costs could not be ascertained. Further, out of these seven cases, in three cases (award value Rs. 3097.89 crore), even financial concurrence was not obtained before approval of the estimates by the competent authority ***(Annexure VIII)***.

4.7.1.2 Audit analysed the different stages of tendering process in two contracts, *viz.*, Metro Corridor (MC) 1A and 1B contracts as appearing at ***Annexure IX***. It is observed that the tenders were invited in October 1999 for both these contracts on the basis of the initial estimates in the DPR without firming up the cost estimates. The process of approval of cost estimates in both these contracts was initiated only after negotiations and opening of revised financial bids in October 2000. The estimates were approved in December 2000/January 2001 after receipt of the final negotiated bids.

4.7.1.3 The management stated (April 2008) that all major works were done on 'design and construct' basis and as such preparation of detailed estimates was not possible. They added that the five tier contract awarding procedure involving the GC, two internal committees, acceptance of the competent authority and concurrence by the JBIC, ensured that optimum prices were obtained for all the major works. The fact, however, is that the company had expressed its concern to the JBIC regarding lack of competition for major contracts. In such a situation, firming up of the estimates before opening of financial bids would have helped the company in ascertaining the reasonableness of the prices obtained and in optimising the prices during negotiation.

Recommendation No. 11
The company should evolve a system of finalising the cost estimates before inviting financial bids to maintain transparency and to ensure reasonableness of the offers received.

4.7.2 System of opening of bids

4.7.2.1 The JBIC guidelines permitted rejection of tenders and invitation of fresh ones in case the lowest evaluated bid exceeded the cost estimates by a substantial amount. The guidelines further provided that where exceptional circumstances justified this, the borrower may, as an alternative to re-tendering, negotiate with the lowest evaluated tenderer (or failing a satisfactory result of such negotiation, with the next lowest evaluated tenderer) to try to obtain a satisfactory contract.

4.7.2.2 In case of MC 1A and 1B contracts, the company requested (28 March 2000) for simultaneous negotiation with two or three the bidders as a departure from these guidelines. After initial reluctance to allow negotiation with two or three bidders simultaneously, the JBIC relaxed (August 2000) its guidelines after considering revision

of the specifications or modifications of the Project and advised the company to conduct negotiations with both the bidders in both the contracts. This departure from guidelines by the JBIC without the concurrence of the GOI was not in consonance with the loan agreement which laid down that any departure was to be requested by the borrower (*i.e.,* the GOI).

4.7.2.3 Revised bids were received (13 and 16 October 2000) from these consortia. Consortium 'A' remained the lowest evaluated tenderer for MC1B and Consortium 'B' (previously the second lowest tenderer) became the lowest evaluated tenderer for MC1A. The procedures adopted in bid opening and evaluation procedures of MC1A contract were examined and the following were noticed:

(i) Before the opening of the original bids it was recorded in the tender opening register that the seals of the envelopes were intact, but no such statement was recorded at the time of revised bids. Besides, the tender opening register for revised bids did not contain signatures of the tenderer's representatives.

(ii) A letter indicating a discount of 13 *per cent* on the contract price, stated to be in a separate envelope by the management, was placed on top of the revised financial bid documents of Consortium 'B' after making corrections to the page numbers of the bid documents. This letter did not find any mention in the covering letter of Consortium 'B' or in the tender opening register.

(iii) The corrections in page numbering, which have financial implication allowing the bidder to become the lowest evaluated tenderer, were not recorded by the GC in the financial evaluation report, as was done by it in the evaluation report of the original bids.

(iv) The fact that discount rate of 13 *per cent* was not mentioned in words, was not recorded by the tender opening committee.

4.7.2.4 The management stated (April 2008) that it was quite common that such discount letters were included in the bids at the last moment and, therefore, did not necessarily find place in the covering letter. Tender opening was witnessed by 17 representatives of the contractors and 10 representatives of the GC/the company; and bid prices were acknowledged by the two bidders by affixing their signatures in the 'negotiated price bid opening sheet'. The fact, however, remains that there were procedural shortcomings in the processing of bids and there was no mention of receipt of the sealed envelope in the tender opening register.

4.7.3 System of evaluation of bids

In one of the contracts for track works of Line 3, single tender was called for from IRCON International Limited. After negotiations, IRCON gave an offer for Rs. 86.61 crore which was 4.64 *per cent* higher than the estimated amount of Rs. 83.03 crore and the Tender Committee recommended award of the contract to IRCON at the negotiated offer value of Rs. 86.61 crore. The tender accepting authority observed that "Since our estimate does not include works contract tax (WCT) we should give a counter offer of our estimated cost and WCT on actual incidence". Accordingly the company gave a counter offer of Rs. 84.46 crore which was accepted by IRCON and the work was awarded to them. Audit noticed that the in-house estimates of cost were prepared based on the rates of last accepted order which already included WCT. Hence inclusion of WCT again has resulted in the counter offer being higher by Rs. 1.43 crore. The management replied (April 2008) that the intention of the competent authority was to

limit WCT to two *per cent* of the contract value. The reply is not tenable since the tender accepting authority was under the impression that the estimates did not include WCT which was not correct.

4.7.4 Relaxations in commercial and technical terms

As per the JBIC guidelines, a contract was to be awarded to a bidder who met the technical criteria and whose price bid was determined as the lowest. Audit found that in four contracts (MC 1A, MC 1B, SYS 1, RS 1) relaxations in commercial and technical terms *(Annexure X)* were allowed after the opening of the financial bids while negotiating with the lowest bidder (s). This practice was non-equitable as the other pre-qualified bidders were denied the opportunity to revise their bids in view of the change in commercial and technical terms. The management stated (April 2008) that the changes were not substantial and did not affect the functionality and safety of the product. Further, it resulted in reduction in the quoted price and the bid prices of other bidders were far too high to make a difference on this account and the practice was as per the JBIC guidelines. The fact, however, is that the JBIC guidelines were silent on technical and commercial changes in the bids during negotiations.

Recommendation No. 12

The company needs to further strengthen its system of processing of bids to bring in more accountability, transparency and fairness.

4.8 Construction supervision and contract execution

For Line 1 and Line 2, the company assigned the work of construction supervision to the GC who was responsible for the development of a suitable system for ensuring quality and time schedule for the work. In respect of Line 3, the company took upon itself the responsibility of construction supervision. Audit analysis of the time schedule and quality requirements and issues arising therefrom are discussed in Chapter V on Project Monitoring. Issues relating to payments are discussed below:

4.8.1 Payment of advances beyond contract provisions

In six cases, advances amounting to Rs. 38.72 crore not contemplated in the agreements were sanctioned to the contractors *(Annexure XI)*. The management stated (April 2008) that the interest bearing advances (except in one case) beyond contract provisions were given to contractors under compelling circumstances in the interest of the Project; and this had not resulted in any loss to the company. The fact remains that this was a deviation from the terms of the agreement.

4.8.2 Short recovery from contractors

(a) For effecting recoveries from the contractor (MC 1B contract) towards exemption of duties on supply of equipment, the company applied the rates applicable on the date of import/supplies, which were lower as compared to the rates prevailing on the date of submission of bids. This resulted in short-recovery of Rs. 14.41 crore towards excise duty (Rs. 9.50 crore) and customs duty (Rs. 4.91 crore). The management stated (April 2008) that the actual benefit, which could have accrued to the contractor on account of exemption, was only to be recovered from the contractor as per the contract. The reply is not tenable, as the rate applicable on the date of submission of bids, should have been the basis for effecting recoveries.

