CHAPTER-3
CONTRACT AND PROJECT MANAGEMENT

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3.1 A comprehensive framework of rules and procedures for tendering and contract management is essential for execution of works in an economic, efficient, effective and transparent manner. DMRC formulated (2012) and adopted Procurement Manual for procurement of goods and services. DMRC also formulated General Conditions of Contract, formats for Notice Inviting Tender, Instructions to Tenderers, and Schedule of Powers to different levels of officers. Besides, DMRC followed guidelines of Japan International Cooperation Agency (JICA) for JICA funded contracts.

Audit analysed the procurement of goods and services at the Pre-tender[64], tender[65] and execution stages by reviewing 47 selected civil contracts and 03 other contracts (CC-11, CC-86 R and CC-95) out of 127 civil contracts (more than ₹ 5 crore) executed during Phase-III to assess whether project execution and contract management was done with due care, economy and in a timely and transparent manner. The significant deficiencies noticed are brought out in the following paragraphs.

3.1.1 Discrepancies in estimation of cost of work

In the DPR (February 2011), the estimated cost of elevated station and viaduct were ₹20.59 crore per station and ₹29.87 crore per km, respectively. These were assessed on the basis of the completion cost of Phase-II, duly updated to January 2011 price level by adding escalation of five *per cent* per annum. DMRC estimated (March 2012) the civil construction cost as ₹598.19 crore for CC-26R contract for construction of viaduct of 9.03 km and eight elevated stations.

In this regard, Audit observed that the cost estimation was made by escalating the awarded rates (awarded in 2006) of BC-7, BC-8 and BC-9 by five *per cent* per annum to obtain the estimated rate as in February 2012 (i.e., 34 *per cent* increase). These works were completed in 2009-2010. Computation of estimated price of CC-26R contract by escalating the six year' old rate by five *per cent* per annum, resulted in higher estimated cost by 23 *per cent* (i.e., 34 *per cent* calculated on the basis of five *per cent* per annum minus actual price escalation i.e., 11.02 *per cent*). DMRC invited (August 2012) Notice Inviting Tender at ₹537 crore (i.e., 90 *per cent* of estimated cost of ₹598.19 crore i.e., as per prevailing practice). Considering the actual escalation, the estimated cost was derived at ₹486.33 crore (598.19/ 1.23). Thus, the estimates were prepared on the higher side by ₹111.86 crore (i.e. ₹598.19 crore -₹486.33 crore).

The Ministry/ GNCTD and DMRC accepted (January 2021 and July 2020) that rates of completed projects are more reliable and should be considered for estimation of tender value of any work rather than using escalation @ five *per cent per annum*. Actual price escalation on the rates of completed similar work are more reliable and appropriate.

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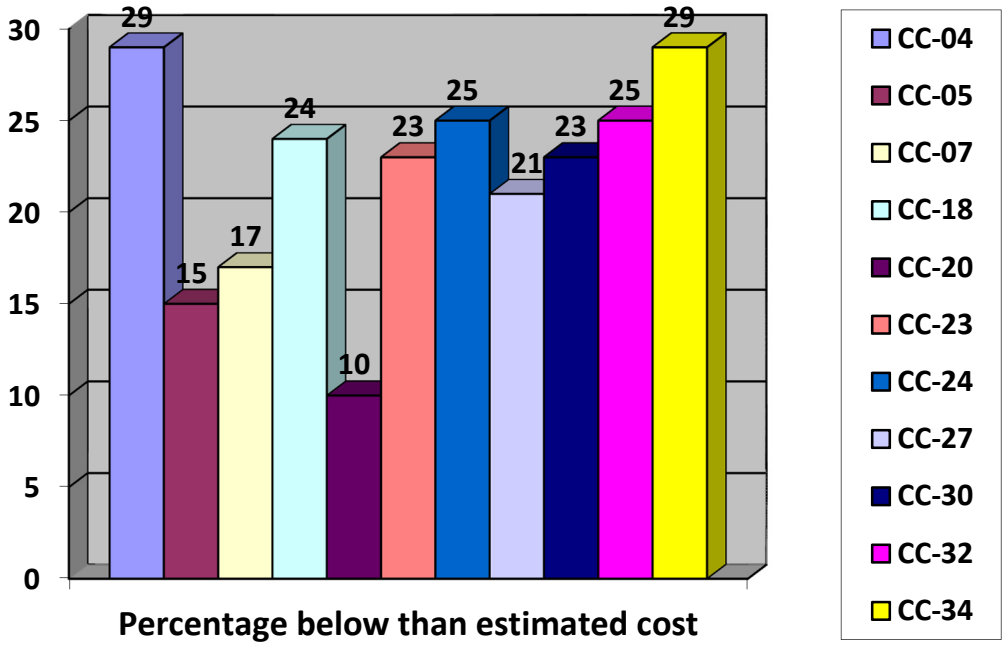
[64] ***Pre-tender stage includes cost estimation, finalisation of bidding criteria, preparation of Notice Inviting Tender etc.***

[65] ***Tender stage includes opening of bids, evaluation of bids, award of work etc.***

3.1.2 Non-preparation of justified cost estimates

The justified cost is prepared to ascertain if the bid price is reasonable and reflects the current market rates to ensure responsiveness of the bidder. The criteria could be to assign current market rates to the standard labour, material, and equipment coefficients. Since this process was not adopted in DMRC, it was not possible to be assured at any given point of time that the price quoted by the lowest bidder was justified or not. There was also the risk of susceptibility to manipulation in case of a cartel among the bidders. In case of contract CC-18, it was noticed that the contractor had quoted a rate of 24.4 *per cent* below the DPR provision and the work was awarded. There were many such cases where the tendered cost was well below the estimated cost as detailed in Chart 3.1.

Chart 3.1



It would be unreasonable to assume that the contractor quoted for such huge contracts at a prospective loss[66] or they were expecting to compromise the quality of the deliverables for the project. Had there been a system to estimate the justified cost, DMRC would have been able to know the likely cost.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that the practice of making justified cost estimate is relevant when works are executed based on Bill of Quantity basis such as building works wherein the risk due to unpredictable scenario is substantially low or absent. However, in case of metro system, works are executed in an urban environment wherein the level of uncertainties regarding geotechnical strata, soil conditions, water-table, building conditions, utilities etc., are much higher. Besides, most of these works are high expertise works and cannot be

[66] ***i.e., quoting 10 per cent to 29 per cent lower than estimated price given by DMRC***

based on item rate schedules. Hence, last accepted rate of Phase-II completed works were adopted to derive the cost estimates for the works in reference.

The reply of the Ministry/ GNCTD/ DMRC needs to be viewed in the light of the fact that DMRC has been working in the same urban environment since 1996 and has gained adequate expertise to estimate costs of non-standard items like geotechnical strata, soil conditions, water-table, building conditions, utilities etc. Thus, the explanation of adopting last accepted rate is far from convincing and a progressive organisation like DMRC should not continue with it just because it is the adopted practice. Hence, DMRC may establish a cell to study the cost aspects of various projects and come up with a schedule like Delhi Schedule of Rates for metro projects. This would be a great contribution to the metro community across the country.

3.2 Appointment of General Consultant on nomination basis

During the implementation of Phase-I of Delhi MRTS project, DMRC appointed General Consultant[67] at a price of ₹208.15 crore. During the Performance Audit of Delhi MRTS Phase-I, Audit recommended (Recommendation No. 10) that the appointment of General Consultant should be based on a system where the best bid is selected based on both technical quality and financial cost.

Para 11.2.5.8 of DPR of Phase-III states that implementation of Phase-I and Phase-II has enabled DMRC to acquire expertise for implementation of metro projects. The need to engage an all-embracing team of 'General Consultant' for execution of Phase-III will therefore not arise. However, a few expatriate specialists may still be needed to assist in certain specialised areas like signalling, boring of tunnels by Tunnel Boring Machines, etc. Detailed Design Consultants for a few areas may, however, be engaged.

However, DMRC continued the consultancy service of the same General Consultant during the Phase-III project on nomination basis. Letter of Acceptance (LoA) was issued on 08 June 2012 for contract period of 51 months and their services continued upto 31 March 2020 with total expenditure of ₹235.83 crore. In addition, Detailed Design Consultants viz. M/s Ayesa and M/s Systra were also appointed for Line-7 and Line-8 and work was awarded (2011) to them at ₹64 crore. In this regard, Audit observed that:

(i) In violation of the DPR recommendations, DMRC continued the services of the existing General Consultant for the entire Phase-III and NCR extensions, in addition to appointment of Detailed Design Consultants for Line-7 and Line-8. Thus, even after 20 years in the field of execution of MRTS project, DMRC availed the services of General Consultant and Detailed Design Consultants during Phase-III indicating that DMRC was unable to develop/ strengthen its internal design or supervision mechanisms and had to depend on outside consultant. Besides, Central Vigilance Commission (CVC) guidelines restrict the award of tender on nomination basis and emphasised that

[67] ***a consortium of M/s PCI-PBI-TONICHI-JARTS-RITES***

appointment of consultant should be done in a transparent manner. Yet, DMRC did not explore the possibility of open tendering for appointment of consultant.

