

Chapter II

Performance Audit on Upgradation of Roads by PWD in West Bengal

Chapter-II

Performance Audit

Public Works Department

2 Performance Audit on Upgradation of Roads by PWD in West Bengal

2.1 Introduction

Road transport is the dominant mode of freight and passenger movement in India, primarily on account of the ease of accessibility, door-to-door service and flexibility of operations. A wide and well maintained road network is a critical infrastructure for the overall socio-economic development of any State or region. Roads include National Highways (NHs) and Expressways, State Highways (SHs), Major District Roads (MDRs), Other District Roads (ODRs) and Village Roads (VRs).

SHs and MDRs constitute the secondary system of road transportation after NHs. SHs are the broader road network connecting the District Headquarters in the State, important towns, tourist centres, minor ports, major towns/cities within a State and also NHs and SHs of neighbouring States. District roads are key roads within a district and comprise MDRs and ODRs connecting the district headquarters with major rural areas. They function as the arterial infrastructure network of the rural economy by connecting production centres with markets and enable movement of passengers within and between districts. SHs and MDRs are constructed and maintained by the State Government through the State Public Works Department (PWD). ODRs and Village Roads are also constructed and maintained by institutions such as Zilla Parishads, Municipalities and Panchayats.

The total road network in West Bengal as per Basic Road Statistics of India (2017-18), Ministry of Road Transport and Highways (MoRTH) is 3,29,126 km. The Public Works Department of West Bengal has 15,530 km (4.82 *per cent*) of various categories of roads like SHs (3,612 km), MDRs (9,500 km), ODRs and VRs (2,418 km) under their jurisdiction¹ as of January 2021.

PWD executes road development works through its two Directorates *viz.*, the Public Works Directorate and the Public Works (Roads) Directorate. Each Directorate has three² Zonal offices. The Public Works Directorate and Public Works (Roads) Directorate have under them 11 and eight circle offices respectively which are associated with execution of road development works under their respective zones. The 19 circle offices have 61³ divisional offices, which are responsible for ensuring proper planning, execution, monitoring & supervision and adequate quality control in road development works of PWD.

The Department had also set up West Bengal Highway Development Corporation Limited (WBHDCL) in 2012-13 for development of State Highways. Through WBHDCL, the State Government contemplated creation of a Special Purpose

¹ *Egiye Bangla website of Government of West Bengal.*

² *North Zone, South Zone and West Zone.*

³ *33 divisional offices under PW Directorate and 28 divisional offices under PW (Roads) Directorate.*

Vehicle (SPV) to upgrade and maintain the core road network (mainly SHs) in the districts and adopt Public Private Partnership (PPP) as an instrument for delivery of better roads by collection of user charges or toll.

Details of budget *vis-à-vis* expenditure on capital outlay on roads and bridges by the PWD on up-gradation of various types of roads including construction of new roads in the State during 2015-16 to 2020-21 are shown in **Table 2.1**.

Table 2.1: Year wise Budget and Actual Expenditure on roads by PWD
(₹ in crore)

Year	Budget	Actual Expenditure	Excess (+)/ Savings (-)
2015-16	3,407.44	1,956.92	(-) 1,450.52
2016-17	2,722.03	1,885.82	(-) 836.21
2017-18	3,935.30	3,527.64	(-) 407.66
2018-19	4,363.03	5,059.08	(+) 696.05
2019-20	5,922.12	4,127.66	(-) 1,794.46
2020-21	2,917.92	3,046.72	(+) 128.80
Total	23,267.84	19,603.84	(-) 3,664.00

(Source: Budget Publications of Government of West Bengal)

The State has incurred an expenditure of ₹ 19,603.84 crore (82.90 *per cent*) on construction/upgradation of roads and bridges in the last six years against the total expenditure of ₹ 23,646.76 crore (Capital expenditure ₹ 19,603.84 crore + Revenue expenditure ₹ 4,042.92 crore) on roads and bridges.

In view of substantial investment made by the State Government on upgradation of roads during the last five years, Performance Audit was taken up to ascertain whether the expenditure had been incurred in a prudent and efficient manner while adhering to aspects of quality, safety and mobility.

2.2 Audit Objectives

Audit was conducted with a view to assess whether:

- Upgradation of roads was undertaken after proper planning and the required survey & investigation;
- Projects were completed on time and the roads developed as per the specifications laid down in Detailed Project Reports (DPRs) and extant codes and SoRs of PWD;
- Laid down mechanism for monitoring and quality control were adequate and the same were adhered to;
- Upgradation of roads resulted in increased mobility; and
- Road safety measures were executed as per extant norms.

2.3 Audit Criteria

The audit criteria were drawn from the following:

- Schedule of Rates (SoRs) of PWD (Road & Bridge works) 2008, 2014, 2015 and 2018;
- Indian Road Congress (IRC) guidelines;
- Ministry of Road Transport and Highways (MoRTH) Specifications 2001 (Fourth Revision) & 2013 (Fifth Revision);

- Terms and conditions in Standard Contract Agreement (Form 2911) of PWD; and
- Contract agreements & Standard Bidding Document of WBHDCL

2.4 Scope of Audit

The audit was conducted between December 2020 and May 2021 and covered a period of five years (2015-16 to 2019-20). Three districts⁴ from West zone and two each from South⁵ and North zone⁶ were selected on the basis of the highest expenditure on road works. All the 19 divisions⁷ of PW Directorate and PW (Roads) Directorate in the seven selected districts along with WBHDCL were selected for the purpose of detailed audit. An amount of ₹ 8,778.48 crore was incurred on road works in these test-checked divisions during the period under audit.

Out of total 995 road works undertaken in the 19 test-checked divisions, 130⁸ road works with an estimated cost of ₹ 3,037.93 crore were selected for detailed analysis in seven districts. Selection of the works was done in the divisions on the basis of expenditure incurred, with adequate representation from various categories of Roads such as SHs, MDRs, ODRs and VRs. The road works selected were mainly i) Widening & Strengthening, and ii) Strengthening. Out of the 130 selected projects, 25 were selected for quality control examination.

2.5 Audit Methodology

The following methodology was adopted in the Performance Audit.

- An Entry Conference was held on 22 December 2020 with the Additional Secretary of the Department wherein audit objectives, scope, criteria *etc.*, were discussed and the inputs of the Department were obtained.
- Scrutiny of files and records *viz.*, Detailed Project Reports (DPRs), Technical Estimates and files related to projects/works.
- Joint physical verification of projects with departmental staff.
- Interaction with stake holders like members of bus owners' associations and interviews with pedestrians and drivers along with departmental officers.
- Analysis of data from other Government departments on post project traffic increase (Motor Vehicles Department, District Magistrate offices *etc.*) wherever available.
- An Exit Conference was held on 01 June 2022 where audit observations were discussed with the Department.

2.6 Macro level Planning

Road network is a critical infrastructure and its creation and upgradation as well as maintenance is a capital intensive activity. Judicious and planned approach

⁴ Bankura, Birbhum and Purba Burdwan.

⁵ North 24 Parganas and South 24 Parganas.

⁶ Alipurduar and Cooch Behar.

⁷ Alipurduar, Cooch Behar, Bankura, Burdwan North, Burdwan South, Birbhum-I, Birbhum-II, South 24 Parganas, Diamond Harbour & Barasat-I (Highway Divisions) and Alipurduar, Cooch Behar, Birbhum, Burdwan, South 24 Parganas, Bankura, Barasat, Bishnupur & Barrackpore (PW Divisions).

⁸ 52 projects of PWD, 75 projects of PW (Roads) and 3 project of WBHDCL consisting of 29 SHs, 61 MDRs, 13 ODRs and 27 Village Roads.

in this regard is essential to ensure that such investments are made where these are most required, thereby maximising returns to the State in terms of accrued benefits and also ensuring optimum utilisation of scarce resources.

The plan for upgradation of roads should ideally aim to progressively widen the existing roads, strengthen the pavements to carry heavier vehicles and improve geometrics to ensure better operating speeds with adequate road safety measures, based on scientific assessment of traffic load and connectivity requirements. New habitations or habitations that do not have all weather road connectivity need to be identified so that upgradation of existing infrastructure as well as additional infrastructure to be created can be given adequate attention. The plan should also prioritise improvement of those routes which provide linkage to industrial growth centers, agriculture produce market centers, heritage and tourist centers, power generating centers, medical and institutional hubs, ports, State and international borders, *etc.*

2.6.1 Absence of plan for development of roads

PWD had prepared a 20 years' master plan for development of roads in the State, which was effective till 2000-2001. Thereafter, no long term plans have been made by the Department as also brought out in the Report of the Comptroller and Auditor General of India (Economic Sector) for the year ended 31 March 2012. The Department also did not provide any response to audit regarding existence of long term/short term plans for road development. Thus, PWD has been functioning without any such formalised plans, either long-term or short term.

For effective planning of developing road infrastructure, a comprehensive data base of the road network and periodic analysis of traffic on the roads is essential. The Department did not provide any response to audit on whether they have a consolidated database of the road network. Though the concerned divisions do maintain a database of roads with information on the classification of roads by type, their length and width and whether they are surfaced, no standardisation of format was seen across the divisions and each Division was maintaining the database as per their convenience. The database did not include information on details of last work done or the composition of the road pavement *etc.*, which would be essential in effective planning for upgradation or maintenance. Further, it was seen in the divisions that no mechanism was in place for consultation with stakeholders like District Administration, Transport Department or Police for assessing the local demands or requirements of stakeholders.

Traffic census to assess the growth of traffic flows over time should be one of the inputs to assess the requirement for planning and implementing road works so as to ensure that road infrastructure is adequately developed and maintained to keep pace with traffic load. The Department did not respond to queries on whether any regular traffic census was mandated or conducted by them. The divisions conducted traffic census on roads taken up for upgradation for preparation of DPRs only. However, traffic load assessment through traffic census was not found to be a factor in deciding the works to be taken up by the divisions.

Though WBHDCL had prepared (March 2016) a baseline master plan incorporating the list of roads for which development works were to be taken

up in order of priority, there was nothing on record to suggest that execution of work was taken up as per the list.

It is, thus, evident that there is no institutionalised system of collecting data on roads, traffic flows and volumes and no comprehensive data base of assets of the PWD to provide inputs for planning development and maintenance of the road infrastructure. In the absence of a formalised system of planning, road works were stated to be taken up by divisions on the basis of condition of the roads.

2.6.2 Non prioritisation of road works

In 16⁹ of the 19 test-checked divisions, no assessment of traffic was conducted on the existing roads to identify or prioritise road development works. It was also confirmed during joint physical verification along with departmental officers that roads in very poor condition had not been prioritised for taking up works as detailed below:

- a. Audit observed that the entire road from Lalpur near Samuktala to Chuniajhora T.G. under Alipurduar Highway Division was damaged (0.0 km to 16.45 km). The road was taken over (December 2017) from Alipurduar Zilla Parishad (ZP) in poor condition with the wearing course being worn out. This road serves as an important mode of connectivity of nearby villages to the market at Samuktala and many tourist spots (Jayanti, Phaskhawa and Bhutanghat). However, no upgradation work of the road has been initiated till date (December 2020) despite demand by the villagers and the Sabhadhipati of the ZP.

Interaction with the local road users jointly with the departmental staff (December 2020) revealed that this road had been in poor condition for the last three years resulting in inconvenience to the users including farmers to carry their farm produce to the nearby local markets.



Fig.2.1: Worn out Bituminous surface at 0.5 km of road from Lalpur near Samuktala (20.12.2020)



Fig.2.2: Worn out Bituminous surface at 14 km of road from Lalpur near Samuktala (20.12.2020)

- b. Audit observed (January 2021) that WMM (Wet Mix Macadam) of Silipal–Sarenga-Bamundia Ghat Road (SH) of Bankura Highway Division was exposed (wearing and binder courses had worn out) for the stretch from 9.00 km to 17.00 km. The strengthening work of the road for the

⁹ Alipurduar, Cooch Behar, Bankura, Burdwan North, Burdwan South, Birbhum-I, Birbhum-II, South 24 Parganas, & Barasat-I (Highway Divisions) and Alipurduar, Cooch Behar, Birbhum, Burdwan, South 24 Parganas, Bankura & Barasat (PW Divisions).

stretch from 9.00 km to 21.4 km and from 17.00 km to 21.4 km was last taken up in 2007 and 2014-15 respectively. Interaction with a bus driver also revealed that the condition of the road was poor since 2018-19 as a result of which journey time from Simlipal to Bamundia Ghat had doubled besides increasing the wear and tear of vehicles.

The Division in reply (January 2021) stated that tender is being finalised for the improvement of the road. However, the fact remains that the road has been in poor condition for the last two years.



Fig.2.3: Interaction with stakeholder (driver) at Simlipal-Sarenga- Bamundiaghat Road (16.01.2021)



Fig.2.4: WMM exposed at 9.5 km of Simlipal-Sarenga- Bamundiaghat Road (16.01.2021)

- c. Similarly, WMM in some stretches and sub-grade in other stretches was found (February 2021) exposed throughout the Nalhati Bhabanandapur (2.67 km to 14.50 km) road (MDR) under Birbhum Highway Division-I along with numerous depressions (upto sub-grade) in the stretch from 3.3 km to 6.00 km. The road is important as it connects with the stone quarry of the Nalhati area. Interaction with stakeholders revealed that the road has been in poor condition for the last four years adversely affecting traffic movement to and from the quarry.



Fig.2.5: Meeting with stakeholder on Nalhati Bhabanandapur Road under Birbhum Highway Division-I (27.02.2021)



Fig.2.6: Subgrade exposed at various locations of Nalhati Bhabanandapur Road under Birbhum Highway Division-I (27.02.2021)

In reply, the Department stated (February 2022) that the work was delayed due to some technical problems which has now been sorted out. However, the fact remains that the Division could not commence the work even after five years.

2.6.3 Non-assessment of intended benefits

Construction of roads and bridges augments the economic activity of the whole State and have an impact on socio-economic aspects like breaking the isolation of remote areas, agriculture, employment generation, income and poverty alleviation, health and education *etc.* As such, construction of new roads and upgradation of existing roads requires an analysis of its impact in the areas where the construction activities have taken place.

The Department while preparing DPRs of road works have to assess the projected intended benefits that would accrue to the society both economically and socially after completion of the works. However, this exercise was not conducted in all the projects. Audit observed that out of 130 works, 127 related to widening and strengthening. In 46 test-checked works (*Appendix-8*) with estimated cost of ₹ 847.68 crore, the Department did not assess the intended benefits. In 81 works, though the intended benefits were assessed in the DPRs, the Department did not analyse the actual benefits accrued after completion of the works.

Thus, in the absence of assessment of actual benefits, the Department was not aware whether the completed projects had achieved the targeted socio-economic benefits.

The Department stated (February 2022) that after completion of projects it was obvious that socio-economic development would take place in and around the area. However, the fact remains that due to failure to conduct impact analysis, actual impact of the construction of the road could not be assessed.

2.7 Project Planning

For planning of individual road project, a Detailed Project Report is to be prepared by Sub-divisions/divisions after conducting soil investigation, assessment of traffic volume and topographic study. For projects upto ₹ 1.00 crore, technical sanction is provided by the Executive Engineer (EE), for projects above ₹ 1.00 crore to ₹ 2.50 crore by the Superintending Engineer (SE) and for projects above ₹ 2.50 crore to ₹ 5.00 crore by the Zonal Chief Engineer (ZCE). For projects, valuing more than ₹ 5.00 crore and up to ₹ 10.00 crore, the ZCE accords technical sanction only after the approval of the Zonal Project Screening Committee¹⁰ (ZPSC). Projects outlays beyond ₹ 10.00 crore are technically sanctioned by Chief Engineer Planning, after approval of the State Project Screening Committee¹¹ (SPSC).

Roads are to be designed on the basis of scientific assessment of traffic load (initial and future growth), geometrics to ensure better operating speeds with

¹⁰ ZPSC comprise of Zonal Chief Engineer, Assistant Chief Engineer (monitoring), Assistant Chief Engineer (Planning), SE of the concerned circle and one officer not below the rank of SE.

¹¹ SPSC comprise of Principal Secretary PWD, E-I-C and ex-officio secretary PWD, CE (Hqrs) PW Directorate, CE (Hqrs) Roads Directorate, CE Planning Roads Directorate, CE & Director RBRI, CE Planning PW Directorate, SE Bridge Planning Circle, SE State Highway Planning Circle.

adequate road safety measures and connectivity requirements. These factors together determine the composition and thickness of different layers to be used in construction of the road.

A road is constructed in layers (Sub-Grade, Sub-Base, Base course, Binder course and Wearing course) with different kind of materials like earth, moorum, sand, stone dust, stone aggregates, lime stone dust, bitumen, *etc.* (**Fig. 2.7**).

