FACULTY OF ENGINEERING

UNIVERSITI PUTRA MALAYSIA

LABORATORY QUALITY MANUAL

UPM/FK/LQM 1

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Reviewed by: Quality Manager	**Approved by: Dean**

QUALITY POLICY

We are committed to provide quality testing and calibration services with reliable and accurate results to our customers' satisfaction.

The objectives of this quality policy can be achieved by:

1) providing good professional practice and ensuring continuous improvement of the management system
2) ensuring all personnel involved in testing and calibration services are familiar with the policy and quality management system documents
3) enhancing the competency of staff through training
4) implementing and ensuring testing and calibration services are in compliance with MS ISO/IEC 17025 and SAMM requirements

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Date:01.03.2017

1.0 INTRODUCTION

The Faculty of Engineering (FK) of Universiti Putra Malaysia (UPM) was established on 1st January 1975 at the main Serdang Campus, some 22 kilometers to the south of Kuala Lumpur. It is one of the largest faculties in UPM with a student population of over 3000 owes as much to the excellence of its academic staff as to facilities and infrastructure that are being continuously made available. The campus' location at the heart of the Multimedia Super Corridor (MSC) provides the faculty with the excellent access to the array of IT and multimedia facilities available in the Corridor. With the UPMNET providing sophisticated campus-wide broadband ATM network, coupled with the computing facilities at the faculty, students and staff have ready access to the latest in IT, Multimedia, CAD/CAM and internet facilities.

Above all, they can enjoy the placid and conducive working environment in the famous 'green campus' which aesthetically encapsulates UPM's history as the nation's first agriculture college. The eight academic departments housed within the faculty offer eight respective Bachelor of Engineering degree programmes. The organization chart of the faculty is in Appendix I. The faculty is proud of the international character of its student population. Out of 800 postgraduate's population, almost fifty percent are international student.In additional to provide excellent facilities and opportunities for teaching and research, the faculty has established Research Centre to R&D on selected priority areas of engineering and its related fields.

The laboratories in FK involved in this accreditation for MS ISO/IEC 17025 are in Appendix II;

Refer;

1) Appendix I for the Organizational Chart of Faculty of Engineering, UPM
2) Appendix II for Organizational Chart of Faculty of Engineering MS ISO/IEC17025 Accredited Laboratory
3) Appendix III for List of FK Personnel in MS ISO/IEC 17025 Accreditation

2.0 QUALITY OBJECTIVES

The main objectives of FK related to MS ISO/IEC 17025 are to ensure that:

- More than 80% of tests and calibration are completed within the agreed time given.

  The agreed time shall commence right from the beginning of sample and/or equipment received and/or on site until issuance of the testing report and/or calibration certificate.

- Customer satisfaction survey should achieve at least 80% from acceptable (score of 2) and very good (score of 3) (refer to Customer Feedback On Testing and Calibration Services Form – UPM/FK/F 14)

- More than 80% of complaints received from customers are resolved andcustomer is informed within the agreed time given by Quality Manager.

3.0 NORMATIVE REFERENCES

This Quality Manual is applicable to FK in developing the management system for quality, administrative and technical operations.

For the purposes of this document, the relevant terms and definitions given in MS ISO/IEC 17025 SAMM Policies (SP), SC 1.2 – Specific Criteria for Accreditation in the Field of Chemical Testing and SC 1.5 – Specific Criteria for Accreditation in the Field of Mechanical Testing and Non-Destructive Testing (NDT) are applied.

4.0 MANAGEMENT REQUIREMENTS

4.1 Organization

4.1.1 FK is established under the University and University College Act 1971 (Act 30); Perintah (Pemerbadanan) Universiti Pertanian Malaysia (Pindaan) 1997 [P.U.(A) 348] effective from 26th July 1997; and Perlembagaan Universiti Putra Malaysia [P.U.(A) 106] effective from 15th March 1998.

4.1.2 It is the responsibility of FK to carry out testing and calibration activities in such a way to meet the requirements of MS ISO/IEC 17025, SAMM requirements and also to satisfy the needs of customers, regulatory authorities and Department of Standards Malaysia.

4.1.3 The management system covers work carried out in FK's permanent facilities. FK's address is :

Quality Assurance Unit (UJK)
Faculty of Engineering
Universiti Putra Malaysia
43400 UPM Serdang
Selangor

4.1.4 FK and the personnel are free from any commercial or financial industry, including the parent company UPM, or any other pressure that much affects the judgement of FK. The person who is doing the testing shall not involve in any activities that might incur conflicts of interest.

4.1.5

a) FK has managerial and technical personnel who, irrespective of other responsibilities, have the authority and resources needed to carry out their duties including the implementation, maintenance and improvement of the management system and to identify the occurence of departures from the management system or from the procedures for performing tests and calibration and to initiate actions to prevent or minimize such departures (Refer to Appendix II for Organizational Chart of Faculty of Engineering MS ISO/IEC 17025 Accredited Laboratory);

b) FK has to ensure that its management and personnel are free from any undue internal and external commmercial, financial and other pressures and influences that may adversely affect the quality of their work (Refer to Procedure on Confidentiality and Integrity–UPM/FK/MRQ1);

c) It is the policy of FK to ensure that the protection of its customers' confidential information and proprietary rights are strictly maintained.

d) It is the policy of FK to avoid involvements in any activities that would diminish confidence in its competence, impartiality, judgement or operational integrity (Refer to Procedure on Confidentiality and Integrity - UPM/FK/MRQ 1);

e) FK has defined its organization and management structure, its place in parent organization, and the relationship between quality management and technical operations (Refer to Appendix I and II);

f) FK has specified the responsibility, authority and interrelationship of all personnel who manage, perform and/or verify work affecting the quality of the tests and calibration (Refer to Personnel File (UPM/FK/P/FL-4))

g) FK will provide adequate supervision of testing and calibration staff, including trainees, by people familiar with methods and procedures, purpose of each test and calibration and assessment of the test results and calibration certificates;

h) The technical manager (TM) is responsibile for the overall technical operations and provision of resources needed to ensure that the required quality of laboratory operations is achieved (Refer to Appendix IV);

i) FK has appointed a member of staff as Quality Manager (QM) who, irrespective of other duties and responsibilities, has defined responsibility and authority for the management system related to quality. The QM has direct access to the highest level of management at which decisions are made on laboratory policy or resources (Refer to Appendix IV);

j) FK has appointed Deputy Quality Managers (DQM) and Deputy Technical Managers (DTM).

DTMs are attached for each laboratory. Their responsibility and authority are stated/defined in Appendix IV;

k) FK ensures that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the management system.

4.1.6 Communication

Top management shall ensure that appropriate communication is established within the laboratory regarding the effectiveness of the management system. The communication processes are conducted through laboratory meeting at least 3 times a year, faculty management meeting quarterly, internal memo/email and other relevant process.

4.2 Management System

4.2.1 FK has established, implemented and maintained an appropriate management system within the scope of its activities. FK has documented its policies, systems, programmes, procedures and instructions to the extent necessary to assure the quality of the test results and calibration certificates. The system's documentation is communicated to, understood by, available to, and implemented by the appropriate personnel. The effectiveness of the management system is assessed through planned internal audits, regular management reviews, analysis of potential and actual problems and other methods approved by the Quality Manager or Top Management.

This Laboratory Quality Manual and associated documents (including operating procedures and test and calibration methods) and records serve as the quality plan for the laboratory. Once the revised documents completed, it will be communicated through internal email. Training/briefing are conducted on the new revised procedures/documents. QM and/or TM or deputies will ensure on the implementation of the new revised documents/procedures.

4.2.2 FK management system policies related to quality, including a quality policy statement, is defined in this Quality Manual. The quality objectives are established and reviewed during management review. The quality policy statement is issued under the authority of Top Management.

4.2.3 FK Top Management is committed in the development and implementation of the management system and in the continuous improvement of its effectiveness.

4.2.4 FK Top Management has communicated to the organization the importance of meeting customer requirements as well as statutory and regulatory requirements.

4.2.5 The Quality Manual includes or makes reference to the supporting procedures including technical procedures. It outlines the structure of the documentation used in the management system. The structure of the documentation is shown in Figure 1.