(ii) As per the Japan International Co-operation Agency (JICA) guidelines (Section 3.02), single-source selection may be appropriate only if it presents a clear advantage over competition in terms of natural continuation of previous work, emergency cases, very small assignment, and single eligible firm. However, a major part of the initial Phase-III corridors was based on state of art technology like Communication Based Train Control system, Unattended Train Operation based Rolling Stock, etc., which were not implemented during the earlier phases of DMRC and the length of Phase-III corridors was more than metro corridors constructed during Phase-II. Thus, the continuation of the existing consultant was not justifiable.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that to rope in the new technology of tunnelling in underground sections, Communication Based Train Control technology for Unattended Train Operation mode of operation (for the first time in India), necessitated the induction of General Consultant. The names of stations are mentioned in the DPR but design and construction method, integrating with the multi modal system required the expertise provided by General Consultant. The scope of Detailed Design Consultant was to stipulate the broad technology and assistance in preparation of Tender Documents while the role of General Consultant was to implement (including supervision of site) the project with the latest technology, construction method and assurance of high level of Safety and Quality. Since the award of contract to General Consultant was a natural continuation and the rates were negotiated in conformity with the prevailing rates, there was no need of bid comparison.

The reply of the Ministry/ GNCTD/ DMRC is not acceptable as the same technology was used in the construction of underground section of Phase-I. Even after execution of two phases of DMRC and supervision consultancy of other metros, DMRC still has to depend on supervision and monitoring by General Consultant. Further, without resorting to open bidding and comparison with other consultancy work, it is not clear how DMRC's negotiated rates were the prevailing rates. Further, Bangalore Metro Rail Corporation appointed General Consultant for Phase-I MRTS project based on Global tender/ competitive bidding basis. For Phase-II projects, Bangalore Metro Rail Corporation did not appoint any General Consultant and the work is being supervised by Bangalore Metro Rail Corporation Engineers. In case of Kochi Metro and Jaipur metro, DMRC itself is working as General Consultant. However, DMRC continued with the same General Consultant in Phase-III even after implementation of Phase-I and Phase-II of Delhi MRTS project.

3.3 Grant of special advance of ₹555.69 crore beyond contractual provisions

Audit observed that there was no provision in the contract agreements for providing special advance to the contractor. However, DMRC granted special advances of ₹555.69 crore in 13 contracts. As per the Standard Operating Procedure (December 1998) of DMRC, special advance is considered only under exceptional

circumstances in the exigencies of the progress of work with prior approval of Managing Director and finance concurrence and at an interest rate of State Bank of India Prime Lending Rate plus two *per cent* against bank guarantee of equal amount. Audit also observed that the special advance in 13 contracts were provided without analysing the financial statements of the contractors. Details of special advance paid to various contractors are given in **Annexure-IV**.

Audit further observed that there were two instances in contract CC-26 R (31 December 2016 and 25 July 2017) where outstanding advances availed by the contractor was more than the balance work to be executed.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that special advances were granted on genuine grounds after due diligence to facilitate the contractor to execute and complete the work. In addition, the contractor had to pay interest on such advance.

The reply of the Ministry/ GNCTD/ DMRC is not tenable as there was no provision in the contract agreement to provide special advance to the contractor.

3.4 Awarding of work with major change in structural drawing after award of work

DMRC floated (August 2014) Notice Inviting Tender (NIT) for construction of elevated stabling lines near Kalindi Kunj Depot and miscellaneous work (CC-90) at Jasola Vihar on Line-8 at a cost of ₹159 crore. Tender Committee evaluated (6 January 2015) the financial bids and found that the bid of M/s Afcons Infrastructure Ltd. was the lowest among three bidders at ₹184.4 crore. This offer of L-1 bidder was 15.78 *per cent* above the estimated cost of ₹159 crore. DMRC accepted the recommendation of Tender Committee to accept the offer of M/s Afcons Infrastructure Ltd., with condition to review the structure design to keep the cost within original estimates. In this regard,

Audit observed that the drawing of the elevated stabling line was revised after the opening of financial bid. After this change in structural drawing, the actual completion cost of the contract was ₹150.64 crore. Thus, there was possibility of reducing the cost by changing the drawing. However, this was not explored by DMRC prior to tender. It was only explored when the quoted price of L-1 bidder was above the estimated cost. DMRC procurement manual permits retendering only "When the lowest offer obtained exceeds the amount available under the administrative approval and it is proposed to modify the design and or specifications to bring down the cost". However, instead of re-tendering (with revised design), DMRC decided to change the design of the structure to keep the total cost within the original estimates.

Thus, DMRC has changed the structural design after the award of work. This has resulted in violation of DMRC Procurement Manual and undue favour to the contractor.

DMRC replied (July 2020) that Tender Committee minutes showed that there was possibility of bringing down the cost by suitably revising the design of structure such as span arrangement, foundation type and loading conditions. As the Tender was Bills

of Quantity based, decision was taken by the accepting authority to award the tender with necessary changes in the drawings while keeping the total cost within the original estimate. The Ministry/ GNCTD also submitted (January 2021) that discharge of tender & re-invitation would have resulted in abnormal delay in project execution as well as invite representation from L1 bidder.

The reply of the Ministry/ GNCTD/ DMRC is not tenable because the tender was Bill of Quantity based, there were significant changes in the drawing (i.e., span arrangement, foundation type, loading conditions) after opening of financial bids. These changes should have been brought to the notice to the prospective bidders to get the best quotation by re-inviting the tender as per DMRC procurement manual.

3.5 Delay in execution of Mayur Vihar Pocket I to Trilokpuri section due to indecisiveness in rehabilitating of project affected persons of Trilokpuri

As per the DPR (February 2011) of Phase-III, 18,612 square meter (sqm) government land and 685 sqm private land was required for Trilokpuri-Vinod Nagar alignment on Line-7. Social Impact Assessment study of Phase-III was conducted (June 2011) by RITES on behalf of DMRC after approval of DPR by the Board of Directors. DMRC did not envisage the relocation of 108 project affected persons in the DPR submitted (February 2011) to the MoUD and the GNCTD. In this regard, Audit observed that:

(i) As per the Social Impact Assessment study, only 88 project affected families were interviewed at two locations i.e., Shakurpur and Rajouri Garden on the Mukundpur-Yamuna Vihar section (55 km), while 325 affected structures (including 245 residential structures) were identified on the Mukundpur-Yamuna Vihar Line. However, at the time of execution, DMRC identified (September 2011) 364 structures/ units for relocation at a single location of Trilokpuri, which is over and above already identified 325 structures.

(ii) Due to delay in obtaining land from project affected persons, the work (300 meter viaduct at Trilokpuri) of ₹7.64 crore was de-scoped from CC-26 R contractor i.e., M/s ITD-ITDCEM JV and re-awarded (December 2019) to M/s Pragati Construction Consultant (CC-125 R2) at the cost of ₹20.59 crore (i.e., ₹10.28 crore[68] higher). Excess expenditure could have been avoided, if rehabilitation and resettlement of project affected persons had been done in a timely and planned manner.

(iii) Break in Line-7 at Trilokpuri affects the ridership as it was constructed for providing radial connectivity along with ring road, which connects majority of metro lines of DMRC and connects Ghaziabad/ East Delhi region directly to South Delhi/ Gurgaon region. Against the daily projected ridership of 11.11 lakh in 2019 as per the DPR, the actual ridership per day on Line-7 was only 1.73 lakh (i.e., 84 *per cent* shortfall). Thus, with the same assumptions as in DPR, DMRC has been losing estimated annual Fare Box Revenue of up to ₹1,369.16 crore[69]. Besides, DMRC was

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[68] ***₹20.59 crore-₹10.31crore (escalated awarded cost ₹7.64 crore from 2012 to 2019)***

[69] ***11,11,133 (projected ridership of Line-7)-1,73,348 (actual ridership of Line-7) in 2018-19 X fare of average journey of 16 km i.e., ₹40X365***

also losing Non-Fare Box Revenue due to problems related to delay in awarding advertisement contracts, co-branding contracts etc.

