

Chapter-5

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No work can commence without obtaining administrative approval of the competent authority and sanction to incur the expenditure proposed. The rules also require that preparation of detailed design and preliminary estimates should precede sanction of work by the administrative authority.

Preparation of cost estimates and issue of sanctions has a direct bearing on the total project cost, quality of works executed and timeliness of completion of road works. It is essential that laid down provisions of rules and standards/norms prescribed are strictly adhered to in preparing cost estimates and according administrative and technical sanctions. Audit, however, observed serious deficiencies in preparation of cost estimates and issue of administrative and technical sanctions, weakness in internal control mechanism and monitoring as elaborated in succeeding paragraphs:

5.1 Irregularities in preparation and sanction of estimates

For accurate preparation of preliminary estimate/ detailed estimates of a road work, it is essential that the department has reliable information on traffic density of the existing road, soil strength of the area where the road is being constructed and the status of the existing road in term of the crust thickness. Audit observed that maximum expenditure (77 *per cent*) during 2011-16 was incurred on the works of widening and strengthening of existing roads. For assessing the need for widening and strengthening of existing roads, calculation of values of Passenger Car Unit (PCU)¹ and Million Standard Axle (MSA)² based on traffic census data, California Bearing Ratio (CBR)³ for determining soil strength and Characteristic Deflection (CD) were required for arriving at the crust thickness required as per IRC guidelines.

Audit, however, noticed that the department either did not conduct traffic surveys on roads which were being proposed for widening or did not maintain proper records to monitor the status of existing road. Further, the department also did not conduct required soil tests to prepare road design and cost estimates. Audit also observed that required tests needed for designing the crust of the road such as BBDT⁴ and CBR⁵ were also not conducted properly in test-checked cases. Divisional authorities also did not comply with Project Formulation and Appraisal Division (PFAD)⁶ of Planning Department

¹ Passenger Car Unit-is calculated in terms of load of different vehicles i.e. Motorcycle, Car, Bus, Truck etc. with their corresponding value as 0.5, 1, 3 and 3.

² Million Standard Axle is an indicator of traffic load on a road.

³ California Bearing Ratio is a measure of load bearing of soil.

⁴ Benkelman Beam Deflection Test.

⁵ California Bearing Ratio.

⁶ Of planning department.

approvals. As a result, the estimates prepared and approved by the competent authorities were either inflated or faulty leading to avoidable expenditure or defective design of road works.

During scrutiny of records of 170 works costing ₹ 4,789.06 crore which were executed during 2011-16 in test-checked districts, audit observed serious deficiencies in estimates/designs as discussed in the succeeding paragraphs:

5.1.1 PFAD approval not attached with estimates: The E-in-C ordered (November 2010) that copy of approval accorded by PFAD would invariably be enclosed with every detailed estimate to ensure that the items and quantities of works included with every detailed estimate are approved by the Government and there was no irregular inclusion or deletion.

During test-check of records audit observed that out of 126 test-checked works costing ₹ 4,472.85 crore wherein PFAD approval was required, in 111 detailed estimates (88 *per cent*) costing ₹ 3,419.14 crore, copies of approval of PFAD were not found enclosed with detailed estimates. This implied that competent authorities granted technical sanctions without verifying whether the detailed estimates conformed to PFAD approvals. In 15 cases where PFAD approvals were enclosed with detailed estimates, audit noticed that divisional authorities did not comply with the PFAD approvals and changes in the scope of work were made in violation of PFAD approvals which were also irregularly sanctioned by the authorities according technical sanction. The cost of the irregular changes in the scope of work on account of reduction in approved length of roads, addition of new unapproved items of work, deletion of approved items, and alteration in the quantities was estimated to be ₹ 6.50 crore in three test-checked cases.

5.1.2 Traffic Census: The width of the road is decided on the basis of traffic density of a road. The traffic density is calculated in terms of Passenger Car Unit⁷ (PCU) per day. IRC-09: 1972 norm provides that traffic census should be conducted 24 hours a day for seven days, in presence of AEs at least on three days. The rules provide for conducting traffic census every year for every road and this report of traffic census with Form-3 was to be sent to Zonal Chief Engineers for onward submission to Chief Engineer, Headquarter-1 and Director, Research Institute.