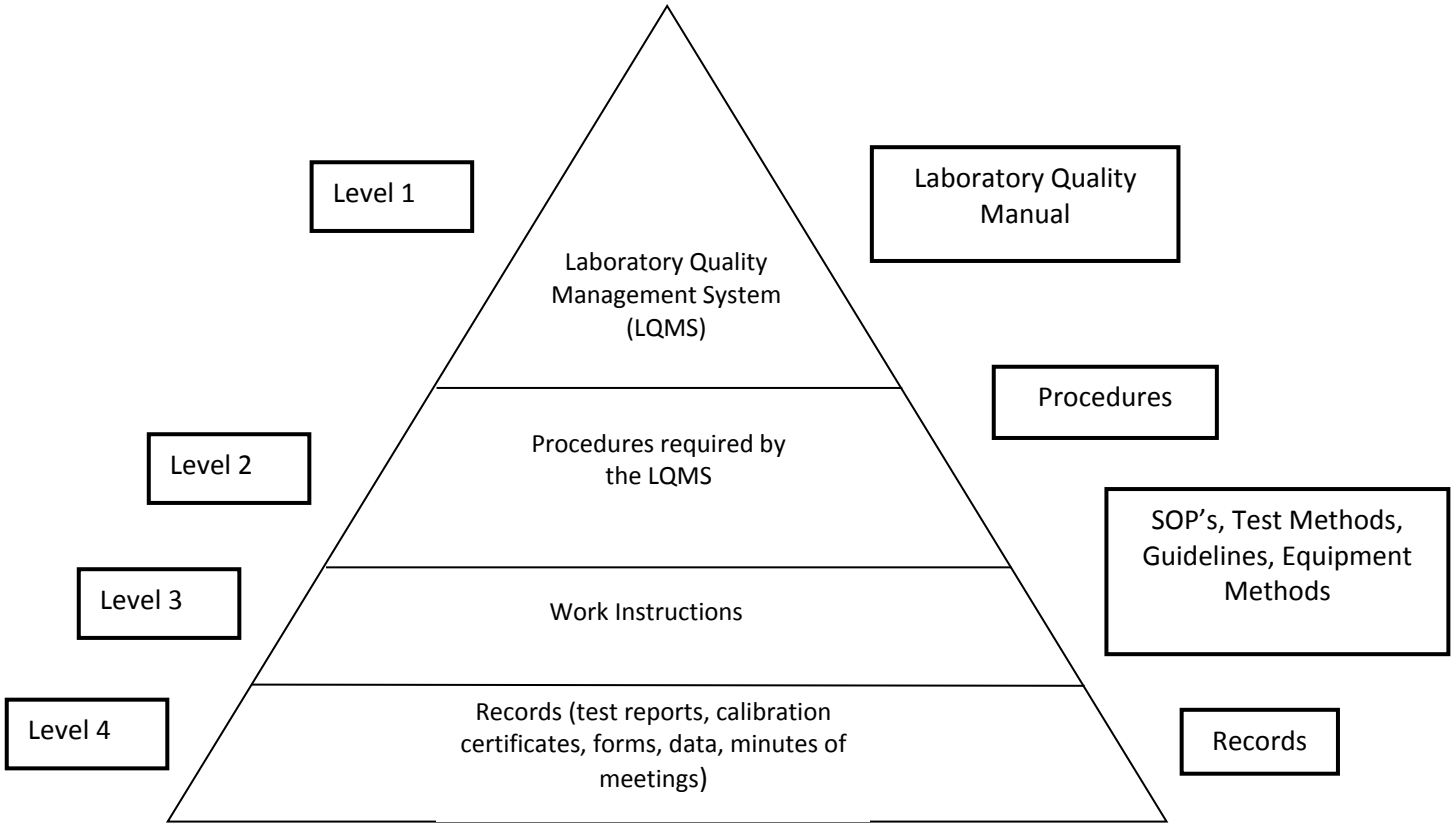


Figure 1: Document Structure

4.2.6 Quality Manager, Technical Manager and their deputies are responsible to ensure compliance with MS ISO/IEC 17025 and SAMM requirements. Quality Manager is responsible for all quality matters that affect FK and ensures that Laboratory Quality Management System (LQMS) are established, implemented and maintained according to MS ISO/IEC 17025 accreditation. Technical Manager is responsible for implementing LQMS and ensuring all personnel involved are technically competent to perform test and calibration according to the specified methods. In the absence of the manager, the appointed deputy will carry out the responsibilities of the manager (Refer to Appendix II for Organizational Chart of Faculty of Engineering MS ISO/IEC 17025 Accredited Laboratory).

4.2.7 FK Top Management shall ensures that integrity of the management system is maintained when changes to the management system such as changes in the organization structure, documentation and procedures are planned and implemented. This process can be carried out effectively through the following activities such as continual staff training for competency, schedule proficiency testing (PT program), interlaboratory testing, awareness program, internal/external audit, appointment of deputies and also management reviews.

4.3 Control of Documents

4.3.1 General

FK has established and maintained procedures to control all documents that form part of its management system (either internally generated or from external sources). (Refer to Procedure on Control of Documents–UPM/FK/MRQ 3).

In order to ensure that all personnel are using the correct information, all documents that form part of its management system are controlled by the Document Controller. These include documents of internally generated such as quality manual, quality procedures, standard operating procedure, work instruction, test and calibration method and forms or from external sources. The Document Controller maintains an updated master list and distribution list of all controlled documents.

The control of data related to testing is covered in section 5.4.7. The control of records is covered in section 4.13.

4.3.2 Document Approval and Issue

4.3.2.1 All documents issued to personnel in FK as part of the management system are reviewed and approved for use by authorized personnel prior to issue. A master list or Procedure on Control of Documents (UPM/FK/MRQ 3) identifying the current/correct revision status and distribution of documents in the management system is established and made available to preclude the use of invalid and/or obsolete documents.

4.3.2.2 The Procedure on Control of Documents (UPM/FK/MRQ 3) ensures that:

a) Authorised editions of appropriate documents are available at all locations where operations essential to the effective functioning of FK are performed;
b) Documents are reviewed once every 3 years (if no change in the system/process) and, where necessary, it will be revised to ensure continuing suitability and compliance with applicable requirements such as from the audit findings that require improvement of new change and Management Review Meeting;
c) Invalid or obsolete documents are promptly removed from all points of issue or use, or otherwise assured against unintended use;
d) Obsolete documents retained for either legal or knowledge preservation purposes are suitably marked.

4.3.2.3 Management system documents generated by FK are uniquely identified. Such identification includes the date of issue identification, page numbering, total number of pages, or a mark to signify the end of the document, and the issuing authority(ies).

4.3.3 Document Changes

4.3.3.1 Changes to documents are reviewed and approved by the same function that performed the original review unless specifically designated otherwise. The designated personnel has access to pertinent background information upon which to base their review and approval.

4.3.3.2 Where practicable, the altered or new text is identified in the document or the appropriate attachments.

4.3.3.3 FK's Control of Documents system allows for the amendment of documents by hand pending the re-issue of the documents, the procedures and authorities for such amendment has been defined (Refer to Procedure on Control of Documents – UPM/FK/MRQ 3). Amendments are clearly marked, initialled and dated. A revised document is formally re-issued as soon as practicable.

4.3.3.4 The procedure describes how changes in documents are maintained and controlled in computerized system.

4.4 Review of Requests, Tenders, and Contracts

4.4.1 FK has established and maintained procedures for review of requests, tenders and contracts (Refer to Procedures on Review of Requests, Tenders and Contracts- UPM/FK/MRQ 4).

4.4.2 Records of reviews, including any significant changes, are maintained. Records of pertinent discussions with a customer relating to the customer's requirements or results of the work during period of execution of the contract are also maintained.

4.4.3 The review also covers any work that is subcontracted by FK.

4.4.4 The customer is informed of any deviation from the contract.

4.4.5 If a contract needs to be amended after work has commenced, the same contract review process is repeated and any amendments are communicated to all affected personnel.

4.5 Subcontracting of Tests and Calibrations

4.5.1 When FK subcontracts any work, a competent subcontractor that complies with MS ISO/IEC 17025 for the work in question is selected.

4.5.2 FK advises the customer about the arrangement in writing and, when appropriate, obtain the approval of the customer in writing.

4.5.3 FK is responsible to the customer for the subcontractor's work, except in the case where the customer or a regulatory authority specifies which subcontractor is to be used.

4.5.4 FK maintains a register of all subcontractors that it uses for tests and calibrations and a record of the evidence of compliance with MS ISO/IEC 17025 for the work in question.

The reporting of subcontracted tests and calibrations shall follow the requirement of SAMM Policy 3 (SP3): Policy on The Use of SAMM Accreditation Symbol and Combined ILAC MRA Mark or Reference to SAMM Accreditation.

4.6 Purchasing Services and Supplies

4.6.1 It is the policy of FK to ensure that the selection and purchasing of services and supplies it uses that affect the quality of tests and calibrations are monitored to preserve the quality of results (Refer to Procedure on Purchasing - UPM/FK/MRQ 5).

4.6.2 FK ensures that purchased supplies, reagents and consumables materials that affect the quality of tests and calibrations are not used until they have been inspected or otherwise verified as complying with standards specifications or requirements defined in the methods for the tests and calibrations concerned. These services and supplies used will comply with specified requirements. Records of actions taken to check compliance are maintained.