(iv) There was also under-utilisation of Rolling Stock as out of 312 cars purchased for Line-7, only 239 cars were running/ operational in September 2019 due to low ridership.

(v) Contractor had partially completed pier and viaduct from Pier 52 to Pier 53. This work was descoped from the contractor and the balance work re-awarded to a new contractor. However, the overpayment of ₹1 crore has not been recovered till date.

Thus, Social Impact Assessment study conducted for Phase-III was deficient as it did not envisage 108 project affected person at Trilokpuri resulting in delay in rehabilitation and resettlement process. Due to delay in operationalisation of metro in this section for more than five years, DMRC has lost estimated annual Fare Box Revenue upto ₹1,369.16 crore as well as cost overrun of ₹10.28 crore.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that during Social Impact Assessment study, out of 686 (578+108) project affected families, 188 families (27.4 *per cent*) were surveyed. Further 108 plot holders having 364 project affected families at Trilokpuri did not figure in the Social Impact Assessment study due to non-cooperation of project affected persons. DMRC has been floating open e-tenders for advertisement and co-branding etc., of Line-7 and the quotes received are as per the market potential of the said inventory. Under-utilisation of Rolling Stock and depot facilities is due to non-completion of approximately 300 meter of viaduct at Trilokpuri which is in progress. DMRC has faced various problems in rehabilitation and resettlement at Trilokpuri. Rehabilitation and Resettlement is nearly complete and ongoing construction work of viaduct work will be completed by March 2021.

The reply of the Ministry/ GNCTD/ DMRC is not acceptable as non-consideration of project affected families at Trilokpuri in Social Impact Assessment study resulted in delay in planning and execution of Rehabilitation and Resettlement activities. Pre consultation with project affected families to obtain their willingness for alternative arrangements etc., which is essential for smooth rehabilitation and resettlement activities, was not done. Social Impact Assessment study which was conducted in June 2011 after approval of DPR by Board is silent on non-cooperation by project affected families of Trilokpuri. Only 88 project affected families were surveyed on Line-7 without considering 108 plot-holders having more than 500 project affected families at single location. The Ministry/ GNCTD/ DMRC has accepted that letter for recovery has been written to the contractor and final bill will be made to the contractor after making recoveries for the incomplete work.

3.6 Extra expenditure of ₹72.73 crore due to construction of elevated Majlis Park station

As per the DPR of Phase-III, Mukundpur station (now Majlis Park) was planned to be constructed at grade on the vacant land belonging to Delhi Police and Public Works Department (PWD). DMRC had to revise (21 March 2012) the alignment due to non-

availability of Delhi Police land. Thereafter, Mukundpur station (changed to elevated from at grade as mentioned in DPR) was shifted towards the left of PWD road no 51. Chief Project Manager office estimated (21 June 2012) the cost of ₹137.86 crore for construction of elevated Mukundpur metro station and depot entry, the same was approved (11 July 2012) by the Managing Director, DMRC against DPR provision of ₹62.15 crore while stating that additional financial implication of ₹75.76 crore shall be met from expected savings in civil tenders. The work was awarded (02 January 2013) to M/s Arvind Techno Pvt Ltd at ₹123.4 crore and completed on 31 May 2016 at ₹134.88 crore. In this regard, Audit observed that:

(i) DPR was not prepared with due diligence as the Consultancy Division of DMRC seemed unaware of Delhi Police's plans for the same land. Tender process for the Delhi Police Housing project was in an advance stage and going on since 2008 whereas DMRC submitted the DPR of Phase-III (containing at grade Mukundpur metro station on Delhi Police land) in February 2011. Due to non-availability of Delhi Police land for DMRC project, the alignment of Mukundpur station had to be shifted to the other side of the road, resulting in extra cost of ₹72.73 crore[70].

(ii) Mukundpur (now Majlis Park) station was constructed as an elevated station on vacant land of PWD instead of constructing at grade station, which could have saved ₹39.01 crore[71]. Elevating this station would also have repercussions for Phase-IV which would require new elevated interchange station and increase in height of piers for crossing the existing line, thereby substantially increasing the cost. Thus, DMRC did not plan Mukundpur station and alignment after exploring the possibility of at grade station.

(iii) It was also observed by the Technical Consultant (IIT Delhi) that no cost comparison of various alternatives was considered and justification for the chosen option was neither on record nor furnished. Such kind of issues can be avoided if there exists a policy for selection of a corridor. DMRC should, therefore, formulate a policy to address all the issues in connection with corridor selection. Further, the public has no option but to use whatever facilities are provided by DMRC either at ground level or at an elevation.

Thus, DMRC did not determine the location of Mukundpur station with due diligence at the time of preparation of DPR. DMRC also did not explore the possibility of construction of at grade station on the vacant land of PWD after denial of Delhi Police for construction of metro station on its land.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that the Phase-III DPR was sent to the Government for approval on the basis of the Government land available at site. The Delhi Police issue came up only at the time of transfer of land. The best possible solution was, thus, adopted after leaving the Delhi Police land

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[70] ***Completion cost ₹134.88 crore – estimated cost ₹62.15 crore***

[71] ***The amount was calculated after exploring feasible alternative i.e., at grade station, 600 meter at grade section and integrated depot entry and exit at present location of Majlis Park station***

while also keeping in view the integration of Phase-IV work. In case Majlis Park station is to be made at grade, the rail level just before Shah Alam Marg must be minimum nine meter to ensure minimum headroom of six meter as per PWD requirement/ norms. Further, the turnout/ cross over before the station and after the station are also to be accommodated in the length of 741.39 meter as per operation requirements including the length required for achieving a rail level of nine meter just before Shah Alam Marg which is 250 meter with maximum permissible gradient i.e., four *per cent*. Thus, technically the rail level at Majlis park station cannot be kept at grade.

The reply of the Ministry/ GNCTD/ DMRC is not acceptable, in the absence of any records relating to permission/ approval for utilising the Delhi Police land before finalisation of DPR and approval stage. Further, DMRC stated that 741.39 meter length was available between end of ramp and start of Shah Alam Marg. Hence there was enough length for construction of Majlis Park station (140 meter), and front cross over facility (220 meter) at grade nine-meter headroom, with four *per cent* gradient could have been provided in 225 metre and the subsequent stretch could have been used for providing turnouts and crossover facilities. However, the same was not done resulting in extra expenditure of ₹39.01 crore to DMRC.

3.7 Construction of subway at the request of Delhi International Airport Limited at Indira Gandhi Domestic Airport

DMRC entered (March 2013) into a contract agreement with M/s ITD-ITD Cem JV for design and construction of tunnel by shield Tunnel Boring Machine, Palam and Indira Gandhi Domestic Airport underground stations (CC-32) by cut & cover method. The awarded cost of the contract was ₹752 crore. A meeting between DMRC & Delhi International Airport Limited (DIAL) was held (17 January 2013) to resolve transfer of land and other issues for construction of underground Indira Gandhi Domestic Airport station. DIAL requested DMRC to extend the passenger subway from Terminal 1C (Arrival Terminal) to Terminal 1D (Departure Terminal) with DMRC fund, and DMRC agreed to the proposal of the DIAL. A Memorandum of Understanding (MoU) was signed (30 March 2013) between DIAL & DMRC to provide the passenger tunnel from Terminal 1C to Terminal 1D. DMRC decided (August 2016) that the work of subway is to be done by inviting open tender. Accordingly, DMRC entered (July 2017) into a new contract (CC-32AR) with M/s Dharamraj Constructs India Private Limited to construct a subway from Indira Gandhi Domestic Airport metro station to Terminal 1C (arrival terminal) and Terminal 1D (departure terminal) at an awarded cost of ₹40 crore.

In this regard, Audit observed that:

(i) As per the original CC-32 contract, a subway was to be constructed from Indira Gandhi Domestic metro station to Terminal 1C (arrival terminal) of the airport only. DMRC, on the request (17 January 2013) of DIAL extended passenger subway from Terminal 1C to Terminal 1D, parking space of G+5 building and to the new terminal building which was under construction adjacent to Terminal 1C at a cost of ₹40 crore

which will be used by the DIAL for inter terminal connectivity. Thus, the actual expenditure incurred by DMRC on behalf of DIAL should be recovered from the DIAL.

(ii) The work of subway from Indira Gandhi Domestic Airport metro station to Terminal 1C (arrival terminal) was deleted from the scope of contract CC-32 (₹2.77 crore) and awarded to a new contractor at ₹40 crore citing that the alignment of Phase-IV station will be passing under the subway. Till January 2021, 98 *per cent* of 32-AR work has been completed. However, approval of the MoHUA/ GNCTD under Phase- IV was from Tughlakabad to Aerocity only.