Audit noticed that in 51 out of 63 test-checked works (81 *per cent*) costing ₹ 970.95 crore, where traffic census was required, detailed estimates were not supported by traffic census reports. However, the competent authorities accorded technical sanction ignoring this basic requirement.

In another 12 works, audit noticed that traffic census was not conducted for full seven days as per IRC norms (*Appendix 5.1*).

Further, none of the 33 divisions test-checked in 17 districts could produce records to audit in support of selection of census points by EEs, conducting

⁷ Traffic density is calculated in terms of load of car (value taken as one) and values of other vehicles like cycle, motor cycle, truck, bus are calculated with reference to car by taking their values as 0.50, 0.50, 3, 3 etc.

census in supervision of AEs for three days and deployment of staff for census. In all 63 cases, traffic census reports were not sent to E-in-C office through concerned SEs as ordered by E-in-C.

In reply, E-in-C stated (August 2016) that detail of traffic census is kept in divisions in road register which confirmed that traffic census data was not sent to E-in-C office.

Case Study 5.1

In Jhansi district (PD), traffic census data were enclosed with preliminary and detailed estimate for Jhansi-Mavai-Gird road. Audit noticed that traffic census reports attached with preliminary and detailed estimates were of the same dates but, the number of overloaded trucks and buses were different which established that the actual traffic census was not carried out.

Similarly, in Budaun district (CD), traffic census report enclosed with the detailed estimate of Bilsa-Wazirganj road was also enclosed with the detailed estimate of Bilsa-Sirasaul-Sanjarpur-Harganpur-Ujhani road. Dates of conducting traffic census were same for both the roads and number of buses, trucks and cycles recorded during census was also same and even name of road and census point was also same of Bilsa-Wazirganj road which indicated that data of one road was copied for the second road. Thus, in these circumstances, reliability of the traffic census reports enclosed with the detailed estimates was doubtful.

5.1.3 Calculation of MSA⁸: An important factor on which crust design is dependent is the Million Standard Axle (MSA) which is an indicator of traffic load on the road.

As the value of MSA depends, among other things, on number of commercial vehicles per day (CVPD), higher is the MSA (traffic load) of a road, greater will be the thickness of the crust required. Since, the traffic census is not regularly and properly carried out by the public works divisions in the State, the computation of MSA factor based on unreliable traffic data adversely impact the designing of the road crust as discussed in earlier paragraph.

5.1.4 Assessing CBR value of soil: California Bearing Ratio (CBR) is a measure of load bearing strength of the soil and also is an important factor in determining the crust design of the road. IRC-37: 2001 prescribes that at least three samples should be taken from each site for each type of soil at the same density and moisture content and tested for CBR value. As per pavement thickness design of IRC 37: 2001, increase and decrease in CBR values impacts directly on the assessment of required crust thickness e.g. if, value of CBR varies from 4 to 5 or 5 to 4, the required crust thickness also varies from

⁸ $N_s = [365 \times A \{(1 + r)^x - 1\} / r] \times F$ where N_s = cumulative number of standard axle, A = traffic in the year of completion of construction, r = annual traffic growth, x = design life in years, F = vehicle damage factor. Value of MSA⁸ depends on number of commercial vehicle per day (CVPD), year of construction period, design life, vehicle damage factor, lane distribution factor and annual traffic growth. While values of year of construction period, vehicle damage factor, lane distribution factor, design life and annual traffic growth rate are fixed and need no further calculation, value of CVPD is derived from the traffic census conducted on a road.

660 mm to 700 mm and vice versa which increases or decreases the cost of work as crust thickness is major component of expenditure.

Audit observed that in 78 out of 89 test-checked works costing ₹ 2,350.32 crore (88 *per cent*), CBR test reports were not enclosed with the detailed estimates although tests were required to be carried out and annexed with the estimates. Further, in none of the 78 cases, three samples of soil were taken as prescribed in IRC. It implied that either requisite CBR tests of soil were not conducted by the divisions as required in the IRC norms or the CEs/SEs accorded technical sanctions without examining the CBR test results. Hence, failure to conduct required soil test as per IRC norms indicates highly casual attitude of the engineering authorities in designing the road crust and preparing estimates. This may adversely impact the designing of the road crust.

