ROADS FUND BOARD

TECHNICAL AUDIT MANUAL
(Report No. 30)

September 2008

Prepared by

Japan International Cooperation Agency
Katahira & Engineers International
Note on the Expression Used in the Manual

In this Manual, there are sentences written in the boxes and sentences written outside of boxes. The sentences written in the boxes are the “basic rules” or “stipulations”. What are written in boxes are supposed to be observed/followed as the standard procedures.

On the other hand, what are written outside of the boxes are “explanations”. Therefore, they should be read for better understanding of the basic reason behind, meaning, background, detailed procedure, etc of what are written in the corresponding box. Readers or users of the Manual are recommended to carefully read the explanations outside of the boxes to properly apply what are stipulated in the boxes and achieve best result of Technical Auditing.
# TECHNICAL AUDIT MANUAL

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### ANNEX: SOME HINTS FOR SITE INSPECTION/MONITORING
SECTION 1: INTRODUCTION

1.1 Application and Objective of the Manual

Clause 1.1.1: Application
This Technical Audit Manual is applied to the technical audits conducted by the Road Fund Board on the road works executed in accordance with the Performance Agreement agreed upon between the Road Fund Board and the Implementing Agencies (TANROADS, Road Authorities and the like).

This Manual is designed for in the technical audits conducted by Road Fund Board (RFB). The main users of this Manual are assumed to be the RFB staff, consultants engaged by the RFB for the purpose of technical audit, the road authorities including TANTOADS, local road authorities and the relevant officials of PMORALG.

Clause 1.1.2: Objective of the Manual
The objective of the Manual is to show the basic concepts and standard procedures of the technical audit conducted by RFB.

This manual describes the basic concepts and standard procedures. Detailed parts of actual technical audit may vary depending on the actual conditions of road works to be audited. Therefore, this Manual should not be rigidly applied. Those who are involved in the technical audit should carefully examine if each stipulation can be simply applied. Wherever necessary for attaining the objective of the technical audit, any part of this Manual needs to be modified.

Like any other manuals, this manual is intended to be used by relatively inexperienced auditors. Once an auditor accumulates sufficient experience, he/she may be allowed not to refer to, or even deviate from, the procedures prescribed in this Manual, provided that such deviation is expected to lead to better result.

Standardization of procedures and/or formats of reports/documents is very effective to prevent errors as well as easy understanding of the readers. Therefore, the procedures and formats shown in this Manual should be adhered to as much as possible, in spite of what is written in the above.

Clause 1.1.3: Pertinence of This Manual
This Manual has been prepared considering the current environment surrounding road maintenance/improvement in Tanzania. Thus, this manual needs constant review and revision/improvement as appropriate.
The environment surrounding road maintenance/development may change any time. What is important now may not be so next year. Therefore, this Manual needs to be constantly reviewed and revised as necessary.

1.2 Legal Basis and Objective of Technical Audit

<table>
<thead>
<tr>
<th>Clause 1.2.1: Legal Basis of Technical Audit</th>
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<tbody>
<tr>
<td>Technical Audit is conducted in accordance with the relevant stipulations (Clause 5.3 and Clause 5.6) of Performance Agreement and Clause 5 Subsection (4) of Roads Tolls (Amendment) No. 2 Act, 1998.</td>
</tr>
</tbody>
</table>

The basic objective of Technical Audit conducted by RFB is to assure that the road users who pay the road user charge, or fuel levy and other charges, get “value for money”. RFB is responsible for “accountability” of this “value for money”. The Performance Agreement stipulates, in Clause 5.3, that;

“The quality of all road maintenance works shall be in accordance with the Maintenance Standards, relevant specifications as agreed and safety standards as per recognized.”

And Clause 5.6 stipulates that;

“The BOARD reserves the right of inspecting and overseeing the performance of TANROADS in connection with maintenance works in order to verify .................. and for the purpose of generally monitoring the performance of TANROADS against the agreed norms and standards.”

Further, Clause 5 Subsection (4) Paragraphs (h) to (i) of Roads Tolls (Amendment) No. 2 Act, 1998 stipulates that;

“The function of the Board with respect to the Fund shall be-
(h) to ensure that the operation of TANORADS, local authorities, other road agencies and the Fund are technically and financially sound;
(i) to monitor the use of the funds disbursed to TANRAODS, local authorities or other agencies for the purpose of the objective of the Fund;”

These stipulations constitute the legal basis for the Technical Audit. The Auditor Team should always keep in mind this legal basis and the basic objective of Technical Audit. The Auditor Team needs to be confident, after audit, that the Team can clearly explain to the Board or the road users to what extent the audited works satisfy the demand of road users.
The ‘value for money’ is often discussed in ways different from that defined in the above box. One of the examples of such as impact on the regional development. It is more appropriate that this kind of ‘value of money’ be discussed in occasions other than technical audit.

**Clause 1.2.2: Objective of Technical Audit**

The main objective of Technical Audit conducted by RFB shall be to verify that the works are, or have been, executed in accordance with the technical standards agreed between RFB and the Implementing Agency and the standard practices of Tanzania.

Implementing Agencies are supposed to conduct their own technical audit, whatever the terminology may be, to assure that the works have been executed in accordance with the conditions set forth in the contract. The primary responsibility for this task rests with the Implementing Agency. Therefore, the Technical Audit conducted by RFB is to check this technical audit, or assurance of quality and other matters stipulated in the contract, has been properly practiced.

Appropriateness of technical matters such as technical standards or planning of maintenance works may be discussed somewhere during the Technical Audit, but extensive discussion on such subjects ought to be held somewhere else. The main objective of Technical Audit shall be verification of the manner of the procurement and management of works.
1.3 Professional Ethics as the Basic Principle

Clause 1.3.1: Professional Ethics as the Basic Principle

It is assumed that the concerned personnel of both of the Implementing Agency and Contractor practice professional ethics to the highest degree. This concept constitutes the basis for stipulating the procedures prescribed in this Manual.