(b) During execution of the MCIA contract, the company allowed the contractor (October 2002) to replace 20-30 *per cent* of cement by fly ash for structural concrete subject to adjustment in contract price. However, the company did not recover Rs. 3.47 crore on this account, as the contractor argued that non-replacement of part cement with fly ash would have led to inferior concrete. The management stated (April 2008) that no adjustment was made as the use of fly ash was permitted as per the technical conditions. The reply is not acceptable because saving was to be passed on to the company as per the technical conditions and according to the IIT non-replacement of part cement would not have led to inferior concrete.

(c) As per the contract agreement, interest on advances was to be calculated from the first day of the month in which the advance was paid to the contractor. It was observed that there were short recoveries totalling Rs. 40.20 lakh from the contractors in four contracts, due to non-charging of interest for the month in which advances (second installment onwards) were released. The management stated (April 2008) that all the recoveries had been correctly carried out. However, Audit found (February 2008) that interest of Rs. 40.20 lakh had still not been recovered.

4.8.3 Payment of inadmissible claims

The company paid Rs. 6.92 crore against contractors' claims in eight contracts which were not admissible as per the contract agreement, as discussed below:

(a) In respect of four contracts*, the company allowed (September 2003) inadmissible claims of Rs. 4.43 crore to contractors towards price variation by revising the price variation formula for aggregates. This price variation should not have been allowed because of the failure of the contractors to adhere to the existing law.

(b) A contractor, while executing the work of bridge across river Yamuna, proposed a new design for construction of one pier, which did not require sand filling in remaining 14 wells. The company accepted the proposal and paid Rs. 10.89 lakh for this. Though the contractor has not filled sand in 14 wells, the company has released the payment of Rs. 49.43 lakh towards sand filling on the plea that it was a lump sum contract.

(c) Though the contract◆ did not have any price variation clause, the company accepted the contractor's claim of Rs. two crore towards increase in steel prices on the plea that SAIL's Kolkata stockyard prices (on which bid prices were based) had increased and there had been huge wastage of steel in fabrication of girders.

The management stated (April 2008) that the claims were admitted in order to complete the work on time. They added that in case these claims were not settled, the commissioning of the respective lines would not have been possible on time, thus incurring much more losses in terms of interest. Though acceptance of the inadmissible claims was stated to be in the interest of timely completion of work, the aforesaid contracts were not completed in time.

4.8.4 Non-levy of penalty

4.8.4.1 While discussing proposal for award of work of design, manufacture, supply and commissioning of passenger rolling stock comprising 240 cars, the BOD was informed

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* ***RC2B lot 2, RC2B lot 3, RC2B lot 4 and RC2B lot 5***

◆ ***fabrication, supply and erection of steel girders for viaduct on Barakhambha Road–Dwarka section***

that body shells of 100 cars were to be fully manufactured in India with indigenous material and any deviation would attract penalty of Rs. 150 crore on the contractor. The contract was awarded (22 May 2001) to Mitsubishi led consortium for Rs. 1456.30 crore with the condition that if the contractor failed to carry out the indigenous programme it would be treated as default on his part, entailing termination of the contract. There was, however, no provision for levy of any pecuniary penalty.

4.8.4.2 The management stated (April 2008) that in the event of the contractor failing to set up facilities for indigenisation, inordinate delay in commissioning of trains would have occurred, leading to levy of liquidated damages equivalent to 10 *per cent* of the contract value, which roughly worked out to Rs. 150 crore. Further, knocked down sub-assemblies of the shells were imported and car bodies of 180 coaches were assembled indigenously at Bharat Earth Movers Limited, Bangalore using these sub-assemblies. However, the assembly of body-shells from knocked-down sub-assemblies cannot be considered equivalent to manufacture of the same in the country with indigenous material and in the absence of any explicit clause in the contract agreement, no penalty could be imposed for non-utilisation of indigenous material.

Recommendation No. 13

To enforce utilisation of indigenous material by a contractor, explicit penalty clause should be incorporated in the contract agreement to serve as an adequate deterrent to the contractor.

4.8.5 Avoidable payment due to not allowing demobilisation of the plant

The company did not allow the contractor to demobilise the welding plant, though the welding work had been completed in one section (R2) of RC3 contract. As the plant remained idle for five months (April-August 2003), the company had to pay the contractor Rs. 1.43 crore. The management stated (April 2008) that the plant was an essential equipment having a bearing on the completion of the Project and thus a decision was taken not to allow the contractor to demobilise it. However, as the contractor had assured the demobilisation of the plant at the appropriate time, the company should have allowed the demobilisation and avoided payment of Rs. 1.43 crore.

CHAPTER V

Project Monitoring

5.1. Project implementation

5.1.1 The company was assigned the task of executing Phase I of the Project within 10 years from 1995-96. The three lines proposed for implementation under Phase I were sub-divided into eight sections, to be commissioned at six-monthly intervals starting from September 2002. As the dates of commissioning for individual lines were not provided in the DPRs, the completion date of the last section of each line as given in the DPR concerned was taken in audit as the completion date for that line. Audit found that there was delay in completion as shown in Table 3 below:

Table 3: Delay in completion of the lines

Line No.	Last Section	Date of completion as per DPR	Actual date of completion	Delay in months
1	Inderlok – Rithala	September 2003	March 2004	6
2	Connaught Place – Central Secretariat	March 2004	July 2005	15
3	Barakhamba Road – Indraprastha	September 2005	November 2006	14

5.1.2 Contending that the Project was completed in seven years and three months, *i.e.*, two years and nine months ahead of what was envisaged in the DPR 1995, the management stated (April 2008) that the implementation schedule stated in the DPR had no meaning till the DPR had been sanctioned by the GOI. Phase I of MRTS was sanctioned by the GOI in September 1996 and the organisation for execution of such a gigantic project was put in place thereafter. Subsequently, the proposal for allotment and acquisition of land, preparation of standards and specifications and tender documents was done. Considering the fact that the work of such complex nature was done in India for the first time, certain delays at the initial stage of the project were inevitable.

5.2 Quality control

Audit analysis of quality control indicated scaling down of testing requirements, non-witnessing of tests by the company's representatives, testing of material in non-accredited laboratories and non-preservation of test reports. The audit findings are discussed below:

5.2.1 Scaling down of testing requirements

Testing requirements were scaled down in four contracts as these contracts were falling behind schedule *(Annexure XII)*. The management stated (April 2008) that the testing was relaxed since the welding was being done by computerised submerged arc welding modern machines. As per past experience no pile had failed in load test and hence lateral load test was not conducted in contract No. 3C22. In case of contract 3C51R, the tests were not conducted by independent testing agency as the quality of steel was ultrasonically tested by the SAIL. The reply is not tenable because testing of weld joints

was reduced on the contractor's request to expedite activities at the plant, conducting lateral pile tests was the minimum requirement as per the IS code and independent testing of steel plates was done away with when the contract fell behind schedule.

5.2.2 Non-witnessing of tests by the company's representatives

The tests conducted by the contractors were accepted without being witnessed by the company's representatives in some cases in eight contracts*. The management's reply (April 2008) that the tests were witnessed by the company's representatives, is not correct as some of the test reports did not bear the signatures of the company's representatives.

5.2.3 Non-preservation of test reports

It was observed that test reports were not preserved. The management stated (April 2008) that it was not possible to keep records of all the tests conducted, as there were millions of tests and once the quality was certified by the engineers based on these tests, it was considered not necessary to keep the records of all these tests which would involve additional expenditure. In any case, the company was able to get the works done with international quality standards. The reply is not tenable because if any instance of failure occurs at a later stage, then the quality certificate of the engineer cannot be reviewed in the absence of test reports.

