

Terms of References (TOR)
Of
Laboratory Management Software
[Development of Laboratory Management System (LMS)]
(Contract Package No. SD36)

1. Background

The Government of Bangladesh has received a loan from the World Bank (WB) towards the cost of the program titled "Program for Supporting Rural Bridges (SupRB)." A portion of program fund will be utilized for the Development of Laboratory Management System (LMS) for LGED.

As part of quality control of civil works, Local Government Engineering Department (LGED) has been operating the Central quality control unit and 64 district laboratories manually. Current method poses certain challenges, including the potential for data degradation due to disorganized paper filing. Furthermore, retrieving historical records is a time-intensive process. The timely availability of test reports is critical, and manual process of reporting is proving to be a bottleneck in ensuring their prompt delivery, affecting the overall efficiency of the workflow. In order to smooth operation and effective management of laboratories, LGED needs to do automation of laboratory functions through development of Laboratory Management Software so that the new system will generate Lab reports quickly and eliminate backlogs of paperwork.

2. Objective

The overall objective of the services is to develop and implement an web enabled software application for automation of quality control test results and to facilitate management and real-time monitoring of laboratory related activities of district offices as well as central quality control unit of LGED.

3. Scope of work

The overall scopes of the service are, but not limited to, as follows:

- i. Development of a web-based laboratory management system to store, manage and display location wise laboratory equipment inventory; test list; project wise package/scheme information; customer/contractor register; quality control test schedule and test status against each scheme.
- ii. The software application shall have the function that will calculate number of test and amount of test fee for given scheme according its BOQ and following LGED's schedule of rates.

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- iii. The software application shall have as such facilities by which the management of central quality control unit can monitor and supervise the activities of district level laboratories.
- iv. The software will be able to import BOQ from Rate Schedule and Estimate System (RSEPS) and able to exchange data with customized Project Monitoring System (PMS) so that both the software would be able to use coherently.

4. Features of Laboratory Management System (LMS)

The LMS will have the at least following mandatory features and functionalities:

User Management & Access Control:

- LMS should have role-based access control module.
- In this regard, LGED has developed and maintained a Single Sign-On (SSO) module for management and controlling access of its users for all the web and mobile based applications. LMS should use this module to get users' authentication and access control list, and should implement access control mechanism within the application accordingly.

Dashboard:

- The software should have a dashboard that display the key information of the application in summarized form (graph/chart/table). Based on information need, several dashboards need to be designed for different level of management of LGED.

Equipment Inventory:

- The software should have facility to prepare, store and maintain location wise inventory of laboratory related equipment for districts as well as central quality control unit of LGED.

Customer/Contractor Register:

- The software should have facility to prepare, store and maintain customer/contractor register where clients vital information along with e-mail address will be exist so that the test result can be sent to the client electronically with copy to respective supervising authorities.

Package/Scheme Information:

- The software should have the facility to input project and location wise package/scheme related basic information.
- The software should also have the facility to import project and location wise package/ scheme related basic information from PMS software using API.
- Each scheme should have a tracking ID which will be used to find its test related information and test reports any time.

Quality Control Test Management:

- The software should have facility to input, store and display Item of Works and their association with quality control test schedule (frequency and quantity wise number of required tests).
- It will be capable of generating report for testing all types of quality control test for LGED.
- The software should have facility to input, store, process and display various quality control test related data and able to produce test results based on given criteria.
- The software should have facility to input, store and display scheme wise number of required test and test performed.
- The software should have facility to input, store and display non-scheme wise test information.
- After completion of test the respective customer will be automatically notified through SMS and email while the Test Report will be attached in the email notification.

Test Calculation:

- The software will be able to import BOQ from RSEPS software.
- The Software will be able to calculate number of test and amount of test fee for each scheme according to LGED's schedule of rate.

Reporting:

- A wide range of reports needs to be produced, which will be finalized during requirement analysis phase. Apart from these, following Laboratory Test reports need to be generated from the system (formats of few test reports are given in Annex-A as example):

