

REPUBLIC OF NORTH MACEDONIA
PUBLIC ENTERPRISE FOR STATE ROADS

Terms of Reference
and Scope of Consultancy Services for
Technical audits

The Public Enterprise for State Roads (PESR) from the Republic of North Macedonia has started a Project for construction of new express road from Rankovce to Kriva Palanka which is to be financed by the World Bank. Technical Audits will be carried out to enable the Public Enterprise for State Roads to critically assess the implementation of the Project, in particular to perform the road works with a high quality. The present Terms of Reference describes the Services of a Consultant firm to be retained for carrying out the Technical Audits for the period between September 2019 and December 2020.

1. Background

Macedonia's overall road network totals 13,278 km of roads, of which 1,116 km are classified as National Roads, 3,806 km as Regional roads and 8,566 km as local roads. The Project for Construction of express road Rankovce – Kriva Palanka is carried out in two lots; Execution of the construction works has started in May 2018 and the loan's closing date is December 2020. Summaries of the contracted works and the related Bank project results appear in Annex 1.

2. Objectives of the Technical Audits

2.1. The main objectives of the technical audits are to verify independently whether (i) the road on both lots is being constructed in accordance with the relevant civil works contracts, the relevant standards and specifications and good international practice, and (ii) the documentation, timeliness and overall quality of project management, supervision and construction is appropriate. The technical audits will be a part of the due diligence activities for the Public Enterprise for State Roads and the World Bank.

3. Scope of Work

3.1. To verify construction as per contract, the technical audits are to ensure compliance of road works that will focus on the examination of the quality of works completed, to verify whether the road works comply with the technical specifications and standards described in the Contract

documents. The examination will be based on visual inspections and on the laboratory analysis of road core samples, to verify, among other elements, layer thicknesses, gradings, bitumen content, compaction, voids-in-the-mix and the general quality of materials used. The laboratory testing will include all relevant examinations of unbound granular materials from sub-base and/or local soil material from subgrade, examination of the works on bridges, shoulder's, drainage ditch, culverts etc. Verifying if the applied measures of safety improvement are in accordance with measures provided by the design documentation and Technical Specification Report on the status of contract completion, e.g. road markings, road signs and equipment. The Auditor will record and assess the possible existence of other elements considered relevant to safety.

3.2. To verify quality of processes, the technical audits to ensure works are implemented in an efficient way will focus on an analysis of the entire implementation process of the construction and supervision works. This will include an examination of the general management and contract management and an examination of the road works execution.

3.3. The technical audits will be carried out at three stages in the period between September 2019 and December 2020 (end Dec 2019; end Jun 2020; end Dec 2020). The first audit will be done in the fourth quarter of 2019. The Consultant will carry out the activities described below under the various headings:

3.4. Audit of General Management:

- Examine the division of tasks among the various actors involved in the Project execution and assess their coordination of activities.
- Evaluate the system for Contract management, including: the quality of information furnished by the system and possibilities for cost savings.
- Examine the filing system and documentation, particularly in respect of Contract documents management.

3.5. Audit of Execution of Road Works:

- Verify the conformance of the work and their costs with the planned program, settled in the Contracts.
- Verify that the Contractor executes the works also taking into account the environmental protection, social safeguards and site/traffic safety issues and in compliance with Environmental and Social Impact Assessment Study and Environmental Management Plan (EMP) attached to the Contract.
- Verify the new unit prices (if any), in comparison with the Contracts, as well as the actual works implemented.

- Verify good record keeping Supervision Engineer and Contractors, for example: work site notebooks, work site reports, work orders, justification of eventual amendments, as well as minutes of preliminary and final works acceptance, etc.
- Verify the necessary expertise have been sought and utilized in good time to resolve problems of technical issues.
- Verify the timing of works execution of completed and ongoing works, in relation to the Contract timing. Prepare a summary table for each Contract analyzed indicating the type of works, the total cost and the delays, if any. In the case of delays observed at the work site, analyze the measures taken to make up time. Analyze if necessary, any cost overruns, by type of work, amount of Contract.
- Verify that the goods and materials required for construction works execution were procured in conformance with quantities and norms established in the technical specification and requirements specified in the Contracts.

3.6. Audit of Works Supervision:

- Confirm that the supervision process implemented by the Supervision Engineer is in conformance with the terms of the Contract.
- Confirm that all invoices, authorizations, justifications and variation orders, payment, etc., are available and properly filed. Confirm that payments are made in conformance with the terms of the Contract and within the agreed limits.
- Confirm that the supervision process covers also environmental protection issues and road safety issues that should be accomplished by the Contractor.