5.2.4 Non-submission of testing procedure plan by a contractor

In one contract, the testing procedure plan (TPP) was not obtained from a contactor as required by the Bill of Quantity. The management stated (April 2008) that the TPP adopted was exactly on the lines of previously accepted testing procedure plan for rail corridor contracts and no payment for the TPP was made to the contractor. They added that there was no laxity as the Quality Assurance Plan (QAP) was submitted by the contractor. The reply is not tenable as both the QAP and the TPP were to be submitted by the contractor and approved by the company for meeting the quality and testing standards.

5.2.5 Testing of material in non accredited laboratories

Examination of 222 test reports relating to five contracts◆ revealed that the tests were not conducted in accredited laboratories. The management stated (April 2008) that the tests were conduced for water, steel and cement from laboratories which were certified by/accredited to NABL/ISO and as it was not practical to conduct all tests independently, the manufacturers' test certificate needed to be relied on in many cases. The fact, however, remains that when such tests were required to be done independently, these needed to be got done through accredited laboratories, a view which has also been endorsed by the IIT.

Recommendation No. 14
In order to keep the records of test conducted, the company needs to lay down a preservation life for test reports. It also needs to evolve a mechanism for testing of material through accredited laboratories.

* *3C51R, 3C52R, RC2, RC2B lot2, RC2B lot5, 3C21R, 3C22 and 3C23*
◆ *RC2B lot2, RC2B lot5, 3C21R, 3C22 and 3C23*

CHAPTER VI

Land Management

6.1 Mandate for property development

The sanction (September 1996) of the Union Cabinet provided for transfer of land to the company on 99 years lease at the inter-departmental transfer rate for meeting the requirement for the Project. According to the sanction, a portion of the project cost (estimated at six *per cent*[*] of the revised project cost at April 1996 prices) over and above the equity and debt finance, was to be raised by the company through Property Development (PD). Accordingly, the company initiated activities for generating revenue from PD by way of leasing of shops and restaurants within station buildings and by leasing land for residential and commercial uses to private developers.

6.2 Land acquisition

6.2.1 Land for the Project was requisitioned by the company from land owning agencies, *viz.*, Land & Development Office (L&DO), DDA, the GNCTD, Municipal Corporation of Delhi (MCD) and other State and Central government departments, without indicating the areas of land required for the Project and for the PD. The allotment letters issued by the L&DO and the DDA laid down restrictive condition that land allotted could be used for the purpose of project construction only, violation of which would lead to cancellation of allotment of land. The management stated (April 2008) that PD was one of its authorised activities and non-appreciation of this concept by the land owning agencies had led to the allotment letters being issued in routine manner with usual terms and conditions. However, had the areas for the Project and the PD been delineated clearly while requisitioning the land, the company would have been better placed in getting the restrictive condition withdrawn from the allotment letters.

6.2.2 The company has acquired 32.38 lakh square metres (sqm) of land for Phase I of the Project but has not maintained location/station wise data of land used for the Project and the PD. In nine locations it was observed ***(Annexure XIII)*** that total land acquired was 6.42 lakh sqm, which was in excess of the Project requirement by 14 to 354 *per cent*. Further, out of 4.44 lakh sqm of land identified for the PD in 22 locations, the PD on 3.28 lakh sqm land had been completed up to March 2007. The management stated (April 2008) that the assessment of land was based on survey and planning while preparing the DPR and some extra land had to be acquired depending on local conditions, and also to meet the needs of future growth of traffic. They added that it was not always feasible to segregate land portion, because the PD was generally carried out in addition to operations on most of the lands acquired for the Project. The reply did not indicate the calculations for the extra land required. The company needs to maintain location wise data of land used for the Project and the PD.

6.3 Poor market response

6.3.1 In seven locations the company invited bids for the PD. It was observed that the company finalised the lease/concession for the PD at four locations[♥] on the basis of one

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[*] ***worked out to Rs. 300 crore.***

[♥] ***Shahdara, Seelampur, Pratap Nagar and Inderlok***

qualified bid received in each case and the amount realised was only 0 to 3 *per cent* over the reserve price ***(Annexure XIV)***. Apart from the restrictive clause for land use in the allotment letters, the poor response was because of stringent technical criteria fixed for the bid process. This is evident from the fact that in Seelampur where turnover and net worth criteria were fixed at Rs. 60 crore and Rs. 25 crore respectively, only one qualified bid was received and the amount realised was just three *per cent* over the reserve price; and when the turnover and net worth criteria were relaxed to Rs. 35 crore and Rs. 15 crore respectively for Khyala and Welcome locations, the amount realised was 32 and 36 *per cent*, respectively over the reserve prices.

6.3.2 The management stated (April 2008) that a committee consisting of Commissioner (LD, DDA) along with the L&DO and the Chief Urban Planner of the company concluded that revenues generated through the PD efforts were comparable and were in keeping with market trends. They added that the market response was governed by many factors such as market buoyancy, size and location of the plot, land bank available with the bidders, *etc*. The fact, however, remains that the company had obtained better response by scaling down the stringent technical criteria.

6.4 Accounting and utilisation of revenue from property development

The Ministry of Finance of the GOI allowed (October 2005) the company to retain Rs. 300 crore from the revenue generated from the PD as per the approved financing pattern. Revenue realised beyond this limit was to be transferred to the Consolidated Fund of India or alternatively the corresponding amounts were to be reduced from the budgetary support earlier approved as equity of the Project. The Empowered Group of Secretaries, in their meeting held in October 2005, constituted a committee[◊] to decide about the mechanism for utilisation of the balance amount. A meeting of this committee was held in September 2006 wherein representative of Planning Commission was of the view that the surplus funds should flow back to the Consolidated Fund of India and the company could get need based budget support. During the meeting with Finance Secretary in January 2007, the MD informed that the company had generated about Rs. 311 crore through the PD and after discussion it was decided that it was premature to decide utilisation of surplus funds when there were no surpluses. However, as the company has realised revenue of Rs. 631.71 crore up to 31 March 2008 from property development for Phase I, the surplus revenue should flow back to the Consolidated Fund of India.

Recommendation No. 15

(i) While requisitioning land, the company should clearly indicate the land needed for the project as well as the area demarcated for property developments at each location. Surplus land that cannot be used for the intended purpose, should be surrendered.

(ii) Surplus revenue from the property development activities of Phase I should flow back to the Consolidated Fund of India.

[◊] ***comprising the Secretary the MoUD, the MD, the Secretary the Department of Expenditure, representative from the Planning Commission and the Chief Secretary the GNCTD***

CHAPTER VII

Conclusions

7.1 The Delhi MRTS Phase I Project has been widely assessed as a success story in project implementation that is worth emulating in other projects. It is unique project, under the present administrative model. Some of the innovative practices that contributed to the successful implementation of the Project as reported by the management and as also observed by Audit are:

(i) All decisions were taken by participative discussions rather than through file notings. This led to speedy decision making. However, the company needs to record the minutes of such discussions for future reference and guidance to maintain continuity and to secure proper accountability;

(ii) The company has adopted exemplary practices to minimise inconvenience caused to the public during the construction of the Project.; and

(iii) The company has adopted international standards for fire, safety and environmental safeguards at work sites which are now being emulated by other projects being executed in the country.