4.6.3 Purchasing documents for items affecting the quality of laboratory output contain data describing the services and supplies ordered. These purchasing documents are reviewed and approved for technical content prior to release.

4.6.4 FK evaluates suppliers of critical consumables, supplies and services which affect the quality of testing and calibration, maintains records of these evaluations and list those approved.

4.7 Service to the Customer

4.7.1 FK is willing to cooperate with customer or their representatives in clarifying the customer's request and in monitoring the laboratory's performance in relation to the work performed, provided that the laboratory ensures confidentiality to other customers.

4.7.2 FK seeks feedback both positive and negative from its customers. The feedback is used and analysed to improve the management system, testing and calibration activities and customer services. (Refer to Procedure on Customer Feedback on Testing and Calibration Services – UPM/FK/MRQ 21).

4.8 Complaints

It is the policy of FK to ensure that all customer or other parties complaints and feedback are resolved and handled with adequate records, effective investigations and corrective actions (Refer to Procedure on Handling of Complaints - UPM/FK/MRQ 6).

4.9 Control of Nonconformity Testing and/or Calibration Work

4.9.1 It is the policy of FK to ensure that all nonconformity work are defined and evaluated, and corrective actions are taken by the management/technical authority(ies). (Refer to Procedure on Control of Laboratory Nonconformity Testing and Calibration Work - UPM/FK/MRQ 7).

a) The responsibilities and authorities for the management of nonconformity work are designated and actions (including halting of work and withholding of test reports and calibration certificates as necessary) are defined and taken when nonconformity work is identified;
b) An evaluation of the significance of the nonconformity work is made;
c) Correction is taken immediately, together with any decision about the acceptability of the nonconformity work;
d) Where necessary, the customer is notified and work is recalled;
e) The responsibility for authorizing the resumption of work is defined.

4.9.2 Where the evaluation indicates that the nonconformity work could recur or that there is doubt about the compliance of the laboratory's operation with its own policies and procedures, the Procedure on Corrective Action (UPM/FK/MRQ 8) and Procedure on Preventive Action (UPM/FK/MRQ 9) is promptly followed.

4.10 Improvement

FK will continually improves the effectiveness of its management system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

4.11 Corrective Action

4.11.1 General

It is the policy of FK to identify the appropriate authorities for implementing corrective action when nonconformity work or departures from the policies and procedures in the management system or technical operation occur (Refer to Procedure on Corrective Action – (UPM/FK/MRQ 8) and Procedure on Preventive Action – (UPM/FK/MRQ 9)) is promptly followed.

4.11.2 Cause Analysis

The procedure for corrective action starts with an investigation to determine the root cause(s) of the problem.

4.11.3 Selection and Implementation of Corrective Actions

Where corrective action is needed, FK identifies potential corrective actions. It selects and implements the action(s) most likely to eliminate the problem and to prevent recurrence.

Corrective actions taken are to a degree that are appropriate to the magnitude and the risk of the problem.

FK documents and implements any required changes resulting from corrective action investigations.

4.11.4 Monitoring of Corrective Actions

The results are monitored to ensure that corrective actions taken are effective.

4.11.5 Additional Audits

Where the identification of nonconformities or departures casts doubts on the FK's compliance with its own policies and procedures, or on its compliance with MS ISO/IEC 17025, FK ensures that the appropriate areas of activity are audited. (Refer to Procedure on Internal Audit – UPM/FK/MRQ 10).

4.12 Preventive Action

4.12.1 Needed improvements and potential sources of nonconformitites, either technical or concerning the management system, are identified. When improvement opportunities are identified or if preventive action is required, action plans are developed, implemented and monitored to reduce the likelihood of the occurrence of such nonconformities and to take advantage of the opportunities for improvement (Refer to Procedure onCorrective Action – (UPM/FK/MRQ 8) and Procedure on Preventive Action – (UPM/FK/MRQ 9)) is promptly followed.

4.13 Control of Records

4.13.1 General

4.13.1.1 FK establishes and maintains procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. Quality records include report from internal audits and management reviews as well as records of corrective and preventive actions (Refer to Procedure on Control of Records – UPM/FK/MRQ 2)

4.13.1.2 All records are legible, stored and retained in such a way that they are readily retrievable in facilities that provide a suitable environment to prevent damage or deterioration and to prevent loss. Retention times of records is 6 years.

4.13.1.3 All records are held secured and in confidence in the locked cabinet available in the laboratory and are monitored and can be accessed only to laboratory analysts/technicians. Any records outside the laboratory must require the approval from QM/TM or deputies (Refer to Procedure on Control of Records – UPM/FK/MRQ 2).

4.13.1.4 The procedures cover the protection and back-up records stored electronically and to prevent unauthorized access to or amendment of these records.

Data generated by equipment affecting the test result are retained to provide evidence for traceability.

As only authorised personnel can access the laboratory equipment by using individual password, all print-out from equipment are traceable to the person performing the test.

4.13.2 Technical Records

4.13.2.1 Records of original observations, derived data and sufficient information to establish an audit trail and a copy of test report and calibration certificate issued are retained for 6 years. The records for each test or calibration contains sufficient information to facilitate the identification of factors affecting the uncertainty and to enable the test or calibration to be repeated under conditions as close as possible to the original. The records include the identity of personnel responsible for the performance of each test and calibration and checking of result.

4.13.2.2 Observations, data and calculations are recorded at the time they are made and are identifiable to the specific task.

4.13.2.3 All data including observation and calculation are recorded at the time they are made and be identifiable to the specific task. Each correction are crossed out, not erased, not made illegible or not deleted, and the correct value entered alongside. All alterations to records are signed or initialled by the person making the corrections.

The data/records stored electronically are password protected to prevent unauthorised access to or amendment of data/records on computers. Backups also must be done to ensure integrity and availability of data/information in the event of a system/power failure. License/Commercial/Trademark software is registered and controlled with regular updates the masterlist. TM/DTM is responsible to ensure the aplicability.

4.14 Internal Audits

4.14.1 Internal audit is conducted periodically, and in accordance with a predetermined schedule and procedure. This activityis to verify that its operations continue to comply with the requirements of the management system and MS ISO/IEC 17025 (Refer to Procedure on Internal Audit-UPM/FK/MRQ 10).

The internal audit programme addresses all elements of the management and technical requirements.

4.14.2 When audit findings cast doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test and calibration results, FKtake timely corrective action, and notify customers in writing if investigations show that the laboratory results may have been affected.

4.14.3 The area of activity audited, the audit findings and corrective actions that arise from them are recorded.

4.14.4 Follow-up audit activities verify and record the implementation and effectiveness of the corrective action taken.

4.15 Management Reviews

4.15.1 The management system in accordance to MS ISO/IEC 17025 is reviewed at least once a year according to the Procedure on Management Review – UPM/FK/MRQ 11 by the Top Management. This review ensure the continuing suitability and effectiveness in compliance to the accreditation requirement, organization quality policy and objectives, introduction of necessary changes or improvements. The review takes account of :

- The suitability of policies and procedures;
- Quality objectives achievement
- Reports from managerial and supervisory personnel;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;
- The results on interlaboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Customer feedback;
- Complaints;
- Recommendations for improvements;
- Other relevant factors, such as quality control activities, resources and staff training.

4.15.2 Findings and actions from management reviews are recorded. The management ensures that those actions are carried out within an appropriate and agreed timescale.

5.0 TECHNICAL REQUIREMENTS

5.1 General

5.1.1 Many factors determine the correctness and reliability of the tests and calibrations performed by the laboratory. These factors include contributions from :

- Human factors (5.2);
- Accommodation and environmental conditions (5.3);
- Test and calibration methods, and method validation (5.4);
- Equipment (5.5);
- Measurement traceability (5.6);
- The handling of test and calibration items (5.8);

5.1.2 The extend to which the factors contribute to the total uncertainty of measurement differs considerably between (types of) tests and calibrations. FK takes account of these factors in developing test and calibration methods and procedures in the training and qualifications of personnel, and in the selection of the equipment being used.

5.2 Personnel

5.2.1 FK management ensures the competence of all who operate specific equipment, perform test and calibration, evaluate results, and sign test reports and calibration certificates. Personnel performing specific tasks is qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required. Staff undergoing training are supervised before assigning specific tasks. The competency of personnel performing specific tests demonstrated by the ability to achieve performance characteristics of the tests and calibrations.The list of competence personnel related to each test and calibration method is shown in Appendix V.

5.2.2 The management of FK formulates the goals with respect to the education, training, and skills of FK personnel. It is FK policy to identify training needs and to provide training to personnel. The training program is relevant to the present and anticipated tasks of FK. The effectiveness of training actions taken is evaluated (Refer to *Pengurusan Latihan Staf Universiti Putra Malaysia* – UPM/SOK/LAT/P001).