Sl. No.	Test Name	Sl. No.	Test Name
1	Dimension (Bricks)	35	Field CBR (DCP)
2	Unit Weight (Bricks)	36	Field CBR Test (Truck Mounted)
3	Water Absorption (Bricks)	37	Unconfined Compressive Strength Test of Soil
4	Compressive Strength (Bricks)	38	Consolidation Test of Soil
5	Gradation (Coarse Aggregate)	39	Direct Shear Test of Soil
6	Combined Gradation (Coarse Aggregate)	40	Tri-axial test of soil
7	ACV (Coarse Aggregate)	41	Tensile test of Reinforcement
8	TFV (Coarse Aggregate)	42	Bend & Rebend test of Reinforcement
9	LAA (Coarse Aggregate)	43	Setting Time of Cement (ASTM)
10	Flakiness Index (Coarse Aggregate)	44	Setting Time of Cement (EN)
11	Aggregate Impact Value (Coarse Aggregate)	45	Compressive Strength of Cement (ASTM)
12	Elongation Index (Coarse Aggregate)	46	Compressive Strength of Cement (EN)
13	Unit weight (Coarse Aggregate)	47	Slump test of Concrete
14	Specific Gravity (Coarse Aggregate)	48	Fineness of cement by Blaine's air permeability method

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15	Water Absorption (Coarse Aggregate)	49	Compressive strength test of concrete cylinder
16	FM (Fine Aggregate)	50	Compressive strength test of concrete cube
17	Gradation (Fine Aggregate)	51	Compressive strength test of core specimen
18	Unit weight (Fine Aggregate)	52	Rebound test of concrete
19	Specific Gravity (Fine Aggregate)	53	Mix design of concrete
20	Water Absorption (Fine Aggregate)	54	Compressive strength of Uni-Block
21	Surface moisture (Fine Aggregate)	55	Penetration of Bitumen
22	Material finer than 75 micron by washing	56	Softening Point of Bitumen
23	Plasticity index of Soil	57	Flash and Fire Point of Bitumen
24	Grain size analysis of soil	58	Loss on heating of Bitumen
25	Natural moisture content of soil	59	Ductility test of Bitumen
26	Unit weight of soil	60	Specific Gravity of Bitumen
27	Specific Gravity of soil	61	Bitumen content (extraction test) of asphalt concrete
28	MDD (Standard)	62	Bitumen content (extraction test) with gradation of asphalt concrete
29	MDD (Modified)	63	Marshall Mix design of asphalt concrete
30	Field density (Core-Cutter)	64	Viscosity Test of Bitumen
31	Field density (SRD)	65	Calibration of CTM
32	Field density (Densometer)	66	Calibration of Proving Ring
33	Unit weight of Calibrated sand	67	Bore log for SPT
34	CBR		

Others:

- It will have the system which will help the management of central quality control unit to monitor and supervise the activities of district laboratory.
- It will have the provision to monitor the test status of the laboratory, for example- number of sample received, number of test performed and number of test remaining

5. Application Compliance Requirements

- The software application should be developed following Service Oriented Architecture (SOA).
- The software application should be developed following MVC framework.
- Considering the operating/client environment at different level of this application, it should be developed in such a way so that it requires low bandwidth to run.
- The software application should support cross browser platforms (popular web-browsers such Mozilla Firefox, Opera, Chrome, Edge, Internet Explorer, Safari etc.)
- The software application should have ability to seamless integration with future module/ components/applications
- The application should be lightweight and rich client-side scripting
- UI should be developed based on the analysis of UX

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- Any web interface of this application should be fully responsive.

6. Tools and Technologies to be used

Followings are the preferred software development tools and technologies:

- Development (Server End): Asp.Net, C#.Net, MVC
- Development (Client End): HTML, BOOTSTRAP, Angular JS, CSS
- Scripting Language: jQuery, Ajax, JSON
- Database: **Oracle 11g**
- Operating System: Windows
- Hosting & Deployment: IIS Server
- Reporting: HTML, Crystal Report etc.
- Testing: Jmeter/PostMan/xUnit

7. Security and Privacy Requirements

The consulting firm should submit an extensive and complete security and privacy plan for the application considering the following issues:

- Project technical scope
- Functional and nonfunctional requirements and ultimate objectives
- User roles - Accessibility, Authorization and Accountability
- Importance of data management
- Technologies to be used for development & run
- Hosting
- Client and service side
- Overall standard application security requirements.

Apart from these, the consulting firm should provide a checklist based on system and hosting security plan (i.e. fraud, hacking, money laundering etc.) and have to provide the test report of that checklist.

8. Hosting Requirements

The consulting firm should submit primary hosting requirements for this application related to hardware, servers, network, security, storage, traffic, firewall, bandwidth etc. i.e. complete hosting infrastructure that will be requires for their developed application hosting considering the implementation scope. Based on their submitted requirements regarding hosting, the client will provide detail hosting infrastructure, facility and environment.

9. System Audit

This system will maintain an audit trail of any changes or updates made in any information that are considered as vital and should maintain the audit log with information such as

- Log the users who are accessing the system
- Log the parts of the application that are being accessed
- Log the fields that are being modified

- Log the results of these modifications
- Log attempted breaches of access
- Log attempted breaches of modification rights
- Timestamp.