Professional ethics is assumed as the basis of the condition of the contract. Likewise, the professional ethics is assumed in conducting Technical Audit. This concept is very important since Technical Audit cannot inspect every detail of road works. Majority of the tasks to ensure the quality of the works is inevitably vested upon the staff of the Implementing Agency, especially those of the branch office which is responsible for administration of the project. This Manual assumes that the staff of the Implementing Agency exert every effort, in accordance with his/her professional ethics, to attain the best quality of the works.

1.4 Definition of Terms

Unless the context otherwise specifies or requires, the meaning of the following terms shall be as defined below:

**Audit** shall mean, when written with the capital letter of A, Technical Audit as defined in this Manual.

**Auditor** shall mean a person or persons duly appointed by the Road Fund Manager, or any other official of Roads Fund Board authorized in accordance with the rules of Roads Fund Board, to conduct Technical Audit as defined in this Manual.

**Auditor Team** shall mean a team consisting of Auditors.

**Board** shall mean, when written with the capital letter of B, the Roads Fund Board.

**Chief Auditor** shall be the member of the Auditor Team so designated by the Road Fund Board. Usually the Chief Auditor is a staff member of RFB. The Chief Auditor shall be the Team Leader of the Auditor Team and assume overall responsibility for the audit conducted by the Auditor Team.

**Contract** (or the Contact) shall mean the contract for the works under discussion.

**Contractor** shall mean a natural person or legal person who execute road maintenance works under contract with Implementing Agency.

**Employer** shall mean the Implementing Agency or its division or staff under whose name the Contract is signed.

**Engineer** shall mean the person who acts on behalf of the Employer as stipulated in the Contract.

**Implementing Agency** shall mean any institution legally stipulated in the Road Act 2007 to be responsible for the maintenance of roads and enter contract with RFB to maintain roads and receive the fund for this maintenance.
Manual shall mean, when written with a capital letter M, this Technical Audit Manual.

Performance Agreement shall mean the agreement agreed upon between RFB and any of Implementing Agencies to be in charge of road maintenance.

Periodic Maintenance shall mean all maintenance works carried out at intervals of several years. Some activities included here are also referred to as Preventive Maintenance. Typical activities on paved roads include rescaling, overlays of less than 100 mm, fog sprays and shoulder reforming. Pavement layer reconstruction or the addition of a pavement layer must not be included.

Routine Maintenance shall mean all maintenance works required continuously or at interval on every road whatever its engineering characteristics or traffic volume, and comprises activities such as grass cutting, drain cleaning, culvert and bridge cleaning and maintenance, road furniture and bridge guard rails maintenance, paved road patching, edge repair, crack sealing, and line marking, and also unpaved road grading, shaping and pothole repair.

Roads Fund Board shall mean the institution duly established by the Road Toll (Amendment) No. Act, 1998 as revised in the 2002, with the mission to ensure adequate and stable flow of funds to implementing agencies and monitor its utilization for sustainable road maintenance.

Technical Audit shall mean the act of examining and verifying that the road maintenance works have been executed in accordance with Performance Agreement.

1.5 Type of Technical Audit and Methodology

Clause 1.5.1: Post-Completion Audit as the Main Type of Technical Audit
Main type of Technical Audit conducted by RFB shall be “Post-Completion” audit. However, RFB may conduct technical audit on the works which are being executed for the purpose of monitoring and verification of actual manner of execution of works.

There are two kinds (types) of technical audit. One is that conducted while the road works are in progress and the other is that conducted after completion of the works. Since majority of the technical audits conducted by RFB are done on the road maintenance works executed in the previous financial year, they necessarily become “post-completion” audit.

RFB may consider to conduct technical audit on the works which are being executed. This becomes necessary if RFB wish to verify the actual manner of execution of works to be assured that the works are executed in accordance with the good engineering practices.
Clause 1.5.2: Methods of Technical Audit

Technical Audit conducted by RFB shall consist of audit on documents and audit on the site conditions. The objective of Document Audit shall be to verify that proper procedures of procurement and administration of the works have been practiced. The objective of Site Audit shall be to verify that works have been actually executed in accordance with the conditions stipulated in the contract.

Both Document Audit and Site Audit are essential components of Technical Audit. The purpose of Technical Audit can be achieved through effectively conducting the two components.
SECTION 2: PREPARATION

2.1 Annual Technical Audit Plan

Clause 2.1.1 Preparation of Annual Technical Audit Plan

The Roads Fund Manager shall prepare an annual plan of Technical Audit not later than the end of July every year.

As soon as a new financial year starts, the Roads Fund Manager and his/her assistants should prepare the annual plan of technical audit for the previous financial year. This annual plan should be sent to the Implementing Agencies for their information. The Annual Technical Audit Plan shall include, in principle, the following:

- Region/District to be Audited in Each Quarter of the Year
- Indicative Time Schedule
- Preliminary Estimation of Required Manpower and Cost

Annual Audit Plan may be revised, as necessary, to adjust to the change of conditions which may occur after it is prepared and approved.

2.2 Selection and Appointment of Auditor Team

Clause 2.2.1: Composition of Auditor Team

Auditor Team shall typically consists of:
(i) One Team Leader
(ii) One to four members of the Auditor Team

Since various aspects need to be audited, the Audit is to be conducted by a team of experts. The number of experts and the expertise required varies depending on the project to be audited. Thus consultants with necessary expertise are engaged and appointed as the members of Auditor Team.

The Team Leader, or Chief Auditor, is to give overall direction to the other team members. He/she shall assume the overall responsibility of the Audit. He/she take charge of some tasks of Technical Auditing depending on his/her expertise.

Time to time FRB may dispatch other technical auditor(s) comprising of its staff, as necessary. The objective of such technical audit may be different from those of the Technical Audit conducted by the engaged consultants.
The table below summarizes the typical composition of an Audit Team and major tasks of the members of the Team.