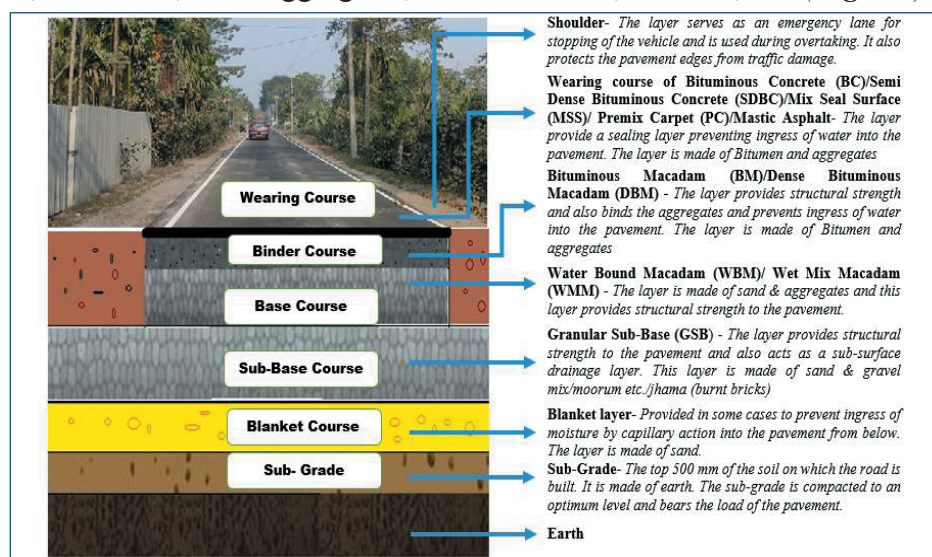


Fig. 2.7: Schematic diagram of different layers of a road

Audit observed that there were lapses at all levels (EE, SE, ZCE, ZPSC and SPSC) in designing and approval of road pavements which led to avoidable/unfruitful/wasteful expenditure as a consequence of unnecessary execution of works as discussed in the subsequent paragraphs.

2.7.1 Preliminary Investigation

Prior to execution of any road work, it is essential to conduct preliminary investigations like topography survey, soil investigation, traffic survey, *etc.* The topographical survey reveals the alignment of the road, the curves of the road and the water level around the road. Soil investigation reveals the nature and load bearing capacity of the soil. The traffic survey of a road helps to assess the quantum and nature of traffic that would ply on the road after completion of the work. These factors together determine the thickness of different layers to be used in construction of the road. Thus, it is imperative that such tests are done before preparation of DPRs to ensure that the road work is effectively designed and executed as per the site and traffic requirements.

2.7.1.1 Topographical Survey

As per IRC guidelines¹², topographical survey is necessary for improving existing roads so as to remove inherent deficiencies with respect to sight distance/visibility in horizontal and vertical plane, cross-drainage structures, roadside drainage provisions, area drainage considerations as well as safety features.

Topographical survey was not conducted in 78 test-checked works having an estimated cost of ₹ 1,433.64 crore. Out of the remaining 52 test-checked works

¹² SP-19:2001 clause 4.2.

where topographical survey was stated to have been conducted, the division failed to produce any records regarding such survey in 35 works having an estimated cost of ₹ 1,313 crore.

Failure to conduct topographical survey could lead to erroneous planning and design of the roads. Besides, requirement of drainage may also be overlooked. Some instances where topographical survey was not conducted resulting in subsequent need for additional work and consequent delays in completion of works are shown in **Table 2.2**.

Table 2.2: Additional works taken up for execution due to failure to conduct topographical survey

Sl. No.	Name of the work	Tender cost (₹ in crore)	Additional/ excess items	Additional cost (₹ in crore)	Time overrun (in days)	Reason for extra works/additional works
1	W&S of Beliatore-Sonamukhi-Patrasayar-Rasulpur Road, Bankura PW Division	36.68	GSB, WMM, cement concrete pipe (NP4) etc.	2.50	260	Water overtopping during monsoon season was not noticed
2	Improvement of MKKS Road, Burdwan South Highway Division	11.76	Surface drain and additional layer of 200 mm GSB	0.20	186	Proper surface drainage system was not provided
3	Strengthening of Hingalganj - Dulduli Road from 12.50 to 33.60 km, Barasat PW Division.	7.29	Extra earthwork, WBM and Bullah piling	0.47	122	Deficiency of earth on embankment and low level of the road.
4	W & S of Rampurhat-Tarapith Road, Birbhum Highway Division-I	38.83	M-15 grade concrete and 17 cross drains.	2.62	273	Due to change in design and number of cross drains.
Total		94.56		5.79		

(Source: Records of the PW/Highway divisions)

These instances of increase in cost and delay in completion of the projects could have been avoided by the Department if proper topographical survey was conducted during preparation of DPRs. The failure of the divisions to conduct the topographical survey was also overlooked by the SE, ZC, ZPSC or the SPSC while according technical sanction to the projects.

The Department stated (February 2022) that in case of one work¹³, topography survey was not done as the work was strengthening in nature. In case of another work¹⁴, it was stated that submergence of road during monsoon was not taken into account during preparation of DPR. The reply is not tenable as topography survey prior to taking up of any kind of road project is required to remove inherent deficiencies of the road, which was not done in the instant cases.

2.7.1.2 Investigation of soil and existing layers

As a part of preliminary investigation, soil test is required in order to calculate the California Bearing Ratio (CBR)¹⁵ of the sub grade¹⁶. The different layers

¹³ Improvement of MKKS Road, Burdwan South Highway Division.

¹⁴ Strengthening of Hingalganj - Dulduli Road from 12.50 to 33.60 km, Barasat PW Division.

¹⁵ Load bearing capacity of soil. Higher CBR value means the surface is strong enough to bear higher traffic load.

¹⁶ Soil on which the road is constructed.

and thickness of flexible pavement of any road to be upgraded depends on the CBR value and the traffic volume of the road. Investigation of existing layers of the road is also necessary for laying additional layers required for the proposed development/upgradation.

Out of the 130 test-checked works, soil test for determination of CBR was required to be conducted in 116 works. In 93 works where CBR was stated to have been determined in the DPR and used in pavement designing, the divisions could not provide any evidence of this being done for even a single work. As a result, authenticity of CBR value used in designing the roads could not be verified. In two works {*Appendix-9(i)*} with estimated cost of ₹ 31.77 crore, it was seen from the DPRs that CBR tests were done at locations beyond (10 kms away from the project) the project length of the road. In another work¹⁷ executed at a cost of ₹ 7.62 crore, CBR taken into consideration pertained to another nearby road which was attributed to urgency. In two works {*Appendix-9(ii)*} with an estimated value of ₹ 31.17 crore, DPRs were prepared without investigating the existing layers of the road. As a result, while executing the works, the divisions found the existence of a bituminous layer beneath the existing granular layer of the roads which if not removed, would result in slippage and deformation of the newly laid layers.

Such deficient soil investigation prior to the commencement of work exposes the newly constructed roads to the risk of slippage and deterioration.

The Department while accepting (February 2022) the observation in case of Burdwan South Highway Division, offered no comments in the case of the other two divisions¹⁸.

2.7.1.3 Traffic Census

As per IRC guidelines¹⁹, traffic census provides information of the volume and type of traffic plying on the road for designing pavement of roads to be constructed. Any deficiency in designing would lead to deterioration of roads, well before its design life. The traffic census²⁰ should be conducted:

- (i) for three days with 24 hours each day, twice a year²¹, in case of rural roads;
- (ii) at least for seven days with 24 hours each day for SH and MDR;
- (iii) at a point of the road away from the urbanised development and village areas;
- (iv) the collected field data should be recorded in prescribed format²²; and
- (v) by enumerators under the supervision of trained supervisors.

Scrutiny of records of test-checked works revealed the following irregularities in conducting traffic census.

- a) In four works (*Appendix-10A*) with estimated cost of ₹ 33.84 crore, it was

¹⁷ Strengthening of Hingalganj-Dulduli Road, 12.50 km to 33.60 km of Barasat PW Division.

¹⁸ Barasat and Cooch Behar PW Divisions.

¹⁹ IRC-37:2012 and IRC-SP-72:2007 & 2015.

²⁰ IRC-9:1972: clause 3.1, 4.1, 5.2 & 5.3 and IRC-SP-72:2015: clause 3.4.1 for rural roads.

²¹ Once during peak harvest season and other during the lean season.

²² Plate-I is the IRC prescribed format to record data collected by enumerator in the field.

noticed that the estimates were prepared on the basis of CE's order without conducting any traffic census. In another 10 works with estimated cost of ₹ 57.58 crore, the divisions did not provide information regarding conduct of traffic census.

- b) In 19 works (**Appendix-10B**) with estimated cost of ₹ 499.02 crore, the census was not done for seven days as required for SHs and MDRs. The Department stated (February 2022) that in case of Burdwan and Bankura PW Divisions traffic census was done for three days only as there was no such variation in traffic noticed during this period. In case of Cooch Behar and Bankura Highway, it stated that seven days traffic census was not done due to urgency in preparation of DPR. The reply is not tenable as a reasonable assessment of variation in traffic cannot be done in 3 days and was not as per IRC guidelines.
- c) In four works (**Appendix-10C**) with estimated cost of ₹ 36.89 crore, traffic census was not done for three days as required for ODRs and VRs. It was seen in one work²³ that traffic census was conducted for three days but for 16 hours instead of 24 hours each day.
- d) In 30 works (**Appendix-10D**) with estimated cost of ₹ 335.59 crore, traffic census was done in one season only instead of two seasons (lean and peak). The Department stated (February 2022) that traffic census could not be done for both the seasons as the DPRs were to be submitted urgently. The reply is not tenable as leaving out one season may lead to distortion in calculation of the traffic volume which may lead to erroneous design of the road.
- e) In 16 works (**Appendix-10E**) with estimated cost of ₹ 210.65 crore, location where the census was conducted was not recorded. The Department accepted (February 2022) the observation in case of South 24 Parganas Highway Division. No replies were furnished in case of other Divisions.
- f) In 67 works (**Appendix-10F**) with estimated cost of ₹ 1,510.81 crore, the divisions failed to provide field reports²⁴ of any of the traffic census that were reported to have been conducted while designing the roads. As such, the reliability of the traffic count could not be ascertained in audit and the possibility of incorrect traffic volume being considered for pavement designing could not be ruled out. The Department accepted (February 2022) the audit observation and stated that it has been noted for future guidance.
- g) In four road works {**Appendix-9(iii)**} with an estimated cost of ₹ 21.19 crore, total traffic count in the approved DPR included buses as one of the types of traffic plying on the roads. However, during joint meeting (6 January 2021) with the stakeholders²⁵ of the roads and Divisional personnel, it came to light that no buses plied on the roads. The fact was also accepted by the two divisions concerned. This raises doubt on the authenticity of the census itself. The erroneous traffic count gave rise to an inflated Million

²³ Construction of Road from Gantimore to Gandharbapur for a length of 4.150 km of Burdwan South Highway Division.

²⁴ The report in which the enumerator records the traffic data at the census points.

²⁵ Commercial Bus Owners Association of Cooch Behar District.

Standard Axles (*msa*) for the roads. As the inflated *msa* was found to be more than two, the roads were designed as per IRC guidelines²⁶ which recommended laying bituminous layers on the roads. If correct traffic, excluding the buses, were taken into account, the *msa* for all these roads would have been less than 2. Thus, the use of unnecessary bituminous layer due to incorrect traffic count led to an extra additional expenditure of ₹ 2.25 crore. The Department, in case of Cooch Behar PW Division stated (February 2022), that plying of buses in the road may not be a regular phenomenon because during picnic/tourist season, buses ply in many roads where there are no regular buses. The reply is not tenable as traffic census should not be conducted during abnormal condition of traffic as per extant IRC guidelines.

- h) The Bankura PW Division while executing two works {**Appendix-9(iv)**} with estimated cost of ₹ 83.34 crore, conducted the traffic census at a busy locality (bazar) which raises doubt on the accuracy of the traffic count used in designing the roads and the use of higher than necessary specifications for these roads cannot be ruled out.
- i) As per IRC guidelines²⁷, traffic census should be conducted for 24 hours, dividing a day into three shift of eight hours each. In one road work {**Appendix-9(v)**}, Burdwan North Highway Division decided to increase the specification of the road, while the work was in progress, on the ground that the road had to support heavily loaded sand-filled trucks. Thus, it was evident that the original traffic census was incorrect. The Department stated (February 2022) that the specification was increased due to plying of sand filled trucks and the GSB was extended to the edge to facilitate sub-surface drainage. The reply is not tenable as proper traffic census would have captured the sand filled trucks. Moreover, the contention of the Department regarding extension of GSB due to sub-surface drainage seems to be an afterthought as no such reason was mentioned in the excess-less statement of the work.
- j) Burdwan South Highway Division while executing a work²⁸ with an estimated cost of ₹ 35.83 crore, revised the pavement design while the work was ongoing. The volume of traffic used in the revised design was 50 per cent more than the traffic volume used in the original design. Thus, increase in traffic volume led to laying of extra bituminous layer thereby incurring avoidable expenditure of ₹ 0.39 crore. The Department stated (February 2022) that during execution of the work, an increase in traffic volume was noticed and so the change was affected. The reply is not tenable as the Division should have done a fresh traffic census instead of arbitrarily inflating the previous traffic census.
- k) As per IRC guidelines²⁹, when a new road is being planned, Origin-Destination (OD) traffic survey is to be conducted to find out the traffic likely to use the road when the road is completed. It was observed

²⁶ IRC-37-2012: clause 2.1 and clause 10.

²⁷ IRC-9-1972: clause 5.1.

²⁸ Strengthening & upgradation of Hatgobindapur-Purbabalisha Road, 0.00 km to 15.36 km.

²⁹ IRC-SP-21-2001: clause 6.3.1.

that Diamond Harbour Highway Division, while constructing a new road³⁰ (MDR), conducted traffic survey on nearby existing roads and took 40 per cent of the traffic count for designing the new road, without assigning any reasons. As the project was a new road, the Division was required to conduct an OD survey.

Thus, it is evident that the extant guidelines were regularly violated at the divisional level and higher authorities like SE, ZCE and ZPSC also overlooked the aspect of traffic survey while approving the DPRs.

2.7.2 Designing of roads pavements

Analysis of records related to selected roads in the test-checked divisions revealed various errors/irregularities in designing of road pavements leading to avoidable/unfruitful/wasteful expenditure as discussed in the following paragraphs.

2.7.2.1 Execution of road works without pavement design

As per IRC guidelines³¹, pavement designing has to be done to decide upon the thickness of the road and the various bituminous and non-bituminous layers to be laid. In order to design a pavement, various factors such as the volume of traffic, CBR of the sub-grade, the design life, proposed width and the rate of growth of traffic of the road are taken into consideration.

Audit observed that in eight works {Appendix-9(vi)} with estimated cost of ₹ 52.65 crore, thickness of the pavement as well as the thickness of the various layers were laid arbitrarily without any calculation as required under IRC guidelines. As the design of these roads was not as per the norms, possibility of quality being compromised or unnecessary layers being provided, could not be ruled out. Of these eight works, it was noticed in three works {Appendix-9(vii)} with estimated cost of ₹ 20.17 crore, that the divisions did not calculate the pavement design and thickness of different layers were fixed as per directions of the Chief Engineer (Head Quarter), PW (Roads) Directorate.

In one of these three roads³², 50 mm BM and 25 mm SDBC was laid in the stretch from 6 km to 11 km, at a cost of ₹ 1.61 crore as per directions of the Chief Engineer. However, the contiguous section from 0 km to 6 km of the road was constructed with 75 mm BM and 25 mm SDBC after calculating the pavement design as per extant IRC guidelines. Joint physical verification revealed that the stretch from 0 km to 6 km, which was designed as per extant IRC guidelines, was in good condition while the other had deteriorated, although both the stretches were constructed more or less during the same period.

2.7.2.2 Violation of IRC guidelines in pavement design of Non-Rural Road – Avoidable expenditure of ₹ 0.39 crore

IRC guidelines³³ recommend thickness of pavement and various bituminous and non-bituminous layers of a road, based on the *msa* and CBR. Providing more

³⁰ Construction of New Link Road from Taranagore more 4.6 km to Kaliala more 13.8 km of Joynagar Jalabheria Kultali Road.

³¹ IRC-37 for Non-Rural Roads and IRC-SP-72:2007 and 2015 for Rural roads.

³² Strengthening of Joydeb Kenduli Illambazar Road, 6 km to 11 km of Birbhum Highway Division-I.

³³ IRC-37:2012 "Guideline for the design of flexible pavements".

thickness than that recommended would result in avoidable expenditure while a lesser thickness would result in construction of a sub-standard road prone to damage. Birbhum Highway Division, while executing two road works, did not adhere to the recommendation of the IRC guidelines which led to avoidable expenditure as shown in **Table 2.3**.