5.2.3 Any personnel recruited by FK either permanent, under contract or temporary for additional technical and key support personnel, FK ensures that such personnel are supervised and competent and that they work in accordance with FK management system.

5.2.4 Current job descriptions for managerial, technical, and key support personnel involved in tests and calibrations are maintained.

5.2.5 FK management authorises and identify personnel to perform specific test and calibration, issue test report and calibration certificate, give opinions and interpretations and operate equipments. Records

of the relevant authorization(s), competence, educational and professional qualifications, training, skills and experience of all technical personnel, including contracted personnel are maintained. These records are readily available including the dates of authorization and competence is confirmed.

5.3 Accommodation and Environmental Conditions

5.3.1 TM/DTM will ensure the conditions of the accommodation and environment are condusive and do not invalidate the results or adversely affect the required quality and performance of test and calibration. Particular care is taken when tests and calibrations are conducted at sites other than the laboratory permanent facilities. The accommodation and environmental conditions that can affect the results of test and calibration are recorded.

5.3.2 The laboratory monitor, control and record environmental conditions according to specifications, methods and procedures that influence the results. Tests and calibrations are stopped when environmental conditions jeopardize the results of the tests and calibrations.

5.3.3 Incompatible activities are separated and measures are taken to prevent cross-contamination.

5.3.4 Access to and use of areas affecting the quality of tests and calibrations are controlled. Only authorised personnel are allowed to enter the laboratory, Others are escorted by authorised personnel at all times.

5.3.5 Good housekeeping and maintenance requirement are monitored to ensure the environmental conditions do not jeopardize the results of the tests and calibrations.

5.4 Test and Calibration Methods and Method Validation

5.4.1 General

FK uses appropriate methods and procedures for all tests and calibration within its scope. These include handling, transport, storage and preparation of items to be tested and calibrated, and where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of test and calibration data.

FK has instructions on the use and operation of all relevant equipment, handling and preparation of items for testing and calibration are available. These instructions, standards, manuals and reference data relevant to the test and calibrationof the laboratory are kept up to date and available to appropriate personnel. Deviation from test and calibration methods occurs only if the deviation has been documented, technically justified, authorised, and accepted by the customer.

5.4.2 Selection of Methods

FK uses test and calibration methods, which meet the needs of the customer and appropriate for the tests and calibrations. Methods from international, regional or national standards and latest valid edition are preferably used. When the customer does not specify the method to be used, appropriate methods can be selected from international, regional or national standards, or by reputable technical organisations, or in relevant scientific texts or journals, or as specified by the manufacturer of the equipment. Laboratory developed method can also be used.

The customer is informed when the method proposed by the customer is considered to be inappropriate or out of date.

FK confirmed that it can achieve the performance characteristics of standard method before introducing the tests and calibrations.

5.4.3 Laboratory-Developed Methods

The test and calibration methods developed by FK for its own use is a planned activity and assigned to qualified personnel with adequate resources.

Plans is updated as development proceeds and effective communication amongst all personnel involved is ensured. The method developed is validated before use.

5.4.4 Non-Standard Methods

When necessary, the laboratory establish procedure for non-standard methods and validation of the method. The methods are subjected to agreement with the customer and include customer's requirements and the purpose of the test and calibration.

5.4.5 Validation of Methods

5.4.5.1 Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

5.4.5.2 FK validates non-standard methods, laboratory developed methods, standard methods used outside their intended scope, and modifications of standard methods to confirm that the methods are fit for intended use. The validation results, procedure used, and a statement as to whether the method is fit for the intended use are recorded.

5.4.5.3 The range and accuracy of the data/values obtained from validated methods are assessed and met the customers requirements.

5.4.6 Estimation of Uncertainty of Measurement

5.4.6.1 FK has established procedure for estimating uncertainty of measurement (Refer to Procedure on Measurement of Uncertainty - UPM/FK/TRQ 13).

5.4.6.2 The estimation is based on knowledge of the method performance and the measurement scope and makes use of previous experience and validation data.

5.4.6.3 When estimating the uncertainty of measurement, all uncertainty components, which are of importance in the given situation, are taken into account using appropriate methods of analysis.

For uncertainty of measurement in testing and calibration, requirements of SAMM Policy 5: Policy on Measurement Uncertainty Requirements for SAMM Testing Laboratories – Issue 2, 28 February 2007 are met.

5.4.7 Control of data

5.4.7.1 Calculations and data transfer is subjected to appropriate checks in a systematic manner. All laboratory work will be recorded by the person conducting the tests and calibrations in worksheet retained in a job file.The worksheet will be dated and each page will be signed by the person conducted the test and calibration. The calculation and data transfer will be checked by the technical manager or deputy technical manager.

5.4.7.2 Automated equipments included audit trail features to establish full traceability of data and user.

5.4.7.3 When computers or automated equipment are used for the acquisition, processing, recording, reporting, storage or retrieval of test and calibration data, FK ensures that:

a) computer software developed by the user is documented in sufficient detail and is suitably validated as being adequate for use;

b) procedures are established and implemented for protecting the data; such procedures include, but not limited to, integrity and confidentiality of data entry or collection, data storage, data transmission and data processing (Refer to Procedure on Control of Documents – UPM/FK/MRQ 3);

c) computers and automated equipment are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of test and calibration data.

5.4.7.4 If there is discrepency between the records, the controlled document in hardcopy is referred.

5.5 Equipment

5.5.1 Testing/Calibration Equipment

FK is equipped with all items of measurement, test and calibrating equipment required for the correct performance of tests and calibrations (including preparation of test and calibration data items, processing and analysis of test and calibration data). The equipment used outside its permanent control, FK ensures that the requirements of the MS ISO/IEC17025 Standard are complied.

5.5.2 Calibration and/or Maintenance Schedule

Equipment and its software used for testing and calibration are capable of achieving the accuracy required and complies with specifications relevant to the tests and calibrations concerned. Calibration and/or maintenance schedule and service check are established and implemented for critical equipment that can have significant effect on the test and calibration results. Before being placed into service, equipment is calibrated and checked in accordance to identified specification requirements and complies with the relevant standard specifications.

5.5.3 Authorisation for Use

Equipment are operated by authorised personnel. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) are readily available for use by the laboratory personnel.

5.5.4 Each equipment and its software used for testing and calibration and significant to the result are uniquely identified.

5.5.5 Records of Equipment

Records of each equipment and its software significant to the tests and calibrations performed are maintained. The records include at least the following:

a) the identity of the equipment and its software;

b) the manufacturer's name, type identification, and serial number or other unique identification;

c) checks that equipment complies with the specification;

d) the current location, where appropriate;

e) the manufacturer's instructions or reference to their location;

f) dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and date of next calibration;

g) the maintenance plan and maintenance carried out;

h) any damage, malfunction, modification or repair to the equipment.

5.5.6 FK has procedures for safe handling, transport, storage, use and planned maintenance of measuring equipment to ensure proper functioning and prevent contamination or deterioration (Refer to Procedure on Handling and Maintenance of Equipment - UPM/FK/TRQ 14).

5.5.7 Any equipment which has been subjected to overloading or mishandling, gives suspect results or has been shown to be defective or outside specified limits is taken out of service immediately. It is isolated to prevent its use or clearly labelled as being out of service until it has been repaired and shown by calibration or test to perform correctly. Procedure for examining the effect of the defect or departure from specified limits on previous tests and calibrationsis accordance to Procedure on Control of Laboratory Nonconformity Testing and Calibration Work – UPM/FK/MRQ 7. Any work/test/calibration

carried out using this defective equipment will be stopped immediately and report/record must be thoroughly investigated and justified/retested/recalibrated upon release.

5.5.8 Calibration Status

All equipment that require calibration are labelled, coded or otherwise identified to indicate the status of calibration, including the date when last calibrated and the date of expiration criteria when recalibration is due.

5.5.9 When the equipment goes outside the direct control of FK, the function and calibration status of the equipment are checked and shown to be satisfactory before the equipment is returned to service.

5.5.10 Intermediate Checks

When intermediate checks are needed to maintain confidence in the calibration status of the equipment, these checks are carried out according to *Prosedur Penentukuran Peralatan/ Verifikasi* - UPM/SOK/CAL/P001).

5.5.11 Where calibrations give rise to a set of correction factors, FK has procedures to ensure that copies (e.g. in computer software) are correctly updated (Refer to Procedure on Control of Records (UPM/FK/MRQ 2).

5.5.12 Test and calibration equipment, including both hardware and software, are safeguarded from adjustments which would invalidate the test and calibration results.

5.6 Measurement Traceability

5.6.1 General

All equipment used for tests and calibrations, including equipment for subsidiary measurements (e.g. for environmental conditions) having a significant effect on the accuracy or validity of the results of the test, calibration or sampling, are calibrated before being put into service. FK has an established programme and procedure for the calibration of its equipment (Refer to *Prosedur Penentukuran Peralatan/ Verifikasi* - UPM/SOK/CAL/P001).