Ensure an audit trail is kept for all transactions and all audit transactions logged are kept on the trail file or trail database from where system can generate different audit reports as and when required.

10. Coding Conventions

The consultant must follow the standard coding styles to produce high-quality code for further uses of the code in terms of reusability, refactoring, task automation, language factors etc. The consultant should submit a standard coding convention approach, which may include different conventions like commenting, indent style, naming, etc following the best coding practices.

11. Documentation

The documents enlisted here give an overview of the minimum requirements only. The suggested standard and list of documents are as follows:

- SQAP – Software Quality Assurance Plan (IEEE 730)
- SCMP – Software Configuration Management Plan (IEEE 828)
- STD – Software Test Documentation (IEEE 829)
- SRS – Software Requirements Specification (IEEE 830)
- SVVP – Software Validation & Verification Plan (IEEE 1012)
- SDD – Software Design Description (IEEE 1016)
- SPMP – Software Project Management Plan (IEEE 1058)
- Technical manual and training manual (both for administrator and system user)

The consultant should submit both the hard and soft copies of these documents. Soft copies should be provided in original formats (e.g. MS Word, Visio) of the application software by which these documents will be developed. PDF or any other means of converted formats shall not be accepted.

12. User Acceptance Test (UAT)

User Acceptance Test (UAT) is a very vital and essential phase in the application development lifecycle. At this phase, all types of users must test the developed application by themselves and have to provide a details feedback/ test report. Based on the UAT report, Consulting Firm has to update the application accordingly to ensure user satisfaction by making it more user friendly. It is expected that, considering the type of users and their role in the application, the Consulting Firm must propose a comprehensive UAT plan in their technical proposal which may cover the followings:

- UAT activities to be perform (planning, designing test cases, selection of testing team, Executing test cases and documenting, Bug fixing, sign-off etc.)
- Types of user wise roles and test items distribution

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- resource requirement,
- activity wise time requirement
- activity wise test case , test results/ deliverables
- detail user feedback / test reports
- System update plan

13. Synchronization of Test Frequency with Item of Works

In consultation with LGED, the consultant should input all the item of works according to LGED's Schedule of Rates and carry out synchronization of test frequencies with the same so that number of required tests can be calculated from a given BOQ.

14. Deployment and Implementation

This is the phase of Software Development Life Cycle (SDLC), when the consent is being given to "GO LIVE" of the developed system after completed all kinds of development, integration, testing and hosting. This is very crucial and sensitive stage for a Government application because at this stage the system becomes public and expose to access towards all levels of users. The Pilot or full scale implementation period starts formally in this stage only. Consulting Firm is requested to propose their deployment and implementation plan covering the major activities to be performed, the deliverables to be provided etc.

15. Training and Knowledge Transfer

- The Consulting Firm must propose a detail training plan for the users of the Laboratory Management System.
- The Consulting Firm should include necessary training methodology, documentation and training materials support in their training plan.
- The training materials shall include user manual, administration manual, quick start tutorial, online help, frequently asked questions.
- The training plan must describe the sequencing, time, duration and resources involved in implementation of each of the consultant's proposed training activities.
- The training plan should contain full course descriptions for all courses that to be carried out for respective users.
- The Consulting Firm should develop multimedia training materials for all users, this will include video tutorials with voice over narration for all core functions of the system including reporting and analytics. These materials shall be accessible from the system for viewing and reviewing for all users through a web portal.
- The training activities should cover the training feedback, evaluation and report.
- The Consulting Firm also need to propose their smooth, efficient and effective knowledge transfer idea and plan in their technical proposal with the training plan.

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16. Operation, Maintenance and Support Service

After the development and deployment phase when the implementation period starts the Consulting Firm has to provide maintenance and support service for the **08 (Eight) months**. The Consulting Firm must provide a detail maintenance and support service plan in the technical proposal, which may include the followings:

- Support service types and mode of services
- Service desk functionalities
- Configuration management
- Change management
- Service layers for support
- Tools will be used for Support service management
- Communication management and modality
- Release management
- Incident management
- Problem management
- Maintenance and support service related reporting
- Support service types
- Service Log Management

Apart from the above mentioned issues, if consulting firm thinks any other issue to be included in their plan, it would be considered as added value addition.

A focal person/project manager should be responsible for interfacing with LGED during maintenance support service. The Consultant should provide an online customer service system through which designated officials from LGED can record system relevant complain and can view response status accordingly. Designated focal person of the consultant should respond against each complain within 1 (one) hour from making complain and should arrange to fix the problem within 24 to 72 hours depends on the complexity of the problem as determined by LGED.