**Table 2.3: Pavement layer required as per IRC guidelines
vis-à-vis actually laid**

Name of the work	Type of road	Layer recommended as per IRC guidelines	Layer actually laid	Excess layer laid	Additional cost (₹ in crore)
W & S of Rampurhat Tarapith Road of Birbhum Highway Division-I	MDR	DBM- 90 mm	DBM-100 mm	DBM-10 mm	0.28
W & S of Tilpara Massanjore Road of Birbhum Highway Division-I	MDR	DBM-55 mm	BM-75 mm	DBM-20 mm	0.11
Total					0.39

(Source: Records of the PW/Highway divisions)

Thus, as a result of not following the extant IRC guidelines, the divisions laid excess layers and incurred extra avoidable expenditure of ₹ 0.39 crore.

The Department stated (February 2022) that in one work³⁴ extra thickness of bituminous layer would increase the life of the road. In case of the other work³⁵, it was stated that 55 DBM was converted to 75 BM. However, the fact remains that the Department had to incur extra expenditure.

In another work³⁶, the layers designed as recommended by IRC guidelines was rejected by the State Project Screening Committee (SPSC) without assigning any reason. The guidelines recommended laying 75 mm BM and 25 mm SDBC. However, the SPSC cancelled the BM and substituted 25 mm SDBC by 20 mm Premixed Carpet & Seal Coat. As a result, the road upgraded (October 2018) at a cost of ₹ 8 crore deteriorated within two years of its construction.

2.7.2.3 Unjustified use of wearing course – Avoidable expenditure of ₹ 3.84 crore

As per IRC guidelines³⁷, the recommended wearing course³⁸ is Semi Dense Bituminous Course (SDBC) when *msa* of the road is upto five. In cases where *msa* is more than five, Bituminous Concrete (BC) is recommended. The guidelines also stipulates that wearing course such as Mastic Asphalt can be used only in case of heavy duty road pavements.

Audit observed that in six works {Appendix-9(viii)} with estimated cost of ₹ 139.41 crore, the divisions designed the pavement adopting IRC-37: 2001 & 2012. As the *msa* of these roads were less than five, the divisions were required

³⁴ W & S of Rampurhat Tarapith Road.

³⁵ W & S of Tilpara Massanjore Road.

³⁶ Strengthening of Kusumgram Shamaspur Road, 0 km to 12 km of Burdwan PW Division.

³⁷ IRC-37:2012 and IRC-107-1992 tentative specifications for bitumen Mastic wearing courses.

³⁸ The top most layer of the pavement which is laid over the binder course.

to lay 25 mm SDBC as wearing course. However, the divisions used 30 mm BC (costlier item) as wearing course in four of the works {Appendix-9(ix)} in violation of the guidelines while in case of the remaining two works {Appendix-9(x)}, where the *msa* was 2.5, the Division laid costly Mastic Asphalt as a wearing course, although SDBC would have sufficed as per the IRC guideline. The Division laid Mastic Asphalt on one of the roads³⁹ on the ground that the road was prone to deterioration due to discharge of lubricating oil from nearby motor garages. However, as per IRC guidelines⁴⁰, Mastic Asphalt is not to be provided in oil dripping areas as it damages the coating and leads to deterioration of the road surface. In the case of the other work, no justification for providing Mastic Asphalt was found on record.

Thus, use of BC and Mastic Asphalt, instead of recommended SDBC led to an avoidable expenditure of ₹ 3.84 crore.

The Department stated (February 2022) that BC was used in place of SDBC as per the decision of State Project Screening Committee (SPSC) to sustain heavily loaded vehicle plying on the roads. It was also stated that Mastic Asphalt was used due to submergence of the road during rainy season. The reply is not tenable as neither the decision of SPSC nor any order to this effect was produced to audit. The contention of heavy vehicle plying on the roads is also not tenable as *msa* of the roads was calculated considering heavy vehicles during the traffic census. As regard to use of Mastic Asphalt, the issue of submergence was not mentioned in the DPR nor in any other record.

2.7.2.4 Erroneous *msa* calculation-Avoidable expenditure of ₹ 7.62 crore

As per IRC-37:2012, any non-rural road having *msa* of less than two is required to be designed as per guidelines⁴¹ meant for designing of rural roads. As per the rural roads guidelines, if Equivalent Standard Axle Load (ESAL)⁴² of the road is more than 15 lakh, a binder course of 50 mm BM is required.

Scrutiny of records of three roads {Appendix-9(xi)} works with estimated cost of ₹ 35.56 crore revealed that *msas* of the roads were more than two as per the DPRs, and accordingly the road pavements were designed as per the guidelines meant for designing the non-rural roads (IRC-37:2012). However, Audit calculated the *msa* of these roads as per the IRC guidelines with the available data in the DPR and found that in all the three roads, the *msa* was less than two and pavement design guidelines⁴³ meant for rural roads should have been used.

It was further seen in two other road works {Appendix-9(xii)} with estimated cost of ₹ 35.56 crore that though the *msa* of the roads were less than two as per the DPRs, the divisions did not design the road as per the specification meant for rural road.

³⁹ Strengthening of Alipurduar Patlakhawa Road 0 km to 14.5 km of Alipurduar PW Division.

⁴⁰ IRC-107:1992, clause 3.

⁴¹ IRC-SP-72:2007 & 2015 Guideline for design of flexible pavements for low volume rural roads.

⁴² The estimated or projected magnitude and occurrence of various traffic, loading are converted to the total number of passes of Equivalent Standard Axle Loading (ESAL) usually the equivalent of 80 KN single axle load.

⁴³ IRC-SP-72:2007 & 2015.

Due to use of non-rural road guidelines instead of rural road guidelines, the divisions incurred an avoidable expenditure of ₹ 7.62 crore as shown in **Table 2.4**.

Table 2.4: ESAL of roads and excess of pavement layers

Name of the work	msa as per DPR	Actual msa	ESAL of the road	Excess layers laid in mm	Specifications as per IRC in mm	Avoidable cost (₹ in crore)
W & S of Boxirhat Jorai Road, Alipurduar PW Division	2.50	1.50	10,84,591	BM-50 mm	No Binder Course	2.44
IRQ of Vivekananda Street, Cooch Behar PW Division	2.00	0.99	5,29,306	BM-50 mm	No Binder course	0.40
W&S of Kholapota Baduria Maslandapur Habra Road of Barasat PW Division	9.00	0.36	14,03,801	DBM-75 mm & BC -40 mm	No Binder course & OGPC ⁴⁴ - 20 mm	3.37
Strengthening of Bhatar Bonpas Road 0 km to 14.5 km, Burdwan North Highway Division	1.74	NA	14,41,279	DBM-50 mm	BM-50 mm as per Benkelman beam deflection test	0.60
Anandapur- Kharki- Boynan- Tadah Road 0 km to 15.1 km, South 24 Parganas Highway Division	1.90	NA	19,72,510	DBM-50 mm & SDBC-25 mm	BM-50 mm and PC & SC-20 mm	0.81
Total						7.62

(Source: Records of the PW/Highway divisions)

The Department accepted (February 2022) the audit observation in case of Alipurduar and Cooch Behar PW Divisions. In respect of Barasat PW Division, it was stated that IRC-37:2012 was used for designing as the road was MDR. The reply is not tenable as the value of *msa* was below 2 and the road was to be designed as per IRC-SP:72:2015.

2.7.2.5 Consideration of wrong specifications-Avoidable/unfruitful expenditure of ₹ 2.13 crore

Audit observed that in two test-checked works {Appendix-9 (xiii)} with estimated cost of ₹ 76.87 crore, the divisions interpreted the guidelines erroneously while designing the pavement of the roads leading to extra expenditure of ₹ 2.13 crore as detailed below:

- Burdwan PW Division, erroneously provided 75 mm BM and 80 mm DBM as binder course in the widening portion of the road against 85 mm DBM layer recommended in the extant IRC guidelines in W & S of Burdwan Kalna Road (27 km to 51 km). After construction of 6.2 km (against a total of 24 km) with 75 mm BM and 80 mm DBM, the error was realised by the Division and it was decided (December 2015) to lay only 85 mm DBM in the rest of the widening portion of the pavement. This led to avoidable expenditure of ₹ 1.02 crore on laying the unnecessary bituminous layer of 75 mm BM.
- As per guidelines⁴⁵, a blanket layer⁴⁶ is to be constructed with sand or non-plastic moorum having Plasticity Index less than five only and for up-gradation of CBR of the sub grade, a layer of 500 mm of better CBR

⁴⁴ Open Graded Premix Carpet.

⁴⁵ IRC-37:2001, Annexure-4 part-III and IRC-37:2012: clause 5.2.

⁴⁶ Blanket layer is an effective intrusion barrier provided on the expansive soil sub grade as a sub base.

material (materials having a higher CBR than the existing CBR of the sub grade) is to be laid on the sub grade.

Birbhum Highway-I Division provided a blanket layer of 300 mm stone dust in Strengthening of Nalhati–Rajgram Road (0 km to 15 km) to increase the CBR of the sub-grade from four *per cent* to eight *per cent*. The Division laid non-specified material like stone dust as blanket layer and also did not lay the layer of material with better CBR to a thickness of 500 mm. Thus, the purpose of laying a blanket layer or the intended increase in CBR was not achieved. This led to an unfruitful expenditure of ₹ 1.11 crore incurred on laying of the 300 mm stone dust layer.

The Department stated (February 2022) that to achieve better CBR, 300 mm stone dust was provided. However, as per IRC-37:2012, effective CBR can only be achieved by providing sand layer of at least 500 mm.

2.7.2.6 Erroneous designing of rural roads-Avoidable expenditure of ₹ 15.70 crore

As per IRC guidelines⁴⁷, for designing of rural roads⁴⁸, value of ESAL and CBR of the sub-grade is to be calculated in order to decide on the composition of the road pavement. As per the extant guidelines, roads having ESAL below 15 lakh did not require any bituminous binder course. In the case of 13 village road works {*Appendix-9(xiv)*}, it was seen that the roads were designed without following the guidelines meant for rural roads and bituminous binder course were provided unnecessarily. Similarly, in two other village roads, excess sub base, base and wearing course were laid. Further, in another village road {*Appendix-9(xv)*}, though the guidelines for rural road were used for designing the pavement, the division used higher specification of wearing course of Mastic Asphalt instead of the recommended OGPC. These anomalies resulted in avoidable expenditure of ₹ 15.70 crore as detailed in **Table 2.5**.

Table 2.5: Excess layers provided on rural roads

Sl. No.	No. of works	Guideline used for designing	Guideline to be used	ESAL of the road (in lakh)	Layers to be provided in mm	Excess layers provided in mm	Avoidable expenditure (₹ in crore)
1	13	IRC-37:2001 & 2012	IRC-SP 72: 2007&2015	0.96 to 14.55	No Binder course	BM-50 mm	13.99
2	1 ⁴⁹	IRC-37:2012	IRC-SP-72:2015	18.20	BM-50 mm OGPC-20 mm	DBM-50 mm SDBC-25 mm	0.44
3	1 ⁵⁰	IRC-37:2012	IRC-SP-72:2015	15.50	GSB-200 mm WMM-225 mm OGPC-20 mm	GSB-100 mm WMM-25 mm SDBC-25 mm	0.61
4	1	IRC-SP: 72:2015	IRC-SP 72:2015	16.31	OGPC-20 mm	Mastic Asphalt-25 mm	0.66
Total							15.70

(Source: Records of the PW/Highway divisions)

⁴⁷ IRC-SP-72:2015 Table 4.

⁴⁸ Other District Road (ODR) and Village Road (VR).

⁴⁹ W&S of Junbedia Amarkan Road of Bankura Division, PWD.

⁵⁰ W&S of Rajgram-Surpanagar Road of Bankura Division, PWD.

The Department stated (February 2022) that BM were laid on these roads as the rate of growth of traffic as provided in the IRC guidelines were not applicable in these areas. However, the reply is not tenable as the IRC guidelines prescribes five *per cent* annual growth of traffic in cases where the actual data of growth of traffic is not available.

2.7.2.7 Non-consideration of existing layer-Avoidable expenditure of ₹ 7.37 crore

For improvement of a road pavement, existing layers of the road is to be assessed for further required layers as per extant IRC guidelines. Audit observed that in four works {Appendix-9(xvi)} with estimated cost of ₹ 164.78 crore, the roads had usable existing sub-base and granular base layers. The divisions should have considered these layers and accordingly laid fresh layers to meet the design requirement. However, it was seen that the divisions ignored the existing layers and laid layers with excess thickness, which led to avoidable expenditure of ₹ 7.37 crore as shown in Table 2.6.

Table 2.6: Usable pavement layer and excess layer laid

Name of the road	Existing layer	Additional layers required	Layers provided	Excess layer laid	Avoidable expenditure (₹ in crore)
W&S of Simlipal Khatra 0 km to 26.4 km, Bankura Highway Division	WMM-130 mm	WMM-120 mm	WMM-150 mm	WMM-30 mm	2.74
	-	GSB-180 mm	GSB-230 mm	GSB-50 mm	
W&S of KNS Road 10 km to 18 km, Burdwan North Highway Division	BM- 100 mm equivalent DBM-70 mm	DBM-7 mm	DBM-50 mm	DBM-43 mm	0.79
W&S of Ahmedpur-Kirnahar-Ramjibanpur Road 0 km to 29.106 km, Birbhum Highway Division-II	WMM-100 mm	WMM-150 mm	WMM-250 mm	WMM-100 mm	2.96
Strengthening of Bashirhat-Pifa-Raghavpur Road 11 km to 27 km, Barasat Highway Division-I	WMM-50 mm	WMM-200 mm	WMM-250 mm	WMM-50 mm	0.88
Total					7.37

(Source: Records of the PW/ Highway divisions)

The Department stated (February 2022) that excess layers were laid in the four divisions due to various reasons such as less Resilient Modulus of the existing BM, wastage of WMM while picking the bituminous layer and practical experience.

In respect of weak Resilient Modulus of existing BM layer, the reply is an afterthought as it was not mentioned in the sanctioned estimate. Further, wastage of WMM could have been avoided by using milling method of picking up of the existing bituminous layers.

2.7.2.8 Erroneous design due to non-consideration of effective CBR - Avoidable expenditure of ₹ 4.00 crore

As per IRC guidelines⁵¹, CBR of the sub-grade can be improved by laying 500 mm of better quality sub-grade material having higher CBR (materials

⁵¹ IRC-37:2012, clause 5.2.

having higher CBR than that of the existing sub grade). For the purpose of designing pavement with effective CBR, a resultant of the existing CBR and the newly laid sub grade material should be considered as per the extant guidelines. Audit observed that in four works pertaining to three divisions, the extant provision of the guidelines on effective CBR had not been followed resulting in avoidable expenditure of ₹ 4.00 crore as detailed below:

- a) In two works *{Appendix-9(xvii)}* with estimated cost of ₹ 76.17 crore, the divisions decided to improve the CBR of the sub-grade by laying better quality of sub-grade materials on the existing sub-grade. In one of the works⁵², whose original CBR was three *per cent*, it was decided to lay 350 mm of sand layer and in the other work⁵³, where the CBR was 3.5 *per cent*, it was decided to lay 300 mm of stone dust layer. After laying these sub-grade materials, the divisions took the effective design CBR as seven *per cent* and eight *per cent* respectively and designed the road pavement accordingly. The claim of the divisions that the CBR had increased was not backed by any calculation. The process of calculation of effective CBR, as provided in the IRC guidelines is applicable only when 500 mm of sub-grade layer is laid. Laying of sub-grade materials with thickness less than 500 mm would not result in increasing the sub-grade CBR as per the IRC guidelines. Thus, the expenditure of ₹ 3.49 crore incurred on laying these sub-grade materials was unfruitful. The Department stated (February 2022) that CBR can be raised by laying 300 mm stone dust or 350 mm sand as per IIT-Pave technique provided in IRC-37:2018. The reply is an afterthought as the designing was done as per IRC-37:2012 and not as per IRC-37:2018.
- b) In one work⁵⁴ with estimated cost of ₹ 38.60 crore, the Division laid 500 mm of medium sand over the sub-grade. The Division, while designing the pavement, did not calculate the effective CBR achieved due to laying of 500 mm of medium sand. It designed the non-bituminous pavement thickness of 600 mm based on the existing sub-grade CBR of three *per cent*. Audit observed that after laying 500 mm of sand, the effective CBR would have been five *per cent* and accordingly, IRC guidelines provides for 550 mm of non-bituminous pavement thickness.

Thus, by not considering the effective CBR, the Division laid 50 mm excess pavement thickness leading to an avoidable expenditure of ₹ 0.51 crore.

2.7.2.9 Erroneous drainage layers

As per IRC guidelines⁵⁵, sub-surface drainage is important for long life and better performance of the pavement. The moisture which reaches the lower layers of the pavement from different sources like the pavement surface, seepage from shoulders, and capillary rise of moisture from the ground is termed as sub-surface moisture. Disposal of this moisture away from the pavement body is termed as sub-surface drainage.

⁵² W&S of Saptagram-Tribeni-Kalna-Katwa Road 83 km to 102.34 km of Burdwan North Highway Division.

⁵³ Strengthening of Murarai-Mitrapur Road, 0 km to 13.5 km of Birbhum Highway Division-I.

⁵⁴ W&S of Bolpur-Palitpur Road, 12.70 km to 25.70 km under Birbhum PWD.

