

Approval Criteria
for
Information Technology Testing Laboratory
-Software Applications and Systemsfor E-governance Solutions

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Standardization, Testing & Quality Certification

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**Approval Scheme for
Information Technology Testing Laboratory**
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1. Scope of Document

- 1.1. The general criteria for laboratory approval are laid down in the international standard General Requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005) and IT Testing Laboratories seeking approval must meet all of these requirements.
- 1.2. This document describes specific requirements that an IT testing laboratory has to meet, in addition to the requirements of ISO/IEC 17025: 2005.
- 1.3. This criteria document provides extra information and interpretation of ISO/IEC 17025:2005 requirements and other aspects of laboratory management practices which are considered to be minimum standards for IT testing laboratories being approved against STQC Approval Scheme.
- 1.4. As majority of IT testing laboratories are primarily involved in testing software applications and systems under three main disciplines:
- Software conformance Testing
 - System conformance Testing
 - Network Testing

This document has tried to provide a better insight in the understanding of ISO/IEC 17025:2005 requirements as applicable to IT Testing Laboratory.

- 1.5. For the purpose of covering the activities pertaining to grant of approval, a group wise list of IT tests for which STQC Approval Body offers approval may be sought for different type of testing given below under the heading of IT Disciplines given in 1.4 above.

Sl.No.	Type of Testing
1.	Functional Testing
2.	Performance Testing
3.	Application Security Testing
4.	Usability Testing
5.	Code review
6.	Network Security Testing
7.	Vulnerability Analysis & Penetration Testing
8.	Portability Testing
9.	Interoperability testing
10.	Accessibility testing
11.	Configuration & Compatibility Testing
12.	Website Testing

- 1.6. The definitions of terms used in IT testing is given in Annexure – I.

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2.0. Criteria for Approval

All laboratories seeking certificate of approval for Information Technology Testing must comply with the ISO/IEC 17025: 2005 General requirements for the competence of Testing and Calibration Laboratories. In addition the Testing Laboratories shall also comply with the following supplementary requirements which specifically elaborate the interpretation of ISO/IEC 17025 requirements as applicable to information technology. Compliance to both ISO/IEC 17025 & Supplementary requirements is mandatory to demonstrate the capability & competence of IT Testing Laboratory engaged in testing of e-governance solutions.

This approval criterion is applicable to all IT testing labs irrespective of size, scope of testing and number of personnel.

2.1. Supplementary Requirements:

Additional supplementary requirements as applicable IT Testing Laboratory with reference to Clauses of ISO/IEC 17025:2005 standard requirements is given below:

4 Management requirements

4.1 Organisation:

The management system requirements of ISO/IEC 17025 and the additional requirements of this document apply to the laboratory's permanent facilities, testing performed at the customer's facility, and on any testing performed via a remote connection to the customer's facility.

4.1.2 Quality documentation must address the Supplementary requirements and Approving Body requirements as per Approval Agreement.

4.1.4.

4.1.4.1 When the laboratory is part of a larger organization, the access to the test artefacts (Test Plan, Test Design, Test cases, Test Results and Test Report) shall be clearly defined for those personnel other than lab staff and are part of the organization.

4.1.4.2 For laboratory staff who have additional responsibilities other than Testing (design, development, production or marketing related responsibilities), clear policy shall be available to ensure impartiality and controlling potential conflict of interest.

4.1.4.3 When the testing software is developed as part of the development process, the laboratory shall have procedures for ensuring its independence and that of its staff from the development process, and for identifying and controlling potential conflict of interest.

4.2 Quality System: *No additional requirements*

4.3 Document Control

4.3.3.4 Test artefacts which includes test plan, test suite, test cases including relevant input data, test procedures and test design specification shall be controlled, reviewed, approved and revised as required by clauses 4.3 and 5.4 of ISO/IEC 17025.

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Where Test Management Tools are used for controlling & tracking of test artefacts, procedure shall address appropriate implementation of management and control configuration, maintenance of traceability between related documents and defect tracking.