7.2 Audit pointed out certain shortcomings and lapses in the systems and procedures, as highlighted below, to facilitate the management to further improve its systems and bring it at par with the best practices.

(i) The innovative practices adopted by the Project need to be adequately documented for the benefit of similar and other infrastructure projects;

(ii) Under the unique administrative model evolved by the Government of India, the company has not been put under direct control of any administrative ministry. This model presents ambiguity relating to the issues of (i) coordination and control by the executive government and (ii) the proper forum for legislative accountability. There are also no independent Directors on the Board of Directors of the company, a practice which is not conducive to good corporate governance.

(iii) The company has not prepared a Corporate Plan to chart out its goals and strategies for achievement of business development, diversification, technology upgradation, and customer satisfaction. It has also not 'Manualised' the procurement guidelines for domestically funded contracts.

(iv) The highest daily average ridership attained by the company was 21 *per cent* of the original projections and 29 *per cent* of the revised figure. The shortfall in ridership was mainly due to higher fare structure, lack of proper connectivity and lack of feeder bus system.

(v) The company adopted the broad gauge in Phase I as per the decision of the Group of Ministers. However, it was not ensured that the associated systems were planned and implemented to meet the stated objectives of adopting the broad gauge as envisaged by the Group of Ministers in August 2000.

(vi) The company has not provided Automatic Train Operation on all lines to ensure safer operation of trains. Noise levels were beyond the permissible limits and there were premature wear and cracking in the wheel and floor of the rolling stock raising doubts on the stipulated 30 years design life.

(vii) General consultant for the Project was appointed based on a system where the best bid was selected on 'technical quality' basis and not on 'technical quality cum cost' basis.

(viii) Out of 13 'design and construct' contracts reviewed in audit, estimates were revised or approved after opening of financial bids in seven cases. Further out of these seven cases, in three cases, even financial concurrence was not obtained before the approval of estimates by the competent authority.

(ix) On the request of the company, the JBIC allowed negotiation simultaneously with the first two lowest parties in two contracts, which was not in accordance with the loan agreement. A letter indicating discount of 13 *per cent* on the contract price, allowing a bidder to become the lowest evaluated tenderer in one contract, did not find any mention in the tender opening register.

(x) There were cases of granting advances (Rs. 38.72 crore) not provided in the contracts, short-recovery from contractors (Rs. 18.28 crore), payment of inadmissible claims (Rs. 6.92 crore) and avoidable payment (Rs. 28.02 crore).

(xi) The contract for design, manufacture, supply and commissioning of rolling stock was awarded with a condition that if the contractor failed to carry out the indigenous programme it would be treated as default on his part attracting termination of the contract. There was, however, no provision for levy of any pecuniary penalty.

(xii) Audit analysis of quality control indicated scaling down of testing requirements, non-witnessing of tests by the company's representatives, testing of material in non-accredited laboratories and non-preservation of test reports.

(xiii) The company has acquired 32.38 lakh square metre of land for Phase I of the Project but has not maintained location wise data of land used for the Project and property development. In nine locations the company acquired total land of 6.42 lakh square metre, which was in excess of the Project requirement by 14 to 354 *per cent*.

(xiv) The company finalised the lease/concession for property development at four locations based on one qualified bid received in each case and the amount realised was only 0 to 3 *per cent* over the reserve price. Apart from the

restrictive clause for the land use in the allotment letters, poor response was also because of the stringent qualifying criteria fixed for the bid process.

(PRAVIN TRIPATHI)
Deputy Comptroller and Auditor General
cum Chairperson, Audit Board

New Delhi
Dated: 20 October 2008

Countersigned

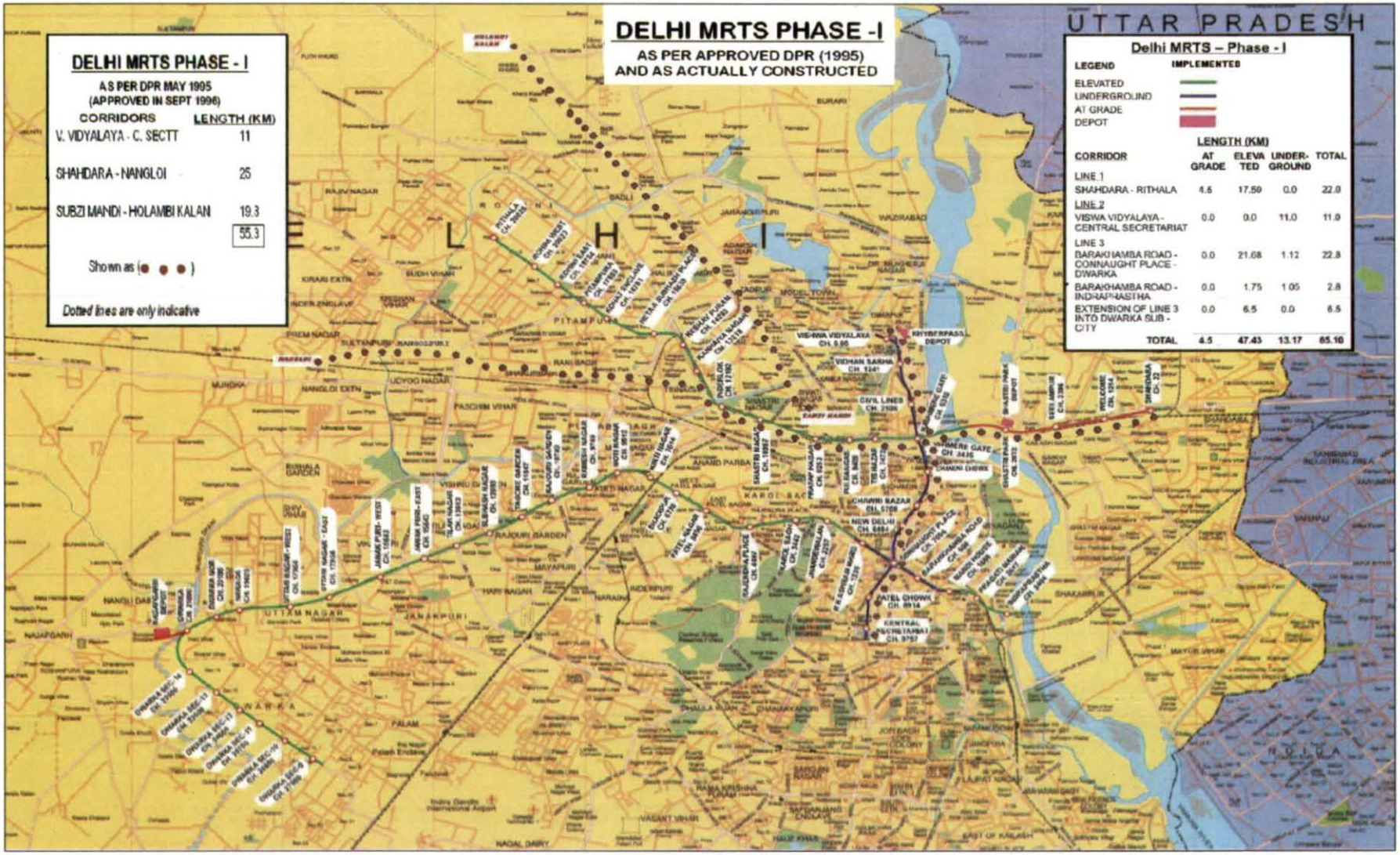
(VINOD RAI)
Comptroller and Auditor General of India

New Delhi
Dated: 20 October 2008

ANNEXURES

Annexure I

(Referred to in paragraph no. 1.2.3)