⁵⁵ IRC-SP-42:2014: section 5 Guidelines of Road Drainage.

As per IRC guidelines⁵⁶, upper GSB layer is called the drainage layer which can be used to drain the moisture from the pavement/shoulder. It also stipulates that lower GSB layer shall serve the purpose of separation or filter layer, which will prevent the ingress of sub-grade soil into the upper pavement. Further, the filter layer along with the drainage layer shall run concurrently till the edge of the embankment.

Scrutiny revealed that in 11 works {Appendix-9(xviii)} with estimated cost of ₹ 332.19 crore, five divisions did not provide the drainage and filter layer concurrently till the edge of the embankment, raising the risk of ingress of sub soil into the drainage layer. This would lead to non-functioning of the sub-surface drainage system, thereby affecting the performance and longevity of the pavement.

The Department stated (February 2022) that the filter layer was not extended till the embankment because the adjacent area had water level higher than the drainage layer during the monsoon. The reply is not justifiable as the same was not considered while laying the drainage layer up to the edge of the embankment.

2.7.2.10 Erroneous design of Dense Bituminous Macadam- Avoidable expenditure ₹ 2.29 crore

As per IRC guidelines⁵⁷, VG 40 grade bitumen should be used when *msa* of the road exceeds 30, provided that the air temperature in that location exceeds 40°C in summer. Furthermore, the guidelines⁵⁸ also provides that unit thickness of DBM with VG-30 equals 0.833-unit thickness of DBM with VG-40. IRC guidelines⁵⁹ also provide that one unit thickness of BM equals to 0.70 unit thickness of DBM.

Scrutiny revealed that in three works, excess thickness of BM/DBM was laid using VG-40 as detailed below:

- a) In one work⁶⁰ with estimated cost of ₹ 50.23 crore under Bishnupur PW Division, 90 mm DBM was laid with VG-30 though the *msa* of the road was more than 30. Besides, the road was in a region (Bankura district) where the temperature exceeds 40°C in summer. Thus, as per IRC guidelines, the Division should have used VG-40 bitumen. This would have reduced the required thickness of the DBM layer to 75 mm. As a result, the Division incurred an avoidable expenditure of ₹ 1.03 crore due to laying excess thickness of 15 mm DBM.
- b) In one work⁶¹ with estimated cost of ₹ 24.64 crore, the Division laid 75 mm BM using VG-40. However, as per IRC guidelines⁶², the required thickness of the pavement should have been 53 mm DBM using VG-30

⁵⁶ IRC-SP-42:2014, clause 5.2 sub clause 5.2.1, clause 5.2 sub clause 5.2.1 (ii), Figure 5.3 and IRC-37:2012, clause 7.2.1.3.

⁵⁷ IRC-37:2012, Table VII-1 of Annexure VII, Annexure-III.

⁵⁸ IRC- 37:2012, Annexure-III.

⁵⁹ IRC-81:1997, clause 7.4.

⁶⁰ Upgradation of Bishnupur-Kotulpur Road, 0 km to 18 km.

⁶¹ W&S of Nabanda Joykrishnapur Road, 10 km to 28.6 km of Bankura Highway Division.

⁶² IRC-37:2012 "Guidelines for the design of flexible pavements", clause 10.

which is equivalent to 44 mm DBM with VG-40⁶³. This when converted to BM with VG-40, the thickness would be 63 mm of BM with VG-40. Thus, the Division by laying 75 mm BM instead of 63 mm BM (excess 12 mm BM), incurred an avoidable expenditure of ₹ 0.56 crore. The Department stated (February 2022) that the actual requirement of BM with VG-40 was 78.57 mm and so laying of 75 mm BM was not excessive. However, the Department did not provide any calculation for the same.

- c) In another work⁶⁴, the Division erroneously converted the required thickness of 90 mm of DBM with VG-30 to 80 mm DBM with VG-40. However, as per IRC, the thickness of DBM with VG-40 would be 75 mm. Thus, due to erroneous calculation, extra thickness of DBM of 5 mm was laid resulting in avoidable expenditure of ₹ 0.23 crore.

2.7.2.11 Erroneous designing of low volume concrete pavement – Avoidable expenditure of ₹ 1.21 crore

As per IRC guidelines⁶⁵, for construction of concrete pavement roads having Commercial Vehicle Per Day⁶⁶ (CVPD) not exceeding 450, the base on which the concrete pavement is to be laid shall comprise of 100 mm GSB followed by 150 mm WMM.

Scrutiny revealed that in one work with estimated cost of ₹ 11.66 crore, CVPD of the road was less than 450 (here 257). However, the division provided excess layers of GSB, WMM and even provided a layer of Dry Lean Concrete (DLC) whose use is not mentioned in the guidelines as shown in **Table 2.7**.

Table 2.7: Excess layer of GSB, WMM and DLC laid on low volume concrete pavement

Name of the work	Value of CVPD	Thickness of layers required as per IRC	Existing usable layers	Thickness of the layers actually laid	Excess thickness of layers laid	Avoidable expenditure (₹ in crore)
Strengthening of Khagra- Joydev Road from 0 km to 8 km, Birbhum Highway Division-II	257	GSB-100 mm WMM-150 mm	None	GSB-330 mm WMM-250 mm DLC-150 mm	GSB-230 mm WMM-100 mm DLC-150 mm	1.21
Total						1.21

(Source: Records of the PW/ Highway divisions)

Thus, the use of excess layers underneath the concrete pavement led to an extra avoidable expenditure ₹ 1.21 crore.

The Department in reply stated (February 2022) that at present, the traffic is very high as numerous heavy sand laden trucks ply on the road. The reply is not tenable as the designing was done taking into consideration future volume of traffic. So, the present increase as stated had already been taken into consideration for designing the pavement.

⁶³ IRC-37:2012, Annexure III.

⁶⁴ W&S of Mahachanda Road, 0 km to 10.45 km of Burdwan Division PW Division.

⁶⁵ IRC-SP-62:2014, clause 1.4.2 and 3.6.2.3.

⁶⁶ It is the number of commercial vehicle plying on a road per day, having a weight of 3 Tonne or more.

2.7.2.12 Erroneous design of interlocking concrete block pavement- Avoidable expenditure of ₹ 3.09 crore

As per IRC guidelines⁶⁷, the base on which the paver blocks are to be laid should be made of bound material like lean concrete or unbound material like WMM or WBM. The sub-base should be of granular material. The thickness of both the base and sub-base should not exceed 250 mm each under any circumstances. Furthermore, the thickness of the paver block is decided by the *msa* of the road. The following deviations from the guidelines were observed by Audit in three works:

- a. In one work⁶⁸ with estimated cost of ₹ 17.22 crore, the Barasat Highway Division-I provided GSB layer of 350 mm instead of the prescribed 250 mm. In another work⁶⁹ with estimated cost of ₹ 42.94 crore, the pavement already had 200 mm sub-base (Jhama) and 150 mm base (WBM). The Division should have considered 50 mm of the existing WBM as sub base making the total sub base 250 mm. In addition to this, a fresh WMM layer of 150 mm on the pavement would have made the base layer 250 mm as required by the guidelines. However, the Division laid fresh 250 mm of WMM on the pavement which resulted in laying 100 mm WMM unnecessarily. Thus, laying of additional layers of GSB (100 mm) and WMM (100 mm) led to an extra avoidable expenditure of ₹ 2.62 crore. The Department stated (February 2022) that existing 100 mm Jhama/GSB were considered for increasing the CBR of the road. The reply is not tenable as the existing Jhama and GSB layers also provides structural strength to the pavement.
- b. In case of another road⁷⁰ with estimated cost of ₹ 16.48 crore, instead of laying 80 mm paver blocks as per IRC guidelines, the Division laid 100 mm decorative paver blocks (costlier item) on a stretch of 1.25 km. No justification was also provided for using excess thickness and the costlier decorative paver blocks. Thus, the use of 100 mm decorative paver block in lieu of the recommended 80 mm paver blocks resulted in an avoidable expenditure of ₹ 0.47 crore.

2.7.2.13 Erroneous design for construction of Crash Barrier on Bridges- Wasteful expenditure of ₹ 3.45 crore

In order to prevent vehicles from topping over from bridges and causing fatal accidents, PWD decided (January 2018) to install crash barriers on all new bridges. It was decided to install crash barrier in case of old bridges having one-meter wide-footpath and railings on those without a foot path.

Accordingly, three test-checked divisions⁷¹ installed crash barriers on 10 existing bridges during January 2018 to March 2018 at a cost of ₹ 0.72 crore. However,

⁶⁷ IRC-SP-63:2004 “Guidelines for the use of interlocking concrete block pavement”: clause 4.5 and Table 1 under clause 6.1.

⁶⁸ Construction of rigid pavement- Jessore Road, 13.7 km to 14.7 km of Barasat Highway Division-I.

⁶⁹ W&S of Dumdum Lauhati Road, 0.75 km to 12.00 km of Barasat Highway Division-I.

⁷⁰ W&S of Garia Railway Station to Gangajowara Road, 0 km to 4.43 km of South 24 Parganas Highway Division.

⁷¹ Alipurduar PW Division and Alipurduar & Cooch Behar (Highway Divisions).

PWD reversed its decision (July 2019) of installation of crash barriers on old bridges on the ground that additional load on those bridges was not considered in the original design and could have a detrimental effect on the bridge structures. It was also decided that the divisions which had already constructed crash barriers on old bridges had to remove the same.

Audit observed that the three divisions were in the process of removing the crash barriers from 10 such bridges⁷² at a cost of ₹ 2.73 crore, thereby incurring wasteful expenditure of ₹ 3.45 crore.

Thus, from the above it is evident that the Department frequently deviated from the extant IRC guidelines leading to erroneous designing of road pavements. The Department needs to correct this approach and provided reasons for such deviations in the DPR. Further, there was lack of due diligence on the part of the divisions in preparation of DPRs. Though the DPRs were checked and approved by the higher authorities, they failed as is evident from the numerous instances of lapses in design resulting in total avoidable/excess/wasteful expenditure of ₹ 56.01 crore.

2.8. Contract Management

The PWD generally engages contractors for execution of road works through e-tendering. The estimate of the works are prepared by the Department and Notice Inviting Tenders are issued. The technical bids offered by the bidders are evaluated and thereafter, the financial bids are opened. Once a bidder is selected, the Department enters into a contract with the bidder through a contract agreement, which spells out the various terms and conditions of the works.

2.8.1 Defect Liability Period on road signages

As per the standard conditions of contract⁷³, the security deposit deducted from the contractor's bill shall not be refunded before the expiry of the Defect Liability Period (DLP) which is generally three years from the date of completion of the work. If any defect is noticed after completion of the work and the same is not rectified by the contractor during DLP, the security deposit of the contractor shall be used to make good the damage.

In November 2016, PWD introduced minimum warranty period of seven years⁷⁴ on road signages made of retro-reflective sheets. As such, it was decided to install road signages for a cluster of roads in a district through separate tender, so that a minimum of seven years of DLP could be obtained on signages.

Audit observed that in 16 road projects (**Appendix-11**), under seven test-checked divisions, expenditure on road signages was ₹ 0.55 crore during 2016-2020. However, no separate contract incorporating DLP of seven years for installation of road signages were entered into by the concerned SEs. As a result, the Department lost the opportunity to avail seven years warranty on road signages.

⁷² Raidak Bridge, Linalool Bridge, Mora Raidak Bridge, Sutagna Bridge (at 1st km), Goramara Bridge, Khutamara Bridge, Ghargharia bridge, Mora Kaljani, Sutagna Bridge (at 5th km) and Turturi Bridge.

⁷³ Form No 2911 volume (i, ii & iii).

⁷⁴ PWD Memorandum No.: 264/SPW/2016 date 10/11/2016.

The Department stated (February 2022) that the works, in respect of three divisions⁷⁵, were executed before the order of November 2016. The reply is not acceptable as NIT of all the works were issued after November 2016.

2.8.2 Undue advantage to agencies due to not obtaining Additional Performance Security - ₹ 0.49 crore

As per order (April 2017) of the Department, the bidders quoting abnormally low rates for a work had to submit an Additional Performance Security (APS) of 10 *per cent* of the tendered value of the work. This was to be obtained from the successful bidder if the contractual rebate offered was less than 20 *per cent* of the estimated cost of the work, provided that the contractor had his own prime machineries for executing the work.

In three test-checked divisions, Audit observed that 18 works (*Appendix-12*) were executed without obtaining APS from the contractors, though the tenders were accepted with contractual rebates ranging between 22 *per cent* and 42 *per cent*. An amount of ₹ 0.49 crore in the form of APS was not obtained from these successful bidders, thereby extending undue benefits to them.

2.8.3 Delay in execution of work

As per the standard conditions of contract⁷⁶, work allotted to a contractor is required to be completed within the allotted time. The Department, in order to avoid delay in completion of projects, directed (August 2014) the divisions to complete substantial pre-construction works such as site clearance, land acquisition *etc.*, before awarding the original work. Provision has also been made in the contract agreement that if the progress of the work is delayed due to some hindrance, then the Engineer-in-charge has the discretion to provide extension of time on reasonable grounds to complete the work. NITs of the works also provided that no extension of time was to be granted for pre-construction works or due to non-availability of materials.

Audit observed that in 24 works under 12 divisions (*Appendix-13*), extension of time was granted on the ground of non-clearance of sites and non-availability of materials. The works were allowed to be completed with extension of time ranging from 21 days to 618 days, thereby providing undue advantage to the contractors. Further, in four works {*Appendix-9(xix)*}, where the delays ranged from 102 to 475 days, no reason for the delays was provided by the divisions despite requisition.

The Department stated (February 2022) that extensions of time were provided on the ground of monsoon, non-clearance of sites *etc.* The reply is not tenable as monsoon period was considered while fixing the scheduled period of completion in the tender agreement. Delays attributed to non-clearance of site is also not tenable as the Department is required to clear the site prior to issuing work orders as per extant departmental order.

2.8.4 Doubtful use of bitumen in road works

Standard format of NIT stipulates that the contractors executing road works would furnish the authenticated challans of the bitumen procured and used in

⁷⁵ Alipurduar & Cooch Behar PW Divisions and Burdwan South Highway Division.

⁷⁶ Form 2911: clause 2 and 5 of condition of contract.

the work. The challans provide information of the source of the procurement of bitumen and also provides assurance about the quality of the bitumen being brought to site by the contractors.

Audit observed that in 20 works (*Appendix-14*) under 10 test-checked divisions, 15,870.144 MT of bitumen was used. However, no challans for 4,862.58 MT (30.64 *per cent*) of bitumen costing ₹ 20.36 crore were produced to Audit. In the absence of challans, it is not clear how the Department obtained assurance about the quantity and quality of bitumen used in these works.

Audit also cross-checked the vehicle numbers mentioned in the challans of 10,032.13 MT (63 *per cent*) of bitumen costing ₹ 35.75 crore with the registered vehicle database maintained by the Transport Department. Records revealed that 87 vehicles purportedly used to carry 1065.52 MT bitumen (11 *per cent* of 10,032.14 MT) to work sites were two wheelers, three wheelers, small commercial vehicles, passenger vehicles such as buses and even ambulances, which raises doubt regarding authenticity of these challans.

Thus, the Department failed to put in place an effective mechanism to check the challans of bitumen resulting in payment against fictitious challans.

2.8.5 Lack of financial control

- a. WBHDCL had appointed a Supervisory Consultant (SC) for the work of Widening and Strengthening of Ghatakpur-Malancha-Sarberia Section of Kolkata Basanti Road. The SC was to check and certify the price adjustment payment made to the contractor. As per the contractual agreement, the contract price was to be adjusted for increase or decrease in rates of labour, material, fuel and lubricants *etc.*, in accordance with the formula given in the contract. The contract stipulated that the base index to be used for calculation of price adjustment was to be 28 days prior to the date of opening of financial bid for the contract.
- b. However, while calculating the price adjustment, the opening date of the technical bid⁷⁷ was reckoned. This led to consideration of base index rate of April 2014 in place of May 2014 leading to an over payment of ₹ 1.25 crore towards price adjustment to the contractor.
- c. The WBHDCL entered (2014) into contracts for the execution of two works {*Appendix-9(xx)*}. As per agreement, the contractors were required to submit 10 *per cent* of the tendered value in the form of financial instrument as Security Deposit (SD). The SDs were to be retained by the Company till 28 days from the date of expiry of the DLP of the work (three years). Scrutiny revealed that the SD of one work⁷⁸ had validity upto November 2019, whereas the DLP of the work was upto January 2021. It was revalidated (July 2020) by the contractor after a lapse of 227 days. In case of the other work⁷⁹, SD was valid upto February 2020 while DLP

⁷⁷ Technical bid is opened before financial bid and date of opening of financial bid of eligible bidder is considered.

⁷⁸ W&S to 2-lane/ 2-lane with paved shoulder configuration of Ghatakpur-Malancha-Sarberia section of Kolkata-Basanti Road SH-3 (31 km).