The calibration interval may be reduced or extended based on factors such as history on stability, performance of equipment, maintenance, number usage of equipment, accuracy required and ability of staff to perform regular checks.

5.6.2 Specific Requirements

5.6.2.1 Calibration

Calibration process is carry out by the Mass Metrology Laboratory (MML).

5.6.2.1.1 FK establishes traceability of measurement standards and measuring instruments to the SI unit by means of an unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurement. The link to SI units is achieved by reference to national measurement standards. National measurement standards is the primary standards, which are primary realizations of the SI units or agreed representations of SI units based on fundamental physical constants, or they are secondary standards which are standards calibrated by another national metrology institute when using external calibration services, traceability of measurement are assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability. The calibration certificates issued by FK contain the measurement results, including the measurement uncertainty and/or a statement of compliance with an identified metrological specification.

5.6.2.1.2 Calibration certificates shall include the following, where necessary for the interpretation of calibration results:

a) The conditions (e.g. environmental) under which the calibrations were made that have an influence on the measurement results;

b) The uncertainty of measurement and/or a statement of compliance with an identified metrological specification or clauses there of;

c) Evidence that the measurements are traceable.

5.6.2.2 Testing

5.6.2.2.1 Measurement from measuring, test and calibration equipment with measuring function are traceable to the SI units by means of an unbroken chain of comparison. However, calibration programme may not be applicable if it has been established that the association contribution from the calibration contributes little to the total uncertainty of the test and calibration result. When this situation arises, FK ensures that the equipment used can provide the uncertainty of measurement needed.

5.6.2.2.2 Where traceability of measurements to SI units is not possible and/or not relevant, the same requirements for traceability to certified standard materials, agreed methods and/or consensus standards, are required.

5.6.3 Reference Standards and Reference Materials

5.6.3.1 Reference standards

FK has a programme and procedure for the calibration of its reference standards (Refer to Procedure on Calibration and Intermediate Check of Equipment/Reference Standards and Materials – UPM/FK/TRQ 15). Reference standards are calibrated by a body that can provide traceability. Such reference standards of measurement held by FK are used for calibration only and for no other purpose. Reference standards are calibrated before and after any adjustment.

5.6.3.2 Reference Materials

Reference materials, wherever possible, are traceable to SI units of measurement, or to certified reference materials. Internal reference materials are checked as far as is technically and economically practicable.

5.6.3.3 Intermediate Checks

FK has procedures for Intermediate Checks needed to maintain confidence in the calibration status of reference, primary, transfer or working standards and reference materials are carried out according to schedules and Procedure on Calibration and Intermediate Check of Equipment/Reference Standards and Materials – UPM/FK/TRQ 15).

5.6.3.4 Transport and storage

FK has procedures for safe handling, transport, storage and use of reference standards and reference materials in order to prevent contamination or deterioration and in order to protect their integrity (Refer to Procedure on Handling of Reference Standards/Materials - UPM/FK/TRQ 16).

5.7 Sampling

Sampling is not under the scope of accreditation. All samples tested by FK are submitted by the customers/requestors.

5.8 Handling of Test and Calibration Items

5.8.1 FK has procedures for the transportation, receipt, handling, protection, storage, retention/or disposal of test and calibration items, including all provisions necessary to protect the integrity of the test and calibration item, and to protect the interests of FK and the customer (Refer to Procedure on Handling of Test Samples and Calibration Items - UPM/FK/TRQ 17).

5.8.2 FK has a system for identifying test and calibration items. The system is designed and operated so as to ensure that items cannot be confused physically or when referred to in records or other documents.

5.8.3 Upon receipt of the test and calibration items, abnormalities or departures from normal or specified conditions, as described in the test and calibration methods, are recorded. When there is doubt of the test and calibration items FK consults the customer before proceeding and records the discussion.

5.8.4 FK provides facilities for avoiding deterioration, loss or damage to the test and calibration item during storage, handling and preparation (Refer to Procedure on Handling of Test Samples and Calibration Items - UPM/FK/TRQ 17). Handling instructions provided with the item are followed. All test and calibration items are held secured and protected.

5.9 Assuring the Quality of Test and Calibration Results

5.9.1 FK has quality control procedures for monitoring the validity of tests and calibrations undertaken (Refer to Procedure on Quality Control of Test and Calibration Results, and Test Reports and Calibration Certificates - UPM/FK/TRQ 18). The resulting data is recorded in such a way that trends are detectable and, where practicable, statistical techniques are applied to the reviewing of the results. This monitoring is planned and reviewed and may include, but not limited to, the following:

a) regular use of certified reference materials and/or internal quality control using secondary reference materials;

b) participation in interlaboratory comparisons or proficiency-testing programmes listed in SAMM Policy 4: Policy for Participation in Proficiency Testing Activities;

c) replicate tests using the same or different methods;

d) retesting of retained items;

e) correlation of results for different characteristics of an item.

5.9.2 Quality control data is analysed and, where they are found to be outside pre-defined criteria, planned action is taken to correct the problem and to prevent incorrect results from being reported. If any failure, the Nonconformity Form (UPM/FK/F 5) are filled up.

5.10 Reporting the Results

5.10.1 General

The results of test and calibration are reported accurately, clearly, unambiguously and objectively.

The results and interpretations (when necessary) are reported in test report and calibration certificate and include all the information requested by the customer.

Test report and calibration certificate for internal customers are reported in a simplified way. Any information which is not reported to the customer is readily available in FK.

5.10.2 Test Reports and Calibration Certificates

Test reports and calibration certificates shall conform to the requirements of SAMM Policy 3: Policy on The Use of SAMM Accreditation Symbol andCombined ILAC MRA Mark or Reference to SAMM Accreditation.

The test report or calibration certificate includes at least the following information:

a) a title (e.g. “Test Report” or “Calibration Certificate”);

b) the name and address of laboratory;

c) unique identification of the test report or calibration certificate and page number that represent the total pages;

d) the name and address of the customer;

e) identification of the method used;

f) a description, condition and unambiguous identification of the test or calibrated item;

g) the date of test or calibrated item receivedand performance of the test or calibration;

h) the test or calibration results and the units of measurement;

i) the name, function and signature or equivalent identification of person authorizing the test report or calibration certificate; all pages of test report or calibration certificate are either signed or initiated by approved signatory;

j) A statement to the effect that the results relate only to the items tested or calibrated.

FK include a statement specifying that the test reportor calibration certificate shall only be reproduced in full with written approval from the laboratory.

5.10.3 Test Reports

In addition to the requirements listed in 5.10.2, the interpretations (if any) of the test results may also include the following:

a) Deviations, additions or exclusions from the test method and information on specific test conditions, such as environmental conditions;

b) A statement of compliance/non-compliance with requirements and/or specifications;

c) A statement on the estimated uncertainty of measurement;

d) Additional information required by specific methods, customers or groups of customers.

e) A statement declaring any parameters that are not covered within the scope of testing (disclaimer).

5.10.4 Calibration Certificates

In addition to the requirements listed in 5.10.2, calibration certificates include the following

a) the conditions (e.g. environmental) under which the calibrations were made that have an influence on the measurement results.

b) the uncertainty of measurement and/or a statement of compliance with an identified metrological specification or clauses there of.

c) Evidence that the measurements are traceable.

Statement of interpretation (if any) of the calibration may also be included.

5.10.5 Opinions and Interpretations

If opinions and interpretations are included, they must be clearly marked as in a test report and calibration certificate. (Refer to Procedure on Issuing of Test Report and Calibration Certificate – UPM/FK/TRQ 19).

5.10.6 Testing and Calibration Results Obtained from Subcontractors

Results of tests and calibration performed by subcontractors are clearly identified. FK are responsible of the result from subcontractor.

5.10.7 Electronic Transmission of Results

In the case of transmission of test and calibration results by electronic meanssuch as email, PDF format will be used and meet the requirements ofMS ISO/IEC17025 Standard (Refer to clause 5.4.7 in this Quality Manual).

5.10.8 Format of Reports and Certificates

The test report and calibration certificate format is simple and accommodates the test and calibration carried out and minimizes the possibility of misunderstanding or misuse.