(iii) DMRC has transferred (07 June 2013) the commercial rights to DIAL for display of advertisement panels in the underground tunnel connecting Indira Gandhi Domestic Airport station and Terminal 1C and the tunnel connecting 1C and 1D. This has resulted in undue favour to the DIAL. However, the operation and maintenance of the subway was to be done by DMRC.

(iv) It was also observed by Technical Consultant (IIT Delhi) that even though space was already available on the ground, it is not clear as to whether DMRC explored the possibility of connecting them at the ground level as opposed to the more uneconomical option of underground connection. Further, the requirement was perceived based on the estimated forecast of passengers and keeping the convenience of passengers in mind. The expected ridership has not been achieved so far. As against projected daily ridership of 1,16,002 as per DPR in 2019, the actual daily ridership in December 2019 was 5,830 only. The fact that DMRC is relying on future possibility of improvement in the situation with further development at the T1 terminal further reflects the lacuna of ridership estimation and planning based on such estimates.

Thus, DMRC constructed additional subway from Terminal 1C to Terminal 1D without any provision in the DPR on the request of DIAL at the cost of ₹40 crore. This needs to be recovered from the DIAL.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that in order to provide better accessibility to metro station from departure terminal, it was decided to extend the arrival subway up to the departure terminal and the underground subway was constructed solely on DMRC requirement to attract more commuters to the metro station. Hence, its cost is not required to be recovered from DIAL. Further, the work of subway was deleted from the scope of CC-32 because keeping the contract CC 32 open would have resulted in high idling cost as the decision of the interface issues are pending with DIAL. Provision is kept in the subway in advance for Phase-IV alignment. The Ministry stated (January 2021) that the purpose of the subway was to connect the Arrival and Departure Terminal with the existing metro station and not to interconnect the two terminals mutually. Further, definitive agreement (including commercial rights) shall be signed only after finalising all the balance minor interface issues related to integration of airport development plan with all stakeholders including DMRC.

The reply of the Ministry/ GNCTD/ DMRC is not tenable because construction of a subway tunnel for connecting Terminals at the airport is not within the mandate of DMRC but DIAL as they charge passenger service fees from passengers for the services provided for their comfort and convenience. Connection of Arrival and Departure building results in inter terminal connectivity only. Construction of subway within the airport is beyond the scope of DMRC's mandate, which is to provide facilities and amenities within the metro stations. The reply of DMRC in respect of deleted work from earlier contractor is also not acceptable as the same amount of time will be required for meeting the interface issue in both the scenarios (i.e., executed through variation or through new contractor). Further, it is evident from the reply that the work was deleted from CC-32 before finalisation of interface issues with DIAL. At the time (May 2007) of construction of Airport Line of Delhi metro during Phase-II, DIAL paid an upfront grant of ₹350 crore to DMRC towards civil works inside the airport. On the same analogy, DMRC should have demanded grant for the work done for the subway inside the airport. Till date, neither any DPR nor the alignment from Aerocity to Indira Gandhi Domestic metro station has been approved by the MoHUA/ GNCTD. The proposal of connecting Arrival and Departure Terminal with the existing metro station was done solely on the request of DIAL and that too in the unpaid area[72]. Moreover, a definitive agreement is to be signed within two months from the date of signing of MoU (30 March 2013). However, despite lapse of eight years, definitive agreement has not been executed till date.

3.8 Flawed design of Hauz Khas interchange station resulting in inconvenience to the commuters

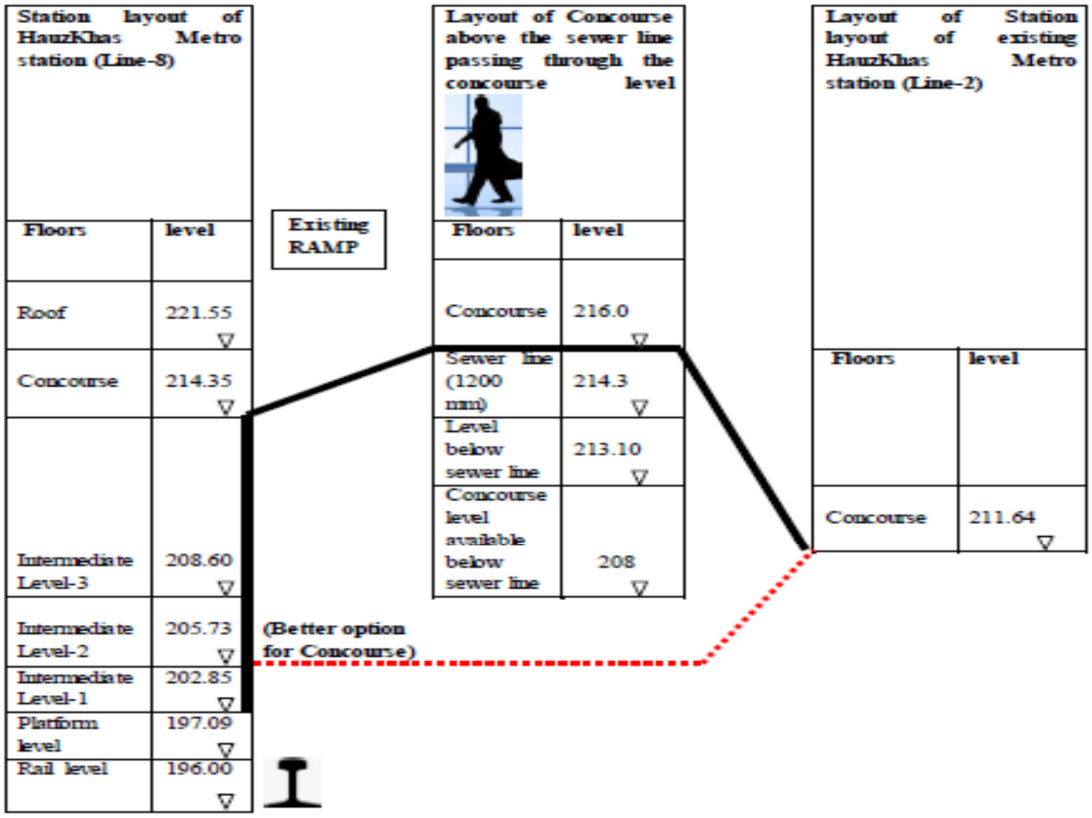
DMRC entered (January 2013) into a contract (CC 27) with M/s L&T- SUCG JV for design and construction of tunnel from end of underground ramp (near Shankar Vihar metro station) to Hauz Khas metro station on Line-8. The chainage of the new tunnel for Line-8 was passing below the existing tunnel of Line-2 constructed during Phase II. Hence, the rail level was provided at 196 meter with concourse and platform with three intermediate levels.

Audit noticed that for interchanging the metro from Line-8 to Line-2, the commuters have to come at the concourse level by passing through three intermediate levels after which they have to pass through the concourse level with ramp of two meter (above the sewer line) and then come down by using staircase/ escalator to connect the concourse level of the Line-2.

[72] ***Area outside Automatic fare collection system i.e., common area prior to ticketing***

Figure 3.1

Layout of interconnecting stations at Line-8 and Line-2



In this regard, Audit observed that:

(i) For interchanging facility at Hauz Khas metro station, commuters have to pass through three intermediate levels before passing through ramp over the sewer line to come down to the concourse level of the Line-2 (shown in above figure). If the concourse level connected to Line-8 and Line-2 passed below the sewer line, it would have been more convenient to the commuters.

(ii) By constructing the concourse level at 205.73 meter, instead of two intermediate levels, only one would have been sufficient. However, due to additional intermediate level, four environment control systems and three auxiliary sub stations had to be installed at Hauz Khas metro station (Line-8). This is in contrast to other underground stations where only two environment control systems and two auxiliary sub stations were provided. For additional intermediate level, extra lifts/ escalators/ staircases were also installed. There are several void areas at intermediate level which are presently of no use.

(iii) As per tender drawing, staircase was provided between two escalators (up and down) from concourse to intermediate level and symmetrical layout of escalators. Staircase was also provided from intermediate level to platform level. Layout of escalators and staircase from platform to intermediate level were kept as per tender drawing. However, from intermediate level to concourse, the staircase was provided

adjacent to the escalators (up & down). Thus, there was no symmetry in the layouts for both levels resulting in inconvenience to the passengers, as they cross each other.