⁷⁹ W&S to 2-lane/ 2-lane with paved shoulder configuration of Chanditala-Seakhala-Champadanga section of SH-15 (36.20 km).

was upto October 2020. The validity of the SD expired 254 days prior to completion of DLP and was not re-validated. This lack of internal financial checks had exposed the WBHDCL to unnecessary financial risk.

- d. As per the Standard Bidding Document (SBD) of the works, the contractors engaged in the works were required to buy insurance policy, in the joint names of WBHDCL and the contractor, to cover loss on damage to works, plant and materials, equipment, property and injury or death. The policy was to cover the period from the date of commencement of work till the end of DLP. In case insurance was not done by the contractor, the WBHDCL was to buy the insurance and recover the premium paid from the contractor.
- e. WBHDCL completed (March 2020) four road projects having estimated cost of ₹ 537.74 crore. Scrutiny revealed that in case of three test-checked works {Appendix-9(xxi)}, no insurance was taken by the contractors. The WBHDCL also did not buy any policy on behalf of the contractors. In case of the remaining test-checked work⁸⁰, Audit observed that the insurance policy was provided for 20 months (11 Nov 2014 to 20 July 2016) leaving the work uncovered for 51 months till the end of DLP (09 Oct 2020), thus providing undue advantage to the contractors.

2.8.6 Avoidable expenditure of ₹ 1.02 crore due to excess carriage of materials

As per the Departmental SoR (Road and Bridge works), cost of carriage of materials to be brought from source to the work site is to be calculated as per the rates provided in the SoR. In order to do so, it is required to determine the distance between the source and the mid-point of the road under development.

Audit observed that in three works with estimated cost of ₹ 61.55 crore, while calculating the distance between the source of material (aggregates) and the mid-point of the work site, the divisions considered longer distance than actual resulting in avoidable expenditure of ₹ 1.02 crore as detailed below:

- a. In one work⁸¹, the Division allowed carriage of 45 km for aggregates from Bankura Railway Station to the mid-point of the work site. However, Audit calculated the shortest distance using SH-9 and found the distance to be only 32 km. It was also found that the Division while executing another work {Appendix-9(xxii)} in an adjacent location used SH-9 for transportation of aggregates from Bankura Railway Station to the work site. Due to consideration of longer route, extra mileage of 13 km was provided in the work resulting in excess expenditure of ₹ 0.66 crore toward transportation of aggregates.
- b. In two other works {Appendix-9(xxiii)} of Diamond Harbour Highway Division, executed in 2015 and 2017, the Division decided not to obtain aggregates from the nearest Railway stack yard (Baruipur Railway Station) but opted for a distant Railway stack yard (Ballygunge Railway Station). Audit observed that the Division had provided Baruipur as the nearest

⁸⁰ W&S to 2-lane/2-lane with paved shoulder configuration of Chanditala-Seakhala-Champadanga section of SH-15 (36.20 km).

⁸¹ W&S of Beliatare-Sonamukhi-Patrasayar Road, 0 km to 20 km of Bankura PW Division.

Railway stack yard in another work⁸² executed in 2018. As a result, the Division provided excess carriage of 19 km in these two works, leading to excess expenditure of ₹ 0.36 crore.

2.8.7 Use of old machineries

As per West Bengal Financial Rules amended in 2012, bids shall be invited in two parts (technical and financial) for high value purchases exceeding ₹ 10 lakh. Only after a bidder qualifies in the technical bid would he be considered for the financial bid. As per NIT for the works in PWD, technical bid consists of technical details along with commercial terms and conditions including declaration by the bidder regarding possession of Plant, Machinery and Equipment (PM & E) required for the work. The NIT further stipulates that the permissible maximum age of plants and machineries should not be more than five years on the date of publication of NIT. The age of Plant and Machineries could, however, be extended up to seven years, if fitness certificates are obtained from the manufacturer. In case of equipment, the age should not be more than eight years. These credentials were to be evaluated by the tender committees created⁸³ (January 2014) by the Department in each Circle. Audit observed the following discrepancies in this regard:

Audit observed that nine works (*Appendix-15*) under two divisions⁸⁴ were awarded to bidders having 31 P&M older than 6 years 4 months to 19 years. None of these P & M had fitness certificates for use beyond five years. Further, age of 10 equipment, offered for use was between 8 years 3 month and 17 years. Thus, the agencies were selected disregarding the eligibility criteria of PM&E. As a result, there was no assurance regarding workmanship of these works valuing ₹ 46.30 crore.

The Department had directed (2017) all the tender inviting authorities to mention in the NIT, the types of machineries and equipment that would be required against items of works. These machineries and equipment were to be listed by the bidders in their technical bid. Audit observed that in two NITs {*Appendix-9(xxiv)*}, all the prime machineries required for the works were not mentioned. Further, in one {*Appendix-9(xxii)*} of the NITs, some of the machineries mentioned did not even exist in the list of machineries to be used in PWD works.

Thus, it is evident that the tender inviting authorities were providing leeway to the bidders to use old and non-standardised machineries, which could be detrimental to the quality of the executed work.

The Department stated (February 2022) that age limit is restricted to prime machineries only and is not applicable for minor machineries. The reply is not tenable as such age violation was done on the prime machineries also.

⁸² *Strengthening of Jaynagar- Jalaberia- Kultali Road, 7.4 km to 19.8 km of Diamond Harbour Highway Division.*

⁸³ *PWD Order No: 02-CRC/2M-7/2008 dated 29/01/2014 read with PWD Memo no 797-W(c)/1M-24/15 dated 06/12/2017.*

⁸⁴ *Alipurduar PW Division and Cooch Behar PW Division.*

2.9 Monitoring and supervision

2.9.1 Monitoring

Project monitoring refers to the process of keeping track of all project related metrics including performance of agencies appointed for execution of the work, identifying potential problem areas and taking corrective action necessary to ensure that the project can be completed as envisaged within the allotted time and budget outlay. Monitoring is essential to ensure that execution is carried out as per plan and is capable of fulfilling the desired expectations of stakeholders. Similarly, projects are also required to be supervised to ensure that they are being executed according to approved plans, specifications, adopted codes and as per contract documents. In order to ensure that proper monitoring of projects are done, the Department entrusted this responsibility to the two Chief Engineers (CEs) of Headquarter of PWD and PW (Roads) Directorates and to the six Zonal Chief Engineers (ZCE)⁸⁵ of both the Directorates. Besides, CEs and ZCEs, Superintending Engineers and Executive Engineers were also required to visit the work sites for having a better perspective of the ongoing works. Findings on deficiencies in monitoring are discussed below:

A. Maintenance of Site Order Book

The Site Order Book of a work is a monitoring tool that records instructions of the departmental officer visiting the site to monitor the projects. The book also records the action taken by the contractors on the instructions provided by the departmental officers. The book is required to be submitted along with the final bill, so that the payment to the contractor is released only after obtaining assurance that the instructions passed by the supervisory officers have been duly complied with.

PWD Code⁸⁶ stipulates inspection of various works by the concerned SE within the Circle. Any suggestions or advice of the SE is required to be noted in the site order book. It was also stated (April 2021) by the ZCEs of PW (Roads) Directorate that in order to monitor various ongoing works, site visits were done by the concerned ZCEs, SEs and EEs.

ZCE, West Zone, PWRD, in reply to Audit Query stated (January 2021) that major decisions were taken through orders passed after the visit and minor decisions were recorded in site order book. ZCE North Zone PWRD stated (January 2021) that instructions were provided verbally and ZCE, South Zone, PWRD stated (April 2021) that such instructions were not recorded at all.

However, out of 19 test-checked divisions, 10 divisions⁸⁷ stated (between December 2020 and April 2021) that no site order books were maintained for works and one Division⁸⁸ stated that although site order books were used, the same were not preserved. The remaining eight divisions maintained the book.

⁸⁵ ZCE North Zone PW (Roads), ZCE West Zone PW (Roads), ZCE South Zone PW (Roads), ZCE North Zone PWD, ZCE West Zone PWD and ZCE South Zone PWD.

⁸⁶ PWD Code Volume-I GoWB: clause 55.

⁸⁷ Alipurduar, Cooch Behar, Bankura, Birbhum-I & Birbhum-II (Highway Divisions) and, Burdwan, Birbhum, Barasat, South 24 Parganas & Alipurduar (PW Divisions).

⁸⁸ Cooch Behar PW Division.

Thus, in the absence of site order books, it is not clear how the Department was able to ensure quality of works and regulate payments to the contractors.

In reply, the Department stated (February 2022) that site order books were not preserved. The reply is not tenable as the books were to be submitted along with the final bills for preservation. However, the Divisions while furnishing the final bills of the works did not submit the site order books.

B. Maintenance of Method Statement

As per IRC guidelines⁸⁹, ‘method statement’⁹⁰ is a monitoring tool to be submitted by the contractors before commencement of any work to ensure construction as per approved methodology and sequential constructional activities. However, it was seen that out of 25 works selected by Audit for supervisory and quality assurance checks, no such method statement was submitted by the contractors in 14 works (*Appendix-16*) pertaining to 12 divisions. Though such statements were stated to have been maintained in respect of the remaining 11 works (*Appendix-16*) pertaining to eight divisions, the same could not be produced to Audit. In the absence of such mandated statements, it is not clear how the Department could ensure that proper methodology and sequence was followed by the contractors in execution of works.

The Department stated (February 2022) that bar charts provided by the agencies are sufficient and thus a Method statement is not required. The reply is not tenable as Method statement contains various procedures of how the work would be executed by the agencies, whereas the bar chart depicts only the sequence in which the various items of the work would be executed.

C. Maintenance of bar charts

As per PWD contract agreement (Form 2911), a bar chart is to be submitted by the contractor before the actual commencement of the work, indicating the schedule of progress of the work. The bar chart thus acts as an important tool to monitor the progress of work with reference to the approved time frame.

Audit observed that no such bar charts were submitted by the contractors in 13 works having estimated cost of ₹ 250.90 crore in 10 divisions out of 25 test-checked works. Five divisions stated (March 2021) that charts were submitted by the contractors in respect of seven works having estimated cost of ₹ 129.34 crore. However, relevant documents could not be provided in support. In the case of the remaining five works of three divisions, the bar charts were produced to Audit as detailed in *Appendix-16*. The Department accepted (February 2022) that the bar charts were not preserved and so could not be produced to audit.

D. Generation of fortnightly reports on potholes/ditches

In order to keep the road free from potholes/ditches that may cause fatal accidents, the Department directed (February 2019) the SEs to send fortnightly reports on the status of the roads under their jurisdiction to the concerned ZCEs. The ZCEs were to send the consolidated report to the Department every month

⁸⁹ IRC-SP-57:2000, clause.4.3.2 (a) and 4.5.

⁹⁰ Detailed proposals of constructing agencies which are approved by EIC. No change shall be carried out from the procedures prescribed in the method statement without first obtaining approval to such change from EIC. IRC-SP-57:2000, clause 4.3.2 (a) and 4.5.

through the Chief Engineer, Headquarter. However, out of six ZCEs, only one (ZCE, South Zone PWRD) could provide such reports which were sent to the Department. In the absence of these vital information and reports, there was little scope for the Department to monitor the condition of roads.

2.9.2 Supervision of works

As per PWD contract agreement form 2911, the works are to be inspected and supervised by the EIC and his subordinates. Audit observed that while executing the works, the divisions were overlooking the various aspects of supervision as detailed below:

2.9.2.1 Absence of Work Order Book

As per standard tender agreement⁹¹, the Work Order Book is to be maintained by the concerned Sub-Divisional Officer for works under his jurisdiction. The instructions to the contractor shall be provided through the Work Order Book and contractors shall regularly note the entries made in the Work Order Book and also record thereon the action taken there against. Audit observed that 11 divisions did not maintain Work Order Books pertaining to 15 out of the 25 works test-checked. Though seven divisions stated that Work Order Books were maintained for 10 works, no evidence could be furnished in this regard as detailed in **Appendix-16**. As a result, it could not be ensured whether the contractors carried out the instructions of the Sub-Divisional Officers. In the absence of Work Order Books, there was no assurance regarding quality of the works executed by the divisions.

The Department stated (February 2022) that such a Work Order Book is maintained only in case of group tender works. The reply is not tenable as it has to be maintained as per the standard tender agreement.

2.9.2.2 Commencement of subsequent pavement layer without approval

As per standard form of contract agreement, after completion of an item of work, contractors are to inform the divisions within five days (in writing) prior to laying the subsequent layer. The next layer shall only be laid after approval from the concerned EE. This provision is to ensure that the completed items are measured properly prior to it getting covered up by subsequent items of work.

Audit observed that in 21 works under 15 divisions, no such intimations were provided by the contractors after completion of items of works. In reply, the divisions stated (December 2020 and April 2021) that the process was done verbally with the contractors. In four works under three divisions, though such approval was stated (May 2021) to have been sought by the contractors in writing, no documentation to this effect could be produced to Audit as detailed in **(Appendix-16)**.

Thus, it is evident that supervising officers did not ensure that subsequent layers were laid only after properly measuring or assessing quality of the layers laid underneath.

The Department stated (February 2022) that such approvals are provided verbally after proper inspection of the constructed layers. The reply is not

⁹¹ Form 2911: section 3 (Special terms and conditions).

tenable as the standard tender agreement specifies that such approval are to be provided in writing.

2.9.2.3 No fulltime supervision of works

IRC guidelines⁹² provide that all the works are to be fully supervised by the departmental staff irrespective of the type of road. Audit observed that nine works under nine divisions were executed without full supervision by the departmental staff as detailed in *Appendix-16*. It was seen that one⁹³ of these nine roads deteriorated within one and a half years of its construction. In reply, the divisions stated (May 2021) that full time supervision could not be carried out due to shortage of departmental supervisory staff.

Audit further observed that in 18 of the test-checked divisions⁹⁴, there were 761 sanctioned posts of Assistant Engineers, Junior Engineers and Work Assistants directly involved in maintaining the quality of road works. However, 50 per cent of the sanctioned posts were vacant. These vacancies had and will have a detrimental effect on the various monitoring and supervisory activities of the divisions.

The Department stated (February 2022) that although the works, in case of five divisions⁹⁵, were not supervised fully, they were closely monitored. However, the same was not in line with IRC guidelines.

2.9.2.4 Appointment of Supervisory Consultants (SCs) and Highway Project Monitors (HPMs)

In order to improve quality checking of works during implementation, the Department decided (May 2014) to employ SCs for supervising works valuing more than ₹ 25 crore. Subsequently (September 2019), the value was increased to more than ₹ 50 crore. Similarly, it was decided (May 2014) to employ HPMs for supervising works valuing between ₹ 10 and ₹ 25 crore which was also subsequently (September 2019) revised to ₹ 25 to ₹ 50 crore.

Audit selected 25 works for supervision and quality assurance checks in the selected 19 divisions, of which 10 works were eligible for appointment of SCs and 8 works for HPMs. It was observed that appointment of SCs served no purpose as quality checking of the works during the implementation was poor as detailed below:

- a. SCs were not engaged for two eligible works {*Appendix-9(xxv)*}. In the remaining eight works {*Appendix-9(xxvi)*} where SCs were appointed, only 43 per cent of the required number of quality control tests were performed.
- b. Of the eight works requiring such appointment, HPMs were not appointed in three works {*Appendix-9(xxvii)*}. In one work⁹⁶, HPM was appointed

⁹² IRC-SP-57:2000, clause 3.3 Table 3.1 Sl. No. 4.4.

⁹³ W&S of Beliatore-Sonamukhi-Patrasayar Road, 20.00 Km to 44.876 Km of Bankura PW Division.

⁹⁴ Excluding Diamond Harbour Highway Division.

⁹⁵ Burdwan North, Burdwan South, Bankura, Birbhum-I and Barasat-I Highway Divisions.

⁹⁶ W&S of Canning Dock Ghat Tiger Project Office to Uttar Talai Janakalyan More Road, 0.00 km to 8.10 km under South 24 Parganas PW Division.

after the completion of 90 *per cent* of the works and in another work⁹⁷, HPM was appointed after 26 days of completion of work.

The Department while accepting the audit observations stated (February 2022) that during the absence of SC and HPM, the works were supervised by departmental personnel. The reply is not tenable as the fact remains that SC and HPM were engaged for better and independent supervision of works.

Thus, from the above it is evident that the Department failed in every aspect of monitoring of the ongoing projects for ensuring quality of roads constructed. Full time supervision of works could not be made due to acute shortage of manpower. Even the purpose of appointing SCs and HPMs was defeated as they failed to do the work assigned to them.

2.10 Quality Control in Road work

Quality Control in road construction involves compliance with standards of material and workmanship to ensure performance of roads as per design and specifications. This also involves monitoring and supervision mechanism to ensure that the asset being created is of standard quality and workmanship.

Schedule of Rates (SoR) of PWD provides a list of mandatory tests of materials that are to be conducted prior to their use in the works as well as during the execution of work. Besides, Ministry of Road Transport and Highways (MoRTH) specifications for Roads and Bridges, IRC guidelines and standard terms and conditions of contract (Form 2911) supplement the required checks that are mentioned in the SoR. These also specify the type of monitoring and supervision that are to be followed before and during the execution of road works to ensure quality. Non-compliance to the extant quality control norms is one of the primary reasons for short life of roads, which entail additional government expenditure on repairs as well as cause inconvenience to the public.