4.4 Review of requests, tenders and contracts

4.4.1 The contract shall adequately address Test Environment related issues clearly specifying the Hardware, Software & middleware platforms including those components supplied by the Client. The test environment boundary interface points shall also be clearly defined.

4.4.1.1 The contract shall define and reviewed for acceptance of Test methodology as covered in 5.4.2.

4.5 Sub-contracting of Tests and Calibration

A competent sub-contractor laboratory shall be STQC approved IT Testing Laboratory or have the approval by National approval body which are Mutual Recognitions arrangement (MRA) partners.

The approval/approval status of subcontractors shall be regularly reviewed to ensure validity.

4.6 Purchasing, services and supplies

The following items are categorized as services and supplies:

- i) Commercially available software testing tools, Test Management Tools
- ii) Test Tool up-gradation & validation services,
- ii) Hardware and software maintenance services
 - i) Network maintenance services
 - ii) Maintenance of UPS, air conditioners etc.
- iii) Hardware Consumables CDs, DVDs, USBs, Diskettes, Tapes used in the testing which effects testing quality

4.7 Service to the client: No supplementary requirements

4.8 Complaints: No supplementary requirements

4.9 Control of Non-conforming Testing and/or calibration work: No supplementary requirements

4.10 Improvements: No supplementary requirements

4.11 Corrective Action: No supplementary requirements

4.12 Preventive Action: No supplementary requirements

4.13 Control of records:

4.13.1 General: No supplementary requirements

4.13.2 Technical records

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Technical records shall also include the correct and complete identification of the test environment consisting of deployment diagram as appropriate, list of hardware and software used for all system components along with configuration details.

In case of at-site testing the following control of technical records shall be ensured:

- a. Security and Integrity of test records
- b. Test Environment configuration used during testing
- c. Backup of Test records
- d. Access control to Test artefacts
- e. Review & approval of Test artefacts (Test Plan, Test case, Test Results)
- f. Authority for removal of test records at site after completion of work.
- g. Audit trail to establish traceability and any modifications to test artefacts.
- h. Methodology to transfer test artefacts to permanent facility & its retention.

4.14 Internal Audit

4.14.1.1 The internal audit schedule should ideally cover all elements of the Quality System over a 12 months period.

4.14.1.2 The laboratories procedures for at-site testing must be described in the laboratory's quality system documentation and be subject to the internal auditing process.

4.15 Management reviews

4.15.1.1 The effectiveness of the Quality System shall be reviewed by Management at least once in a year.

4.15.1.2 The laboratories procedures for at-site testing must be described in the laboratory's quality system documentation and be subject to the review process.

5.0 Technical Requirements:

5.1 General: No supplementary requirements

5.2 Personnel

5.2.1 Personnel:

5.2.2.1 Educational qualification for personnel performing software testing given below:

Designation	Job Profile	Academic qualification	Experience in years
Test Engineer	Developing test design specifications, test cases, test suits etc.	B Tech, B E, MCA or equivalent Diploma in IT/CSc/ Electronics /Communication	- min. 2 years;

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Test Lead/ Test Manager	Developing Test Plan, Test Methods, review of test design specifications, test cases, test suits etc.	B Tech, B E, MCA or equivalent, Diploma in IT/CSc/ Electronics /Communication CSTM/ISTQB certification or equivalent is desirable;	min. 2 years min. 5 years;
Technical Manager	Overall Responsibility of Technical operations	B Tech, B E, MCA or equivalent, Diploma in IT/CSc/ Electronics /Communication; CSTM/ISTQB certification or equivalent is desirable,	min. 5 years min. 10 years
Quality Manager	Overall Responsibility of QMS activities of laboratory	B Tech, B E, MCA or equivalent, Diploma in IT/CSc/ Electronics /Communication	min. 5 years min. 10 years

Note: In case the above functions are carried out by contract personnel,

1. The contract shall address:
 - Responsibilities and authorities
 - Confidentiality, integrity & indemnity requirements.
2. The laboratory is responsible for ensuring required qualification, experience, training, up gradation of the technology and domain related knowledge etc.