Within this period, the maintenance team from the consultants should be responsible for fixing reported problems, take appropriate measures to handle system related security aspects, perform reasonable alteration in the application (e.g. inclusion of few data fields, changing attributes of UI components), generate new reports as per demand of the management, maintaining the backup and recovery of data and also assisting the client to maintain the system through transfer of knowledge on a regular basis.

17. Copyright

LGED shall be entitled to all proprietary rights including but not limited to patents, copyrights and trademarks, with regard to many Vendor.

All kinds of source code including code documentation and other approved documents (all versions trail, products, developed applications, documents and all kinds of deliverables which bear a direct relation to or is made in consequence of the services provided by the vendor under this scope of this TOR.

At the request of the LGED, the vendor shall assist in securing such property rights and transferring them in compliance with the requirement of the applicable law. After the completion of the project such rights will be handed over to the LGED that will be produced at the time of entire system development and implementation life cycle under the scope of this TOR will be owned by LGED.

The vendor should properly deliver all the entire approved source codes and other deliverables to the LGED. The vendor cannot claim any royalty or authority of any sort in case of replicating the source code or database or any other deliverables under this TOR for any future use that LGED and the Government of Bangladesh may see fit.

Any studies, documents, reports, graphics or other material prepared by the vendor for this project under this TOR shall belong to and remain the property of LGED

18. Handover the Application

After successful development, deployment and operation the Laboratory Management System, the Consulting Firm will transfer the system to the Client with all technical documentation, i.e. system architecture, business logics, entity relation diagram, module integration points, data flow diagram, workflow engine, data dictionary including full credentials & detail source code .

19. Duration of the Project

The consulting firm needs to work for the above-mentioned scope as per approved project management schedule. The firm must complete the Laboratory Management System development and deployment i.e. development life cycle as per their proposed development methodology within **06 (Six) months** including **08 (Eight) months** of operation, maintenance and support service period.

The detailed timeframe plan should include the following:

- Total duration of the application development
- Total duration of the Maintenance and support service at implementation phase
- Proposed SDLC Phase wise and deliverable wise time distribution and duration
- The schedule may cover Activity, Deliverables, Time in Days, Dependencies etc.
- Can be present as table or Gantt chart.

20. Work Distribution and Team Composition

The team is expected to consist of the following key experts:

(i) Key Professional

Sl. No.	Position	Man Month	Qualification

1.	Team Leader (1)	4	A senior ICT Professional with a Master's degree in computer science or equivalent from a recognized university having at least 15 years' relevant professional hands-on technical experience with at least 7 years' in lead position with evidences; particularly on major IT-ICT-MIS development, implementation and integration of various medium and large projects that is/are successfully commissioned and running locally and/or abroad. S/he will provide technical advice, planning and supervisory input and team leadership on site.
2.	System Analyst/ Solution Architect (1)	1.75	Minimum Bachelor in computer science or equivalent degree. Proposed personnel should have at least 12 years' working experience with minimum 6 years' experience in system design, development or integration in IT/ICT/MIS related project. Relevant Certification will be added advantage. In-depth experience in and knowledge of web-based application development using the .NET/Open Source platforms for large WAN/Intranet and public-facing Internet solutions.
3.	Sr. Software Engineer (1)	1.75	Minimum Bachelor in computer science or equivalent degree specializing in programing. S/he shall have at least 12 years' of overall experience out of 6 years in programming field. In-depth experience in and knowledge of web-based application development using the .NET/Open Source platforms for large WAN/Intranet and public-facing Internet scenarios. Sound experience in achieving planned results and outcomes in challenging and heterogeneous IT-ICT-MIS strategies and environments. Extensive experience in successfully developing tailored / customized IT-ICT based applications.
4.	Software Engineer (2)	9	Minimum Bachelor in computer science or equivalent degree specializing in programing. S/he shall have at least 10 years' of overall experience out of 5 years in programming field. In-depth experience in and knowledge of web-based application development using the .NET/Open Source platforms for large WAN/Intranet and public-facing Internet scenarios. Sound experience in achieving planned results and outcomes in challenging and heterogeneous IT-ICT-MIS strategies and environments. Extensive experience in successfully developing tailored / customized IT-ICT based applications.
5.	Database Developer (1)	1.5	Minimum Bachelor in computer science or equivalent degree specializing in database design and management. S/he shall have at least 10 years' of overall experience out of 5 years in experience in design and development of relational database.