<table>
<thead>
<tr>
<th>Position in the Team</th>
<th>Main Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader/Chief Auditor</td>
<td>• Lead other Team Member(s) in conducting the technical audit</td>
</tr>
<tr>
<td></td>
<td>• Responsible for preparation of draft Audit Plan</td>
</tr>
<tr>
<td></td>
<td>• Conduct Technical Audit according to the TOR given by RFB</td>
</tr>
<tr>
<td></td>
<td>• Responsible for preparation of draft Audit Report</td>
</tr>
<tr>
<td></td>
<td>• Conduct Technical Audit on the subject of his expertise</td>
</tr>
<tr>
<td>Auditor</td>
<td>• Conduct Technical Audit under the overall supervision of the Team</td>
</tr>
<tr>
<td></td>
<td>Leader/Chief Auditor</td>
</tr>
<tr>
<td></td>
<td>• Assist Team Leader/Chief Auditor in preparing draft Audit Plan,</td>
</tr>
<tr>
<td></td>
<td>draft Audit Report and other documents</td>
</tr>
</tbody>
</table>

**Clause 2.2.2: Selection of Consultant**

The consultant(s), as the team, shall have sufficient experience to cover the following subjects:

(i) tendering/bidding for road works,
(ii) site management/quality control/material tests/quantity survey, and
(iii) contract management/certificate for payment/handover.

The number of consultants to be engaged for one time of technical audit should be determined based on such factors as;

(i) number and size of contract (volume of works),
(ii) types of works included (bituminous works vs. gravel, concrete works, earth works etc) and inspected, and
(iii) total length of the road sections to be inspected.

Consultants are engaged to audit documents and sites as described in the following sections. They are to prepare reports for the assigned tasks. The consultants to be engaged should be selected considering the above subjects and factors. The consultants to be engaged also should be those who know the local conditions.

**Clause 2.2.3: Appointment of Auditor and Provision of Letter of Introduction**

Each member of the Auditor Team shall be appointed by the Road Fund Manager. Letter of Introduction for Audit shall be issued and given to each member of the Auditor Team.

Roads Tolls (Amendment) No. 2 ct, 1998, Clause 5, Subsection (4) Paragraph (k) stipulates that;
“The function of the Board with respect to the Fund shall be-
(k) to appoint, subject to approval by the Controller and Auditor General, an auditor or
auditors to carry out the audit of the Fund;”

This paragraph constitutes the legal basis of appointment of auditors.

Each member of the Audit Team shall bring the Letter of Introduction and show it to the
Implementing Agency which undergoes the technical audit.

The letter of Introduction is specially important for the consultants engaged as the members of
the Auditor Team to let him/her have authority and dignity. A consultant who is a member of
Auditor Team may have been engaged by the Implementing Agency to be audited. Naturally,
he/she may have some sentiment of “fear” to the Implementing Agency. Letter of Introduction is
important to remove this sentiment and encourage the consultant as the agent of RFB.

2.3 Selection of Projects to be Audited

<table>
<thead>
<tr>
<th>Clause 2.3.1: Selection of Projects to be Audited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects to be audited shall be selected at random basis, but to cover at least 20 % of the</td>
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<tr>
<td>projects contracted in the financial year for auditing. Also, the selection shall be made for</td>
</tr>
<tr>
<td>different classes of contract amount, type of works, and regions.</td>
</tr>
</tbody>
</table>

The project to be audited are selected considering the following:

(i) The regions which has not undergone audit in the recent years should be given high
priority.
(ii) The number of regions to be audited shall be as equally distributed among zones as
possible.

If RFB finds any special reason, RFB may conduct Technical Audit to a particular Region which
underwent Technical Audit in the previous financial year. Such special reason include, but not
limited to, the following:

(i) Poor quality of works
(ii) Poor conditions of filed documents

2.4 Timing of Auditing

<table>
<thead>
<tr>
<th>Clause 2.4.1: Timing of Auditing</th>
</tr>
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<tbody>
<tr>
<td>Auditing shall be conducted not more than 2 months from the closure of financial year.</td>
</tr>
</tbody>
</table>
It is desirable to audit as soon as the project has been completed to see the condition of the road as the project has been completed. However, there may be various constraints to conduct auditing shortly after the completion of works, such as time needed for the report of completion of the works reach to RFB and RFB start preparation of audit, such as arranging the travel to the region. Accordingly, certain time lag between the completion of works and implementation of audit needs to be tolerated.

2.5 Notice to the Implementing Agency

<table>
<thead>
<tr>
<th>Clause 2.5.1: Notice to the Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Implementing Agency who is responsible for the works to be audited shall be notified at least two weeks before the arrival of the Audit Team.</td>
</tr>
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</table>

Prior notice is essential to let the Implementing Agency be informed of the Technical Audit and prepare relevant documents and other matters. The notice should be sent to the headquarters of the Implementing Agency while a cc shall be sent the branch of the Implementing Agency which is responsible for the Projects to be audited.

2.6 Review of the Quarterly Report and Other Relevant Documents and Understanding of the Project

<table>
<thead>
<tr>
<th>Clause 2.6.1: Review of the Quarterly Report and Other Relevant Documents and Understanding of the Project</th>
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<tbody>
<tr>
<td>The Auditor Team shall obtain the Quarterly Report and other relevant documents of the Implementing Agency, review it and try to understand the picture of the project to be audited.</td>
</tr>
</tbody>
</table>

- Good understanding of the project to be audited is indispensable for effective and efficient auditing. Therefore the Auditor Team shall review and grasp the features of the project to be audited. For this purpose, it is advised that the Auditor Team review the Quarterly Report, in case of TANROADS to know the outline of the Projects.

