Quality Control Unit

Quality Control is essantial for durability and sustainability

LGED

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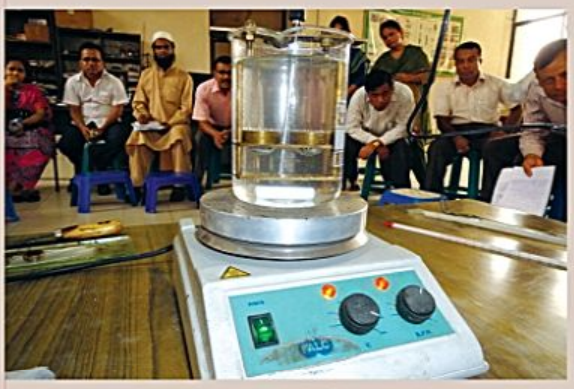
Photo Gallery

Demonstration session of LAA test

Demonstration session of Sieve Analysis

Demonstration session of AIV test

Cement cube is being compacted using Jolting apparatus (EN)



Demonstration of Bitumin Softening Point at CQCL

On-the-Job-Training (OJT) session on flexible pavement

Viscosity test of Bentonite solution is in process at CQCL before allowing bentonite powder at construction site

Cement mortar mixing is going on using mortar mixture for compressive strength of cement at CQCL

Background

Local Government Engineering Department (LGED) is a public sector organization responsible for developing, maintaining and managing rural, urban and small scale water resources infrastructures in Bangladesh. LGED has set up its field offices including quality control laboratory in each district. For sustainability and qualitative infrastructures, LGED has given due importance to maintain quality of all infrastructures since the beginning of its construction.

View of the Opening session of OJT at RTC, Rajshahi

Quality Control (QC) activities in LGED started its journey with the establishment of a Laboratory in Faridpur district under Intensive Rural Works Programme (IRWP) in 1984. The activities were further geared up during Infrastructure Development Project (IDP:1985-90) with the establishment of a Quality Control Laboratory in Dhaka and four District Quality Control Laboratories in project districts. Under Institutional Support Project (ISP: 1990-96), Central Quality Control Laboratory (CQCL) in HQ Dhaka with remaining fifty nine District Quality Control Laboratories (DQCL) were then established gradually and required equipment were supplied to those district laboratories as per needs. Consequently LGED officials started to be posted in those Laboratories after 1992. With the increase of capacity of LGED engineers and technical staff, supports of consultants gradually reduced and came to end in 2000. At present, all the offices of quality control laboratory are manned by technical officers and staff from the revenue budget.

Institutionalization of QC Unit

Unconfined compression test of soil sample is being processed at CQCL, Dhaka

With the institutionalization of Quality Control Laboratories in LGED, some staff having graduation degree were re-designated as Laboratory Technicians (LT) and posted in the newly established laboratories. Intensive in-service trainings were provided to those Laboratory Technicians. GOB officials started to lead the unit from 2000. Assistant Engineer in the office of each Executive Engineer in the district was assigned to lead the laboratories. In late 2003, JICA extended their hands of cooperation through RDEC (Rural Development Engineering Centre) Project to strengthen the capacity CQCL and that transformed a radical change in the approaches and performances of the Unit. Now LGED maintains 65 laboratories including CQCL manned by skilled GoB manpower and equipped with the modern testing equipments. Moreover, for operation and maintenance of laboratory equipment, GoB started to allocate revenue budget amounting to Tk. 70 lakhs for the first time in 2003-04 which has increased to Tk. 112 lakhs in 2012-13. To make all the infrastructures technically sound, safe, durable and cost effective, LGED has also adopted standard quality control procedure and frequency of testing.

Objectives

The prime objective of quality control unit is to ensure quality of infrastructures to be built through conducting quality control tests on materials and works. This ultimately leads to durability of the infrastrucures and prevents premature failure of the same and reduces cost of maintenance.

Jotting apparatus

Pressure guage calibration device

Tri-axial compression testing machine

Major Functions

The major function of Quality Control Unit (QCU) is to ensure quality of construction works through regular tests on materials and works. The specific functions are:

Central Quality Control Laboratory (CQCL)

- Assess requirement of equipment for HQ and DQCL
- Procure laboratory equipment required to establish minimum standard
- Calibrate equipment of HQ and DQCL
- Monitor activities of district laboratories
- Conduct quality control tests on day-to-day basis
- Provide technical support to district laboratories in conducting routine jobs
- Random sampling of materials from different sites for cross-checking
- Conduct random checking of tests conducted by DQCL
- Conduct different experimental works in association with projects
- Prepare operational manual, training manual etc,
- Impart training on quality control and tests for LGED and Municipal Engineers
- Report to concerned authority on quality of works/materials depending on the test results
- Assist preparation of technical specification of construction works
- Assist Project Directors, supervising teams of LGED and ministry in performing laboratory tests according to their requirements
- Pilot research (e.g. ISG, Jute Geo Textile, Anti saline agent, use of locally available materials etc)
- Conduct laboratory tests on material and works as per request of other organizations,
- Monitor and ensure test related revenue collection.