(iv) Technical consultant (IIT Delhi) observed that the constraint of the presence of a sewer line of 1,200 mm diameter should not have been a major bottleneck as DMRC has shifted even larger sewer pipes of about 1,650 mm diameter for construction works, for example, near Jawahar Lal Nehru Stadium. The existing pipelines and other infrastructure facilities could have easily been shifted for the straight crossing thereby eliminating extra intermediate levels. Review of drawings also revealed that the concourse could have been connected with the previous level instead of taking it up and bringing it down to avoid the sewer line.

Thus, DMRC constructed the concourse level at 214.35 meter instead of at 205.73 meter. This has resulted in construction of two additional intermediate levels and inconvenience to the commuters.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that if the concourse level were provided below the sewer line, the concourse level would be 205.73 meter[73]. The concourse level of existing Hauz Khas station is 211.64 meter. Hence, there would still be a difference of 5.91 meter for passengers to travel. The top of roof slab would be 212.3 meter (214.3 meter-2 meter) and the overburden height would be 11.2 meter (223.5 meter-212.3 meter). Such a design would be very difficult and uneconomical. DMRC also stated that due to additional area of connecting subway, which is air-conditioned, the requirement of additional Environment Control Systems was unavoidable. Further, the diversion was not required if concourse was kept at 205.73 meter as suggested by Audit. DMRC had explored various option of Hauz Khas station before deciding the final design.

Reply of the Ministry/ GNCTD/ DMRC is not tenable as the sewer line of 1,200 mm diameter could have been diverted. Moreover, if the concourse level had been provided below the sewer line, the concourse level would be at 205.73 meter eliminating the need to construct two additional floors i.e., intermediate level-3 at 208.60 meter & Concourse level 214.35 meter. DMRC has accepted that two additional environment control systems and one auxiliary sub stations have been provided due to the additional area.

However, the facts remain that faulty layout of alignment of staircase and escalator causes inconvenience to the commuters.

In the Exit Conference, DMRC accepted and appreciated the Audit observation and stated that the option as pointed by Audit was not explored which would have been more convenient to the commuters.

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[73] ***214.3 -2m (soil cushion)-5.5m (clear height) -1.5 m (slab thickness)***

3.9 Payment of ₹21.05 crore directly to sub-contractors/ vendors despite joint venture reservation/ refusal for the same

DMRC issued (19 June 2012) Letter of Acceptance (LoA) to M/s FEMC-Pratibha joint venture (JV Contractor) for design and construction of tunnels and four stations between Moti Bagh and Lajpat Nagar Stations (CC-18) at ₹1,089.59 crore. As per LoA, the work was to be completed by 24 December 2015. However, due to slow progress, labour unrest and other issues, DMRC offloaded the work and got them executed at the risk and cost of contractor. Managing Director, DMRC approved (September 2019) encashment of performance bank guarantee amounting to ₹54.48 crore for adjustment of liability amount spent at the risk and cost of joint venture and performance bank guarantee was encashed on 04 September 2019. Audit observed that DMRC released (September 2019) ₹21.05 crore to these sub-contractors/ vendors on the basis of joint venture letter dated 18 September 2018. But, from 01 February 2019, co-venture of joint venture was in suspension and the powers of its Board and all rights vests in Resolution Professional. Resolution Professional stated (August 2019) that more than 60 vendors have already filed their claims with the undersigned. Hence, until complete scrutiny of their claims, no amount can be released to the said vendors.

Thus, DMRC without reconciliation of the claims of sub-contractors/ vendors with Resolution Professional, released ₹21.05 crore to the sub-contractors/ vendors. This was based on JV's old letter, when Corporate Insolvency Resolution Process was not in place.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that the release of ₹21.05 crore post completion of defect liability Period is merely honoring the contractor's request letter dated 18 September 2018. Further, the decision of not considering Resolution Professional as the authorised representative of the joint venture was taken based on the judgement of the Hon'ble High Court of Delhi in another case of M/s PIL-CRFG JV. Therefore, no cognizance has been given to the letter received from the Resolution Professional. Prior to transfer of the above amount, the contractor had already been asked (14 June 2019) to convey any deviations from their letter dated 18 September 2018. However, no reply was received.

The reply of the Ministry/ GNCTD/ DMRC is not acceptable as after commencement of Corporate Insolvency Resolution Process against one joint venture partner and receiving a letter from Resolution Professional, letter of 18 September 2018 does not have relevance. Further, without any contractual relationship, DMRC released ₹21.05 crore to these sub-contractors/ vendors in violation of contractual provisions. The judgement given in another case cannot be directly applied in this case, as the circumstances and merits of two cases may be different. Further, after being informed by Resolution Professional that more than 60 vendors have already filed their claims with them, it is imprudent to release any amount to the said vendor until a complete scrutiny of their claims is done. The confirmation/ receipt of letter dated 14 June 2019 from joint venture/ Resolution Professional/ contractor was not provided. As, DMRC has no contractual relationship with sub-contractor and vendors, any surplus amount

after adjusting DMRC claim should be transferred in the account of joint venture as per contractual provisions.

3.10 Construction of smaller width platform at Dwarka (new) and Nangli station

During review of Dwarka-Najafgarh corridors, the following inconsistencies were noticed:

Figure 3.2

Construction of Dwarka (new/ Line-9) platform with lesser width

As per the DPR of Dwarka-Najafgarh, all elevated stations are planned with two side platforms (4.5 meter wide each). Further, the DPR stated that stations have been planned following the norms and criteria being adopted by DMRC for Phase-I and Phase-II of Delhi Metro. Audit observed that the platform width of Dwarka (new station) and Nangli station was 2.9 meter (clear width 2.57 meter, which may further be reduced to 2.27 meter (approximately) post Platform Screen Doors facility in future), whereas platforms of existing Dwarka metro station constructed during Phase-I in 2005 is of more than four meter. New Dwarka station is an interchange station with front crossover facility, means boarding and de-boarding takes place from same side of the platform. Audit also observed that in other metros, platform widths have been worked out on the basis of holding capacity of the platform for worst-case scenario (i.e., two missed headways) in the design year. The same exercise/ calculation was not mentioned in DPR of Dwarka-Najafgarh section.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that detailed calculation of platform width is not required at DPR stage. However, the calculation details are reproduced now i.e., peak hour boarding/ alighting is given as 839.

Reply of the Ministry/ GNCTD/ DMRC is not tenable as it was clearly mentioned in the DPR that all elevated stations are planned around two side platforms (4.5 meter wide each). As per DPR, Peak Hour Peak Direction Traffic of 10,373 and 13,187 were mentioned from Dwarka to Najafgarh depot in 2021 and 2031, respectively, whereas in the calculation, Peak hour boarding/ alighting is given as 839 for Dwarka station. However, in addition to boarding/ alighting passengers, there are also interchange passengers who use the Dwarka (new) station platform.

3.11 Non-provisioning of Platform Screen Doors

In May 2012, DMRC proposed for procurement of a new type of Rolling Stock i.e., Unattended Train Operation based Rolling Stock on standalone Line-7 and Line-8. Director (Rolling Stock) apprised to the Board of Directors that for operation in GoA3/ GoA4, Platform Screen Doors are required to be provided to stop intrusion from the platform to the track. Audit observed that DMRC had planned to operate Unattended Train Operation based Rolling Stock on standalone Dwarka-Najafgarh corridor without installing Platform Screen Doors which is essential for Unattended Train Operation. DMRC also constructed lesser width platform at Dwarka (new) and Nangli station as against DPR provisions. Installation of Platform Screen Doors at a later stage would have higher cost implication, passenger safety issue and interface issue. It will also be a time-consuming process as already experienced by DMRC during the installation of Platform Screen Doors on existing operational Line-2.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that Dwarka-Najafgarh section is using Unattended Train Operation compliant Rolling Stock and Signalling System i.e., can be upgraded to fulfil Unattended Train Operation requirements in due course as and when required. Given the volume of traffic as of now, this section is not planned for Unattended Train Operation. Use of Platform Screen Doors is mandatory with Unattended Train Operation, which is not the case in this section.

DMRC reply regarding Platform Screen Doors is not acceptable as Unattended Train Operation based Rolling Stock was procured for the section. By constructing lesser width of platform and not installing Platform Screen Doors, DMRC is compromising passenger safety. Further, DMRC while responding to para no 2.3.1.3 stated that although not essential, under Indian conditions with Unattended Train Operation provision, Platform Screen Doors is expected to increase passenger safety against accidental falls and unauthorised entry to track.