Auditor Team should summarize the result of the review of documents listing the points of attention for the planned technical audit and attach such summary to the Audit Plan.
2.7 Preparation of Audit Plan and Schedule

<table>
<thead>
<tr>
<th>Clause 2.7.1: Preparation of Audit Plan and Time Schedule</th>
</tr>
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<tbody>
<tr>
<td>After reviewing the contract and relevant documents and understanding the Project, the Auditor Team shall prepare an Audit Plan and Time Schedule for each project to be audited so that the Technical Audit can be conducted effectively and efficiently. The Audit Plan and Schedule shall be approved by the Road Fund Manager prior to the departure of the Auditor Team. The Audit Team shall bring the Audit Plan to the location of the Audit and refer to ensure that the Audit is done in accordance with the Plan.</td>
</tr>
</tbody>
</table>

The Audit Plan shall typically include, but not limited to, the following items.

- Particular points to be looked into, such as process of tendering/procurement, design and cost estimate
- List of documents to be audited
- Scheme of site inspection

Form-1 shows an example of Audit Plan.

After the draft of Audit Plan and Time Schedule has been prepared, it is advisable to convene a meeting of the members of Audit Team and allocate the tasks to be carried out by each member.

<table>
<thead>
<tr>
<th>Clause 2.7.2: Transmission of Time Schedule</th>
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<tbody>
<tr>
<td>The Time Schedule shall be sent to the Implementing Agency for preparation as soon as it is approved by the Road Fund Manager.</td>
</tr>
</tbody>
</table>

After the Audit Plan and Time Schedule is approved, the Time Schedule shall be sent to the Implementing Agency for their information and preparation. In the cover letter for sending the Time Schedule, the Implementing Agency should be requested to get prepared for the Technical Audit. The preparation done by the Implementing Agency include the following:

- Preparation of all the documents relevant to the Project
- Preparation of tools apparatus and/or equipment needed for measurement and survey for Site Audit
SECTION 3: DOCUMENT EXAMINATION

3.1 Meaning of Document Examination
The purposes of Document Examination should be understood as one of the means to ensure that the works have been executed in accordance with the standard procedures and the conditions stipulated in the Contract. As for the procurement, standard procedure is stipulated in the Public Procurement Act. Naturally, the Implementing Agencies are supposed to observe these stipulations.

Standard Technical Specification, for example, stipulates the required laboratory tests and field tests. These tests are designed to assure the required quality of the works. Conducting these required tests and properly filing the tests results are the first step of quality control. Missing of these tests result implies low consciousness for importance of quality control.

Checking the data of such tests is the easiest and most commonly adopted means of checking the quality of works. Therefore, documents examination is conducted not only to check that the required documents are properly filed but also to check that the works were executed in accordance with the stipulations of the Contract. Document Examination is very important in Technical Audit of RFB which is conducted after the works have been completed and the actual manner of execution of works cannot be observed.

3.2 Documents to be Examined

Clause 3.2.1: Verification of All Documents
The Auditor Team shall, in principle, verify that all of the following documents are properly filed and maintained.

(i) Documents required in the tendering process
(ii) Signed contract and documents attached to it
(iii) Documents to be submitted by the Contractor in accordance with the stipulations of the Contract
(iv) Documents related payment
(v) Documents to be prepared by the Implementing Agency and/or its consultant for the purpose of contract administration, quality control and other purposes in accordance with its rule/ regulation.
(vi) Documents related completion of works and handover
(viii) Any document(s) which may have affected any part of the works.

As explained in Subsection 3.1 above, good filing and maintenance of the documents shows diligence of the Implementing Agency in discharging their duties.
Documents prepared and filed in the tendering stage include the following:

- Announcement/advertisement
- Tendering documents (Instruction to the bidder, Standard Contract etc)
- Record of bid opening
- Bid evaluation report
- Record of contract negotiation

The documents to be submitted to the Implementing Agency (Employer of the contract) are stipulated in the Contract, including the Technical Specifications. Also, there are several kinds of tests conducted by the Implementing Agency or its consultant for the purpose of quality control. The Auditor Team shall review the Contract documents and prepare a checklist of the documents to be examined before departure.

Generally, the following documents are required to the contractor:

- Work Schedule
- Material Plan and Data of Material Testing (Soil, Aggregate, Bituminous Material, Cement, Ready Mixed Concrete, Guard Rail, Traffic Sign, Paint for Pavement Marking)
- Monthly Progress Report

It should be noted that many of the above documents need to be approved by the Implementing Agency as the Employer. Also, some of the tests as listed above need attendance/witness of the Implementing Agency. The Auditor Team shall needs to be satisfied that these approvals have been properly given and recorded and tests results have been signed by the attended staff/consultant of the Implementing Agency.

Generally, the following tests are conducted by the Implementing Agency or its consultant:

- Field Density Test
- Quantity Surveys (Surveys for certifying the completed works)

Also various variation order or instructions are issued by the Employer to the Contractor. They also should be filed in a chronological order so that the process of change of design etc are easily traced.

At the time of completion of works and handover the project, certificate of completion of work and other documents are issued. These documents need not be examined in detail for the purpose of Technical Audit conducted by RFB.

There are various kinds and large volume of documents as listed above. Filing all these documents in an orderly manner is an essential part of quality control or site management. If this has not been done, one might suspect the diligence of the Engineer on quality control/site management. Therefore, inspecting that all the required documents have been submitted or
prepared (by the supervision consultant engaged by the Implementing Agency) on designated time and filed in a orderly manner is one of the effective and efficient method for examining the effort of the Implementing Agency on quality control/site management.

It is advised that RFB issue a letter to the Implementing Agency requesting the documents as described above be filed in a chronological order and by subjects, such as laboratory tests data, filed density data etc.

**Clause 3.2.2: Sampling of Documents for Detailed Examination**

After the verification of the documents as stipulated in Clause 3.2.1 above, the Auditor Team shall examine that individual documents have been prepared and submitted in accordance with the stipulations of the Contract. This examination shall be conducted on a random sampling basis considering the available time, but the rate of sampling should not be less than one per five documents.