Bitumin penetration test is being conducted by LGED Engineers at CQCL, Dhaka

District Laboratory (DQCL)

- Sampling of materials from different work sites as per frequency or as directed by engineer-in charge
- Conduct routine tests on materials and works
- Report on quality of materials/works
- Maintain laboratory equipment
- Ensure collection of revenue against tests done under different contracts and external parties
- Conduct laboratory tests on material and works as per request of other organizations
- Conduct tests on water quality in selected 21 districts

Practical demonstration of OJT on base course construction at Naogaon by CQCL Engineers

Testing Facility in Upazila Offices

- Sampling of materials from different works
- Field tests on materials and works
- Tests like DCP, FM, slump, aggregate size control etc

Random thickness check of bituminous layer at Bhandaria, Pirojpur by EE, CQCL

Manpower

The Quality Control Unit at HQ is headed by a Superintending Engineer (SE) supported by an Executive Engineer (EE), 2 Assistant Engineers (AE) and other support staff as per approved organogram. In addition, Assistant Engineer in the office of Executive Engineer leads the Quality Control Unit in each district supported by a Laboratory Technician. An Additional Chief Engineer also oversees the activities of QCU. The district quality control unit maintains close cooperation with the Central Quality Control Unit at Dhaka.

Physical Facilities

LGED's Central Quality Control Unit is located in the RDEC building at LGED HQ in the ground and first floor having floor area of 500 sq.m. The district laboratory is located in ground floor at the respective LGED office (district) building.

Sieve shaker

Equipment/Resources

For smooth operation of laboratories, the unit procured equipment for Central Laboratory at HQ as well as District Laboratories. The following equipment is available in the Quality Control Unit:

Equipment for Testing of Soil

1. Rotary Hydraulic Drilling Rig
2. Electronic Cone Penetrometer
3. Digital Tri-axial Tester
4. Digital Consolidometer
5. Digital Direct Shear Tester
6. Electric Liquid Limit Device
7. Digital Unconfined Compression Tester
8. Shear Tester
9. Hydrometer (for grain size analysis)
10. Cone penetrometer
11. Drilling Slurry testing equipment
12. Sand equivalent tester

Universal Testing machine

Non-Destructive Testing Equipment (Concrete)

13. Pile Integrity Tester
14. Smith Rebound Hammer
15. Core Drill Machine

Equipment for Testing of Road

16. Digital Laboratory CBR
17. Mechanical Compactor (MDD)
18. Truck mounted apparatus for In-situ CBR
19. Dynamic Cone Penetrometer
20. Field Density Testing (Core cutter/sand cone)

Digital Compression Tester

Equipment for Testing of Bitumen

21. Softening point tester
22. Penetration tester
23. Flash and Fire point tester
24. Marshall Test Apparatus
25. Bitumen extractor
26. Marshall Loader
27. Mechanical Compactor (Marshall)

Equipment for Testing of MS Rod

28. Universal Testing Machine

Sand cone apparatus

Other Equipment

29. Heavy duty solution balance
30. Field scale & Triple beam balance
31. Digital weighing machine
32. Drying oven
33. Temperature control water bath
34. Mechanical compactor (Proctor & Marshall)
35. Sieve set (fine and coarse)
36. Equipment for testing water quality (PH, conductivity, dissolved oxygen, nitrate, phosphate, arsenic etc.)

Equipment in Upazila Offices

1. Sieve Set
2. Weighing machine/balance
3. Core cutter for density measurement
4. Dynamic cone penetrometer (DCP)
5. Hand Augur
6. Slump test apparatus
7. Cylinder/cube mould etc.

Slump test cone

Mortar mixer

Quality Control Tests

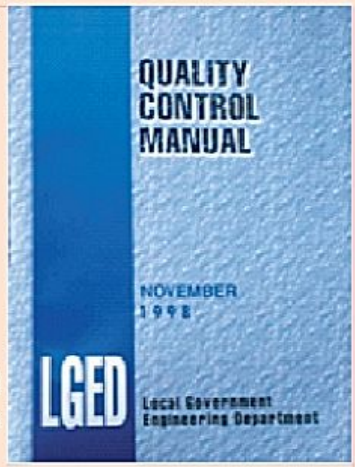
The following tests are performed in HQ Central Laboratory (CL) and District Laboratories (DL) as and when required:

Name of Tests	CL	DL
BRICKS		
Compressive Strength	√	√
Water Absorption	√	√
Size And Shape	√	√
Unit Weight	√	√
Efflorescence	√	√
AGGREGATES		
Sieve Analysis of Aggregates (C/F)	√	√
Unit Weight	√	√
Absorption Of Aggregates	√	√
Specific Gravity	√	√
Los Angels Abrasion	√	√
Ten Percent Fines Value	√	
Aggregate Crushing Value	√	
Aggregate Impact Value	√	√
CBR Of Coarse Aggregate	√	√
CBR Of Fine Aggregate	√	
DCP Test	√	√
Standard Proctor Test	√	√
Modified Proctor Test	√	√
Field Density By Sand Replacement	√	√
Field Density By Core Cutter	√	√
Voids Ratio	√	
Soundness Of Aggregate	√	
Elongation Index (EI)	√	
Flakiness Index (FI)	√	
Moisture Content	√	√
CEMENT		
Normal Consistency	√	√
Setting Time	√	√
Compressive Strength	√	√
REINFORCEMENT		
Tensile strength	√	
Bend test	√	
BITUMEN		
Softening Point (R&B)	√	√
Specific Gravity	√	
Flash & Fire Point	√	√