Annexure II

(Referred to in paragraph no. 3.2.3)

Statement showing estimated increase in the capital cost of the Project due to adoption of Broad Gauge

Particulars	Amount *(Rupees in crore)*
Extra cost of coaches	50
Extra cost of viaduct	90
Extra cost of land for depots	20
Cost over run due to delay of six months	100
Total	260

Annexure III

(Referred to in paragraph no. 3.2.3)

Statement showing expected additional energy consumption cost for Broad Gauge Rolling Stock

A: Assumptions made:

1. Train configuration: 4-Car trainset (DTC-MC-DTC)
2. Mileage earned per day: 360 kms approximately
3. Working days in a year (average): 350 days
4. Cost per unit of energy: Rs.5.00
5. Addition estimated energy consumption by Broad Gauge Rolling Stock as compared to Standard Gauge Rolling Stock on account of reduced weight and design: five *per cent* approximately

B : Calculation for Additional Estimated Energy Consumption cost:

1. Net Average Energy Consumed (total-regenerated energy) per Trainset Kilometer for 4- Car existing Broad Gauge train sets: 12.0 units approx.
2. Total Energy consumption per trainset *per annum*: 12.0x360x350 = 1,512,00 units
3. Total Energy consumption per for 60 trainset (in Phase I) *per annum*: 1,512,00x60 = 90,720,000 units.
4. Additional Energy consumption *per annum* by Broad Gauge Rolling Stock: 5 *per cent* of 90,720,000 = 4,536,000 units
5. Additional cost of Energy consumption *per annum*: Rs. 4,536,000 x 5 = Rs. 22,680,000 = Rs. 2.26 crore.

Annexure IV

(Referred to in paragraph no. 3.3.2.2)

Statement showing avoidable extra expenditure due to delay in taking decision on conversion of 1500 V DC TS to 25 kV AC TS

(Rupees in crore)

Particulars	Amount
Average cost of indigenous manufacture of 25 kV train (4 coaches)	17.67
Average cost of indigenous manufacture of 1500 V DC train (4 coaches) including conversion cost of Rs. 2.36 crore (Rs.15.49 crore + Rs. 2.36 crore)	17.85
Extra cost	0.18
Total extra cost for 17 trains	3.06
Avoidable design cost	23.53
Total avoidable cost in respect of rolling stock	**26.59**

Annexure V

{Referred to in paragraph no. 3. 6.2 (a)}

Statement indicating standard vis-à-vis actual noise levels of rolling stock

A. Interior noise levels

Train No.	Station	Permissible limit in decibles (dB)	Actual level measured in decibles (dB)
D 113	Kashmiri Gate	68	70.4
	Seelampur	68	72.5
	Welcome	68	68.9
	Shahdara	68	67.7
D 209	Rajiv Chowk	68	80.4
	Chawdi Bazar	68	69
	Chandni Chowk	68	73.9
M 341	Indraprastha	68	69.9
	Mandi house	68	69.8
D 113	Kashmiri Gate – Shahdara (elevated)	72	78.7
		72	70.8
	Shahdara-Seelampur (At-Grade)	72	71.2
		72	67
	Seelampur-Welcome (At-Grade)	72	77.3
		72	75.9
	Welcome–Shahdara (At-Grade)	72	78.9
		72	76.7
M 341	Indraprastha – Pragati Maidan	72	77.5
		72	81.2
	Pragati Maidan – Barakhamba Road	72	82.8
		72	86.7
	Barakhamba Road – Rajiv Chowk	72	80.9
		72	82.2

D 209	Rajiv Chowk – New Delhi	85	81.5
		85	74.5
	New Delhi – Chawadi Bazar	85	71.7
		85	84.7
	Chawadi Bazar – Chandni Chowk	85	74.8
		85	79.7
	Chandni Chowk – Kashmiri Gate	85	80.1
		85	81.1

B. Acceleration and deceleration noise on ballast track

Train No.	Station	Duration of measurement (Seconds)	Permissible limits (dB)	Observed levels (dB)
Acceleration	Sahadara – Welcome	12	72	72.4
	Welcome – Seelampur	12	72	--
	Seelampurm-Sashtri park	12	72	70.8
Deceleration	Sahadara – Welcome	20	72	71
	Welcome – Seelampur	20	72	72
	Seelampurm-Sashtri park	20	72	67.4

C. Cab noise level

Train No.	Description of activity	Duration of measurement (Seconds)	Permissible limits (dB)	Observed levels (dB)
D 119	Acceleration	5	70	71.8
		20	70	72.2
	Coasting	5	70	82.4
		20	70	73.9
	Braking	5	70	66.8

D. Door operating noise

Stations		Door opening(dB)	Door Closing(dB)	Permissible limits (dB)
SHD (D113)	1	63.9	77.8	72
	2	73.3	79.3	72
IND (M341)	1	76.9	76.2	72
	2		74.4	72

E. Exterior noise levels

Measuring points	Metro in shade (observed levels) (train no.D-102)		Metro outside shade (Observed levels)			Permissible limits in dB
Measuring time (Seconds)	Depot ballast less	Depot ballast less				
5	82.5	84.4	111.6	79.4	116.5	61
20	98.2	116.9	116.9	116.8	97.7	61

	Measurement Time Duration (Seconds)	L_{eq}	P_{max}	Permissible L_{Aeq} (dB)
Deceleration – Train Entering Station	7	86.5	116.5	72
	9	94.6	111.2	72
	21	88.0	116.5	72
Acceleration – Train leaving Station	10	85.7	116.9	72
	14	84.6	101.1	72
	20	84.4	106.8	72
Train Stationary	6	80.6	96.5	72

Annexure VI

(Referred to in paragraph no. 4.2)

Statement showing contracts selected for performance Audit

"Design and Construct" Contracts

Sl. No.	Contract No.	Description of work	Value of Award	Value of award (Rs. in crore)
1	3SO3	Signalling and Telecom line 3	Rs.59.91 crore + Euro 38.12 million	268.01
2	3SO3A	Signalling and Telecom line 3 extension-Dwarka subcity	Rs. 17.66 crore + Euro 8.403 million	61.91
3	3TO3	Turnouts	Euro 3.572 million	18.58
4	MC1A	Metro Corridor M1 (Vishwavidyalaya – ISBT)	Rs. 937.95 crore	937.95
5	MC1B	Metro Corridor M2 (ISBT – Central Sectt)	Rs. 1649.99 crore	1649.99
6	RS1	Rolling stock	Rs. 1456.30 crore	1456.30
7	SYS1	Signalling –Rail Corridor	Rs. 129.59 crore + Euro 68.218 million + $ 19.309 million.	509.95
8	SYS2	Traction line 2	Rs 103.01 crore+Euro 16.30 million+US$ 19.15 million	261.05
9	SYS4	Automatic Fare Collection for Rail Corridor	Rs 20.14 crore +Yen 1494.79 million	79.98
10	SYS5 lot 1	Lifts and Escalators line 1	Rs 4.29 crore+Euro 7.04 million	33.59
11	3E51 lot 1	Lifts and Escalators line 3	Rs. 3.25 crore + Euro 2.86 million	19.88
12	3SO2	Automatic Fare Collection for Line 3	Rs. 14.66 crore + Yen 1243.49 million	67.09
13	RC7A	Traction line 1	Rs.43.61 crore+ SEK 1430386/- + Euro 311930/- + $ 1117717/-+ GBP 7718/-	51.01
Total of "Design and Construct" contracts: (A)				**5415.29**