After it is verified that the all the required documents are properly submitted/prepared and filed, detailed audit of these documents shall be conducted. However, it is practically impossible to check in detail all the documents described in the above. Thus, detailed audit of the documents is conducted on sample basis. Ratio of the documents to be audited into detail to the total number of the documents shall be 1 out of 5 at minimum. This ratio should not be regarded as absolutely fixed. Whenever possible, as many documents as possible should be audited in detail.

It is advised to prepare a checklist such as Form-2-1 and Form-2-2 be prepared and the result of auditing the documents be recorded. Such check list should become a part of the Audit Report.

**3.3 Methodology of Document Examination**

**Clause 3.3.1: Items to be Examined in the Detailed Examination of Documents**

The Auditor Team needs to be satisfied with the data presented in the relevant documents. For this purpose, the Auditor Team should carefully examine if the intension/objective of the document is proper and the data/information recorded in the document is correct.

Examination of documents needs considerable knowledge and experience on the subject of the said documents. Therefore, consultants who are engaged as members of the Auditor Team are required to have rich experience in site management/quality control so that any data indicated in the documents are not overseen.

The items to be carefully audited may vary depending on the problems of the Project to be specifically examined. In some case, some documents may be examined after some particular
problems are found in the Site Inspection.

(Useful technique for inspecting material test/quality control test data is to see if there is checkmark (v) beside the measured data. Checkmark indicate that the measured data have been compared to the specified value.)

3.4 Evaluation

<table>
<thead>
<tr>
<th>Clause 3.4.1: Evaluation of Documents</th>
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</thead>
<tbody>
<tr>
<td>Evaluation of documents shall be made from the viewpoint of completeness in both kinds of required documents and quality of the documents, including timeliness and other aspects.</td>
</tr>
</tbody>
</table>

First whether or not the required documents are filed is inspected as stipulated in Clause 3.2.1. At this stage, the completeness is evaluated based on the number of missing documents. If any important documents, such as approval of material, are missing, they shall be evaluated as noted defects. On the other hand, missing of some documents with relatively small significance, such as a few out of nearly one hundred data sheets of field density tests shall be regarded as relatively minor defects in the filing of documents, provided that such missing data can be verified during the Site Audit.

Quality of each document should be examined to check if the data or information included in the documents are clear and fit to the purpose of the requirement of the document. If the data/information shown in a document do not satisfy the objective of the document, the said document shall be evaluated as “unsatisfactory” and regarded as equivalent to “missing”.
SECTION 4: SITE INSPECTION

4.1 Meaning of Site Inspection
Site Inspection is the main part of the Technical Audit. Importance of Site Inspection may be self-explanatory. It is conducted to inspect the actual conditions of the executed works.

Firstly, the road conditions should be good enough after the contracted works are executed. If the road conditions are not good, the Auditor Team should seek explanation by the Implementing Agency.

Secondly, it needs to be verified during Site Inspection that the works have been executed in accordance with the conditions stipulated in the Contract.

4.2 Preparation
Before departure (from Dar es Salaam), the Auditor Team should request the Implementing Agency to prepare the tools and equipments needed for the survey of site condition. Such tools and equipments are usually used in filed tests, quantity survey, and other tests/surveys routinely conducted throughout the execution. Therefore, these tools/equipments should be readily available. The tools/equipments typically needed in site audit are as listed below:

Common to All Types of Works
  - Check list
  - Camera (for recording what is observed by the Auditor Team)
  - Field Note and Pencil/Pen
  - Measures; one with maximum length of 20 – 30 m and one with length of 2- 3 m

These tools should be carried to the site regardless of the type of the works to be inspected. Since these tools are used repeatedly and are easy to carry, Auditors should procure and bring to the site of audit.

Check list should be prepared before departure to the site considering the features of the Contracted works, based on the result of Document Examination. Examples of checklist and ribbon chart to be prepared before going to the site are shown in Form – 3.

A camera is used to take photos of the conditions of the roads at the time of Site Inspection. The photos taken during the Site Inspection should be included in the Audit Report to show the road condition. A filed note and pencil/pen are used to memo the things that the auditor wishes to record. A measure may be needed any time at site to measure something. Therefore it is advisable to carry it to the site.
Wearing work wear is strongly recommended so that the members of Auditor Team do not hesitate to step into dirty place or places covered by grasses etc for the purpose of close observation.

In addition to the above three tools/equipment, the following tools/equipment should be prepared, depending on the work items included in the Contract:

- 5 m Straight Edge (used in measurement of flatness/smoothness of road surface)
- Small hammer (so-called “test hammer”) (used in checking of quality of concrete, tightness of bolts, and any hollow in the material)
- Ladder (needed to go high or low place such as bridge, culvert, or cut slope.)
- Flash light (needed to check dark place like inside of culvert.)

4.3 Methodology

<table>
<thead>
<tr>
<th>Clause 4.3.1: Method of Site Inspection of the Work Items for Which Records of Quality Control Tests or Quantity Surveys are Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic method of site audit shall be, in principle, verification of the inspection sheets and record of field tests prepared by the Implementing Agency. However, the Auditor Team may conduct any test or survey or any necessary action wherever any doubt arises.</td>
</tr>
</tbody>
</table>

The primary responsibility of quality control and quantity survey rests with the Implementing Agency. The position of RFB is to examine/confirm the quantity surveys and quality control tests are properly done and payments have been made in accordance with the conditions of the Contract. From this viewpoint, Site Inspection should aim at verifying the data of quantity survey and quality control tests.

Therefore, the procedure of site inspection may be as follows:

(i) Request a photocopy of the record of the quality control tests and inspection sheets.
(ii) At the site, measurement/survey the items shown in the above records at the location shown in the above record and write the figures obtained by the measurement/survey in red ink on the photocopy of the record.
(iii) Compare the figures measured/surveyed during the execution of works and those measures/surveyed at the time of audit.
(iv) If the difference is within the range of error, the data of Implementing Agency shall be evaluated to be acceptable. If there is a large discrepancy between the tow figures, ask the Implementing Agency to explain the cause of the difference.