A total of 130 works were selected for detailed scrutiny in Audit across 19 divisions and WBHDCL. Of these 130 works, 25 were selected specifically for test checking the extent of compliance to quality control norms during execution. Audit check was done to analyse the extent of quality control ensured by the divisions on non bituminous items like earth, GSB, WBM, WMM and Bituminous items like BM, DBM, SDBC, BC and Mastic Asphalt.

2.10.1 Quality check of materials prior to commencement of works

Quality Control in construction involves compliance with standards of materials to ensure that the materials used in the works conform to the required specifications.

2.10.1.1 Earthwork

As per IRC guidelines⁹⁸ and Departmental SoRs, divisions are required to perform various quality checks⁹⁹ of the earth prior to execution of earthwork. The checks

⁹⁷ *Strengthening of Betheria Station to Dhosa Road, 0 km to 13 km of South 24 Parganas PW Division.*

⁹⁸ *IRC-36:1970, clause 3.8.*

⁹⁹ *Deleterious content test, Clay content test, Liquid and Plastic limit test, Maximum Dry Density, Highest Sub-Soil Level & Soil Water Level and Sieve Analysis.*

are performed to determine that the earth is free from organic materials and that the soil does not easily deform when in contact with moisture. Dry density value and Optimum Moisture Content (OMC) are also to be determined to assess the required level of compaction of the earth at optimum moisture level.

Scrutiny of records showed that out of the 25 road works, earthwork measuring 4.14 lakh cum (costing ₹ 6.15 crore) were executed in 10 works (**Appendix-17**) in six divisions. Though a total of 70 quality tests were required to be done to check the suitability of the earth, it was seen that 50 per cent (35 out of 70) of the required tests were not done as detailed in (**Appendix- 18**).

Moreover, in case of tests that were stated to have been done, 57 per cent (20 out of 35 tests) of the test reports could not be produced to Audit by the divisions.

Thus, suitability of the soil was not ensured before use in works thereby compromising the quality of the works. The Department accepted (February 2022) the audit observation.

2.10.1.2 Granular layers

The main ingredients of granular layers (Granular Sub Base, Water Bound Macadam and Wet Mix Macadam) of pavements are stone aggregates and sand. Various tests¹⁰⁰ for aggregates and its mix have been prescribed in Departmental SoRs¹⁰¹.

Out of 25 test-checked works, 10 works involved GSB, seven works involved WBM and 24 works involved WMM having aggregate cost of ₹ 122.15 crore as detailed in **Appendix 19**. Scrutiny of records revealed deficiencies in conducting the tests of materials prior to their use in the granular layers.

In 10 works which involved GSB valuing ₹ 19.28 crore, 25 per cent (10 out of 40) of the tests required for materials of granular layers were not done prior to its use in the work. Further, the division could not provide 37 per cent (11 out of 30) of the reports for tests claimed to have been done.

Similarly in 25 works which involved WBM/WMM valuing ₹ 102.87 crore, it was observed that 32 per cent (44 out of 138) of the required tests of materials to be used in these two items were not done. The divisions also could not provide 15 per cent (14 out of 94) of the reports for tests claimed to have been done as detailed in **Appendix- 20**. Thus, the use of materials without complete mandated quality checks points to compromise with the quality of road works.

The Department in its reply stated (February 2022) that five divisions accepted the audit observation and three divisions stated that the relevant records were not available. Seven divisions did not provide any reply.

2.10.1.3 Mix design of granular layers

Mix design is a combination of aggregates (for GSB and WMM) which ensures a durable pavement with sufficient strength to bear traffic load. As per the

¹⁰⁰ **Tests for GSB:** water absorption test for aggregates, gradation test for mix, Atterberg limit and moisture content for screening materials. **Tests for WBM:** Aggregate Impact Value (AIV), CF&E and water absorption test for the aggregates, liquid limit and plastic limit for the screening and binding materials. **Tests for WMM :** AIV, CF&E and water absorption test for the aggregates and plasticity test for the screening materials.

¹⁰¹ PWD (Road & Bridge works) SoR-2014, SoR-2015 and SoR-2018: clause 2.11.2.2, 2.11.3.2, 2.14.2.4, 2.14.2.5, 2.15.2.1.1, 2.15.2.1.2.

Departmental SoRs¹⁰² and IRC-57:2000¹⁰³, mix design is required to be prepared by the contractor and is to be approved by the EE before commencement of work.

Audit observed that in two works {*Appendix-9(xxviii)*}, mix design of GSB and WMM valuing ₹ 4.88 crore was approved by the EEs after full/partial execution of the layers. Further, in four works {*Appendix-9(xxix)*} involving GSB valuing ₹ 7.37 crore and in six works {*Appendix-9(xxx)*} involving WMM valuing ₹ 15.60 crore, the approved mix designs for both could not be furnished to Audit by the divisions.

This indicates that proper quality control for granular items were not being done by the divisions which could have a negative impact on the load bearing capacity and durability of the roads.

2.10.1.4 Bituminous layers

The main constituents of bituminous items are stone aggregates and bitumen. Quality checks of these materials and its mix are required to ensure a durable pavement. Departmental SoRs stipulated various tests like Aggregate Impact Value (AIV)¹⁰⁴, Combined Flakiness and Elongation (CF&E)¹⁰⁵, Gradation¹⁰⁶, Water Absorption Test¹⁰⁷, Coating & Striping¹⁰⁸, Quality of Bitumen, Mix Design, etc., to ensure quality of bituminous works.

Out of the 25 test-checked works, one work¹⁰⁹ had no bituminous items. In the remaining 24 works (*Appendix- 21*), Audit observed deficiency in quality checks (partially conducted) of materials of bituminous items¹¹⁰ (valued at ₹ 177.69 crore) before being used in work. The divisions were required to conduct 468 tests for the bituminous items in 24 works. However, the division did not conduct 181 (38 per cent) of the required tests as detailed in *Appendix- 22*.

Further, seven test-checked divisions¹¹¹ claimed to have done 39 tests for which no records were provided.

As 38 per cent of the required quality tests were not done prior to execution of the work, use of sub-standard materials in the bituminous works, which might lead to the premature failure of the pavement, cannot be ruled out.

¹⁰² PWD (Road & Bridge works) SoR-2014, SoR-2015 & SoR-2018, clause 2.22.3.3.

¹⁰³ IRC SP- 57:2000, clause 3.3 table 3.1 Sl. No 6.2.

¹⁰⁴ for determination of measure of resistance to sudden impact or shock.

¹⁰⁵ is used to determine the particle shape of the aggregates specimen and each particle shape being preferred in specific condition.

¹⁰⁶ aggregate gradation influence every important properties of the mix like stiffness, stability, durability, permeability, workability, fatigue resistance, skid resistance and resistance to moisture damage.

¹⁰⁷ for determination of the moisture content.

¹⁰⁸ determines the property of the bitumen to adhere to aggregates in presence of water.

¹⁰⁹ Construction of Road from Ganti More to Gandharbapur of Burdwan South Highway Division

¹¹⁰ Bituminous Macadam (BM), Dense Bituminous Macadam (DBM), and wearing courses like Semi Dense Bituminous Macadam (SDBC), Bituminous Concrete (BC), Mastic Asphalt.

¹¹¹ Alipurduar, Cooch Behar, Bankura, Burdwan, Birbhum & Barasat (PW Divisions) and Burdwan South Highway Division.

The Department in its reply stated (February 2022) that three Divisions accepted the audit observations, two Divisions stated that there were no records and 10 divisions did not furnish any replies.

2.10.2 Quality control checks during execution of the works

Departmental SoRs and MoRTH specifications recommend various quality control checks while executing different items of road works. These tests are required to be done in order to check whether approved materials were being used in the execution and also to ascertain whether the execution was as per the design criteria. The types of tests and frequency of such tests have specifically been mentioned. The tests were to be conducted by contractors in the presence of Divisional representatives.

2.10.2.1 Earthwork

As per Departmental SoRs, divisions need to conduct various tests on earth works at the prescribed frequency during execution of the base layer in order to ascertain that approved materials were being used and the desired level of compaction of the earth had been achieved. Any compromise of this base layer may lead to depression of the pavement.

Out of the 25 test-checked works, earthwork (valued at ₹ 6.15 crore) was executed in 10 works. No quality control tests were conducted during execution of two works {*Appendix-9 (xxxi)*} involving 36,529 cum of earthwork (valued at ₹ 0.49 crore). In the remaining eight works where 3,77,092 cum of earthwork was done (valued at: ₹ 5.66 crore), 71 *per cent* (2,195 number) of the required quality checks were not carried out as detailed in *Appendix- 23*.

Further, out of 29 *per cent* of the tests stated to have been done by the divisions, 73 *per cent* of tests (653 numbers) could not be substantiated with test reports. The Department accepted (February 2022) the audit observation.

2.10.2.2 Granular layers

Departmental SoRs¹¹² stipulate carrying out of various tests of materials used in execution of GSB, WBM and WMM items at the prescribed frequency. The purpose of these tests is to ascertain whether materials of approved quality are being used and executed as per approved design mix to achieve the desired level of compaction.

In this context, Audit noticed that in 25 test-checked works, there were 10 works with GSB, seven works with WBM and 24 works with WMM. In 10 works having items of GSB, six works of WBM and 23 works of WMM, there were shortfalls in conducting required quality control tests as per the Departmental SoRs. Of the required number of tests to be conducted, 47 *per cent* of the tests were not done (4,474 out of 9,541) by 15 divisions (*Appendix-24*). Further, 13 *per cent* (661 out of 5,067) of the tests that were claimed to have been done by four divisions¹¹³ could not be substantiated in the absence of test reports.

¹¹² PWD SoRs (Roads and Bridges) 2014, 2015 & 2018: quality control tests for site activities Sl. no. 5 (bases and sub-bases).

¹¹³ Cooch Behar, Birbhum & Burdwan (PW Divisions) and Burdwan South Highway Division.

None of the quality control tests were done in one work¹¹⁴ with WBM (valued at ₹ 0.20 crore) and no test reports were furnished for WMM valued at ₹ 1.92 crore in another work¹¹⁵.

The Department attributed the deficit in the number of tests to shortage of manpower and stated that necessary corrective steps would be taken.

2.10.2.3 Bituminous layers

Quality checks of materials used in bituminous layers ensure that the approved materials, *i.e.*, stone aggregates and bitumen had actually been used as per the approved design mix for a durable pavement. Departmental SoRs stipulates various tests of the materials used in execution of the bituminous items and also the quality of execution of these items.

Stipulated tests¹¹⁶ in respect of BM, DBM, SDBC, BC, and Mastic Asphalt (valued at ₹ 174.64 crore) were done partially (57 *per cent*) in 23 works. Shortfall in the requisite tests is detailed in **Appendix- 25**. Further, the divisions could not produce test reports to substantiate 14 *per cent* (889 of 6,356) of the tests that were claimed to have been done. Test reports were not furnished by Birbhum Highway Division-II in respect of one work¹¹⁷ having BM and SDBC (valued at ₹ 2.06 crore).

In one road work¹¹⁸ with estimated cost of ₹ 11.09 crore, only 11 *per cent* (61 of 544) of the required quality control tests such as grading of aggregates, bitumen quality test, binder content test, density of compacted bituminous layers *etc.*, were conducted. Audit observed that the road deteriorated within the DLP of three years.

Similarly in another road work¹¹⁹ with estimated cost of ₹ 17.91 crore completed in February 2019, it was observed that the Division did not conduct 44 *per cent* of the quality control tests such as density and gradation tests of WMM, CF&E test of aggregates, density and binder content test of Bituminous Concrete. Audit observed that 25 *per cent* of the road got damaged within two years of completion.

The Department accepted (February 2022) the observation and stated that corrective steps would be taken.

¹¹⁴ W&S of Seorakuri-Kulkuri Road via Fullaipur and connecting Md. Bazar, 0.00 km to 9.50 km of Birbhum, PW Division.

¹¹⁵ Strengthening of Joydeb-Kenduli-Illambazar Road, 0.00 km to 6.00 km of Birbhum Highway Division-II.

¹¹⁶ AIV, C F & E, Stripping and coating value, Water Absorption test, Water Sensitivity test, Moisture Susceptibility test, Soundness test, Quality of binder test, Grading of mix, Binder content test, Density of compacted layers, Hardness number, Stability and Void analysis test, Sand equivalent test, plasticity index test, polished stone value and Percentage of fractured faces of aggregates.

¹¹⁷ Strengthening of Joydeb-Kenduli-Illambazar Road, 0 km to 6.00 km of Birbhum Highway Division-II.

¹¹⁸ IRQ of Chowhatta-Hatia-Sainthia Road, 0 km to 18.80 km of Birbhum Highway Division-I.

¹¹⁹ W&S of Ranirhat Kamat Changrabandha Road, 0.00 km to 5.76 km of Cooch Behar Highway Division.

2.10.3 Deficient infrastructure and monitoring of quality control

2.10.3.1 Lack of laboratories

For an effective system of quality control, well equipped laboratories are required. As per IRC specifications¹²⁰, the Department should have laboratories at central, regional (circle) and divisional levels. However, the Department had only one central laboratory viz., Road & Bridge Research Institute (RBRI) at Kolkata. There were no laboratories at the regional level. In the test-checked divisions, there was only one divisional laboratory at Burdwan South Highway Division. The laboratory was equipped to conduct various investigations and quality control tests. However, in the absence of laboratory personnel such as regional assistants and soil lab assistants, the laboratory could not be utilised.

2.10.3.2 Deficient supervision of tests by Divisional personnel

IRC¹²¹ guidelines stipulates that about 10 *per cent* of the quality tests are to be performed in the presence of EE, 20 *per cent* in the presence of AE and 70 *per cent* in the presence of JE in the laboratory of the contractors.

Audit observed that out of 25 works selected for quality assurance checks in the test-checked divisions, in 16 works {*Appendix-9(xxxii)*}, required percentage of tests were not conducted in the presence of concerned EEs. On an average, the supervision of tests done by the EEs was just three *per cent*. In the case of eight works {*Appendix-9(xxxiii)*}, no information was provided by the divisions and in case of the remaining one work¹²² only, the required supervision was done by EE. This points to lack of quality control monitoring by the Head of the Division. The Department accepted (February 2022) the observation and stated that corrective steps would be taken.

2.10.3.3 Deficiency in monitoring of tests by higher authorities

IRC guidelines¹²³ recommends that quality control test data be sent to SEs/CEs by the EEs with a view to ensure continuity as well as compatibility of the specifications in practice. The data was also required to be sent to Central Laboratory for the purpose of feedback.

However, it was seen that quality control data was not sent to these authorities for their perusal and feedback in 14 test-checked divisions (*Appendix-26*). In case of the remaining five divisions, no records to this effect could be furnished. This indicates that authorities beyond the divisions were not involved in the quality control process of any work.

2.10.3.4 Payment to contractors without ensuring quality control tests

IRC guidelines¹²⁴ provide that the test results are required to be presented with every third running account bill, so that payment gets linked with assured quality

¹²⁰ IRC-SP-11:1984 "Handbook for quality control for construction of roads and runways", clause 1.3.2.

¹²¹ IRC-SP-11:1984, clause 1.11.

¹²² W&S of Memari Monteswar Road, 0 km to 31.30 km of Burdwan PW Division.

¹²³ IRC-SP-11:1984, clause 1.3.3.

¹²⁴ IRC-SP-11:1984, clause 1.11.

of work. Further, WBFR (Rule 217) requires that full rates as per agreement should be allowed only if the quality of work done is as per the stipulated specifications. However, it was seen that in the 25 works selected for quality assurance checks, full payments were made to the contractors despite the fact that they failed to carry out the required number of tests. This shows that the divisions were not exercising quality control norms and providing undue advantage to the contractors at the cost of the quality of works.

2.10.3.5 Untrained personnel for quality control works

IRC guidelines¹²⁵ recommends that in order to bring awareness among officers of the Department and to update their knowledge on methods of testing, regular workshops on quality control are held which would make the personnel aware of up to date information on specifications, required test acceptance criteria, frequency of testing and methodology of tests for understanding the quality control system.

However, no such training session was held for personnel of 14 (*Appendix-26*) of the 19 test-checked divisions during 2015-16 to 2019-20. Thus, the concerned personnel of the Department remained unaware of the latest technology and requirements for quality control works.

Thus, it is evident that the Department failed to monitor the conduct of required number of quality control tests thereby compromising the quality of the work. There is no mechanism in place to link payment to the contractors with the quality control checks performed and as a result, the contractors were being paid despite not conducting the required number of tests.