5.10.9 Amendments to Test Reports and Calibration Certificates

Amendments to a test report and calibration certificate after issue are made only in the form of a further document, or data transfer, which includes the statement:

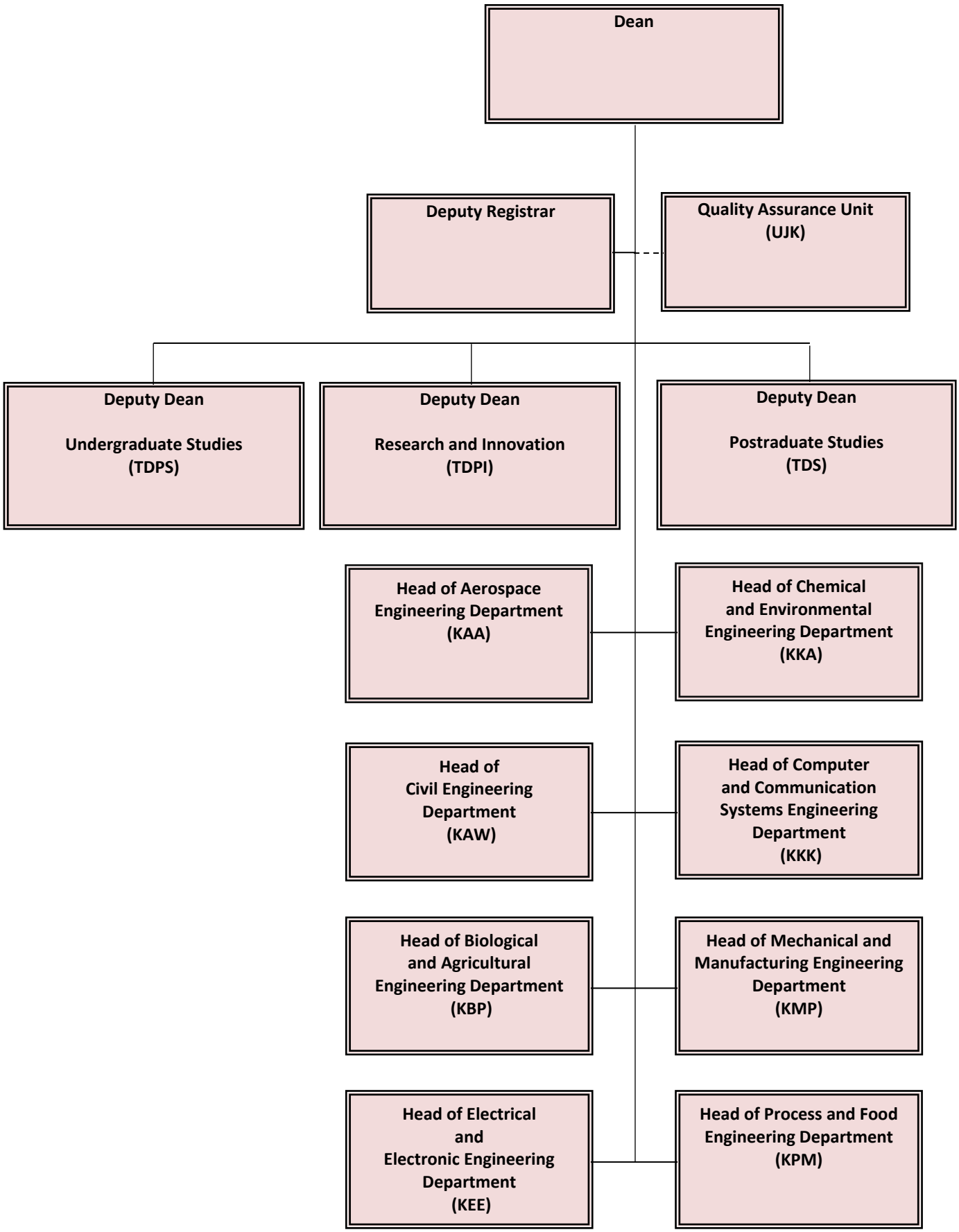
"Supplement to Test Report [or Calibration Certificate], serial number…. (Or as otherwise identified)"

Or an equivalent form of wording.

Such amendments meet all the requirements of MS ISO/IEC 17025 Standard.

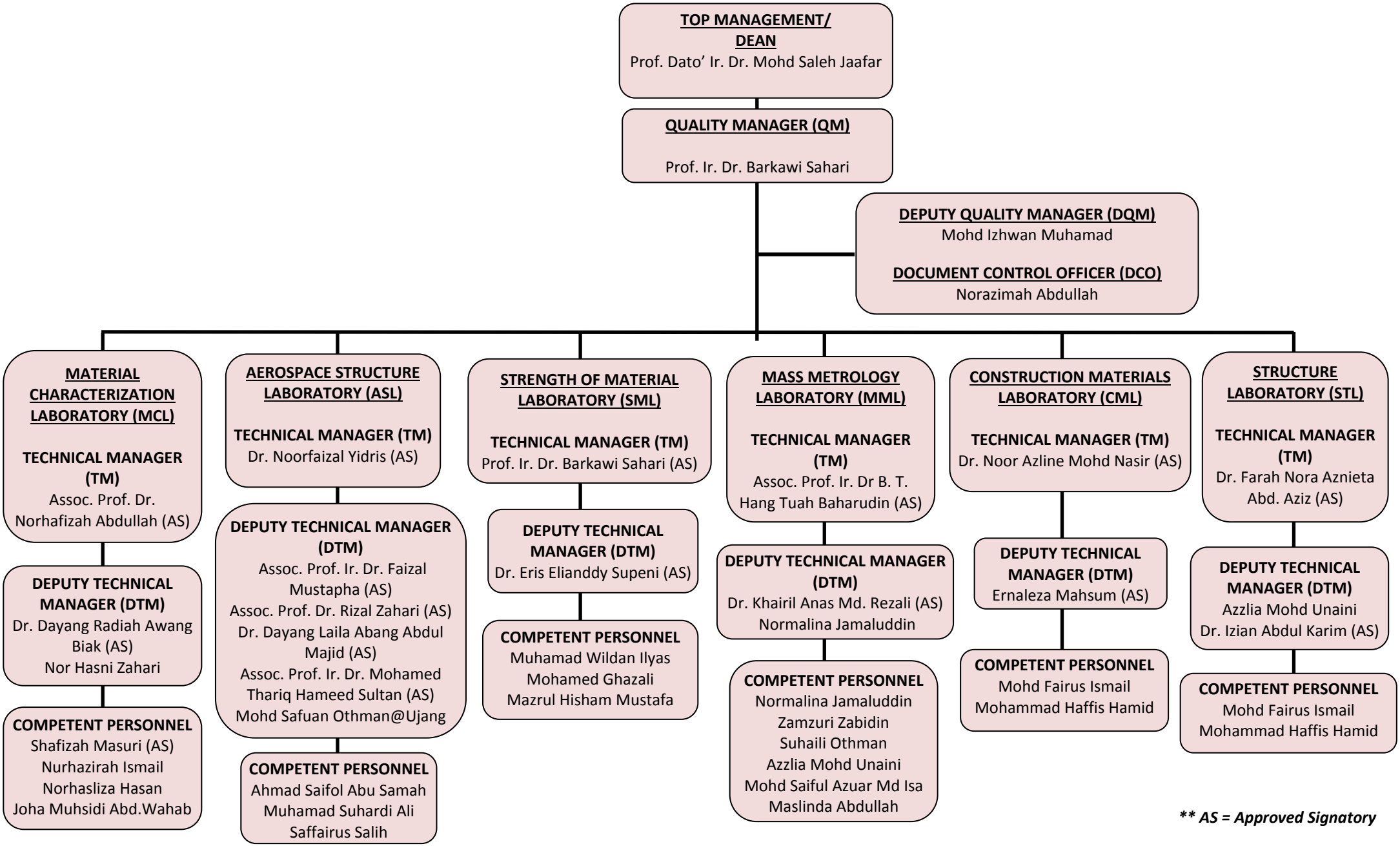
When it is necessary to issue a complete new test report or calibration certificate, this is uniquely identified and contains a reference to the original that it replaces.