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6.	QA Engineer (1)	1.75	Minimum Bachelor in computer science or equivalent degree specializing in programing/software quality assurance. S/he shall have at least 7 years' of overall experience out of 4 years in experience in software quality assurance.
7.	Technical Document Writer (1)	1.25	Minimum Bachelor in computer science or equivalent degree specializing in programing. S/he shall have at least 5 years' of overall experience out of 3 years in experience in preparation of software documentation.

(ii) Non-Key Professional (at least)

The following non-key experts are recommended for this assignment, but the evaluation of their qualifications will not be conducted during the selection process.

Sl. No.	Position	Man Month	Qualification
1.	UI Designer (1)	1.75	Bachelor degree in computer science or equivalent. S/he shall have at least 8 years' of overall experience out of 5 years working experience in user interface and software testing laboratory in any reputed firm, Proven experience in using different proprietary/commercial test management tools, functional testing tools and load testing tools.
2.	Trainer (1)	1.5	Master in Computer Science or IT or MIS or equivalent. S/he shall have at least 10 years' of overall experience out of 6 years working experience in providing training in IT application field.
3.	Training Executive (1)	1.5	Minimum Bachelor in any discipline with at least 6 years relevant experience.
4.	Data Entry Operator (1)	4	Bachelor degree in any discipline preferably in science. Minimum 05 years working experience in data entry activities.

21. Institutional Arrangement

The Consultant shall work directly with the Superintending Engineer (Quality Control) of LGED. Also, the Consultant shall work with the officials of Central Quality Control Unit of LGED in order to achieve the objectives of the assignment. The client (LGED) will provide all documents and data to the consultant required for the service.

22. Facilities to be provided by the Client

Existing data, test list, test parameters, relevant reports will be provided by LGED. Limited office accommodation and furniture in the Headquarters offices of the LGED will also be

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made available during these services. All software applications and databases to be developed shall be hosted on LGED Servers as per arrangement with the ICT Unit.

23. Deliverables and Time Schedule

Sl. No	Name of Deliverables	Timeline
01	Submission of Inception Report duly accepted by the Client	15 th days after the contract
02	Submission of the System Requirement Specification (SRS), System Design Document (SDD) and System Design Prototype (UI/UX prototype) duly accepted by the Client	50 th days after the contract
03	Workshop at Prototype Design Stage:	55 th days after the contract
04	Submission of System Beta version and Technical Report duly accepted by the Client	End of 3 rd month
05	Submission of Testing and Piloting Report duly accepted by the Client	End of 4 th month
06	Completion of training and submission of Training Report duly accepted by the Client	End of 5 th month
07	Submission of Final Report duly accepted by the Client	End of 6 th month
Operation and Maintenance support- 08 months		
08	Submission of mid-term and final Progress Report	End of 4 th months and 8 th month of operation and maintenance period

24. Payment Schedule

Payments shall be made in line with agreed-on outputs according to the following schedule:

(a) For Development Period:

- i. **Inception Report:** Five (5) percent of the total Contract Price shall be paid upon submission of the Inception Report duly accepted by the Client.
- ii. **SRS & SDD & UI/UX Prototype:** Five (5) percent of the total Contract Price shall be paid upon submission of the System Requirement Specification (SRS) and System Design Document (SDD) & UI/UX Prototype duly accepted by the Client.
- iii. **Workshop at Prototype Design Stage:** Five (5) percent of the total Contract Price shall be paid upon delivery of two-day Workshop for the future system users with the use of UI/UX Prototype. All feedback during technical workshop has to be documented.
- iv. **System Beta version & Technical Report:** Fifteen (15) percent of total Contract Price shall be paid upon delivery and acceptance of Beta version of Web Application, UAT Report, technical documentation (system architecture, module integration points, workflow engine, data dictionary, user manual etc.)
- v. **Testing and Piloting Report:** Fifteen (15) percent of total Contract Price shall be paid upon after successfully completion and delivery of all types of security & testing report as well as successfully piloting of LMS covering of all features of 65 Test report with delivery of piloting report duly accepted by the Client.

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- vi. **Training Report:** Fifteen (15) percent of total Contract Price shall be paid upon delivery and acceptance of training materials, user manuals, and implementation of all training programs with training completion report duly accepted by the Client.
- vii. **Final Report:** Fifteen (15) percent of total Contract Price shall be paid upon successful finalizing the application and submission of Final Report (including all technical credential and source code and operation and maintenance period) duly accepted by the Client.

(b). Maintenance & Operation (8 months): After completion of Development & Piloting, this phase will start. Twenty five (25) percent of total Contract Price shall be paid in this phase. Twelve (12) percent of total Contract Price shall be paid after 4th month and Thirteen (13) percent of total Contract Price shall be paid after 8th month of operation and maintenance period.

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