5.2.2.2. The laboratory shall have the training procedure covering :

- o Laboratory Management System
- o Test project specific domain/technology
- o Operation of Test tool
- o Operation of hardware and software at-site

5.2.5. Authorised signatory:

The laboratory shall have minimum one authorised signatory who is responsible for:

- Authorisation for release of test reports
- Providing opinion and interpretations

The Authorized signatory shall have Knowledge of :

- STQC Approval criteria
- Planning & designing of tests, analysis & reporting of test results
- standards or specification, Test Methods & techniques
- the laboratory quality system;

Authorised signatory qualification and experience:

- Bachelor/Master degree in Engineering, MCA or MSc in Computer Science/IT/Electronics with 5 year relevant experience or Diploma in IT/CSc/ Electronics /Communication with min. 10 years; CSTM/ISTQB certification or equivalent is desirable.

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5.3. Accommodation and Environmental Conditions:

5.3.1.1 For software testing, the term “environment” includes the hardware and associated software on which the software being tested is running.

5.3.1.2 If the laboratory intends to perform any part of a testing at the premises of the customer, the developer or the user, the laboratory management system shall include procedures for handling testing performed at those premises including the use of testing tools of the laboratory. The laboratory shall ensure integration of test equipment including test tools with the on-site hardware and software environment;

5.3.1.3 If testing is to be performed using equipment or tool or system controlled by the customer, developer or user, procedures for the extent of control on these items shall also be included.

5.3.1.4 When a computing hosting centre/data centre/cloud environment is utilized to house the lab-owned system hardware/client system hardware it is considered to be within and part of the test environment.

5.3.2.1 For System/Acceptance testing, the test environment shall be the target/production environment. *Incase of any deviation, it shall be justified and recorded along with the risks involved due to test environment related specific failures.*

5.3.2.2 Any virtual environments or other special configurations shall be fully documented in the test records along with a justification as to why it is believed not to affect or invalidate the results.

5.3.3 Test Environment shall be isolated from design, development & production environment.

5.3.3.1 The laboratory shall ensure that there shall be no interference from other activities or any concurrent activities occurring that invalidates the result of the specified tests. For example activities like virus scanning, updating of software, running of undesired services and backup/migration operations which may lead to uncontrolled network environment during the performance testing.

5.3.4 *Access control to lab areas, server room, Data centre and dedicated test areas (like Usability Laboratory) shall be defined to ensure the integrity of SUTs, test environment and test artefacts.*

5.4 Test and Calibration Methods and Method validation:

5.4.1 The Standards which define the software product requirements and its evaluations, requirements for test documentations, design methods for test cases and any other standard methods are considered as test methodologies.

5.4.1.1 The testing methodology to be followed at various phases of testing shall be documented as indicated below:

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Sl.no.	Test Methodology	Test Artefact	Requirements*
1	Test planning & Control	Test Plan	Scope, Risks, Objectives, strategy & approach, Test schedule, Resource Requirements, Roles/Responsibilities etc.
2	Test Analysis & Design	Test design specification	Test requirement specifications, scenario selection, data input selection, Test method selection, Test coverage and traceability to requirements.
3	Test implementation	Test Case Design	Testing procedures, Test cases, test suite, scripts generations etc.
4	Test Execution	Test Result	Test Logs, Anomaly classification
5	Test Reporting	Test Report	Anomaly Report, Test Summary Report
6	Test Closure	Exit Criteria	Test Closure Report

*Separate Test procedures/methods need not rewritten wherever national/international standards are referred.

5.4.1.2. The Laboratory documented procedure shall also address the following:

- a. Assurance that test case results are not ambiguous and have single thread of execution with objective results relating to expected outcomes.
- b. Assurance that any automated test suites will produce valid results.
- c. Test anomaly characterization and priority.
- d. Review & approval of every test artefact.
- e. Criteria for running partial testing or re-testing and regression testing.
- f. Test artefact configuration management.

5.4.1.3. Laboratories testing as per standard methods shall document of all interpretive decisions for any ambiguity in the standard test methods or specifications.