ORGANIZATIONAL CHART OF FACULTY OF ENGINEERING, UPM



Appendix II

ORGANIZATIONAL CHART OF FACULTY OF ENGINEERING MS ISO/IEC 17025 ACCREDITED LABORATORY



***** AS = Approved Signatory***

Updated: 01.03.2017

Appendix III

LIST OF FK PERSONNEL IN MS ISO/IEC 17025 ACCREDITATION

NO.	NAME	DESIGNATION	POSITION/DEPARTMENT/FIELD
1	Prof. Dato' Ir. Dr. Mohd Saleh Jaafar	Top Management	Dean of Faculty of Engineering
2	Prof. Ir. Dr. Barkawi Sahari	Quality Manager (QM)/ Technical Manager (TM) - SML Approved Signatory- SML	Professor/Mechanical & Manufacturing Engineering/Mechanical
3	Mr. Mohd Izhwan Muhamad	Deputy Quality Manager (DQM)	Science Officer/ Electrical & Electronic Engineering
4	Mrs. Norazimah Abdullah	Document Control Officer (DCO)	Administrative Assistant/ Quality Assurance Unit
5	Assoc. Prof. Dr. Norhafizah Abdullah	Technical Manager (TM) - MCL Approved Signatory – MCL	Associate Professor/ Chemical & Environmental Engineering/Chemical
6	Dr. Dayang Radiah Awang Biak	Deputy Technical Manager (DTM) – MCL Approved Signatory – MCL	Senior Lecturer/Chemical & Environmental Engineering/Chemical
7	Mrs. Nor Hasni Zahari	Deputy Technical Manager (DTM) – MCL	Engineer/ Chemical & Environmental Engineering/Chemical
8	Mrs. Shafizah Masuri	Approved Signatory – MCL Competent Person – MCL	Science Officer / Chemical & Environmental Engineering/Chemical
9	Mrs. Norhasliza Hasan	Competent Person – MCL	Teaching Assistant/ Chemical & Environmental Engineering/Chemical

10	Ms. Nurhazirah Ismail	Competent Person – MCL	Teaching Assistant/ Chemical & Environmental Engineering/Chemical
11	Mr. Joha Muhsidi Abd. Wahab	Technical Staff (TS) - MCL Competent Person - MCL	Assistant Engineer /Chemical & Environmental Engineering/Chemical
12	Dr. Eris Elianddy Supeni	Deputy Technical Manager (DTM)- SML Approved Signatory- SML	Lecturer/ Mechanical & Manufacturing Engineering/Mechanical
13	Mr. Muhamad Wildan Ilyas Mohamed Ghazali	Technical Staff (TS)- SML Competent Person - SML	Assistant Engineer / Mechanical & Manufacturing Engineering/Mechanical
14	Mr. Mazrul Hisham Mustafa Kamal	Technical Staff (TS)- SML Competent Person - SML	Assistant Engineer / Mechanical & Manufacturing Engineering/Mechanical
15	Dr. Noorfaizal Yidris	Technical Manager (TM) - ASL Approved Signatory- ASL	Senior Lecturer/ Aerospace Engineering/Mechanical
16	Mr. Mohd Safuan Othman@Ujang	Deputy Technical Manager (DTM)- ASL	Engineer/ Aerospace Engineering/Mechanical
17	Assoc. Prof. Ir. Dr. Faizal Mustapha	Deputy Technical Manager (DTM) – ASL Approved Signatory – ASL	Assoc. Prof. / Aerospace Engineering/Mechanical
18	Assoc. Prof. Dr. Rizal Zahari	Deputy Technical Manager (DTM) – ASL Approved Signatory – ASL	Assoc. Prof. / Aerospace Engineering/Mechanical
19	Dr. Dayang Laila Abang Abdul Majid	Deputy Technical Manager (DTM) – ASL Approved Signatory – ASL	Senior Lecturer / Aerospace Engineering/Mechanical
20	Assoc. Prof. Ir. Dr. Mohamed Thariq Hameed Sultan	Deputy Technical Manager (DTM) – ASL Approved Signatory – ASL	Senior Lecturer / Aerospace Engineering/Mechanical

21	Mr. Ahmad Saifol Abu Samah	Technical Staff (TS) - ASL Competent Person - ASL	Assistant Engineer / Aerospace Engineering/Mechanical
22	Mr. Muhamad Suhardi Ali	Technical Staff (TS) - ASL Competent Person - ASL	Assistant Engineer / Aerospace Engineering/Mechanical
23	Mr. Saffairus Salih	Technical Staff (TS) - ASL Competent Person - ASL	Assistant Engineer / Aerospace Engineering/Mechanical
24	Assoc. Prof. Ir. Dr. B.T Hang Tuah Baharudin	Technical Manager (TM) – MML Approved Signatory – MML	Assoc. Prof. / Mechanical & Manufacturing Engineering / Mass and Mass Related Calibration
25	Dr. Khairil Anas Md. Rezali	Deputy Technical Manager (DTM) – MML Approved Signatory – MML	Lecturer / Mechanical & Manufacturing Engineering / Mass and Mass Related Calibration
26	Ms. Normalina Jamaluddin	Deputy Technical Manager (DTM) – MML Competent Person - MML	Science Officer / Mechanical & Manufacturing Engineering / Mass and Mass Related Calibration
27	Mr. Zamzuri Zabidin	Competent Person - MML	Science Officer / Process & Food Engineering / Mass and Mass Related Calibration
28	Ms. Suhaili Othman	Competent Person - MML	Science Officer / Biological & Agricultural Engineering / Mass and Mass Related Calibration
29	Mrs. Azzlia Mohd Unaini	Deputy Technical Manager (DTM) – STL Competent Person - MML	Engineer / Civil Engineering / Mass and Mass Related Calibration, and Mechanical
30	Mr. Mohd Saiful Azuar Md. Isa	Technical Staff (TS) - MML Competent Person - MML	Assistant Engineer / Mechanical & Manufacturing Engineering / Mass and Mass Related Calibration
31	Mrs. Maslinda Abdullah	Technical Staff (TS) - MML Competent Person - MML	Assistant Engineer / Chemical & Environmental Engineering / Mass and Mass Related Calibration

32	Dr. Noor Azline Mohd Nasir	Technical Manager (TM) – CML Approved Signatory – CML	Senior Lecturer / Civil Engineering/Mechanical
33	Mrs. Ernaleza Mahsum	Deputy Technical Manager (DTM) – CML Approved Signatory – CML	Research Officer / Civil Engineering / Mechanical
34	Dr. Farah Nora Aznieta Abd Aziz	Technical Manager (TM) – STL Approved Signatory – STL	Senior Lecturer / Civil Engineering/ Mechanical
35	Dr. Izian Abd Karim	Deputy Technical Manager (DTM) – STL Approved Signatory – STL	Senior Lecturer / Civil Engineering/ Mechanical
36	Mr. Mohd Fairus Ismail	Technical Staff (TS) – CML & STL Competent Person - CML & STL	Assistant Engineer / Civil Engineering / Mechanical
37	Mr. Mohammad Haffis Hamid	Technical Staff (TS) – CML & STL Competent Person - CML & STL	Assistant Engineer / Civil Engineering / Construction Materials / Mechanical

* MCL - Material Characterization Laboratory

SML - Strength of Material Laboratory

ASL - Aerospace Structure Laboratory

MML - Mass Metrology Laboratory

CML - Construction Materials Laboratory

STL - Structure Laboratory

Updated: 01.03.2017

JOB DESCRIPTION

1.0 ROLES AND RESPONSIBILITIES OF QUALITY MANAGER

The Quality Manager is responsible and has the authority to ensure all quality matters which affect the FK and ensure that the Laboratory Quality Management (LQM) System are established, implemented and maintained according MS ISO/IEC 17025 and SAMM requirements. The responsibilities include:

- Develop, implement, monitor and maintain standards of performance and quality improvement of the Laboratory Quality Management (LQM) and all relevant documents in accordance with the MS ISO / IEC 17025 and SAMM requirements;
- Reviews and approve change to the LQM and other relevant documents;
- Approve relevant documents;
- Plan and prepare audit schedule, organize and coordinate internal audit;
- Manage non-conformances from internal and external audits findings and conduct corrective action, preventive action and procedures, consistent with Laboratory Quality Management System (LQMS);
- Approve report of internal and external audit findings;
- Responsible as Faculty of Engineering Management Representative (MR) to coordinate internal and external arrangements with Standards Malaysia or other related parties;
- Schedule, and prepare report for laboratory management review meeting and follow up;
- Coordinate the activities required to meet quality standards;
- Authorize temporary stoppage of the work/activity/process of the system, withholding of test report or calibration certificate, recalling of issued test report or calibration certificate and repeat the test or calibration or reject the result;
- Chairman of the committee meeting MS ISO/IEC 17025.

2.0 ROLES AND RESPONSIBILITIES OF DEPUTY QUALITY MANAGER

The Deputy Quality Manager shall assist Quality Manager in the followings function:

- Develop, implement, monitor and maintain standards of performance and quality improvement of the Laboratory Quality Manual(LQM) and all relevant documents in accordance with the MS ISO/IEC 17025 and SAMM requirements Plan and prepare audit schedule, organize and coordinate internal audit;
- Manage non-conformances from internal and external audits findings and conduct corrective action, preventive action and procedures, consistent with Laboratory Quality Management System (LQMS);
- Prepare report of internal and external audit findings;
- Prepare and/or review relevant;
- Coordinate internal and external arrangements with Standards Malaysia or other related parties;

- Schedule, initiate and prepare report for laboratory management review meeting and follow up;
- In the absence of the Quality Manager, the Deputy Quality Manager shall ensure full responsibility of his/her function in management and technical matters except authorize temporary stoppage of the work/activity/process of the system, withholding of test report or calibration certificate, recalling of issued test report or calibration certificate and repeat the test or calibration or reject the result;
- Assist and coordinate laboratory carry out their activities required to meet quality standards;
- Identify the occurrence of departures from the standard requirements and report to Quality Manager;
- Permanent member of the committee meeting MS ISO/IEC 17025.