If there is no record of measurement/survey done by the Implementing Agency, the warning should be issued to the Implementing Agency and this fact needs to be later stated in the Audit Clause 4.3.1: Method of Site Inspection of the Work Items for Which Records of Quality Control Tests or Quantity Surveys are Available
Also measurement should be done at locations other than those where measurements were done at the time of completion of works at random basis. This measurement will provide the Auditor with additional information to confirm the degree of accuracy of measurement/survey done by the Engineer.

Some work items, such as grass cutting and cleaning of drainage, road do not require quality control tests or quantity surveys. Therefore, such data do not exist. In such case, the Auditor is forced to judge if the works were properly executed based on the observation of the existing conditions of the items of the said work.

The condition as of the completion of works cannot be adequately verified when certain time period elapses after the execution of some work items, such as grass cutting, cleaning of drains and reshaping of the surface of gravel road. To verify the manner of the execution of such works, it is proposed to stipulate in the contract that the Contractor take photos showing (i) the condition before execution of work, (ii) the manner of works during execution, and (iii) condition after execution and submit them to the Executing Agency.

Although the details figures of measurement are examined, inspection on the general conditions of the road so as to appropriateness for passage of vehicle should not be forgotten.

Poor quality of works can be detected by an experienced road engineer without sophisticated tests/surveys. The point that an experienced road engineer would look at include, but not limited
to, the following.

- General appearance of the executed work
- Smoothness of the road surface (shows the degree of diligence of surface work)
- Cleanness of the site (If debris etc are remaining, diligence of works is doubted.)
- Settlement of road surface as a heavy vehicle passes, in case of unpaved road (Large settlement occurs if the compaction or material is not adequate.)

4.3.5: Verification of Data Recorded by the Implementing Agency

Referring the checklist prepared before departure from the place of Document Examination, the various dimensions of works, such as road (pavement) width, section length, size of drainage facilities, are measured and compared with the data measured by the Implementing Agency for verification of the data.

4.4 Recording

The raw data obtained as the result of measurement/survey done in the Site Inspection shall be recorded on the data sheet and attached to the original of the Audit Report.

4.5 Evaluation

Clause 4.5.1: Evaluation of the Result of Site Inspection

Evaluation of the result of site audit shall be made from viewpoint of compliance with the conditions of the Contract.

Actually, there are no criteria to judge “pass/fail” or “satisfactory/unsatisfactory” of the maintenance works. Evaluation needs to point out the serious problem(s) found in the Site Inspection. Examples of serious problems which may be found in the Technical Audit include, but not limited to, the following:

(i) Discrepancies between what are recorded in BOQ for payment and what have been actually executed
(ii) Discrepancies of kind of works between the Contract (BOQ) and what have been actually executed
(iii) Lack of proof of quality of works

If any serious problems for the subjects as exemplified in the above are found, such problems should be clearly presented in the Audit Report to draw attention of the Board.
4.6 Wrap-up Meeting

Clause 4.6.1: Wrap-up Meeting

After the Document Examination and Site Inspection have been completed, a wrap-up meeting shall be held attended by the head of the office audited, his/her relevant staff and the Auditor Team, and the tentative evaluation of the result of the audit shall be explained by the Audit Team.

The Auditor Team shall summarize the discussions of the Wrap-up Meeting, including the comments/response of the audited office and record in the “Result of Audit Form” as shown in Form-4.
SECTION 5: EVALUATION AND REPORTING

5.1 Evaluation

<table>
<thead>
<tr>
<th>Clause 5.1.1: Evaluation of the Result of Technical Audit</th>
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</table>
The result of Technical Audit shall be evaluated from the viewpoint of compliance with the conditions set forth in the Performance Agreement.

The objective of Technical Audit is to verify that the works have been executed in accordance with the conditions set forth in the Performance Agreement. Therefore, it is basically beyond the scope of Technical Audit conducted by RFB to examine the appropriateness of what are written in the Performance Agreement, such as selection of the road to be maintained. Such discussion ought to be made in the discussion of the Performance Agreement itself.

It should be noted that the Auditor Team should not seek for excessively high standard in the execution of works. Rather, it should be realistic in evaluating the degree of perfection of filed documents and the quality of the works. Minor problems should be tolerated unless they have been willingly caused or caused by grave negligence.

<table>
<thead>
<tr>
<th>Clause 5.1.2: Evaluation of Value for Money</th>
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</table>
Evaluation of Value for Money should made based on the following criteria:

- Was the Plan appropriate?
- Was the work procured in accordance PPA?
- Was the work implemented in accordance with the Contract (Conditions and Specifications)?
- Does the work fit the purpose in terms of usability?

As defined in Clause 1.2.2, the term ‘Value for Money’ is considered to be assured if the works are/have been executed in accordance with the Performance Agreement and/or the Contract. Value for money may be judged from different viewpoint such as impact on the people’s daily life or regional development. However the evaluation on this type of value for money should be clearly separated from the objective of Technical Audit.
5.2 Reporting

**Clause 5.2.1 Preparation of Draft Report**

Within two weeks after completing the visit to the Region, the Auditor Team shall prepare the drafts of two kinds of Audit Reports and submit them to Road Fund Manager. One kind of the Audit Reports shall be for internal use of RFB and another to be sent to the Implementing Agency for their reference. The Audit Report to be sent to the Implementing Agency is prepared by removing the Audit Plan and other parts of the Audit Report for internal use of RFB which are the information internally needed by RFB. In principle, 3 copies for each of two kinds of Audit Reports shall be prepared.