5.4.5 Validation of test methodology: The test suites/plans/specifications/cases shall be technically reviewed and approved prior to execution. This review shall include:

- (a) Confirmation of adequate test coverage of all requirements.
- (b) Confirmation that test case results are not ambiguous and have objective pass/fail criteria.
- (c) Confirmation that any automated test suites will produce valid results.

5.4.6. The evaluation of Measurement Uncertainty (MU) is not applicable as IT Testing executes digital logic on a pass/fail basis.

5.5 Equipment:

5.5.1 Hardware, software and Software test tools significant to testing are considered as equipment. Inventory to be maintained for IT infrastructure with the current versions of the

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Hardware, Software, Tools etc.for the applied scope.

When tests are performed using equipment or systems controlled by the customer, developer or user, the laboratory shall have the procedure to ensure the integrity, validation and extent of control of these equipment. The extent of control includes but not limited to the following:

- Ownership at the time of use of equipment (licensing detail/pattern)
- Permission rights and user roles
- Protection of Software test tool configurations
- Configurations and adaptations to test environment
- Control of test data (Software test tools should be reset or logs emptied between tests to ensure that only current test data is recorded)
- Control of Automated test suite

5.5.2.1 Software Tool validation confirms that the software tools meet the specified requirements. The software tools shall be validated, documented and include the following objective evidence:

- (a) Laboratory developed /customer developed/ open source testing tools – Validation is required
- (b) COTS software tools– Acceptance testing for each installed instance.
- (c) MOTS software tools – Acceptance testing for each installed instance along with validation of the modification or tailoring.

5.5.2.2 A 'reference implementation' shall be used for test tool validation. If there is no suitable 'reference implementation', then the laboratory shall have the procedures to verify the correct operation of the test tool. The laboratory shall maintain the records and shall include the following:

- Test cases being run, date, environmental information
- Summary of the results obtained
- Details of any discrepancies from the expected results
- Results of Comparison with similar such tools

5.5.2.3 Each software test tool installation (instance) shall undergo a documented installation/operational qualification prior to use. There shall be documented evidence of the configuration and inventory of each specific installed software or system and suitable tests to confirm functionality.

5.5.2.4 In case Software test tools are installed on more than one systems, each instance of test tool software shall be uniquely identified on each target environment and be under configuration management.

5.5.4 All equipment including test tools shall be identified and brought under configuration management.

5.5.5 The laboratory shall maintain records of equipment and shall at least address the following:

- (a) Identity – each instance of software/hardware.
- (b) Manufacturer – manufacturer name, and version number.
- (c) Checks - installation/operational qualifications
- (d) Location – target system name or location.
- (e) Manufacturers instructions – user manuals.
- (f) Validation details
- (g) Up gradation and renewal of license

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5.6 Measurement Traceability:

i) Metrological Traceability is not applicable for software testing

5.7 Sampling:

In context of software testing, the laboratory shall have procedure for sampling covering the following depending on the test requirements:

- selection of test cases to test different conditions and combination of variables
- selection of regression tests to rerun
- selection of source code to review based on risk

Laboratory shall detail sampling requirements in the Test plan and maintain records.

5.8 Handling of Test and Calibration Items:

Laboratories shall maintain SUT under configuration management with appropriate metadata to ensure it is unique. The original supplied test item shall be controlled and made available for verification if any intended or unintended modifications occur during installations to the SUTs.

5.8.3 When any suitability or compatibility problems occur during integration of SUT with supporting software, the laboratory shall record the same and customer accordingly intimated for further instructions before proceeding.

5.9 Assuring the Quality of Test and Calibration Result:

The laboratory shall document quality assurance/control monitoring activities during the software test life cycle. The monitoring activities may include review of test activities such as test planning, test analysis & design, test implementation & execution, test reporting etc. for testing at centre and at test site.

5.10 Reporting the Results:

When testing requirements includes multiple test types (Functionality test, performance test, security test etc.) the laboratory shall document policy on issue of full or partial reports for each test type and issued test reports shall be interrelated.

The anomalies listed in the test report shall include severity descriptions for every anomaly.