3.7. Audit of Quality of Road Works:

- Provide a simplified and quantified description of the audited works, which are essentially for both contracts for construction works under the Project for construction of new express road from Rankovce to Kriva Palanka.
- Assess the quality of the works and their conformance with the specifications indicated in the bidding documents and works contracts, and whether the contract terms were respected by the parties.
- Review/audit of the bridges, structures including drainage structures as part of the road construction contracts.
- Provide detailed digital photographs of audit findings together with GPS coordinates.
- Drill and analyze road core samples. Carry out all testing and analysis of sample cores taken from completed road sections to meet the objectives of the assignment, including but not limited to the following:

- There shall be on average one deflection measurement per 50 m of constructed road section
- There shall be on average one sample per one km of constructed road section, taken at random locations and/or at locations where problems may be suspected.
- Testing of material from the layer of unbound mineral aggregate and / or soil from the subgrade/capping layer shall be carried out. Furthermore, the laboratory testing will have to include at least the thickness of sub-base course, grading, fine content and quality, “in situ” compaction. Sample tests of concrete samples from bridges, retaining walls and other concrete structures.
- The technical auditor will be directly responsible for identifying the precise locations where samples are to be drilled and for the actual drilling and taking of the samples. He/ She will also be responsible for the reinstatement of the drilled holes (filling and compacting) with appropriate asphaltic materials which can be cold mix or hot mix.
- The laboratory testing of the core samples will have to include as a minimum the following: the thickness of the various layers, grading of aggregates, bitumen content and quality, compaction, voids-in-the-mix and the general quality of materials used.
- The technical auditor may subcontract the actual drilling of the samples, the reinstatement of the drilled holes and the laboratory testing of the samples to an appropriate, qualified and independent firm or institution. He/She will however be directly responsible for supervising any subcontractor to ensure the quality and accuracy of all subcontracted work, and especially to ensure the accuracy of the laboratory tests.

3.8. Pre-opening road safety audit

- For each section (or part thereof in the event of partial opening to traffic) a pre-opening road safety audit should be conducted in accordance with good international practice as applied in the EU/EFTA and other OECD countries with an implemented road infrastructure safety management system including safety audits/inspections.

3.9. At each of the above points of the audit, the Consultant will not only verify or observe the existence or non-existence of a problem but will make recommendations which will permit the Client to improve its procedures and achieve its desired performance.

4. Technical Audit Consultant Qualifications

4.1. The **technical audit firm** must have previous successful experience with carrying out technical audits or similar quality assurance/supervision services in the road sector, in at least 5 (five) countries worldwide during the past 10 years. The firm must be fully independent and must demonstrate in its technical proposal that it has no conflict of interest. In particular it must demonstrate that it is not related in any way to contractors, supervision consultants and/or project management professionals currently working for or in contract with RUDP. Additionally, the

Consultant shall provide evidence as to how he/she proposes to retain the same staff for the duration of the assignment, and if possible, the key professional staff should be permanent employees of the Consultant.

4.2. The **technical auditor team** should be comprised of at least the following staff:

(i) One Team Leader, who should be a Senior Civil Engineer with highway experience; with at least 20 years total experience of which at least 10 in road projects and with at least 3 years of experience in technical audits. The candidate should have international experience in infrastructure construction, supervision or project management and should be fully conversant with road construction practices and management of road contracts.

Fluency in spoken and written English is required.

(ii) Road Engineer - He/she should be a civil engineer with at least 15 years of experience, of which at least 10 in road construction, supervision or project management. Fluency in spoken and written English is required.

(iii) Structures Engineer - He/she should be a civil engineer with at least 15 years of experience, of which at least 10 in structures construction, supervision or project management, preferably bridges, overpasses, underpasses, i.e. road structures. Fluency in spoken and written English is required.

(iv) Contract management and procurement specialist. He/she should have an engineering degree with at least 15 years of experience, of which at least 10 in the procurement and contract management of road projects.

(v) Quality control specialist. He/she should have a civil engineering degree with at least 10 years of experience, of which at least 7 as quality control / materials engineer in road sector projects. Fluency in spoken and written English is required.

(vi) Road safety auditor. He/she should have a university degree with at least 10 years of professional experience, of which at least 7 as a certified road safety auditor in an EU/EFTA country or other OECD country with an implemented road infrastructure safety management system including safety audits / inspections.

Additional support staff may be added and identified by the Consultant in his proposal as needed in order to fulfill the TOR for the technical audits. The team's composition of key and non-key experts should include expertise in environmental, social, site safety and road safety issues. All staff shall be computer literate in Microsoft Office, Word and Excel.

4.3 **Laboratory and field testing and equipment.** As an integral part of the Technical Proposal, the Consultant shall present details for the asphalt and concrete laboratories and deflection measurement that he is offering for execution of the required tests. The following tests must be

carried out and the laboratory and field equipment offered by the consultant should include all necessary equipment to conduct those tests.

4.3.1 Deflectograph - deflectometer

The Consultant should offer pavement strength evaluation equipment, such as Benkelman Beam or Pavement Deflectometer equipment.