Assumed use of the two kinds of Audit Reports are as follows:

**Audit Report for Internal Use of RFB**

Original is to be maintained in the Archive of RFB for 5 years, in accordance with the National Auditing Law. The Original shall be accompanied by all the data obtained during the Audit while the copies do not need to be so.

**Audit Report to be Sent to the Implementing Agency**

- Original and one copy are to be used and maintained in the headquarters of the Implementing Agency (Relevant department of PMOLARG in case that the Implementing Agency is local government).
- One copy is to be sent to the branch office of the Implementing Agency who directly supervised the audited project for its reference.
- One copy is to be maintained by RFB for one year.

The Technical Audit Report shall cover the following items:

(i) **General Information**
- Dates of auditing and time schedule
- List of Auditor Team members
- Name of Region (in case of TNARoads) or local government responsible for the audited project
- List of audited projects

(ii) **Summary sheet of audited project**
- Name of the project
- Type of work
- Contract amount
- Name of contractor
- Dates of start and completion of work (and dates and contents of revision of contract, if any)
• Total length of road section included in the contract
• Major work items and quantities

(iii) Result of Technical Audit and Evaluation of Each Projects
• General information of the project (name of project, type of work, contract amount, length of road section, contract amount)
• Result of document audit (raised issues, explanation by the Implementing Agency and view of the Auditor)
• Result of site audit (raised issues, explanation by the Implementing Agency and view of the Auditor)
• Photos showing the conditions of the audited sites (general condition and the matters of issue)

(iv) Summary and Conclusion
• Major issues found through the audit
• Problems common to all the projects
• Overall evaluation and recommendation for improvement

**Clause 5.2.2: Recommendation of Actions by the Board**
The Technical Audit Report shall state recommendation/observation for the Board’s consideration on any necessary actions.

The Technical Audit Report needs to state any recommendation/observation which needs Board’s consideration on any actions since it is important function of the Board. The Road Fund Manager may add comment(s) on what are stated in the Technical Audit Report prepared by the consultant team.

** Clause 5.2.3: Transmission of Draft Technical Audit Report to the Implementing Agency**
The Draft Technical Audit Report, after approved by the Roads Fund Manager shall be sent to the headquarters of the Implementing Agency for its comments. The Implementing Agency shall inform that its comments, especially to defend its position on some issues, need to be received by RFB within one month after the draft report is received by the said Implementing Agency.

Before the Technical Audit Report is submitted to the Board, the Implementing Agency should be allowed to defend itself on some of the issues for which it does not agree to the view of the Auditor Team. The headquarters of the Implementing Agency shall consult with its branch office, or local government in case of PMOLARG, which is responsible for the audited works, as necessary.
It shall be the discretion the Roads Fund Manager to instruct the Chief Auditor revision of the Draft Technical Audit Report after receiving comments from the Implementing Agency. As appropriate, Roads Fund Manager may prepare a document separate from the Final Report to state his/her view on the necessary issues. However, the comments received from the Implementing Agency shall be explicitly presented to the Board as reference when the finalized Technical Audit Report is presented to the Board.

The final Technical Audit Report shall be prepared within one month after the closure of comments by the Implementing Agency but not later than three months after the completion of the Technical Audit.

The Report approved by the Board now shall be called “Approved Technical Audit Report”

Copies of the Approved Technical Audit Report (the Approved Report) shall be sent to the relevant parties including the Controller, Auditor General, and Implementing Agency. The Approved Report shall be kept ready for review of the general public upon request.
APPENDICES

Form – 1: Audit Plan Form
Form – 2-1: Document Check List (1) & Form-2-2: Document Check List (2)
Form – 3: Site Inspection Check List and Ribbon Chart
Form – 4: Result of Audit Form
## Form - 1: Audit Plan Form

<table>
<thead>
<tr>
<th>Prepared by:</th>
<th>Approved by:</th>
<th>On: (Date of Approval)</th>
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</table>

### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Road/Project Name:</th>
<th>Region:</th>
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<tbody>
<tr>
<td>Scheduled Date of Auditing:</td>
<td>Chief Auditor:</td>
</tr>
<tr>
<td>Contract No:</td>
<td>Name of Contractor:</td>
</tr>
<tr>
<td>Final Contract Amount: TSh</td>
<td>Type of Contract:</td>
</tr>
<tr>
<td>Contract Effective on:</td>
<td>Completion Date:</td>
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### MAJOR ISSUES

(List here major points to be inspected such as the following)

- Procurement/Tender Process
- Cost Estimate/Contract Amount/Unit Price
- Timing of Start/Completion of Works

### DOCUMENTS TO BE FILED

(List here the documents which are supposed be submitted by the Contractor or the reports of field tests or other tests conducted by the Executing Organization or its consultant.)

### SITE INSPECTION

(List here the items and interval/location of measurement to be done at the site.)
<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Document</th>
<th>Filed</th>
<th>Date of Submission</th>
<th>Date of Approval</th>
<th>Evaluation (Satisfactory or Unsatisfactory)</th>
<th>Remarks</th>
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</table>
## CHECK LIST OF DOCUMENTS (2)

(Document of Filed Tests and Others Done by the Executing Organization or Its Consultant)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Document</th>
<th>Filed</th>
<th>Date of Testing</th>
<th>Evaluation (Satisfactory or Unsatisfactory)</th>
<th>Remarks</th>
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</table>

Form - 2-2: Document Check List (2)
Example of Check List for Site Inspection

<table>
<thead>
<tr>
<th>No.</th>
<th>Chainage</th>
<th>Item</th>
<th>Observation/Evaluation</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>0+00</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0+100</td>
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<td>0+200</td>
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<td>0+300</td>
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</tr>
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<td></td>
<td>0+400</td>
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</tbody>
</table>

Example of Ribbon Chart

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<th>Chainage</th>
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<th>0+100</th>
<th>0+200</th>
<th>0+300</th>
<th>0+400</th>
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<tbody>
<tr>
<td>Item to be Inspected/Observation</td>
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<td>Item to be Inspected/Observation</td>
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</table>
## Form - 4: Result of Technical Audit

### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Road/Project Name:</th>
<th>Region:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract No:</td>
<td>Name of Contractor:</td>
</tr>
<tr>
<td>Final Contract Amount: TSh</td>
<td>Type of Contract:</td>
</tr>
<tr>
<td>Contract Effective on:</td>
<td>Completion Date:</td>
</tr>
</tbody>
</table>

### RESULT OF DOCUMENT AUDIT

<table>
<thead>
<tr>
<th>Problem</th>
<th>Comment of Executing Organization</th>
</tr>
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<tbody>
<tr>
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</table>

**Evaluation**

### RESULT OF SITE AUDIT

<table>
<thead>
<tr>
<th>Problem</th>
<th>Comment of Executing Organization</th>
</tr>
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</table>

**Evaluation**

### OVERALL EVALUATION

<table>
<thead>
<tr>
<th>Prepared by:</th>
<th>Approved by: (Chief Auditor)</th>
<th>On: (Date of Approval)</th>
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<td>(Use more than one page as necessary.)</td>
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</table>
ANNEX

SOME HINTS FOR SITE INSPECTION

Introduction
Inspecting and finding problems in execution of road works is not easy unless one has considerable experience in quality control and site supervision. There is no ‘magic formula’ to detect defects of works without working knowledge on quality control/material testing. Therefore, anyone who wishes to acquire the skill for inspection/monitoring of road works which are being executed should completely master what are written in the relevant textbooks, such as Road Maintenance Handbook prepared by TANROADS/ JICA or various Road Notes published by TRL of the UK. Therefore, it is strongly recommended to carry such textbook(s) to the site and refer when inspecting the site.

However, the followings may be some hints.

1. General Matter

   (i) Cleanliness of the site and/or camp
   If the site during execution of works looks not clean, it usually means that the site is not managed well. The cause of messy site is often poorly planned/organized placement of materials and equipment. It may be also caused by poor preparation of the site before the works start. Similar observation/evaluation can apply to the condition of the camp. (Some one said, “the works are 80% completed if a good work plan and schedule is prepared”.)

   (ii) Marking stakes and other markings
   Often marking stakes and/or other markings are effective for accurate execution. They are the signs of well-planned, well-organized execution. Setting such marking should be encouraged. (See any textbook on execution of road works on this subject.)

2. Earth Work (including Base Course and Subbase Course works)

   (i) Checking compaction during execution
   The most important and essential key is to secure good material and appropriate moisture content. Therefore, grab the material used and judge, based on the experience, whether the material fits to the specification. Especially, check the following, by grabbing the material used at the site: 
• Is content of the fine particles (which pass 0.075 mm sieve) within the range stipulated in the specification?
• Is the moisture content in the range stipulated in the specification?

To judge the above matters by ‘grabbing’ the material, of course, needs substantial experience of soil compaction tests. Therefore, someone who has such experience is needed to capture the problem of soil compaction during the execution.

(ii) Speed of Roller
The roller should not run at high speed to obtain good compaction. A good operator would run the roller at the speed of walking or slower.

(iii) Checking degree of compaction of completed base course
Strongly press (kick) the surface of base course with the edge of heel of your leather shoe. If evident dent is made, the surface is not hard enough, implying that the compaction is not sufficient.

(iv) Proof rolling
Proof rolling is very practical method for checking the degree of compaction of Subgrade, Subbase and Base Course combined. Prepare a large truck with some payload so that the rear axle load becomes 10 tons. Let it run on the surface of Subbase course or Base course at the speed of walking and observe the deflection (sinking) of the wheel. If noticeable deflection (say more than 5 mm) is observed, some insufficiency in the bearing capacity of either or all of Subgrade, Subbase and Base course is suspected.

3. Asphalt Works
The key to control quality of asphalt works is material used and the temperature at the time of execution.

(i) Check the bitumen
Before going to the site, check the maker, production No. etc of the bitumen approved for the work. At the site, first check the bitumen actually used is identical to the approved one.

(ii) Check the temperature of asphalt or asphalt mix at the time of spraying or placing
The temperature needs to be within the specified range. Use thermometer which can measure up to 200 degree Celsius. If smoke is coming out, often temperature is too high. Excessively high temperature leads to oxidization of bitumen and bitumen becomes brittle and fragile.
(iii)  Minimizing apply of oil to roller
This is one of the examples written in many textbooks of asphalt works. Applying too much oil to the roller (to prevent adhesion of asphalt to the roller) results in ‘cut-back’ of bitumen and asphalt mix becomes weak.

4. Concrete Works

(i)  Slump test
Basic test for fresh concrete is ‘slump test’. To secure the required strength, the slump value needs to be within the specified range. Often, workers prefer fresh concrete with high ‘workability’ which is ‘watery’. They may add water after properly produce concrete is brought to the site. Bring a set of slump test tools (cone bucket and scale) if the quality of concrete is important.

(ii)  Proper casting method
There are several rules to be observed in casting concrete. For example, fresh concrete should not be moved horizontally. Horizontal movement, including use of inclined chute, causes segregation of aggregate and mortar resulting in honeycomb. To minimize horizontal movement, fresh concrete need to be carried to as near as possible to the place of casting in bucket or cart. Such basic rules are found in the textbooks of concrete works. Always bring such textbook to the site and refer. After a few years, one can become the expert of concrete casting.

(iii)  Checking hardened concrete
Use so-called test hammer (small hammer) to check the general strength of the cast concrete after hardening. However, the strength of concrete which can be checked is limited to the zone very near to the surface because the impact of the hammer penetrates only to very limited depth. Same can be said for ‘Schmidt Hammer’. The strength shown by Schmidt Hammer is only indicative one. True strength cannot be known unless a test piece is taken by ‘core boring’ and tested in the laboratory.