2.11 Road Mobility

Mobility in the context of roads and transportation refers to the ability and level of ease of moving people as well as goods and services. Mobility is expected to contribute to a safer, more efficient and sustainable transport system by putting the right modes of transport infrastructure in the right places for seamless connection. Mobility also means that mode of transport is also adapted for safe and speedy congestion free journeys. Lack of mobility leads to economic inefficiency, consequential air pollution and affects accessibility. Examples of mobility include providing designated truck lanes on interstate highways to increase the overall amount of goods transported, improving congestion management systems *etc.* The Working Group on Roads for the 11th Plan had recommended that each State may identify a core network of NHs, SHs, and MDRs, which carry bulk of the road traffic and develop the same by following a corridor concept such that it would be possible to reach from one end of the State to the other at an average speed of 70-80 km per hour; the objective should be that a commercial vehicle can cover 500-600 km on such a network in one day.

The rapid growth in India's population and wealth and increased trade and commerce have consequentially increased the quantum of vehicles over the last few decades which had a marked effect on the mobility of its citizens in terms of accessibility to safe, speedy and well-connected modes of transport.

Audit analysed mobility in terms of road alignment, provisions of by-passes (to avoid congested roads), bus bays, removal of encroachments, uniform width of the

¹²⁵ IRC-SP-11:1984, clause 1.12.

roads, homogeneity of bridge width with connecting road, connectivity of roads over rivers with no bridges and existence of weak bridges. 130 roads under the jurisdiction of PWD were analysed in 19 divisions of seven districts and WBHDCL to assess mobility. Audit findings are discussed in the succeeding paragraphs.

2.11.1 Departmental policy on Mobility

The Department has not formulated any policy guidelines nor issued any orders regarding road mobility. This is despite the fact that issues like congestions on roads, encroachment of roadside pavements, large number of weak and narrow bridges which hamper traffic mobility *etc.*, exists on PWD roads. In addition to these there has been an increase in the number of vehicles in West Bengal by 47.28 *per cent* from 2015-16 to 2019-20 (**Appendix-27**) and 39 *per cent* in the test-checked seven districts (**Appendix-28**) during the same period. Audit observed that despite increase of traffic by 39 *per cent* during the period under audit in the test-checked districts, no analysis was done on requirement of new roads. No new roads were constructed during this period by the test-checked divisions, except in Birbhum PW Division, where three new roads¹²⁶ of 14.23 km length was stated to have been constructed.

2.11.2 No periodic quantification of Vehicular Traffic

As per NITI Aayog¹²⁷, traffic congestion is one of the main reasons for impeding mobility of traffic which adversely affect productivity, fuel consumption and economic efficiency. Thus, in order to ensure free movement of vehicular traffic on the roads, it is vital to know the growth of traffic on the road and assess whether the road is capable of handling the increase in traffic. To determine the increase in traffic, it is necessary that periodic monitoring of the traffic is done. However, Audit observed that no such periodic traffic census was conducted to assess the load of traffic. Audit observed during joint physical verification (January 2021) that in one widening work¹²⁸ of MDR, which was executed (2017) without conducting traffic census and where no periodic traffic census was conducted, there was heavy congestion.



Fig.2.8: NN Road at 0.850 km (01.01.2021)



Fig.2.9: NN Road at 0.400 km (01.01.2021)

¹²⁶ Angargoria Mamudpur Road, Angargoria Kabilpur Shahnagar Road and Bagdola Joyrampur Road.

¹²⁷ Transforming India's Mobility, A Perspective (September 2018).

¹²⁸ Widening & Improvement of NN Road (1.81 Km) of Cooch Behar PW Division.

2.11.3 No identification of congestion points

As congestion of traffic has been identified as one of the main factors affecting road mobility, periodic inspections to identify congestion points are imperative so that corrective steps can be initiated to address the easing of those points to increase mobility.

However, out of test-checked 19 divisions, only six divisions¹²⁹ claimed that they had carried out periodic inspection. The other divisions had never done this exercise to identify congested stretches and mitigate the problems by constructing alternative routes, bye passes, under passes and bus bays and other such measures. Out of the six divisions where such analysis was done, it was observed by Audit during joint physical verification of two roads¹³⁰ that there existed at least three congestion points on these roads which had not been identified earlier by the divisions.

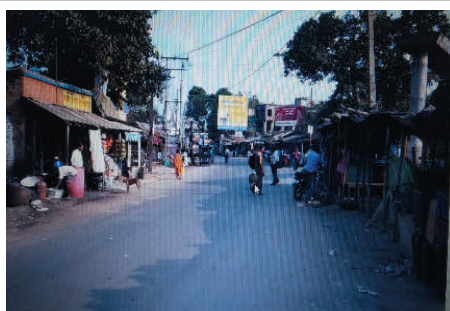


Fig.2.10: Congestion point at Nasigram Maldanga intersection of Monteswar Dainhat Road (Burdwan North Highway Division) due to encroachment of Road Shoulders (11.02.2021)



Fig.2.11: Congestion point at New Town Bazar on Cross Road (Alipurduar PW Division) due to unauthorised market (20.12.2020)

This indicates that though the divisions had done congestion point identification, the exercise was not done in a detailed and comprehensive manner.

Further, meeting with stakeholders¹³¹ held in Cooch Behar district revealed existence of two¹³² roads where the average speed of traffic movement ranged between 10 and 20 km. The Keshob Road, an SH, was extremely narrow while the other Road (Dewanhat Chilkirhat Road-I), an ODR, had numerous curves. The Division was not aware of the condition of the Keshob Road vis-à-vis traffic load on the road and stated that the matter would be investigated. In case of the other road, the Division stated (January 2021) that they had no solution for the issue of multiple curves. This indicates that PWD is not aware of the extent of mobility on its roads nor has any policy to mitigate the impediments affecting mobility.

¹²⁹ Burdwan North, Birbhum-I & Birbhum-II (Highway Divisions) and Alipurduar, Bankura & Birbhum (PW Divisions).

¹³⁰ Monteswar Dainhat Road of Burdwan North Highway Division and Cross Road of Alipurduar PW Division.

¹³¹ Cooch Behar Zilla Minibus Owner Association, Cooch Behar Zilla Bus Owner Association, Cooch Behar Truck Malik Kalyan Samiti, Cooch Behar PWD & Cooch Behar Highway Division Authorities and Audit.

¹³² Keshob Road and Dewanhat-Chilkirhat Road-I of Coochbehar PWD.

2.11.4 Variable Width of Roads

For steady movement of traffic on a road, it is required to have uniform width throughout its stretch. Audit observed that in 25 roads under six divisions¹³³, the width of the roads were not uniform throughout the entire stretch. The difference of width between the narrow stretches with the rest of the road ranged from 1.5 m to 11 m (*Appendix-29*).

Two divisions¹³⁴ accepted the fact that the varied width was affecting traffic mobility, while the other four divisions did not provide any reply. No comprehensive plan has been framed by the Department to address this problem. The Department stated (February 2022) that the narrow stretches of the roads will be widened gradually.

2.11.5 Narrow Bridges

Existence of narrow bridges on roads also act as an impediment in the free flow of traffic. They also pose road safety hazard.

During the course of audit, it was observed that 29 roads under nine test-checked divisions had 44 narrow bridges which were hampering the mobility of traffic as detailed in *Appendix-30*.

The Department stated (February 2022) that six of the bridges has been replaced, work was in progress in four bridges and in case of 19 bridges no action has been taken. The Department did not comment on the remaining 15 narrow bridges.

2.11.6 Weak Bridges

The existence of weak bridges affects mobility of traffic on roads and restrictions are inevitable on speed as well as weight of the vehicles plying through those bridges.

Audit observed that in nine divisions, there were 47 weak bridges (*Appendix-31*) where speed and load restrictions are imposed, affecting mobility of traffic.

The Department, in case of South 24 Parganas PW Division, stated (February 2022) that priority has been given for rehabilitation and replacement of weak bridges. However, there has been delays due to issues like acquisition of land, encroachments and paucity of funds.

2.11.7 Seamless mobility

Audit observed that 17 roads (*Appendix-32*) under seven divisions terminated abruptly on riverbanks with no means to cross to the other side. As a result, the traffic had to take a circuitous route or cross the river by ferry *etc.*, to reach their destination. In one such road *viz.*, Chandrakona-Goaltore-Sarenga-Simlighat Road of Bankura Highway Division, additional 20 km had to be covered to reach Jhargram District due to absence of a permanent bridge on the Kangsabati River, thereby affecting mobility.

¹³³ Alipurduar, Birbhum-II, South 24 Parganas Highway Division, Barasat-I & Burdwan North (Highway Divisions) and Bishnupur PW Division.

¹³⁴ Birbhum Highway Division –II and Barasat Highway Division-I.



Fig. 2.12: Chandrakona-Goaltore-Sarenga-Simlighat Road of Bankura Highway Division. A make shift bridge which becomes unusable in monsoon

The Department stated (February 2022) that new bridges will be constructed only after proposals are received from local administration/populations and also after conducting economic studies.

Thus, the Department is yet to develop a policy/action plan to improve mobility. Congestions arising due to absence of periodic traffic survey of the roads, existence of narrow and weak bridges which hampers traffic mobility, variable width of the roads *etc.*, are yet to be analysed by the Department for taking up remedial measures.

2.12 Road Safety

Road safety is a concern all over the world as road accidents have emerged as a major cause of death and injury with increasing traffic on roads and rise in numbers of heavy and high speed vehicles. Road safety in India is amongst the poorest in the world as per MoRTH¹³⁵ with one fatality every four minutes. A total of 4,49,002 road accidents have been reported by States and Union Territories (UTs) in the calendar year 2019, claiming 1,51,113 lives and causing injuries to 4,51,361 persons.

To ensure road safety in the country, the Government of India adopted (March 2010) the National Road Safety Policy. The Policy outlines the initiatives to be framed by the Government to improve road safety in the country.

Supreme Court Committee on Road Safety (SCCRS) was constituted (April 2014) to measure and monitor the implementation of various laws relating to road safety. The SCCRS directed (March 2015) the States to formulate State Road Safety Policy and set up a State Road Safety Council. It also sought to establish protocols for identification of black spots on roads, their removal and further monitoring to assess the effectiveness of the action taken. Other measures included strengthening enforcement related to traffic rules, patrolling of roads, taking engineering measures, removal of hoardings and objects that obstruct driving or distract drivers, preparing a Road Safety Action Plan (RSAP), take effective measures to remove encroachment on pedestrian paths and lastly to establish a Road Safety Fund.

¹³⁵ As per Road Accidents Report 2019.

2.12.1 State Road Safety Policy

The State Road Safety Policy was framed (February 2016) with a vision of safe road network for all road users to achieve ‘zero road accident figure’ in the long run and reducing road accidents as well as fatalities to 20 *per cent* by 2020. The objectives *inter alia* included:

- (i) Improving road engineering and design, increasing road safety awareness, strict enforcement of rules and provision for emergency care;
- (ii) Developing an “Accident Information System” for better accident management;
- (iii) Coordinated action by departments and ensuring accountability, evaluation, funding and research; and
- (iv) Achieving substantial reduction in road fatalities and injuries, with special attention to Vulnerable Road Users.

The key actions to be undertaken as per the policy were;

- (i) Strengthening road crash database system
- (ii) Safe planning and design of roads
- (iii) Safe driving
- (iv) Awareness, education and training for road users
- (v) Enforcement of safety laws
- (vi) Emergency Medical Services for road accidents
- (vii) Research for road safety, and
- (viii) Strengthening legal and financial environment for road safety.

The measures that were envisaged to be taken for planning and design of roads included measures for periodic identification and rectification of accident-prone zones (black spots) through proper planning, design and construction techniques; implementation of road markings on all NHs, SHs and installation of safety furniture; introduction of traffic calming measures to physically reduce speed in vulnerable areas near schools/hospitals/busy locations; conducting road safety audit through expert agencies; construction of wayside amenities/service centres on major road networks and developing a handbook on ‘Road Safety Design Guidelines’ to be used by engineers at all levels in all road sector agencies covering urban and rural roads. However, the Department was yet to prepare a handbook for ‘Road Safety Design Guidelines’. In the absence of such guidelines there were no established norms in road safety design that could be followed and the divisions had to depend on the decision of the higher authorities for implementation of road safety measures, which were not uniform or coordinated.

2.12.2 Incomprehensive black spot identification

Action Plan for Road Safety in West Bengal (2015) was made under the directive of SCCRS to promote safety on roads and reduce accidents across the State by identification of black spots. Accordingly, the Department prepared a black spot protocol and defined it as a specific spot on a road at midblock section or at any junction with the occurrence of a minimum of 10 accidents and/or a minimum of five fatalities in a year.

However, it was seen from the records that identification of black spots was not being done jointly by the Department and the Police Department with the help of experts as envisaged in the Action Plan. Police identified black spots simply on the basis of the accidents occurring repeatedly on the spot without consulting the Department or any experts. As envisaged in the Action Plan, the information also did not contain nature of the accidents and extent of damage to property.

Once the black spots are identified, the same is sent to the Road Safety Cell¹³⁶ of PWD. The Cell then analyses the black spots and recommends long-term¹³⁷ and short-term measures¹³⁸ to rectify them and the recommendations are sent to the concerned divisions for execution.

A total of 103 black spots were identified by the Road Safety Cell of the Department in 14 test-checked divisions during the period from 2016-17 to 2019-20 as detailed in **Appendix-33**. Lapses in implementation of the recommendation on black spots by Road Safety Cell were observed by Audit during joint physical verification of the roads as discussed below:

- a. Birbhum Highway Division-I was to construct bump in a black spot at 2.7 km of Nalhati Bhabanandapur Road. It was stated that the measures were implemented in the action taken report sent by the Division to Road Safety Cell. However, it was found during joint physical verification that no such measures had been taken.



Fig.2.13: Intersection at 2.7 km on Nalhati Bhabanandapur Road under Birbhum Highway Division-I (27.02.2021)

- b. Road Safety Cell identified (2018) three black spots on Madarihat-Falakata Road under Alipurduar Highway Division and recommended measures like Retro-reflective Pavement Marking on both sides of the road, rumble strips, speed unit signage boards, cautionary signage boards, zebra crossings, illumination of electric posts, installation of solar lights, installation of high mast lights, road shoulder improvement *etc.* However, it was seen that some of the recommendation like rumble strips, speed limit, cautionary signages and reflective studs on the road were not installed at all. In reply, the Division stated (December 2020) that the measures were taken but they were damaged due to heavy traffic and rainfall. The reply is not tenable as rumble strips, speed breaker and retro-reflective pavement markers are unlikely to get damaged due to traffic and rain within a year of their installation. As regards illumination at black spots, it was stated that the responsibility was

¹³⁶ Cell created by PWD in 2015 to act as a Nodal Agency for Road Safety issues pertaining to entire PW Department. The cell is headed by CE, Planning PW (Roads) Directorate and assisted by four SEs acting as nodal officer for the three zones and Headquarters.

¹³⁷ Minor corrections in geometric design of the road.

¹³⁸ Installation of signages, pavement markings, construction of rumble strips, speed-breakers, temporary restoration of pavement conditions.

with Panchayat or Municipalities, but no records of communication made with such authorities were found on record.

- c. Two black spots in one road¹³⁹ of Birbhum Highway Division-II were identified with recommendation (2018-19) to install high mast illumination. However, no such high mast illumination was observed in the site. On this being pointed out, the Division accepted (April 2021) the delay and stated that prompt action in this regard would be taken.
- d. In Cooch Behar Highway Division, Audit observed that three black spots were identified in 2018-19 on Changrabandha-Mathabhanga Road, where the Division was required to construct speed breakers. However, no such construction was done by the Division (December 2020).

Thus, the divisions were not prompt in rectifying the black spots although they were to take up short term measures within a period of 90 days. Partial remedial measures indicate lackadaisical attitude of the Department on a vital aspect of road safety and indicates lack of accountability and follow-up mechanism in the system. It also keeps the road users exposed to the dangers of road accidents and fatalities.

The Department stated (February 2022) that almost all the short-term measures were implemented. However, no records relating to such implementation was produced to Audit. In respect of long term measures, the Department stated that those will be implemented in due course.

2.12.3 Road Safety Measures

As per Ministry of Shipping, Road Transport and Highways and IRC guidelines¹⁴⁰, traffic signs and road markings are essential tools for guiding the drivers, regulating their movement, cautioning of dangers ahead and informing the drivers of the facilities available en-route. No road should be considered to be fit for traffic unless it has been provided with adequate system of traffic signs and road markings. Further, Action Plan of Road Safety stipulates that carriageway and sides of roads must be free of encroachment and roads in market and built up areas, intersections *etc.*, should be properly illuminated.

2.12.3.1 Non-implementation of Road Safety Measures

In seven test-checked divisions, road safety measures such as road traffic signages, pavement markings, speed breakers, road markings and retro-reflective pavement markers were not implemented fully on all the roads till date (May 2021) even after five years of the enactment of the Road Safety Policy in the State. There were in total 375 roads under the jurisdiction of these seven divisions. It was observed that 83 roads did not have adequate road safety measures, 154 roads were not properly illuminated and there were encroachments on 177 roads (*Appendix-34*).