5.1.5 Assessment of Characteristic Deflection: To assess the required overlay (in terms of Bituminous Macadam) for strengthening of different stretches of the roads, IRC-81: 1997 prescribes Benkelman Beam Deflection Technique test (BBDT) by categorising the road (good, fair, poor, etc.) on the basis of pavement conditions. This requires a road survey to be conducted before the test is actually carried out so that the road stretches are correctly categorised as good, fair and poor sections depending on the pavement conditions. Further, in each such category, minimum 10 points at the interval of not more than 50 metres should be marked for deflection observation.

Audit observed that out of 170 cases test-checked by audit, though this test was required in 42 cases, the BBDT test-reports were not enclosed in 27 detailed estimates. Audit, further, observed that even in the remaining 15 cases, though the BBDT test was done, the pavement condition survey reports were not enclosed. Thus, technical sanction was accorded by the competent authorities without the requisite test- reports prescribed by IRC.

Audit also observed that BBDT tests were conducted on the roads on a single day as per the test-reports forming part of the detailed estimates. Since, the number of points and the tests to be conducted on a road was quite large, it was not practically feasible to conduct so many tests on a single day. For example, on Budaun-Bijnor road (PD, Budaun), BBDT tests at 701 points were stated to have been carried out on a single day on 35 km reach, which seems doubtful.

Government had from time to time directed that BBDT test should be conducted by Research Institute or Quality Promotion Cell of PWD. Audit, however, noticed that out of the 15 cases, in only two cases, BBDT tests were conducted by Research Institute/Quality Promotion Cell of PWD and out of remaining 13 cases, BBDT tests for six works were conducted by private institutes and by Aligarh Muslim University, Harcourt Butler Technological Institute, Govind Ballabh Pant University and Central Road Research Institute in seven cases. Conducting of BBDT test from agencies other than Research Institute/Quality Promotion Cell was improper.

Thus, it may be concluded that the divisional officers as well as SEs/CEs who were responsible for preparation of preliminary and detailed estimates and according technical sanction did not adhere to the basic engineering requirements prescribed under IRC norms for designing of road crust and preparation of estimates. The traffic census, soil testing and other necessary tests were either not carried out or had serious deficiencies in large number of projects test-checked by audit. The CEs/SEs accorded technical sanctions to the estimates without insisting that the estimates are supported by all necessary tests and survey reports. Even PFAD approvals were overlooked. As a result, the quality of road design and cost estimates was questionable on the grounds of reliability, accuracy and sustainability. Due to not following the norms and instructions in preparation of estimates also raises the risk of over estimation of cost, misappropriation of funds, irregular changes in the scope of works and execution of substandard works increases. Such cases are discussed in paragraph 5.2.

In reply, the Government stated (June 2017) that administrative orders have been issued to prepare all estimates in accordance to relevant guidelines issued by IRC.

The reply is not convincing as various deficiencies have been noticed in the execution of contracts which indicated that the administrative orders issued earlier have not been enforced effectively.

Recommendation: *Since, preliminary/detailed estimates define the cost, scope and quality of works to be executed; these should be prepared strictly as per IRC norms and government instructions, duly supported by prescribed tests and survey results.*

5.1.6 Plantation works: Engineer-in-Chief directed (September 2008) that while preparing estimates for construction works, public works divisions should include one *per cent* of the cost of work on account of plantation work.

Scrutiny of 168 out of 170 test-checked works revealed that provision of one *per cent* for plantation required for the work costing ₹ one crore, was not made in any of the estimates during 2011-16 and therefore the requisite funds amounting ₹ 47.87 crore were not sanctioned for plantation work. Thus, plantation work could not be undertaken in these districts. This showed that divisional authorities who prepared the estimates and the administrative authorities who accorded administrative and financial sanctions failed to ensure that the norms and instructions relating to environmental protection are adhered to, in road project works in the State.

The Government stated (June 2017) that presently all the plantation and maintenance of roadside trees is under the scope of forest department. However, the State Government did not make available documentary evidence in respect of plantation of trees done along the road side.

Recommendation: *Government should ensure that road construction projects in the State effectively incorporate and implement sustainable*

development requirements in comprehensive manner in all aspects of road construction activities and subsequent maintenance.

5.1.7 Road Safety items: Road safety items of works such as road signage, road marking and Raised Reflective Pavement Markers etc. are essential for ensuring road safety and therefore should be included in works estimates as per IRC norms. Engineer-in-Chief instructed (October 2014) all Zonal Chief Engineers to submit estimates in two parts-Part-1 showing cost of work, contingency, establishment, etc., and Part-2 showing cost of road safety provisions, contingency, establishment, etc.