" Construct Only" Contracts

Sl. No.	Contract No.	Description of work	Value of Award	Value of award (Rs. in crore)
1	RC2B lot 4	Stations-line 1	Rs. 49.84 crore	49.84
2	RC2A lot 3	Viaduct-Line 1	Rs. 78.20 crore	78.20
3	RC2	Viaduct-Line 1	Rs. 36.20 crore	36.20
4	RC1	Yamuna Bridge	Rs. 37.60 crore	37.60
5	RC2B lot 2	Viaduct-Line 1	Rs. 80.48 crore	80.48
6	3C12B	Cut & Cover-Line 3	Rs. 17.85 crore	17.85
7	MC2A	Khyberpass depot	Rs. 67.67 crore	67.67
8	RC3	Track work Line 1 and Shastri Park Depot	Rs. 93.09 crore US$ 1.63 crore less Rebate 2.75%	164.67
9	RC2B lot 5	Stations-line 1	Rs. 35.22 crore	35.22
10	RC2B lot 3	Station Line 1	Rs. 48.49 crore	48.49
11	3C51R	Fabrication and supply of Girders for Viaduct Line 3	Rs. 18.23 crore	18.23
12	3C52R	Fabrication and supply of Girders for Station Line 3	Rs. 41.96 crore	41.96
13	3TO1	Trcak work Line 3 and Nazafgarh Depot	Rs. 78.52 crore + Euro 1.06 million	84.33
14	3C22	Viaduct-Line 3	Rs. 150.71 crore	150.71
15	GC	Consultancy	Rs. 98.68 crore Yen 2471.753 million US$ 9.622 million	213.29
Total of "Construct Only" contracts (B)				**1124.74**
Grand Total (A) + (B)				**6540.03**

Annexure VII

(Referred to in paragraph no. 4.6.3)

Factors not anticipated by the General Consultant while forecasting the requirements of Phase I

(i) Requirement of trains was based on the frequency at which trains have to be run during peak of the peak hours and not on total traffic carried per day. In certain sections of Lind 2 and Line 3, there was over crowding. To sustain ridership and to meet expectation of commuters during peak of the peak period, peak headway needed to be reduced.

(ii) It was planned that during peak period there would be one traffic standby on each corridor, for introduction in case of any problem with train or its On Board Signalling system. Experience showed that traffic standbys were required at both ends of each corridor (three more trains).

(iii) Certain modifications and improvements in trains were needed for which trains needed to be withdrawn for a longer period. Maintenance reserve of eight *per cent* considered during planning of Phase I did not envisage this requirement and one train was required for the same on continuous basis.

(iv) Trains for Dwarka sub city extension of 6.5 km up to Sector-9 as DDA deposit works were to be provided by the Company. Earlier, no trains were procured for this extension, though five trains were required for commercial services in this section.

Annexure VIII

(Referred to in paragraph no. 4.7.1.1)

Statement showing details of estimates approved without obtaining financial concurrence

Sl. No.	Contract No.	Description of work	Date of financial bid opening	Date of approval of estimate by MD	Value of approved estimate (Rs. in crore)	Value of work awarded (Rs. in crore)
1	MC1A	Metro Corridor (M1)	31.03.2000	02.01.2001	1036.40	937.95
2	MC1B	Metro Corridor (M2)	15.04.2000	29.12.2000	1811.85	1649.99
3	SYS1	S&T-RC & MC	25.07.2000	05.01.2001	508.10	509.95
Total						3097.89

Annexure IX

(Referred to in paragraph no. 4.7.1.2)

Statement showing different stages of tendering and estimation process

MC 1 B

Sl. No.	Date	*Tendering procedure*	Estimation
1.	15.4.99 to 10.5.99	PQ applications on sale	DPR estimates available but amount not disclosed in the PQ document
2.	2.9.99	Completion of PQ and intimation to pre-qualified applicants	-do-
3.	15.10.99	Main tender put on sale	DPR provisions revised by GC but corresponding revision of estimates was not done at this stage. No mention of estimated cost of work in the tender documents.
4.	10.12.99	---	GC estimates received (Rs.1653 crore) which were not detailed estimates but contained monetary value of changes in DPR provisions incorporated in the main tender. These were not put in the process for approval by the Company.
5.	21.2.2000	Technical bid opening	--
6.	15.4.2000	Financial bid opening L1 – Dywidag - 2010.10 L2 – Kajima - 2180.9 L3 - Obayashi – 3383.3	GC asked to evaluate the bids on the basis of updated DPR estimates of Rs.1299 crore (without considering the additional monetary impact due to changes in DPR provisions)
7.	Till June 2000	Evaluation of financial bids. L1 stipulated deviations and the loading done by GC to bring L1 at par with other bidders changed the L1 status (*i.e.,* L2 became L1). GC evaluation was not agreed to by the tender committee which did its own loading at the end of which L1 status remained.	--
8.	14.6.2000	JBIC asked to give concurrence to negotiate with L1 bidder and reminded on 4July 2000	--
9.	25.7.2000	JBIC did not concur with the loading practice adopted by the Company and advised the Company to seek clarifications from the bidder.	--
10.	Till August 2000	Clarifications sought from bidders and bids re-evaluated. L1 status remained same.	--
11.	17.8.2000	JBIC concurrence sought for negotiation with L1 bidder and it was also indicated that in order to reduce bid price, certain changes in ER would be required	--
12.	21.8.2000	JBIC informed that negotiations be conducted with lowest two bidders at the same time and in an impartial manner	--
13.	20.9.2000 to	Negotiation with the lowest two	Before going in for negotiations, the

	23.9.2000	bidders	Company asked GC to prepare possible areas of cost reduction (both technical and commercial), which was done by GC. However during negotiations (no authenticated record of which existed) certain other areas of reduction seemed to have come up. (as inferred from the unsigned minutes)
14.	23.9.2000	Issue of addendum to the tender incorporating changes in ER. (relaxation of commercial conditions and technical changes)	Anticipated savings (item-wise) not worked out at this stage. The Company's attempt was to secure a bid as close to the DPR estimate of Rs.1299 crore as possible.
15.	16.10.2000	Negotiated bid opened and L1 adjudged (Offer-1832)	-do-
16.	30.10.2000 to 10.11.2000	Negotiation with L1 bidder with a view to bring down the prices as much as possible. JBIC already told that further negotiation, i.e. after negotiated bid opening would be only with L1 bidder. JBIC agreed with the stand but stressed that, if any conditions/specification was relaxed, equal opportunity was to be given to the other bidder also.	-do-
17.	21.11.2000	--	CPM (Metro) sent GC estimates (Rs.1683 crore) (excluding items of electrical, tunnel, ventilation and air conditioning of stations, to Finance.
18.	28.11.2000	Revised offer from L1 bidder (Rs.1688 crore) who was asked to give another bid showing WCT separately.	-do-
19.	30.11.2000	--	Finance returned estimates file with queries.
20.	12.12.2000	Final offer from the L1 bidder (offer – Rs.1681 crore – Rs.1650 + WCT Rs.31 crore)	--
21.	18.12.2000	--	In response to finance queries, CPM (Metro) has recorded in the estimates file that the earlier estimates were for a different exercise which was no more required.
22.	19.12.2000	--	Fresh estimates of GC (detailed) sent to Finance for vetting
23.	22.12.2000	--	Finance returned file with queries
24.	23.12.2000	--	GC answered finance queries
25.	26.12.2000	--	Finance gave its further remarks on GC reply and marked certain items for GC's notice
26.	29.12.2000	--	File returned to CPM (Metro) who gave his reply to further remarks of Finance. File routed directly to Director (P) and thereafter to MD who approved the estimates.