Name of Tests	CL	DL
BITUMEN (continued)		
Penetration Of Bit. Material	√	√
Core cutter	√	
Bitumen Extraction	√	
CONCRETE		
Compressive Strength	√	√
Slump Test	√	√
Concrete Mix Design	√	
Impact Of Hammer Test	√	
Core Cutter	√	
SOIL		
Moisture Content	√	√
Liquid Limit	√	√
Plastic Limit	√	√
Shrinkage Limit	√	
Unit weight	√	√
Specific Gravity	√	√
Void ratio	√	√
Unconfined Compression Strength	√	
Consolidation test	√	
Field Vane Shear Test	√	
Direct Shear test	√	
Triaxial Shear test	√	
Permeability	√	
Sand Equivalent	√	
SUB SOIL INVESTIGATION		
Boring	√	√
Standard Penetration Test	√	√
Cone Penetration Test	√	
Bearing Capacity		
MISCELLANEOUS		
Calibration of Laboratory Equipment	√	
Pile Integrity Test	√	
Bearing Pad Test	√	
WATER QUALITY TEST		
Water Quality (PH, electrical conductivity, dissolved oxygen, nitrate, phosphate, water hardness, total dissolved solids, temperature, arsenic etc (in selected dist.)		√

In addition, a few tests/field tests are done in Upazila Ofiices. These are Sieve Analysis, Fineness Modulus, Density and moisture content Measurement, Slump Test, DCP, etc.

Achievements



1. Standard quality control laboratory has been established in HQ, Dhaka as well as in 64 districts,
2. A manual on procedures of quality control tests has been developed,
3. Pile Integrity Testing is introduced to ensure quality of huge piling works,
4. Rotary Hydraulic Drilling Rig is introduced in the sub-soil investigation,
5. Introduction of Electronic Cone Penetration Tester for sub-soil investigation,
6. Research and Development (R&D) activities included:
   a) Introduction of locally sourced fine sand at Improved Sub-grade and Sub-Base Courses particularly for Southern Zone of Bangladesh,
   b) Locally sourced shingles at northern zone for Sub-base courses of road works has been recommended.
7. The Unit, in collaboration with Training Unit, conducted training courses on quality control for different categories of technical persons,
8. The QCU also acts as exchequer and earns non-tax revenue income of amount more than Tk. 67 crore per year and the same is deposited to the govt. fund.

Demonstration on aggregate gradation during Quality Control-1 training for UE/UAE at CQCL, Dhaka

Way Forward

- Routine quality control tests are generally done in the district laboratories. Due to weather condition, working season is very limited. For this reason, development works start almost simultaneously in all Upazilas. Moreover, there are several Upazilas in each district ranging from 3 to 16. As such it is very difficult for a Laboratory Technician of DL to perform tests/take samples from construction sites covering several Upazilas under the district. For uninterrupted flow of progress and as a part of decentralization, LGED has a plan to set up a small section of laboratory in the Upazilas so that simple tests can be done in the Upazila and samples can be collected for test in the DL. Accordingly necessary equipment will be provided to all Upazilas.
- The laboratory receives revenue for completed tests. Performance of the DL will be assessed by comparing their results with that of HQ results as well as comparing non-tax revenue income as fees from tests conducted by them.
- Monitoring of District Laboratories will be further strengthened. The Unit has a plan to set mobile laboratories so that additional support can be provided to DL during peak working season as well as perform random tests in order to cross-check the test results done by DL. A separate team of expert will be engaged for the purpose.
- LGED has also a plan to complaince with the International standard in regard to equipment and methods of testing. At the same time, the manpower will be trained to cope with modern methodology.

Training for Lab Engineers on sub soil investigation using rotary drilling machine at LGED Stackyard, Gazipur

- The test result documentation is another area for improvement in future. All test results of CL and DL including relevent information will be computerized.
- LGED laboratories have been conducting tests for works having investment of more than Tk. 5000 crore per year. In order to establish a recognition of quality control activities through LGED laboratories, ISO (International Organization for Standardization) certification would be the right form of stadarization. It will dramatically improve the quality of infrastructures to be built in LGED. The Unit has a plan to receive ISO certification.

For further information, please contact

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Practical Session on field density test using Sand Cone apparatus during QCT-1 course at CQCL, Dhaka

Demonstration Session of CBR test to Lab Technicians at CQCL, Dhaka

The visiting Japanese experts are being briefed relating to diversified activities of Quality Control Unit

Multipurpose Master Loader