Scrutiny of estimates in test-checked districts, however, revealed that in none of the 52 works estimates test-checked by audit, the cost of road safety items was shown separately during 2014-16. Thus, expenditure on road safety items and their provision as per IRC norms in road works could not be monitored by the E-in-C and Government. This revealed that the divisions were lax towards adhering to the E-in-C directions despite high incidence of road accidents in the State.

5.1.8 Road Safety Audit: Government issued instructions in December 2014 directing that provision for road safety items should be made in estimates by the PWD before issue of technical sanction, after conducting road safety audit as per IRC specifications. Test-check of records in selected districts revealed that in none of the 49 test-checked works, any reference of conducting road safety audit was available in the estimates. The divisions also could not produce any evidence of road safety audit having been conducted in these works.

Government had further ordered that, out of total completed works in a year, road safety audit of 10 *per cent* works would be conducted by third party and in remaining 90 *per cent* works road safety audit would be conducted by the concerned Superintending Engineers. Selection of 10 *per cent* works for road safety audit by third party was to be done by concerned Zonal Chief Engineers.

Audit noticed that road safety audits in 90 *per cent* completed road works were not conducted by the concerned Superintending Engineers of test-checked districts during 2014-16. Chief Engineers also did not ensure road safety audit of works by third party in 10 *per cent* cases during 2014-16.

Thus, despite increasing number of road accidents/causalities in the State, SEs/CEs did not accord due importance to the requirement of conducting road safety audits and making State roads safer and compliant to road safety norms.

The Government stated (June 2017) that MORTH and IRC guidelines have been adopted by department which takes care of road safety audit.

The reply is not acceptable as no road safety audit has been conducted in the test checked districts.

Recommendation: In view of high incidence of road accidents/casualties in the State, the department should ensure that road safety audits are conducted and necessary road safety provisions, as per norms, are included and executed in all road construction projects.

5.2 Inaccurate estimates

Cost estimates for road works are not being prepared properly and accurately as per IRC norms and government instructions as discussed in paragraph 5.1 above. As a result, estimates contained serious deficiencies which led to avoidable excess expenditure, loss to the Government, execution of sub-standard works etc., amounting to ₹ 142.57 crore in 19 out of 170 works test-checked by audit. Some important issues are discussed below:

5.2.1 Excess provision in estimates: Test-check of estimates of 11 road works under 10 test-checked divisions revealed excess provision of crust thickness, crust design without traffic census, etc., in contravention of IRC specifications and/or departmental orders. This resulted in excess or avoidable expenditure of ₹ 58.33 crore as detailed in *Appendix-5.2*.

5.2.2 Deficient/wrong provision in estimates: Scrutiny of records revealed that in eight cases, eight divisions included provision of lesser or deficient quantity/wrong provision against what was required as per IRC specifications/departmental orders. This resulted in execution of sub-standard works, infructuous expenditure/excess/avoidable expenditure or loss to the Government, etc., amounting to ₹ 84.24 crore during 2011-16 as detailed in *Appendix-5.3*.

Despite repeated instructions (April 2006 and September 2008) of E-in-C for improving quality of estimates, Audit observed that estimates had major deficiencies and were not based on authentic and reliable data. SEs/CEs also accorded technical sanction to such estimates without ensuring adherence to important norms and instructions of Government and IRC. PFAD also failed to detect these deficiencies at the time of appraising the projects.

In reply, Government stated that the administrative orders have been issued to prepare all estimates in accordance to relevant guidelines issued by IRC.

Reply is not acceptable as the IRC norms were not followed.

5.3 Proposals for Government sanction

Audit noticed that Manual of orders of PWD prescribed that a register of preliminary proposals (PPs), prepared for obtaining administrative approval, would be maintained in divisions in approved format.

During scrutiny of records in test-checked districts it was, however, observed that no record of road work proposals (PPs) submitted to Government were maintained in any of the 33 divisions in 17 districts and there was no data available with the divisions regarding number of preliminary estimates or proposals of road works sent to circle offices for onward submission to

Engineer-in-Chief office for approval during a year. Audit noticed that circle and zonal offices as well as E-in-C office also did not maintain any such data.