MC1A

<table>
<tr><th>Sl. No.</th><th>Date</th><th>Tendering Procedure</th><th>Estimation</th></tr>
<tr><td>1</td><td>15.4.1999 to 10.5.1999</td><td>P.Q. application on sale</td><td>DPR estimates available but amount not disclosed in the PQ document.</td></tr>
<tr><td>2</td><td>27.07.1999</td><td>Completion of P.Q. and intimation to pre-qualified bidders</td><td>Do</td></tr>
<tr><td>3</td><td>06.10.1999</td><td>Main tender put to Sale</td><td>Do</td></tr>
<tr><td>4</td><td>07.02.2000</td><td>Technical Bids Opening</td><td>-------</td></tr>
<tr><td></td><td>28.03.2000</td><td>The Company wrote to JBIC seeking permission to negotiate with second lowest bidders simultaneously.</td><td></td></tr>
<tr><td>5</td><td>31.03.2000</td><td>JBIC did not agree with the Company view.</td><td></td></tr>
<tr><td>6</td><td>31.03.2000</td><td>Financial bid opening:- (Rs. in crore)
<table>
<tr><td></td><td>M/s Dywidag Group</td><td>M/s KUMAGAI Group</td><td>Difference</td></tr>
<tr><td>Prices without change of employer requirement</td><td>1002.44</td><td>1392.94</td><td>390.56</td></tr>
<tr><td>Prices with change of employer requirement</td><td>1047.90</td><td>1399.10</td><td>351.20</td></tr>
<tr><td></td><td>+ Conditions (Valuing Rs. 158.80 crore)</td><td>+ Conditions (Valuing Rs.14.20 crore)</td><td></td></tr>
</table></td><td>In letter dated 31March 2000, the Company stated that DPR estimate (updated to the current price level) should be the basis of tender evaluation. GC prepared updated estimate (January 2000 prices) amounting to Rs.769.30 crore with average eight per cent increase for escalation during construction and submitted its Report on 25 April 2000.</td></tr>
<tr><td>7</td><td>07.04.2000</td><td>The Company again wrote to JBIC asking them to reconsider the decision communicated on 31March 2000</td><td></td></tr>
<tr><td>8</td><td>25.04.2000</td><td></td><td></td></tr>
<tr><td>9</td><td>25.04.2000</td><td>G.C. submitted its financial Report with recommendation to negotiate with L_1</td><td>The Company internally worked out the estimates amounting to Rs.653.60 crore and the same was vetted by Finance on 28 April 2000 for Rs.649.30 crore</td></tr>
<tr><td>10</td><td>8.5.2000</td><td>The Company approached JBIC for their concurrence on the proposal for conducting negotiation with the lowest evaluated tender i.e., M/s Dywidag led JV.</td><td></td></tr>
<tr><td>11</td><td>21.8.2000</td><td>JBIC responded for negotiation with both tenderers at the same in an impartial manner.</td><td></td></tr>
<tr><td>12</td><td></td><td>Negotiation were held on 18, 19^{h}, & 23 September 2000</td><td></td></tr>
<tr><td>13</td><td>23.9.2000</td><td>Addendum No 6 was issued in respect of relaxation of Commercial as well as Technical Requirements.</td><td></td></tr>
<tr><td>14</td><td>29.9.2000</td><td>Addendum No 7 was issued stating that discount would be applicable separately for MC1A and MC1B.</td><td></td></tr>
<tr><td>15</td><td>3.10.2000</td><td>Addendum No 8 was issued in respect of not taking into account any condition that did not have financial impact.</td><td></td></tr>
</table>

<table>
<tr><td>16</td><td>13.10.2000</td><td colspan="4">Both Bidders were called for negotiating financial bid on 23 September 2000 .The status at the time of opening of revised financial bid was as under: (Rs. in crore)</td><td></td></tr>
<tr><td rowspan="3">17</td><td rowspan="3"></td><td></td><td>M/s Dywidag Group</td><td>M/s KUMAGAI Group</td><td>Difference</td><td rowspan="3"></td></tr>
<tr><td>Gross Negotiated Prices</td><td>1109.27</td><td>1034.66</td><td>74.61</td></tr>
<tr><td>Less:- Discount</td><td>24.97</td><td>29.56</td><td></td></tr>
<tr><td>18</td><td></td><td>Net Price</td><td>1084.30</td><td>905.10</td><td>184.15</td><td></td></tr>
<tr><td>19</td><td></td><td></td><td>+ Conditions (Valuing Rs. 39.20 crore)</td><td>+ Conditions (Valuing Rs. 155.70 crore)</td><td></td><td></td></tr>
<tr><td>20</td><td>25.10.2000</td><td colspan="4">JBIC wrote to the Company about objections of M/s Dywidag Group.</td><td></td></tr>
<tr><td>21</td><td>16.10.2000.</td><td colspan="4">Clarifications were called for from M/s KUMAGAI Group</td><td></td></tr>
<tr><td>22</td><td>20.10.2000</td><td colspan="4">Clarifications were submitted by bidder.</td><td></td></tr>
<tr><td>23</td><td>25.10.2000.</td><td colspan="4">Clarifications were called for from M/s Dywidag Group.</td><td></td></tr>
<tr><td>24</td><td>27.10.2000.</td><td colspan="4">Further, clarifications were called for from M/s KUMAGAI Group.</td><td></td></tr>
<tr><td>25</td><td>27.10.2000</td><td colspan="4">Discussion with M/s KUMAGAI Group regarding negotiated Price Bid</td><td></td></tr>
<tr><td>26</td><td>7.11.2000</td><td colspan="4">Informed to JBIC regarding negotiation with M/s KUMAGAI Group.</td><td></td></tr>
<tr><td>27</td><td>27.10.2000 to 22.12.2000</td><td colspan="4">The Company finally negotiated the total price to Rs. 975.47 crore with M/s KUMAGAI led JV after withdrawal of the conditions having value of Rs.155.70 crore.</td><td>CPM referred (27 December2000) the final estimates of Rs. 1036.40 crore to Finance after finalisation of negotiation with L_1. Finance raised observations out of which certain important ones remained unanswered. M.D. approved these estimates on 2 January 2001 without the concurrence of Finance and termed it as academic exercise.</td></tr>
</table>

Annexure X

(Referred to in paragraph no. 4.7.4)

Details of relaxation in commercial terms and change in scope of work after bid opening

Sl. No.	Contract No.	Details of relaxation in commercial terms after bid opening
1	RS 1	i) Reduction in warranty period ii) Increase in mobilisation advance iii) Reduction in maintenance period iv) Change in formula of LD v) Reduction in payment period from 56 days to 28 days
2	MC1A	i) Reduction in performance warranty period ii) Reduction in LD formula iii) Reduction in payment period from 56 days to 28 days iv) Advance payment increased to 15 *per cent*
3	MC1B	i) Advance payment increased to 15 *per cent* from 10 *per cent* ii) Defect liability period reduced to 52 weeks from 104 weeks iii) LD recovered at intermediate Key Dates to be refunded if no effect on subsequent Key Dates iv) Clause 33(ii) of SCC provided that the employer may during a period of three years from the date of taking over of the whole work, purchase as many parts as required by him, at the rates indicated in the schedule. Earlier this period was ten years. v) In Employer's risk following clause was added: "Any operation of the forces of nature against which an experienced contractor could not reasonably have been expected to take precautions".
4	SYS1	i) Reduction in Defect Liability period ii) Increase in foreign currency advance to 15 *per cent* of contract price (equivalent to Rs.12.00 crore). iii) The Company to be responsible for any cost arising from an increase in the rates of taxes/duty/cess except Income Tax with relevance to those stated in the tender. If the actual taxes were less than the amount quoted, the contractor would pass on benefit to the Company.