Any suggestions of workarounds on resolution of anomalies shall be treated as opinions

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**Annexure-I
Definitions**

Acceptance Testing:

Formal testing conducted to determine whether or Not system satisfies acceptance criteria and to enable the customer to Determine whether to accept the system [IEEE STD 610-12:1990].

Configuration management:

A discipline applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, record and report change processing and implementation status and verify compliance with specified requirements.

COTS (Commercial Off The Shelf) Software:

Code that is purchased without modification and either cannot or will not be modified by the lab. An example of this would be Microsoft Word/Excel/or dedicated instrument interface.

Criticality or Severity:

The degree of impact that a requirement, module, fault, error, failure, or other item has on the development or operation of system

Error or Fault:

The difference between a computed, observed, or measured valued or condition and the true, specified, or theoretically correct value condition.

MOTS (Modified Off The Shelf) Software:

COTS software that is configured or adapted to a specific application. Examples include Lab Windows, Lab Tech Notebook, Tile EMC, generic data acquisition software, excel formulas, or MS Office macros, etc.

Product:

eGovernance systems/applications/solutions

Requester Requirements:

An initial version of the evaluation requirements provided by the evaluation requesters.

Reference Implementation:

An implementation of one or more standards or specifications, against which a means of testing and test tools for those standards or specifications are tested, for the purposes of validation of those means of testing and test tools. The term validated reference implementation is used if the reference implementation has been shown to be derived faithfully from (ie. to be 'traceable' back to) the relevant standard or specification.

Software Developer:

An organization that performs development activities during the software life cycle process.

Software Test life cycle (STLC) defines the steps/stages/phases in testing of software like Requirements/Design Review, Test Planning, Test Designing, Test Environment Setup, Test Execution & Test Reporting.

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SUT (System Under Test):

The software product or system undergoing testing by the laboratory

System:

A computing environment that contains both hardware and software. A collection of components organized to accomplish a specific function or set of functions

Test Artefact:

Phase	Activity	Deliverables / Test Artifacts
Requirements/ Design Review	You review the software requirements/design (Well, if they exist.)	Review Defect Reports
Test Planning	Once you have gathered a general idea of what needs to be tested, you 'plan' for the tests.	Test Plan Test Estimation Test Schedule
Test Designing	You design/detail your tests on the basis of detailed requirements/design of the software (sometimes, on the basis of your imagination).	Test Cases / Test Scripts /Test Data Requirements/ Traceability Matrix
Test Environment Setup	You setup the test environment (server/client/network, etc) with the goal of replicating the end-users' environment.	Test Environment
Test Execution	You execute your Test Cases/Scripts in the Test Environment to see whether they pass.	Test Results (Incremental) Defect Reports
Test Reporting	You prepare various reports for various stakeholders.	Test Results (Final) Test/Defect Metrics Test Closure Report

Note: above table is referred from softwarefundamentals.com

Test Requirements:

Description of the objectives of the testing, generally relating to the products intended used and associated risks

Test specification:

Description of the scope of the Testing and the measurement to be performed on the product submitted for Testing and its various components. It details the test inputs, execution Conditions, and predicts results for an item to be tested.

Test Environment:

An operating environment that emulates, as close as possible, the target environment of the SUT. The test environment includes hardware, operating system, and any other software products running on the same machine.

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Test Plan:

A document that describes the technical and management approach to be followed for testing a system or component. It details description of Test actions required and resources needed to perform specified evaluation as well as the distribution of these resources across these action.

Test Method:

Specified Technical procedures for performing a testing service including:

- The specification of all the individual test cases of a test suite
- The test tools (both hardware and software) used to run those test cases and the way in which those test tools are used:
- The procedures used to select and run the test cases;
- The procedures used to analyse the observation and state the result

Test Case:

A set of inputs, execution precondition and expected outcomes develop for a particular objective such as to exercise a particular programme path or to verify compliance with a specific requirement.

Test Software:

Software used in order to carry out or assist in carrying out the testing required.

Test suite:

A complete set of test cases that is necessary to achieve some testing objective.

Ex.: A collection of test cases to be executed as a logical group.

Test Tool:

Software or hardware products that are used to facilitate the testing of the SUT.

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