3.12 Extra payment of ₹5.01 crore to the contractor

As per Letter of Award of contract CC-23, the contractor had to construct five underground stations and underground section between Kalkaji to Hauz Khas on Line-8. The horizontal and vertical track alignment between Panchsheel station and Chirag Delhi station was passing below a deep open nallah (drain). The tunnelling prior to the open nallah was to be made by Tunnel Boring Machine and beyond that (including open nallah and station box) by cut and cover. As the cushion between top

of tunnel structure and open nallah bed is only 1.3 meter which was grossly inadequate for tunnelling by Tunnel Boring Machine, it was proposed (21 December 2012) by Chief Project Manager that the depth of tunnel at nallah location may be lowered by about 2 meter, so that crossing of open nallah can be done using Tunnel Boring Machine as the cushion available will be 3.23 meter which can allow tunnelling by Tunnel Boring Machine and the track level of Chirag Delhi station may also be lowered by 2 meter. The recommendations of the Chief Project Manager were accepted (03 January 2013) by Managing Director, DMRC. The contractor submitted (26 March 2015) a claim for variation of ₹25.16 crore for the above variation against which DMRC paid an amount of ₹5.01 crore. In this regard, Audit observed that:

(i) As per the agreement, the tunnel crossing from West bank of nallah was to be constructed by cut and cover up to Chirag Delhi Station. However, instead of cut and cover method, DMRC decided to construct the tunnel by Tunnel Boring Machine by lowering the rail level by two meter. Due to this, the level of the Chirag Delhi metro station was also lowered by two meter.

(ii) The depth of the nallah between Chirag Delhi station and Panchsheel was known to DMRC prior to award of the contract. The tender alignment for nallah was finalised by DMRC. The construction of tunnel by cut & cover was part of Schedule-A, which was lump sum. Due to the above variation, DMRC incurred an avoidable expenditure of ₹5.01 crore.

Thus, DMRC incurred additional expenditure of ₹5.01 crore due to change in methodology of construction resulting in lowering the rail level by two meter against cut and cover method mentioned in the contract agreement.

The Ministry/ GNCTD and DMRC replied (July 2020/ January 2021) stated that in tender alignment, work was proposed by cut & cover method as the cushion between crown of tunnel structure and bottom of nallah was only 1.3 meter. This was grossly inadequate for tunnelling with Tunnel Boring Machine. At the time of excavation, it was found that the foundations of culvert are strip foundations infringing the alignment. The excavation of cut and cover section in this area would have disturbed the foundation of the culvert. If the details of foundations of road bridge were known prior to tender, then DMRC would have planned crossing nallah with Tunnel Boring machine in which case station level would have been kept two meter lower in tender drawings itself so that Tunnel Boring Machine can pass safely below Bridge foundation.

Reply of the Ministry/ GNCTD/ DMRC that the tunnelling was proposed through Tunnel Boring Machines to ensure safety of culvert is not acceptable as it is not possible to construct tunnel by cut and cover without disturbing the foundation of the culvert. Moreover, Strip Foundation is a common type of foundation, presence of which, in a structure, cannot be ruled out in designing at tender stage. As per tender drawing, if the tunnel was constructed through cut and cover method, contractor has to remove Tunnel Boring Machine through retrieval shaft and re-launch it through launching shaft. However, the effect of saving in this regard was not recovered from the contractor. If the construction was done as per tender drawing no additional financial burden would

have fallen on DMRC. Due to this variation, DMRC has to construct Chirag Delhi metro station at two meter below from the approved tender drawings. Besides, knowledge of foundations of the road bridge and flow of nallah are essential prerequisites for starting the project. This was also endorsed by the Technical Consultant (IIT Delhi).

3.13 Construction of Sadar Bazar cantonment and Shankar Vihar stations without the approval of GoI and GNCTD

Chief Project Manager submitted (February 2012) to the Managing Director, DMRC that as per DPR on Line-8, inter-station distance between Palam to Indra Gandhi Domestic Airport and Indra Gandhi Domestic Airport to Vasant Vihar stations were 5.213 km and 4.259 km, respectively. The inter-station distance was unusually high as the alignment was passing through defence area. Defence authorities requested DMRC to provide stations at Sadar Bazaar and Shankar Vihar to cater to the requirement of the large number of defence personnel living in these areas since there was a separate catchment of non-defence personnel in the vicinity of Sadar Bazaar. Providing two more stations rationalizes the inter-station distances and would bring additional traffic for Delhi Metro. As per the DPR estimates, there was an additional cost implication of ₹54.24 crore including the cost of electrical and mechanical works. The above proposal was approved (February 2012) by the Managing Director, DMRC. In this regard, Audit observed that:

(i) The decision to construct additional stations was without any study or survey for assessment and projection of ridership. Phase-III DPR was formulated on the basis of detailed report of Central Road Research Institute and RITES. However, no such supplementary study was conducted at the time of submission of proposal and the same was approved in one day by Director (Project) and Managing Director, DMRC.

(ii) As these two stations were not provided in the DPR, they were not approved by the GoI and the GNCTD. Fund provision for these two stations was also not made in the DPR.

(iii) As these stations were constructed on the request of Defence authorities, DMRC could have requested the Defence authorities for provision of funds for construction of the stations. DMRC took possession of 4.48 acre of permanent land for construction of station at a total cost of ₹13.46 crore and paid annual rent of ₹0.48 crore for temporary land instead of taking up the matter with Ministry of Defence (MoD) for waiver of land cost. Further, Defence land cannot be used for property development or any other commercial purpose. No lease deed has been signed between DMRC and MoD.

Thus, DMRC had constructed two stations on the request of Ministry of Defence without any provision in DPR, traffic study and without approval of GoI and GNCTD.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that DPR requirement of mid shaft at Shankar Vihar was eliminated with the construction of an elevated station at Shankar Vihar. The cost of mid shaft as per DPR was ₹29.96 crore and total cost of Shankar Vihar station is ₹31.55 crore which is comparable. The station

is also a source of revenue. By constructing the station inside Shankar Vihar, commuters and defence families living in the area now have access to public transport. Since the overall construction cost of two additional stations was within the funds provided in DPR, approval was taken from the Managing Director, DMRC. Property Development is being carried out through advertisements, Sulabh complex etc., inside the metro stations. However, external land of defence is not being used for commercial purpose, as it does not belong to them. The signing of lease deed between DMRC and MoD is under progress. The provision of Shankar Vihar and Sadar Bazar stations is more of technical requirement to break the long inter station distance of underground sections, hence no separate traffic study was found necessary.

Reply of the Ministry/ GNCTD/ DMRC is not acceptable because even at the time of approval from the Managing Director, DMRC for construction of Shankar Vihar station, there was neither such requirement for construction of mid shaft at Shankar Vihar station nor any approval for construction of metro station in lieu of mid shaft sought. Audit noticed that at Shankar Vihar station, entry and exit for general public is restricted, being a defence area. Due to permit system and being a landlocked metro station, the ridership was low and revenue was lowest among all stations on Line-8. In the absence of Property Development and Property Business, being located in defence area, the Non-Fare Box Revenue from these stations will be negligible. Further, DMRC has to incur the operational cost for running the station in the form of energy, manpower, maintenance and housekeeping. Thus, DMRC has already incurred the capex and would continue to incur operational expenses throughout the life of the station. The Ministry in its reply accepted that no separate traffic study was done. Besides, building stations is not an alternative to the mid shaft. Metro stations are built for operational requirement while construction of mid shafts is a technical requirement.

3.14 Variation in CC-04 amounting to ₹78.75 crore for unforeseen conditions

DMRC awarded (29 December 2011) the work of tunnel between Mukundpur and Shalimar Bagh section and underground station at Azadpur on Line-7 to M/S CEC-CICI JV (contractor) at the awarded cost of ₹416.80 crore on lumpsum basis. DMRC revised (21 March 2012) the alignment between Azadpur to Mukundpur due to non-availability of Delhi Police land. As per General Condition of Contract clause, in case of unforeseen physical condition, which could not have been reasonably foreseen by an experienced contractor, the contractor shall give written notice thereof to the Engineer and if, in the opinion of the Engineer, such conditions could not have been reasonably foreseen by an experienced contractor, the Engineer shall certify and the employer shall pay reasonable additional cost to which the contractor shall have been put by reason of such conditions.

During construction, two Tunnel Boring Machines were launched from tunnelling work between Azadpur and Mukundpur. After completion of 658.8 meter for Tunnel Boring Machines 1 and 595.2 meter for Tunnel Boring Machines 2 of the tunnel drive from Azadpur to Mukundpur, Tunnel Boring Machines -1 & 2 were stuck due to rock encounter beneath the Rameshwar Nagar Gurudwara and three houses. Accordingly,

the contractor after demolishing three houses and the Gurudwara, constructed a shaft to retrieve Tunnel Boring Machines.