The Department, in respect of Cooch Behar Highway Division, stated (February 2022) that Road safety measures on all its roads have since been implemented. However, no records in this regard were produced to Audit. In case of other six divisions, no reply has been furnished.

¹³⁹ Illambazar-Dubrajpur Road, SH(21 km to 48.80 km).

¹⁴⁰ IRC-35:2015, IRC-67:2012 and IRC-SP-88:2010.

2.12.3.2 Absence of Gantry signages and uniform accident recording format

The Transport Department, the nodal agency for road safety in West Bengal along with other concerned stakeholders¹⁴¹ decided (2019) that PWD was to prepare a new format for accident recording, and also introduce gantry system¹⁴² of signage on all its Highways and Major roads by September 2020. The gantry signages provide overhead information for easy visibility, regarding directions, distance or multiple destinations before any diversions on the road.

However, the Department was yet to develop a uniform accident recording format. Audit also observed that five of the test-checked divisions¹⁴³ has not yet installed any gantry signages on any of its 125 SH and MDR roads. Further, in six divisions¹⁴⁴ gantry signages have been installed only on 20 roads {Appendix-35(i)} out of 147 SHs and MDRs.

2.12.3.3 Absence of Road signages

During joint physical verification of roads in three test-checked divisions, it was observed in four roads that there was mismatch between the total road signage installed as per record of the divisions and the total signage found during joint physical verification (**Appendix-36**). Though 469 signages were stated to have been installed in these four roads only 292 signages could be found during joint physical verification. Further in one of these roads¹⁴⁵, 29 per cent (31 out of 107) of the installed signages were in a deteriorated condition.

On this being pointed out, Birbhum Highway Division-II stated (March 2021) that survey would be done to assess the signages and adequate steps would be taken.

The absence of the signages stated to have been installed remained un-noticed as the divisions did not have any system of conducting periodic survey of the road signages required as per IRC guidelines¹⁴⁶ to identify and reinstall the missing signages. No directives in this regard has also been issued by the Department for periodic checking of the installed signages. Even periodic maintenance of the installed signages were not being carried out.

In case of Birbhum, PW Division and Highway Division-I, the Department stated that signages were stolen which was reinstalled in case of Birbhum PW Division. However, no records in this regard was produced to Audit.

2.12.4 Absence of Crash Barriers

As per Government order (2018)¹⁴⁷, metal crash barriers were to be constructed or installed in all approaches of bridges, Railway over bridges, flyovers, at high embankments and sharp curves where vision is obstructed.

¹⁴¹ PWD, NHAI, WBTIDC, WB Police, Kolkata Police, Health and Family Welfare Department, Urban development municipal affair department.

¹⁴² Overhead signages.

¹⁴³ Birbhum-I, Birbhum-II, South 24 Parganas & Burdwan South (Highway Divisions) and Burdwan PW Division.

¹⁴⁴ Barasat, Birbhum & Bankura (PW Divisions) and Barasat-I, Bankura & Burdwan North (Highway Divisions).

¹⁴⁵ Kotasur-Ramnagar Road of Birbhum Highway Division -I.

¹⁴⁶ IRC-67:2012 'Code of practice of road signs': clause 12.3.

¹⁴⁷ G.O. No.1M-25/16/237-R/PL dated 15.02.2018 issued by the Public Works Department, Govt. of West Bengal.

Scrutiny revealed that four test-checked divisions¹⁴⁸ had partially installed crash barriers in vulnerable stretches of roads under its jurisdiction. Moreover, physical verification of five bridges and culverts (**Appendix-37**) in three of these divisions also confirmed that crash barriers had not been installed in several vulnerable stretches.

The Department stated (February 2022), in case of Burdwan South Highway Division, that crash barriers have been installed (no records in support of installation was produced to Audit). However, the fact remains that the other three divisions were yet to install the crash barriers.

2.12.5 Road Safety Audit

As per IRC guidelines¹⁴⁹, the application of safety principles in the improvement and maintenance of the roads as a means of accident prevention can be established through Road Safety Audit. The audit should ideally be taken up by the Department before commencement of road works. The purpose of road safety audit is to ensure that the road user would be exposed to minimal risks of accident on both new and existing roads.

2.12.5.1 Slow Pace of Road Safety Audit of PWD Roads

As per the RSAP, PWD was to conduct Road Safety Audit of all roads under its jurisdiction in a phased manner which was to start within three to six months from the enactment of the RSAP (2015).

However, till date (January 2021) the Department had conducted Road Safety Audit of just five State Highways¹⁵⁰ against a total of 1,864 number of roads under its jurisdiction. Audit observed that in the test-checked divisions, the Department had appointed six Supervisory Consultants (SCs) to supervise 19 works (**Appendix-38**) in 11 divisions. Though the SCs were to conduct Road Safety Audit of all the 466 roads under the jurisdiction of these divisions, it was observed that the same was not done till December 2020.

2.12.5.2 DPR not subjected to Road Safety Audit prior to sanction

As per the directive of the Department (March 2017), all Road Projects with estimated cost of more than ₹ 10 crore was to be subjected to Road Safety Audit by a Road Safety Auditor under the supervision of the road safety cell of the Department, prior to according Administrative and Financial approval of the project. However, in 16 of the test-checked divisions, it was seen that 32 works valuing ₹10 crore or more had been executed without conducting Road Safety Audit. It was also stated by the Road Safety Cell of the Department that no such exercise was carried out. No information in this regard was provided by WBHDCL and the remaining three divisions¹⁵¹.

2.12.5.3 Partial Implementation of recommendation of Road Safety Audit

The Department appointed (2018-19) IIT Kharagpur (IIT-K) to conduct Road Safety Audit of five State Highways¹⁵² (SH) under the jurisdiction

¹⁴⁸ Alipurduar, Cooch Behar & Barasat (PW Divisions) and Burdwan South Highway Division.

¹⁴⁹ IRC-SP-88:2019 "Manual on Road Safety Audit", clause 1.2.

¹⁵⁰ SH-1, 2, 5, 6 and 11.

¹⁵¹ Bishnupur, Barrackpore (PW Divisions) and Diamond Harbour Highway Division

¹⁵² SH-1, SH-2, SH-5, SH-6 & SH-11.

of eight¹⁵³ test-checked divisions. In the Audit Report for SH-2 and SH-6 submitted to the Department in 2019, IIT –K had highlighted absence of road markings and signages, wrong signages, improper and inadequate traffic calming measures at the approaches of the minor roads, unsafe precautions at curves, restricted right-of-way such as encroachment and dumping of materials, built-up market areas, untreated intersections & restricted sight distance, poor pavement condition, damaged shoulder, roadside hazards, unsafe space for pedestrians *etc.* IIT-K had also observed that buses were stopping at non-designated locations on the roads. Many bus-stops were also located at the nearside of the intersections. Further, many bus-stops were built on traffic islands of intersections, which were obstructing the line of sight and making it unsafe for vehicles and pedestrians. In most of the cases, the Auditors had recommended that the bus stops be shifted to the far-side of the intersections.

However, out of the eight divisions, two divisions¹⁵⁴ were yet to implement the recommendations (March 2021) and one Division¹⁵⁵ has partially implemented some¹⁵⁶ of the recommendations (January 2021). Information was not provided in respect of the remaining five divisions¹⁵⁷.

The Department stated (February 2022) that estimates have been prepared for implementing the recommendations. However, the fact remains that even after two years, the recommendations are yet to be implemented.

2.12.5.4 Physical verification of Road Safety measures

IIT-K had used various parameters as mentioned in *paragraph 2.12.5.3* to provide recommendations to improve the road safety of the five audited SHs. Audit conducted joint physical verification of 42 roads under the jurisdiction of 14 test-checked divisions on the basis of parameters used by IIT-K and observed the following:

- a. In 11 roads {*Appendix-35(ii)*}, no hazard marking was done on tree trunks/pedestal poles/culvert walls within one metre of the road shoulders, posing road safety hazard to traffic.
- b. In six roads {*Appendix-35(iii)*}, advertisement boards were allowed to be installed on the roadside hindering the visibility of the road users. Further, road safety was compromised due to erection of advertisement poles on the shoulder of the roads without permission from the divisions.

¹⁵³ Bankura, Burdwan North, Burdwan South, Birbhum-II, Barasat-I (Highway Divisions) and Bishnupur, Barrackpore & Birbhum (PW Divisions).

¹⁵⁴ Burdwan North and Birbhum -II (Highway Divisions).

¹⁵⁵ Bankura Highway Division.

¹⁵⁶ Road Marking, Signage, Improvement of Shoulder at few stretches, dismantling of bus stop, channelization of island at junction.

¹⁵⁷ Birbhum, Barrackpore & Bishnupur (PW Divisions) and Barasat & Burdwan South (Highway Divisions).

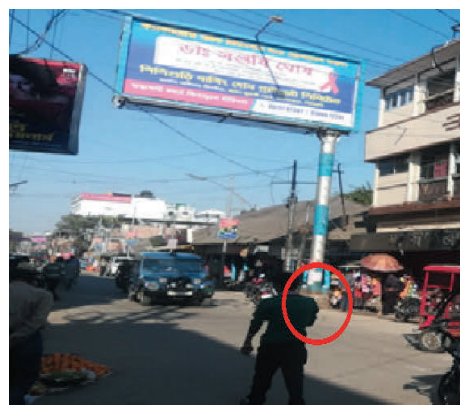


Fig.2.14: Overhanging hoarding installed blocking shoulder and footpath area at 0.500 km chainage of B.S. Road under Cooch Behar PW Division (01.01.2021)



Fig.2.15: Overhead hoarding installed blocking shoulder and footpath area at junction of Suniti Road and Keshob Road under Cooch Behar PW Division (01.01.2021)

- c. Pavement markings, including central and edge markings, were inadequate in a major part in respect of 15 roads *{Appendix-35(iv)}*. Zebra crossing for the pedestrians were also found to be lacking at numerous intersections and market/congested areas.
- d. Retro Reflective Road Studs (Cats eye), used to identify the edge of the roads at night, was found to be missing in numerous stretches of six roads *{Appendix-35(v)}*. Even road studs present were covered with dirt, serving no purpose.
- e. As per the records of West Bengal Police Department, out of 10,042 road traffic accidents recorded in 2018, 988 or 9.8 *per cent* took place on curved stretches resulting in 554 fatalities or 10.23 *per cent* of all fatalities. Audit noticed that in 11 of the test-checked roads *{Appendix-35(vi)}*, road safety measures like traffic calming measures, crash barriers and proper signage such as those prohibiting overtaking, speed limit and chevron marking¹⁵⁸ were not implemented at the curves of the roads.

Thus, in the absence of effective and adequate road safety measures at the curves of the roads, the risk of accidents and fatalities continued to persist.

- f. The encroachment of Right of Way (ROW) of roads causes constriction or narrowing of the ROW. Thus, pedestrians are forced to use the main carriageway increasing the probability of accidents and fatality. It was also pointed out by SCCRS (December 2019) that pedestrians accounted for almost 46 *per cent* of the fatalities in West Bengal. It directed the State to focus on policy intervention for pedestrians and make pedestrian pathways encroachment free and build pedestrian pathways, wherever needed.

However, it was observed that 199 roads out of 740 roads under the jurisdiction of 15¹⁵⁹ of the test-checked divisions had been encroached at several stretches.

¹⁵⁸ *Chevron marking on road have white diagonal stripes which are used to separate traffic lanes or to protect traffic turning right.*

¹⁵⁹ *Cooch Behar; Bankura, Burdwan North, Burdwan South, Birbhum-I, Birbhum-II & South 24 Parganas, Barasat-I (Highway Divisions) and Alipurduar; Cooch Behar; Bankura, Burdwan, Birbhum, Barasat & South 24 Parganas (PW Divisions).*

In reply, three divisions¹⁶⁰ stated that removal of encroachment was being done only when widening and strengthening projects are undertaken. One Division¹⁶¹ stated that steps would be initiated, eight divisions stated that such encroachment were social issues over which they did not have any control and three divisions¹⁶² did not furnish any replies.

Joint physical verification was conducted by Audit in 19 roads {*Appendix-35(vii)*} pertaining to eight divisions to check the severity of encroachment. It was noticed that there were encroachments in the form of construction of shops, local settlements, and temporary stalls of vendors near the carriageway and pedestrian footpaths.

Audit observed that a footpath constructed at a cost of ₹ 1.76 crore on Bankura Durgapur Road (Machantala) by Bankura PW Division, was fully occupied by encroachers.



Fig.2.16: Encroachment of shoulder of Cross road by shops near Radhamadhav Mandir and Kaljani Housing complex under Alipurduar PW Division (20.12.2020)



Fig.2.17: Encroachment of Footpath from Machantala to Lalbazar Traffic More of Bankura Durgapur Road under Bankura PW Division (19.01.2021)

- g. Road side obstructions: In order to assess extent of blocking of carriageway by dumping of construction materials and other objects by the locals, joint physical verification of 19 roads {*Appendix-35(viii)*} pertaining to seven divisions were conducted by Audit. The verification revealed that materials like construction materials, garbage, wooden logs, etc., were seen dumped on the flanks and shoulder of the roads in all the 19 roads.

¹⁶⁰ Cooch Behar, Bankura and Burdwan North (Highway Divisions).

¹⁶¹ Birbhum Highway Division -II.

¹⁶² Birbhum Highway-I, Barasat Highway and South 24 Parganas Highway divisions.



Fig.2.18: Garbage dumped at roadside at Shantinagar, raised pedestrian walkway, parallel road under Alipurduar PW Division (20.12.2020)



Fig.2.19: Road almost blocked by dumping of construction material at 1.5 km-2.5 km of Seorakuri-Kulkuri Road under Birbhum PW Division (08.03.2021)

Thus, it can be seen from the above that though the aims and targets of the State road safety policy were adequate to bring about a perceptible change in safety of the road users, the implementation of the policy is still very poor. The State Road Safety Policy (2016) aimed to reduce accidents and fatalities by 20 *per cent* in four years (2020). Though road accidents in the State slightly decreased from 13,208 in 2015 to 10,158 in 2019, fatality rate increased from 47 *per cent* to 54 *per cent* during the corresponding period.

2.13 Conclusions

The Department did not have any long-term or short-term plans and were functioning without undertaking any structured exercise for priority-based selection and execution of works. Road works were being taken up on the basis of proposals sent by the divisions, which were themselves not based on any plans. As a result, upgradation/improvement of several roads were found to have been overlooked for prolonged periods of time. The Department/divisions also did not obtain feedback from the concerned district administration before taking up road works. Further, no assessment of the intended and accrued benefits was being done by the Department to assess the benefits achieved.

Audit found that there were major lapses in designing the roads resulting in excess/avoidable expenditure. The relevant IRC codes for designing the pavements were either wrongly applied or were neglected. Necessary preliminary investigations were also not conducted properly before designing the pavement. In contract management, it was found that various terms and conditions of contracts were overlooked or wrongly applied leading to loss of Government money.

Quality control checks of materials used in works before commencement and during execution of works were not conducted as per norms. Almost 35 *per cent* of the prescribed tests of materials were not done before execution of work and 53 *per cent* were not done during execution of the works. Besides, there are no regional laboratories and adequate number of divisional laboratories to assist the engineers in the quality control process.

Monitoring and supervision of the works were also not being carried out. Various monitoring tools like daily diaries, site order books, method statements *etc.*, were not maintained. Moreover, there were deficiencies in supervision of

execution of works by departmental officials. The Department failed to put in place an effective mechanism for submission of challans by the contractors for purchase of bitumen and to check their authenticity.

The Department did not have any policy on traffic mobility. Consequently, vehicular traffic was operating far below the design speed of the roads due to issues like congestion, encroachments, variable width along the same road, narrow and weak bridges *etc.*

Implementation of the road safety action plan was carried out only partially. As a result, various measures that were suggested to be implemented for ensuring road safety, such as installation of gantry signages and crash barriers, uniform recording of accident database, developing a handbook for “Road Safety Design Guidelines” for use in urban and rural roads were not carried out. Identification of black spots and measures to rectify them was being carried out in an ad hoc manner. Besides, the Department conducted the road safety audit of only five State Highways since 2015 against 1,864 roads under its jurisdiction. Further, the recommendations in the Road Safety Audit Report submitted by IIT-K in 2019 has not been implemented till date.

2.14 Recommendations

The following recommendations are proposed for consideration of the Department:

- *The Department should frame a Perspective Plan for development of the road network through a process of consultation with the various stakeholders including the District Administration, Transport Department etc., to cater to the demands of the road users.*
- *The Department may build a comprehensive database of all roads in the State and conduct periodic traffic surveys to assess the road development requirements.*
- *The Department should ensure that all relevant codes, guidelines in design and construction of roads are followed. Justification for any deviation from extant norms and guidelines should be recorded and due approval from the competent authority should be ensured.*
- *The Government may investigate the matter of production of fictitious challans for purchase of bitumen and ensure accountability of the officials involved.*
- *The Department should initiate steps to conduct periodical training for staff and officers to keep them up-to-date with the latest techniques and best practices.*
- *Department should conduct road safety audit of at least all SHs and important MDRs.*