4.3.2 Asphalt testing:

- thickness of the various layers
- grading of aggregates
- bitumen content
- bitumen quality
- compaction of asphalt layers
- voids-in-the-mix

4.3.3 Unbound sub-base material testing:

- thickness
- grading
- fine content
- fine quality (Methilen Blue and Sand Equivalent)
- Mechanical strength (Los Angeles)
- “In situ” bearing plate test – E_{v2} and E_{v2}/E_{v1}

4.3.4 Concrete testing:

- compressive strength of concrete samples

4.4 **Other requirements.** It is Consultant’s obligation to provide premises, vehicles and other technical and office equipment for execution of the Services.

5. Support by PESR to Technical Auditor

5.1. PESR will make available to the Auditor all necessary documents and will assist the Auditor in making appropriate appointments with all relevant government offices, institutions, contractors or service providers concerned with the technical audit.

6. Reporting

6.1. Report Submission

General

All draft reports will be submitted in the English language. PESR will forward drafts to the World Bank promptly on receipt and will include any Bank comments in the dispatch of its own. Final versions will be submitted in English and Macedonian.

Inception report

To be submitted within 2 weeks from the commencement of the assignment, presenting the methodology and work organization, reporting format and checklists, proposed rating system, and detailed work schedule for the first audit. The comments by PESR will be transmitted to the Auditor not later than 1 week after the date of submission.

Audit reports

(i) Prior to the conclusion of each audit mission visit, a brief summary of the preliminary conclusions of the visit will be presented to the PESR and representatives of the World Bank. If possible, this should be during a debriefing session, or otherwise in the form of a very short report or PowerPoint presentation.

(ii) For each mission, a Preliminary Technical Audit Report will be submitted electronically to PESR and to the World Bank, no later than 14 calendar days following the end of the mission, in both English and Macedonian language. The comments will be transmitted by PESR to the auditor no later than 2 weeks after the date of submission of the Preliminary Report.

(iii) The auditor will transmit the Final Report for the mission to PESR and World Bank not later than 10 calendar days after receiving the comments. All reports will be transmitted electronically through E-Mail. The reports will use standard software (WORD, EXCEL, etc.).

(iv) Safety audit reports will be submitted separately of the above, in draft and final forms (as per General requirements of section 6.1), with content and structure as per good international practice, at a timeline to be agreed with PESR depending on the foreseen opening to traffic and taking into account the reasonable time needed for feedback and implementation of accepted recommendations.

6.2. Report Contents

6.2.1. Each Technical Audit Report will include as a minimum:

- A Summary of Principal Results of the Audit (observations and recommendations).
- Number and location of the core samples taken of asphalt and concrete.
- Comments on the quality of construction, including a table showing the detailed results of the laboratory testing of Road Core Samples.
- Also, will include color photographs of all core samples.
- Principal weaknesses observed during the course of the audit, their roots and the proposed measures to rectify them. A plan of action for the implementation and monitoring of the proposed remedial measures should be prepared in tabular format.

- Any exogenous factors that impinge whatsoever on the implementation of the Road Sector Program, e.g., qualifications of local contractors and consultants, IFI procedures, funding, etc.
- Any other issue judged pertinent by the auditor. The Technical Auditor is especially requested to flag any situation which would indicate the likelihood of fraudulent or corrupt practices being present anywhere in the execution of the Road Upgrading and Development Project.

7. Frequency of Interventions and Duration of the Assignment

7.1. The audit mission visits to PESR will last on average two weeks for every stage. The taking of the asphalt and concrete core samples should be done upon completion of the related items. Special missions may be requested by PESR and paid separately.

7.2. Each audit mission will consist of: (i) field visits and meetings, and (ii) office work for completion of analyses and preparation of preliminary and final reports.

7.3. The total duration of the overall assignment will cover the period of project implementation not later than December 2020, with the possibility of extension.

7.4. Besides the regular scheduled auditing missions, the Client may ask the Consultant for additional specific interventions as needed, these will be remunerated separately, subject to a ceiling.

8. Payment Schedule

8.1. Each of the auditing missions will be remunerated by a LUMP SUM fee. The financial offer to be presented by the Consultant shall identify the LUMP SUM fee for each auditing mission, but nevertheless also include a unit rate table which shows how the LUMP SUM has been calculated. The Consultant may request an initial mobilization payment of not more than 10 % of the contract amount, which is to be deducted from the lump sum payments of the first two visits.

8.2. The financial proposal of the consultant shall identify separately (i) the price for the investigation works, (ii) staff costs, (iii) preparation of reports, (iv) travel costs and per diems, and (v) all other cost items.

8.3. Table

Tasks	Output	Delivery Schedule	Payments
1. Advance Payment			<p>10% of the total Contract amount not later than 15 days after the receipt of the valid Advance Payment Guarantee.</p> <p>The Advance payment will be deducted from the lump sum payments of the first two visits.</p>
2. Mission visits	Technical Audit Report	Preliminary Technical Audit Report -14 days after completed visit	90% of contract price for the mission after submission by Consultant of accepted Technical Audit Report by the Client
3. Final Report	Final Report	Final Report -14 days after completed visit, but not later than December 30, 2020	10% of contract price for the mission after submission by Consultant of accepted Final Technical Audit Report by the Client, but not later than December 31, 2020