The contractor submitted (29 June 2018) a claim of ₹242.35 crore on account of unforeseen physical condition due to shifting of horizontal & vertical alignment from Azadpur to Mukundpur by DMRC and encountering of rock strata at Rameshwar Nagar below Gurudwara. After scrutiny of claim of the contractor, DMRC approved (November 2019) the net variation amount of ₹78.75 crore. In this regard, Audit along with the Technical Consultant (IIT Delhi) observed that:

(i) Geological and geotechnical details of Delhi region are well known especially after the experience of Phase-I and Phase-II. Detailed geological maps are also available indicating the extension of ridge outcrops in North-East direction and extending up to the Yamuna river, very close to the alignment. Besides, it is common sense to expect rock outcrops in the vicinity at varying depths despite borehole data being available sparingly. The boreholes conducted by DMRC and the contractor along the alignment were spaced around 67 meter, however, the rock outcrop encountered at the said Rameshwar crossing under the Gurudwara and housing colony was only 32 meter width, indicating that they might have missed due to large spacing between the boreholes (67 meter).

(ii) The contractor conducted his own investigations and used DMRC's pre bid borehole data for selecting Tunnel Boring Machines which can cut only through soil strata. If DMRC changed vertical and horizontal alignment by few meter, it is the contractor's responsibility to make sure of the ground conditions and select the suitable Tunnel Boring Machine for the site rather than use something that worked elsewhere. Normally, any pre bid data provided by the owner along with the tender must be treated as first-hand information and the contractor should conduct detailed investigations for the designs. Also, as the said site was unapproachable for placing the drilling rig, they could have conducted indirect geophysical methods such as Ground Penetration Radar or Multi-Channel Analysis of Surface Waves, which are quick and accurate methods to differentiate between soil and rock. A prudent contractor would have assessed the ground conditions based on better refined geological and geotechnical methods and selected mixed Tunnel Boring Machines, as per prevailing practice in such conditions across the world. Hence, the Technical Consultant (IIT Delhi) was of view that the conditions are not latent requiring compensation.

DMRC replied (July 2020) that the present variation arose due to change in alignment because of non-availability of Delhi Police land and the alignment was shifted to the other side of road no. 51. Further, the depth of tunnel increases at the location where rock was encountered directly beneath the Gurudwara and three houses. As per the General Consultant report, a 30 meter length of rock was present along the length of tunnel alignment from Azadpur to Mukundpur. DMRC soil report comprised of 23 bore holes while the contractor's soil report comprised 15 further boreholes. Total 38 bore holes represented an average spacing of 67 meter along the alignment of 2.6 km which formed the basis for reasonable representation of the likely ground condition

along the alignment. The location of presence of rock was between the Gurudwara and three adjacent houses making it impossible to know about the rock. General Consultant Report also mentioned that it finds it difficult to argue that an 'experienced' contractor could have anticipated rock along either the tender or revised alignments from a review of the pre & post contract borehole data samples at site. Suggesting that the contractor should have foreseen rock when there is a clause to unforeseen ground conditions would be illogical. General consultant report clearly mentioned that there was confined patch of intact rock encounter during tunnelling & this constitutes an unforeseen ground condition. Therefore, it was decided to construct emergency escape shaft on that location and retrieve Tunnel Boring Machine.

Thus, contractor relied upon bore hole data at the distance of 67 meter instead of application of latest geophysical methods for assessing ground conditions. Resultantly, DMRC had to incur additional expenditure of ₹78.75 crore.

The Ministry/ GNCTD/ DMRC further stated (January 2021) that Geological map showed extent of rocks at 2.89 km away from alignment. Hence, extension of ridge outcrops along alignment could not be anticipated as confirmed from 38 boreholes which were made since none of them showed any rock. Application of Ground Penetration Radar and Multi-Channel Analysis of Surface Waves are considered not accurate in case of geophysical investigation works due to various limitation[74]. However, the Audit observations have been noted for further optimisation of geotechnical & geological records in future.

Reply of the Ministry/ GNCTD/ DMRC is not acceptable as the variation had resulted due to change in alignment post tender stage. Delhi Police intimated (September 2011) inability to provide land to DMRC before finalisation of tender CC-04 in December 2011. But DMRC intimated the change in alignment in March 2012 after awarding of work. If DMRC had intimated the change in alignment during tendering stage, soil investigations and other risks would have been the responsibility of the contractor. Notwithstanding the cited reasons, when the alignment is changed, fresh investigations should be conducted along the new routes unless the stratigraphy is known. Further, the mentioned limitations of the geophysical methods in the present situation are not convincing.

3.15 Non-compliance of various environment requirements

DMRC is required to comply with various environmental provisions under the National Environment Policy, the Central Water Commission, Water (Prevention & Control of Pollution) Act, and Air (Prevention & Control of Pollution) Act etc.

As per the National Environment Policy (14 September 2006), environment clearance is required for activities based on their potential environmental impacts as indicated in

[74] ***Ground Penetration Radar has been found to perform satisfactorily up to a depth of 4 meter to 5 meter, MASW required a flat ground within at least one receiver spread length i.e., minimum 30 meter for analysing up to depth of 10 meter to 20 meter below the ground surface also the receiver spacing is to be maintained 1 meter to 2 meter, which was not possible in congested area.***

the Schedule to the notification of Rule 5, sub-rule (3) of the Environment (Protection) Rules, 1986. As per the Schedule, environment clearance was required for building and construction projects having built up area of more than 20,000 sqm.

"General Guidelines for Water Audit & Water Conservation" by the Central Water Commission (2017), Ministry of Water Resources recommends water audit as an important management tool for effective conservation of water. DMRC Water Policy (2013) also provides to minimise wastages by carrying out half yearly water audits at selected stations and depots.

Central Water Commission and Central Ground Water Board recommends that supplies to industries should be from surface water and if ground water supply is considered essential, it should be managed by a Government Agency.

In this regard, Audit observed the following deficiencies regarding compliance to the above provisions:

(i) No environment clearance was obtained by DMRC for the Phase-III project even though it had constructed four metro car maintenance depots[75] each having built up area of more than 20,000 sqm.

(ii) DMRC uses water for construction work (project) and operation & maintenance purpose. However, it did not conduct any water audits at stations, depots and construction sites from 2011 till date. It neither assessed the extent of water losses and efficiency of system nor performed any cost benefit analysis for optimum recovery of water nor any benchmarking of suitable parameters for water use. It also did not formulate a Water Management Plan.

(iii) It is DMRC's responsibility as per its water policy to manage extraction and supply of ground water to the contractors. However, during the entire Phase-III project, no details and records were maintained either by DMRC or the contractors for water extracted, consumed or loss of water. The agreements signed by DMRC with the contractors also did not have any provision for maintenance of such record. Thus, there were no checks and balance for extraction and consumption of water by the contractors. Further, although the agreement included that the contractor had to meet the water cost from his own funds, DMRC permitted the contractor to extract water from ground resulting in undue benefit and cost saving to contractor.

(iv) Further, General Conditions of Contract provisions under Clause[76] 2.1.6 were also not honoured for installation and operation of Sewage Treatment Plant as DMRC did not ensure that Consent to Establish and Consent to Operate are obtained by the contractors.

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[75] ***Mukundpur (45,686 sqm), Kalindi Kunj (29,310 sqm), Vinod Nagar (32,104 sqm) and Badli (46,063 sqm)***

[76] ***As per GCC 2.1.6 (Scope of Works), it was agreed that "obtaining statutory permissions for consent to establish and consent to operate including all costs, fees for obtaining such permission from Pollution Control Board" was a part of the lump sum price of contract***

Thus, DMRC did not adhere to various environment requirements including obtaining environmental clearances, conducting water audit and maintaining records of water extracted, consumed and lost during Phase-III.

Regarding environment clearance, DMRC stated (July 2020) that metro project is a physical infrastructure project as per Schedule of Environmental Impact Assessment Notification, 2006 and exempted from seeking environment clearance from the State and Central authorities. It accepted that there is no formal water management plan of DMRC. It added that Phase-III contracts had no provision to quantify consumption of water through instrumentation of water meters. As such neither water meters were installed, nor records maintained. Hence quantity and cost are not available. However, in Phase-IV contracts under Safety, Health and Environment, provision for installation of meters and maintenance of records has been incorporated.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that the previous phases of DMRC also had similar clause in the contract regarding usage of water; water for construction was always drawn through borewells with contractors at their own cost, and that contractors have not saved money by pumping water from ground. No prior environment clearance is also required. The Audit observation implies that the project is linear, which is not the case. Lastly, there is no specific category under which metro rail can approach the State/ Centre for environment clearance. Wherever borewell existed, records were maintained. However, contractor's record keeping was not robust. This will be strengthened in future. For Phase-IV of Delhi Metro, specific clauses have been incorporated in the Conditions of Contract for better water management at construction site.