3.0 ROLES AND RESPONSIBILITIES OF TECHNICAL MANAGER

The Technical Manager is responsible for implementing the LQMS according to MS ISO/IEC 17025 and SAMM requirements and ensuring all technical operations are performed. The functions include:

- Implement the technical management and operations including test methods, equipments operation and calibration of the respective lab;
- Ensure the provision of resources are adequate to make surethe required quality of laboratory operations including technical supervision of staff, coordination for integration and improvement of laboratory complied with MS ISO/IEC 17025 standard and SAMM requirements.;
- Ensure staffs are technically competence through relevant training.
- Initiate corrective, preventive action or improvement based on observation by DQM Technical;
- Authorize temporary stoppage of the work/activity/process of the respective laboratory, withholding of test report or calibration certificate, recalling of issued test report or calibration certificate and repeat the test or calibration or reject the result;
- Permanent member of the committee meeting MS ISO/IEC 17025.

4.0 ROLES AND RESPONSIBILITIES OF DEPUTY TECHNICAL MANAGER

The Deputy Technical Manager shall assist Technical Manager of his/her function:

- Implement the operations including test methods, equipments operation and calibration of the respective lab.;
- Ensure the provision of resources are adequate to make sure the required quality of laboratory operations including technical supervision of staff, coordination for integration and improvement of laboratory complied with MS ISO/IEC 17025 standardand SAMM requirements;
- Ensure staffs are technically competent through relevant training.
- Initiate corrective, preventive action or improvement based on observation by DQM Technical;
- In the absence of the Technical Manager, the Deputy Technical Manager shall ensure full responsibility of his/her function except authorize temporary stoppage of the work/activity/process of the system, withholding of test report or calibration certificate,

recalling of issued test report or calibration certificate and repeat the test or calibration or reject the result;

- Permanent member of the committee meeting MS ISO/IEC 17025.

5.0 ROLES AND RESPONSIBILITIES OF DOCUMENT CONTROL OFFICER

The Document Control Officer is responsible for:

- The operation and management of the Document Control System which applies to all documentation relating to MS ISO/IEC 17025 and SAMM requirements. This includes policies, procedures, guidelines, records, publications and external documents related to quality of test or calibration results for external consumption;
- Handwritten amendment of relevant document;
- Shred and dispose obsolete documents and keep an original copy in obsolete file.
- Distribute copy of document to copyholders;
- Update and manage content of Intranet System for MS ISO/IEC 17025;
- Assist adminstrative tasks related to MS ISO/IEC 17025;
- Permanent member of the committee meeting MS ISO/IEC 17025.

Updated: 22.04.2016

LIST OF COMPETENCE PERSONNEL RELATED TO EACH TEST AND CALIBRATION METHOD

NO.	LABORATORY	TEST METHOD	EQUIPMENT	COMPETENT PERSONEL	APPROVED SIGNATORY
1.	**Material Characterization Laboratory (MCL)**	**UPM/FK/MCL/TMD 1** Determination of Elements (Copper, Nickel and Zinc) in Surface Water Concentration Using Flame Atomic Absorption Spectrometer (APHA 3111B)	**Atomic Absorption Spectrometry (AAS)** • Model : ICE 300 Series • Serial No: SAA67183/SOO480728 • Manufacturer:Therma SCIENTIFIC • Maximum Capacity :	1) Mr. Joha Muhsidi Abdul Wahab 2) Ms. Nurhazirah Ismail	1) Mrs. Shafizah Masuri
2.	**Material Characterization Laboratory (MCL)**	**UPM/FK/MCL/TMD 6** Determination of Glass Transition Temperatures by Differential Scanning Calorimetry	**Differential Scanning Calorimetry (DSC)** • Model : DSC823^{e} • Serial No: SAA46520/SOO381722 • Manufacturer: METTLER TOLEDO • Maximum Capacity :	1) Mrs. Norhasliza Hasan 2) Mrs. Shafizah Masuri	1) Mrs. Shafizah Masuri 2) Dr. Dayang Radiah Awang Biak 3) Assoc. Prof Dr. Norhafizah Abdullah
3.	**Strength of Material Laboratory (SML)**	**UPM/FK/SML/TMD 3** Tension Testing of Metallic Materials (ASTM E8/E8M-15a)	**Universal Testing Machine (UTM)** • Model : 3366 • Serial No: Q9173 • Manufacturer: INSTRON	1) Mr. Muhammad Wildan Ilyas Mohamed Ghazali 2) Mr. Mazrul Hisham Mustafa Kamal	1) Prof. Ir. Dr. Barkawi Sahari 2) Dr. Eris Elianddy Supeni

			• Maximum Capacity : 10kN		
4.	**Aerospace Structure Laboratory (ASL)**	**UPM/FK/ASL/TMD 1** Fatique Test (ASTM e466-15)	**Material Test System Machine (MTS)** • Model : MTS 810 • Serial No: S1283902 • Manufacturer: MTS System Corporation • Maximum Capacity : 100kN	1) Mr. Ahmad Saifol Abu Samah 2) Mr. Mohd Suhardi Ali 3) Mr. Saffairus Salih	1) Dr. Noorfaizal Yidris 2) Assoc. Prof. Ir. Dr. Faizal Mustapha 3) Dr. Dayang Laila Abang Abdul Majid 4) Assoc. Prof. Dr. Rizal Zahari 5) Ir. Dr. Mohamed Thariq Hameed Sultan
5.	**Construction Material Laboratory (CML)**	**UPM/FK/CML/TMD 1** Concrete Compresson Test (BS EN 12390-3 :2009) / (MS EN 12390-3: 2012)	**Concrete Compression Test Machine** • Model : UTS 5000 kN • Serial No: C298/W50DCB-A080801 • Manufacturer: Unit Test Scientific Sdn. Bhd. • Maximum Capacity : 5000 kN	1) Mr. Mohd Fairus Ismail 2) Mr. Mohammad Haffis Hamid	1) Dr. Noor Azline Mohd Nasir 2) Mrs. Ernaleza Mahsum

6.	**Structure Laboratory (STL)**	**UPM/FK/STL/TMD 1** Steel Bar Tensile Test (BS EN ISO 6892-1)	**Universal Testing Machine** • Model : AMSLER HB1000 • Serial No: S00102333/ 170 • Manufacturer: ZwickRoell • Maximum Capacity : 1000kN	1) Mr. Mohammad Haffis Hamid 2) Mr. Mohd Fairus Ismail	1) Dr. Farah Nora Aznieta Abdul Aziz 2) Dr. Izian Abdul Karim
7.	**Mass Metrology Laboratory (MML)**	**UPM/FK/MML/TMD 1** Calibration of Standard Weight	**Comparator Balance** • Brand :Mettler Toledo • Model :XP56C • Maximum Load: 52 g • Readability :1 micro g • Weighing Range :1 mg - 50 g **Comparator Balance** • Brand :Mettler Toledo • Model :AX2005 • Max Load :2109 g • Readability :0.01 mg • Weighing Range :100 g - 2 kg	1) Mr. Zamzuri Zabidin 2) Mrs. Azzlia Mohd Unaini 3) Ms. Suhaili Othman 4) Mrs. Maslinda Abdullah 5) Mr. Mohd Saiful Azuar Md Isa 6) Ms. Normalina Jamaluddin	1) Assoc. Prof. Ir. Dr. B.T Hang Tuah Baharudin 2) Dr. Khairil Anas Md. Rezali

			Comparator Balance • Brand :Mettler Toledo • Model :XP10003S • Max Load :10100 g • Readability :1 mg • Weighing Range :1 kg - 10 kg **Standard Weight** • 1 Set of Class E2 :Master • 1 Set of Class E2 : Working • 1 Set of Class F1 :Swiss • 1 Set of Class F1 :China		
8.	**Mass Metrology Laboratory (MML)**	**UPM/FK/MML/TMD 2** Calibration of Balance	**Standard Weight** • 1 Set of Class E2 :Master • 1 Set of Class E2 : Working • 1 Set of Class F1 :Swiss • 1 Set of Class F1 :China	1) Mr. Zamzuri Zabidin 2) Mrs. Azzlia Mohd Unaini 3) Ms. Suhaili Othman 4) Mrs. Maslinda Abdullah 5) Mr. Mohd Saiful Azuar Md Isa 6) Ms. Normalina Jamaluddin	1) Assoc. Prof. Ir. Dr. B.T Hang Tuah Baharudin 2) Dr. Khairil Anas Md. Rezali

			Data Logger • Model :CENTER 342 • Serial Number : 100405309 • Capacity Range :-30 - 70 degC		