Sl. No.	Contract No.	Details of change in scope of work after bid opening
1	RS 1	i) Reduction in car body weight ii) Change in supply documents of the software, *i.e.* after expiry of warranty period iii) Change in door closing timing from 2.5-3 seconds to 2.5-3.5 seconds iv) Increase in gap between the door and leaf edges (from between 300mm and 10mm to 300mm and 50mm) v) Change in service life of the rubber springs from nine to six years vi) Change in brake service reservoir period from five to three years
2	MC1A	i) Provisional sum for utilities amended ii) Change in Design criteria for cross passages, station layouts, water chiller and concrete mix
3	MC1B	i) HQ/BCC Building deleted, scope amended to design only ii) Chiller installation for three minutes headway added iii) Provisional sum for utilities amended
4	SYS1	i) Deletion of BCC

Annexure XI

(Referred to in paragraph no. 4.8.1)

Statement showing payment of advances beyond contract provisions

(Amount: Rupees in crore)

Sl. No.	Contract No.	Name of contract	*Award value*	Amount of advance released beyond contract provision	Whether interest bearing
1	RC 2A LOT 3	Construction of viaduct	78.20	6.12	Yes
2	RC 2B LOT 4	Construction of stations	49.84	3.00	Yes
3	RC 2B LOT 5	Construction of stations	35.22	1.50	Yes
4	MC 2A	Construction of Khyber pass depot	67.67	8.55	Yes
5	3C 22	Construction of viaduct	150.71	4.00	Yes
6	RS 1	Rolling stock	1456.30	15.55	No
TOTAL				**38.72**	

Annexure XII

(Referred to in paragraph no. 5.2.1)

Statement showing scaling down of testing requirements in some contracts

Sl. No.	Contract No.	Requirement	Actually done
1	3C51R	(i) Ultrasonic testing of steel plates was to be done by independent agency as per the approved Quality Assurance Plan. (ii) One sample per lot was to be tested	(i) Initially this was being done but when the contract was going behind schedule, the steel plates were accepted on manufacturer's certificate. (ii) One sample for the entire quantity received at site was taken.
2	3C52R	(i) 100 *per cent* radiography testing on welded joints was required to be done for curved portals (ii) One sample per lot was to be tested	(i) Radiography testing on welded joints was scaled down to 10 *per cent* for curved portals (ii) One sample for the entire quantity received at site was taken.
3	3C22	IS code 2911 (part 4), provided that routine load tests may generally be one-half *per cent* of total number of piles required and may be increased to two *per cent* depending upon nature, type of structure and strata conditions.	Out of 1105 piles cast under the contract, no pile was tested for routine lateral load. Even none of the eight test piles was tested for lateral load.
4	RC2A lot 3		Out of 762 working piles cast, vertical load test on two piles (0.27 *per cent*) and lateral load test on one pile (0.13 *per cent*) was carried out.

Annexure XIII

(Referred to in paragraph no. 6.2.2)

Statement showing acquisition of land more than that required for the project

(Area in square meter)

Sl. No.	Location	Area acquired	Area utilised / identified for property development	Area used for MRTS	Area acquired over MRTS requirement (*per cent*)
(1)	(2)	(3)	(4)	(5)=(3-4)	(6)=4/5*100
1	Welcome	91895	71638	20257	353.65
2	Seelampur				
3	Rithala	41330	*22620	18710	120.89
4	Khyber Pass	378000	108000	270000	40.0
5	Subhash Nagar	19774	6445	13329	48.35
6	Dwarka Morh	36930	21808	15122	144.21
7	Shahdra	37885	7704	30181	25.53
8	Pratap Nagar	3361	2000	1361	146.95
9	Inderlok	33045	3995	29050	13.75
	Total	**642220**	**244210**	**398010**	

includes 10594 sqm identified for PD

Annexure XIV

(Referred to in paragraph no. 6.3.1)

Statement showing locations where Property Development has been completed

(Rs. per square meter)

Location	Basis of leasing	Area in sq.mt.	No. of qualified bids received	Date Of Award	Name of the Developer	Reserve Price (Rs)	Price at which the land allotted (Rs)	Variation over Reserve price (percentage)
Shahdara*	Bidding	7704	1	January 2005	PDL	18004	18627	3
Welcome*	Bidding	30604	2	March 2006	PDL	17666	24045	36
Seelampur*	Bidding	41034	1	June 2005	PDL	16104	16511	3
Pratap Nagar *	Bidding	2000	1	February 2005	PDL	17568	18011	2
Indeerlok *	Bidding	3995	1	July 2004	PDL	19699	19699	0
Rithala **	Auction	12026	14	October 2005	APRE	40000	45568	14
Khyber Pass *	Bidding	50000	2	July 2003	MGF	20 cr.+5%	20 cr. +5.1% + 5%	-
Khyber Pass **	Auction	58000	6	March 2004	PDL	14705	28529	94
Khyala *	Bidding	33951	2	January 2007	NBL	46003	60976	32
Subhash Nagar **	Auction	6445	15	November 2005	PDL	35000	68285	95
Dwarka Morh **	Auction	21808	7	November 2005	UHPL	35000	35006	1

*** Commercial ** Residential**

GLOSSARY OF ABBREVIATIONS

Sl.No.	Abbreviations	Full Form
1.	AC	Alternating Current
2.	AFC	Automatic Fare Collection
3.	ATO	Automatic Train Operation
4.	ATP	Automatic train Protection
5.	ATS	Automatic Train Supervision
6.	BG	Broad Gauge
7.	BMS	Building Management System
8.	BOD	Board of Directors
9.	BOQ	Bill of Quantity
10.	CBTC	Communication Based Train Control
11.	CP	Corporate Plan
12.	DC	Direct Current
13.	DDA	Delhi Development Authority
14.	DEA	Department of Economic Affairs
15.	DPR	Detailed Project Report
16.	EMU	Electrical Multiple Unit
17.	GC	General Consultants
18.	GNCTD	Government of National Capital Territory of Delhi
19.	GOI	Government of India
20.	IIT	Indian Institute of Technology Delhi
21.	IS	Indian Standards
22.	ISO	Indian Standards Organization
23.	ITT	Instructions to Tenderers
24.	JBIC	Japan Bank for International Cooperation
25.	Km	Kilometer
26.	L&DO	Land & Development office
27.	MCD	Municipal Corporation of Delhi
28.	mm	Milimeter
29.	MoUD	Ministry of Urban Development
30.	MRTS	Mass Rapid Transit System
31.	NABL	National Accreditation Board of Testing Laboratories
32.	OECF	Overseas Economic Cooperation Fund, Japan
33.	OHE	Over Head Equipment
34.	PD	Property Development

35.	PSU	Public Sector Undertaking
36.	QAP	Quality Assurance Plan
37.	SAIL	Steel Authority of India Limited
38.	S&T	Signal &Telecommunication
39.	SG	Standard Gauge
40.	SSI	Solid State Interlocking
41.	TBM	Tunnel Boring Machine
42.	TPP	Testing Procedure Plan
43.	TS	Traction System
44.	WCT	Works Contract Tax