The reply of the Ministry/ GNCTD/ DMRC regarding environment clearance is not acceptable as the comments of Ministry of Environment, Forest and Climate Change on the Phase-III DPR forwarded (November 2015) by MoHUA to DMRC clearly mentioned that while metro rail projects are not covered under the Environment Impact Assessment Notification, 2006, if the total built up area is more than 20,000 sqm, prior Environment Clearance is required from the State. Further, DMRC's claim that they are not required to follow the environmental clearance is incorrect as DMRC itself came into existence after complying with the "Guidelines for Environmental and Social Considerations" of an international funding organisation which are based on the World Bank Operational Policy (OP 4.01). DMRC operations are classified under Category A, which refer to projects likely to have significant adverse impact on the environment and society.

3.16 Discrepancies in tree cutting estimation, compensatory afforestation and disposal of wood

During the execution of Phase-III of Delhi MRTS project, 100 *per cent* plantation is being done by the Forest Department of GNCTD. As per permission letters issued by Forest Department, 1,74,550 trees were to be planted under compensatory afforestation by DMRC during the period from 2011 to 2019. Planting of these many trees by DMRC alone could contribute 2.69 sq km (1,74,550/ 65,000) increase in forest and tree cover

of Delhi[77]. DMRC deposited ₹51.76 crore as security deposit for cost of compensatory plantation in lieu of 17,455 trees[78] to be cut during the period from 2011-12 to 2018-19. DMRC had actually cut 12,646 trees[79] on the basis of actual requirement. However, in the absence of proper records relating to tree plantations by Forest Department and monitoring by DMRC, Audit could not verify whether Forest Department planted the required number of trees on behalf of DMRC. The corridor/ line wise details of estimation of compensatory afforestation and actual tree felled is given in **Annexure-V**.

In this regard, Audit observed that:

(i) There is no approved policy and Standard Operating Procedure for tree cutting, disposal of wood/ timber after tree cutting, preservation and plantation after execution of three Phases by DMRC. Forest Department, GNCTD provides for social auditing and departmental monitoring of compensatory plantations. However, no site visit/ inspection was conducted by DMRC officials for monitoring purposes during April 2011 to December 2018.

(ii) In the absence of any follow up or data maintained by DMRC regarding actual tree plantation, it can be said that claims of DMRC regarding number of compensatory tree plantation in its website (Sankalp Report 2018-19) is misleading as it is stated that 1,90,688 trees have been planted during Phase-III.

(iii) There was inconsistency in the figure of number of trees to be cut in respect of initial four corridors as provided in DPR submitted to the Board of Directors, GoI, GNCTD and the Environment Impact Assessment study conducted by RITES in this regard (**Annexure-V**).

(iv) There was vast difference in the cost of compensatory afforestation as assessed in DPR (₹1.44 crore @ ₹1,250 per tree) in comparison to Environmental Impact Assessment study (₹46.50 crore @ ₹28,000 per tree).

(v) In the DPR of Dwarka-Najafgarh, Mundka-Bahadurgarh (Delhi portion) sanctioned in 2012, the estimated cost of one tree was taken as ₹1200 and ₹700, respectively, as against ₹28,000 per tree. Whereas, in case of Kalindi Kunj-Botanical Garden, which was executed on the request of Government of Uttar Pradesh, the estimated cost of compensatory afforestation was assessed as ₹11.96 crore @ ₹28,000 per tree. But no actual expenditure was incurred on compensatory afforestation on this corridor, as the same was done by Government of Uttar Pradesh at its own cost. Details regarding number of trees to be felled and estimated expenditure on compensatory afforestation was not mentioned in the DPR/ Feasibility Report of Shiv Vihar, Najafgarh-Dhansa Bus Stand and Faridabad-Ballabhgarh corridors.

(vi) As per the permit condition, permit holder (i.e., DMRC) shall transport the wood, and loops arising out of felling of trees at their expense to the nearest public crematorium managed by Municipal Corporation of Delhi (MCD)/ New Delhi

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[77] ***Considering 65,000 tree for increase in 1 km for forest and tree cover of Delhi***
[78] ***As per Forest Department of GNCTD***
[79] ***As per information furnished by DMRC***

Municipal Corporation (NDMC) to give them free of cost and under proper receipt from such crematorium and submit a copy of such receipt to the Forest Department. DMRC produced some receipts for delivering the wood to crematoria operated by a Non-Government Organisation instead of MCD as per permission letter. Further, at Chief Project Manager-2, Inderlok, wood was auctioned/ sold to private parties and revenue amounting to ₹5.82 lakh was realised, which is in contravention of permit condition.

(vii) DMRC had deposited advance payment for the cost of compensatory afforestation for 17,455 trees and reallocation of 746 trees. But during the execution, only 12,646 trees were cut/ felled, and 484 trees were reallocated by DMRC. Hence, the excess amount of ₹14.20 crore for 5,071 trees[80] should have been recovered from the Forest Department, GNCTD (**Annexure-VI**).

Thus, in absence of any approved Policy/ Standard Operating Procedure there were inconsistency in tree cutting estimation, compensatory afforestation and disposal of wood. Further in absence of monitoring, claim of DMRC regarding the compensatory tree plantation cannot be ensured.

The Ministry/ GNCTD and DMRC replied (January 2021 and July 2020) that approved policy or standard operating procedure on this issue cannot be formulated by DMRC as DMRC is fully dependent on terms and conditions imposed by the Forest Department. DPR contains the preliminary survey data. However, Environmental Impact Assessment study is conducted after the approval of the corridor by the Government. Hence, there was variation in the data & number of trees. Small plants like shrubs are also included as tree while obtaining tree felling permission from the Forest Department, GNCTD. However, it is not possible to keep account of these trees while executing the work. Since majority of permission letters for tree cutting have been obtained during 2011-12, identification of saved trees (i.e., for which permission of cutting were taken from Forest Department, but not actually cut due to change in alignment or entry/ exit gate location etc) and convincing Forest Department is not feasible. DMRC ensures compliance of conditions in the permission letter while disposing cut wood. Since insignificant amount has been realised by disposal of cut wood in few cases, it has been facilitated to public crematorium free of cost and receipt obtained from public crematorium has been kept on record.

The reply of the Ministry/ GNCTD/ DMRC needs to be viewed in the light of the fact that DMRC had formulated various internal policies in consonance with applicable Act/ Rules for example water policy. Hence, they could have framed a suitable policy in this regard also. Further DMRC on one hand has claimed savings in the number of trees to be cut, while on the other hand it states that they have not maintained record of small plant/ trees and time gap between permission and execution. As such the entire process needs streamlining.

[80] ***17,455+746-12,646-484 trees***

Conclusion

Thus, number of deficiencies were noticed which adversely affected the contract management and project execution of Phase-III of Delhi MRTS. There is no protocol for estimating the cost of upcoming projects in a scientific manner as DMRC used the concept of derivation of cost estimate based on last accepted rates of 'similar project'. This led to sanctioning of higher funds. Social Impact Assessment study conducted for Phase-III was deficient as it did not envisage 108 project affected persons at Trilokpuri resulting in delay in Rehabilitation and Resettlement process and operationalisation of metro in this section for more than five years. Further, DMRC did not determine the location of Mukundpur station with due diligence at the time of preparation of DPR and did not explore any possibility of construction of at-grade station on the vacant land of PWD. DMRC constructed additional subway from Terminal 1C to Terminal 1D, on the request of DIAL and also constructed Sadar Bazar and Shankar Vihar stations on the request of Ministry of Defence, without any provisions in DPR and without approval of GoI and GNCTD. Flawed design of Hauz Khas interchange station resulted in construction of two additional intermediate levels and inconvenience to the commuters. Besides, DMRC did not adhere to various environment requirements including obtaining environmental clearances, conducting water audit and maintaining records of water extracted/ consumed. There was also inconsistency in tree cutting estimation, and compensatory afforestation.

Recommendations

8. ***DMRC may ascertain cost estimates of projects on the basis of scientific method; establish a cell to study the cost aspects of various contracts and may consider formulating a schedule of rates like Delhi Schedule of Rates for metro projects.***

9. ***DMRC may formulate a policy on grant of special advances to the contractors.***

10. ***DMRC should ensure efficient planning and timely completion of rehabilitation and resettlement activities for smooth completion of project.***

11. ***DMRC may ensure adherence to relevant environmental requirements of obtaining environmental clearance, carry out water audit, maintain records for water consumption and prepare Water Management Plans for future projects.***