On being asked, only eight preliminary estimates were furnished to audit. All the divisions replied that PEs/proposals were being prepared on the basis of requests of stakeholders and instructions from Government. This implied that system of initiation of proposals and preparation of PEs was highly *ad-hoc* and was not based on any systematic planning and proper assessment of requirement. The divisions were also not monitoring the progress of proposals after their submission.

In reply, E-in-C accepted (August 2016) that no register was maintained in this regard in his office. The reply of E-in-C indicated that the number of proposals for construction/upgradation of roads was pending with government and duration of their pendency was not known.

5.4 Irregular technical sanction by Executive Engineers

The Government delegated powers (June 1995) to EEs to accord technical sanction to the works costing up to ₹ 40 lakh. Audit observed that EEs exceeded their delegated powers and accorded technical sanction to 215 works costing ₹ 217.23 crore in 14 test-checked districts during 2011-16 with individual cost of each work ranging between ₹ 40.22 lakh to ₹ 4.48 crore (**Appendix-5.4**). Thus, EEs were not competent to issue technical sanction to these 215 works. Maximum irregular TS were issued by EEs in Saharanpur, Unnao, Gorakhpur, and Mainpuri districts. This requires investigation for fixing responsibility.

5.5 Delay in issuing technical sanction

Engineer-in-Chief ordered (January 2002) all the CEs/SEs/EEs to ensure that technical sanction to the detailed estimates were issued within 15, 30 and 45 days by EEs, SEs and CEs respectively from the date of receipt of administrative and financial sanction in the division. E-in-C, further, directed that if technical sanction was not issued by the competent authority within prescribed time schedule, he would be held liable for the delay.

A total of 20,697 technical sanctions were issued by CEs/SEs/EEs of selected districts during 2011-16. Position of delay by CEs, SEs and EEs in issuing TS to the detailed estimates during 2011-16 was as given in the **Appendix-5.5 A, B & C**.

Audit observed that:

- During 2011-16, CEs delayed grant of TS in 498 out of 2,872 cases received by them. SEs delayed TS in 1,587 out of 8,347 cases and EEs delayed TS in 1,942 out of 9,478 cases.
- Maximum delay in issuing technical sanction was at the level of Zonal Chief Engineers. Of the six test-checked Chief Engineers who were involved

in granting TS, maximum delay was noticed in Gorakhpur zone (maximum average delay: 1670 days). In 71 cases of TS granted by Chief Engineer, Gorakhpur zone, Gorakhpur during 2014-15 delay ranged between 122 to 2553 days.

- Out of 10 test-checked SEs, maximum delay was noticed in Basti Circle where average delay was 950 days during 2011-16. In 272 works the delay was as high as 24 to 1890 days. Technical sanction register for 2011-16 was not furnished by SE, Jhansi and this restricted audit scrutiny of the delays by SE Jhansi.
- Similarly, out of 33 divisions of test-checked districts, maximum delay in sanctioning detailed estimates during 2011-16 was noticed in divisions of Basti and Siddharth Nagar districts.

Thus, cases of maximum delay in sanctioning detailed estimates at Zone, Circle and Division levels were noticed in Gorakhpur zone.

Case Study 5.2

Government accorded (February 2014) administrative approval and financial sanction of ₹ 45.96 crore for widening and strengthening of Basti-Mahso-Mahuli road. But, technical sanction to the detailed estimate of this work was issued in March 2015 by Chief Engineer, Gorakhpur zone. Audit, however, observed that a contract bond (159/SE/13-14) was constituted for ₹ 42.81 crore on 1 March 2014 and full released funds were spent on the work without any technical sanction to the detailed estimate. Thus, contract bond was awarded and payment was made to the contractor irregularly one year before the issue of technical sanction.

Further, it was noticed that the execution of GSB and WMM layer was sanctioned by the Government in seven metre width which was increased to 7.30 metre and 7.15 metre by CE on the request of the contractor. This resulted in increase in cost of ₹ 1.12 crore. Thus, width for execution of GSB and WMM was changed without approval of the Government. Secondly, increase of width on request of contractor indicated that estimate was not prepared properly. On this being pointed out, EE replied that the width was increased as per requirement and not on the request of the contractor. Reply was not acceptable because EE while informing the contractor about increase in the width for execution of GSB and WMM specifically stated that it was decided on the request of the contractor.

The department did not furnish reply.

