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APLMF

Guide 1

National Infrastructure for Legal Metrology

Date

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1 Foreword

The Asia-Pacific Legal Metrology Forum, APLMF comprises member economies of APEC and observer economies. Its mission is to promote the coordination and integrity of legal metrology activities and services in order to achieve greater harmony of measurement and testing within the Asia-Pacific Region and build mutual confidence in measurement between Members. One of its specific objectives is to facilitate the provision of cooperation and assistance in the development of the legal metrology infrastructure of members.

This document aims to address that specific objective. It was drafted initially by the APEC/APLMF Small Working Group on an APLMF Guide to developing a National Infrastructure for Legal Metrology, within the activities supported by APEC/APLMF project: APEC/APLMF Seminars and Training Courses in Legal Metrology (CTI 25/2007T), June 4-6, 2008, in Hangzhou city, PR China, where Workshops on Metrology in Food Safety, Agricultural Products and Product Safety took place.

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This document may be downloaded from the APLMF website in the form of PDF files. Additional information on APLMF publications may be obtained from the secretariat:

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2 Introduction

Considering the situation of member economies in the region, this guide is designed to provide an overview of a national infrastructure for legal metrology. OIML has already developed extensive documentation (refer to [OIML Publications](#)), some of which has been updated in recent times (for example, documents [D1](#) and [D9](#)) but some documents are in need of review.

This guide aims to make the OIML publications more accessible to member economies. It also includes information on some topics that have been developed but that have not yet been incorporated into OIML publications. In addition, it provides information on other topics that are under development.

In general, this guide points the reader to where more detailed information can be obtained.

This guide includes some comment on:

- Metrological infrastructure (control systems and traceability);
- Mutual recognition of type approval test results through the framework of OIML MAA or bi-lateral recognition arrangements;
- Conformity to type;
- Developments in pre-packaging;
- Enforcement strategy;
- Infra-technologies - quality control and accreditation systems that support legal metrology.

3 Terminology

Refer to the Vocabularies tab on the [OIML Publications](#) page of the OIML website. There are two vocabulary documents: [V 1 “International Vocabulary of Terms in Legal Metrology \(VIML\)”](#) and [V 2 “International Vocabulary of Metrology – Basic and General Concepts and Associated Terms \(VIM\)”](#).

3.1 Definitions

3.1.1 Issuing authority

(Definition from OIML B 10-1)

Certifying body or person in an OIML Member State or Corresponding Member that is responsible for national type approval and that issues Type Approval Certificates (see VIML 3.2) for specific categories of measuring instruments on the basis of examination and testing under its own control.

3.1.2 Type Approval

(Definition from VIML)

Decision of legal relevance, based on the evaluation report, that the type of a measuring instrument complies with the relevant statutory requirements and is suitable for use in the regulated area in such a way that it is expected to provide reliable measurement results over a defined period of time.

3.1.3 Metrological Traceability

(Definition from VIM, see VIM for Notes)

Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

3.1.4 Verification

(Definition from VIM, see VIM for Notes)

Provision of objective evidence that a given item fulfils specified requirements.

3.2 Abbreviations

OIML	International Organization of Legal Metrology
OIML MAA	OIML Mutual Acceptance Arrangement
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
ILAC MRA	ILAC Mutual Recognition Arrangement
BIPM	International Bureau of Weights and Measures

4 Scope of Legal Metrology

4.1 Definition of Legal Metrology

The International Vocabulary of terms in Legal Metrology (VIML) defines legal metrology as:

“part of metrology relating to activities which result from statutory requirements and concern measurement, units of measurement, measuring instruments and methods of measurement and which are performed by competent bodies

NOTES

1 The scope of legal metrology may be different from country to country.

2 The competent bodies responsible for legal metrology activities or part of these activities are usually called legal metrology services.”

In most economies this would mean that legal metrology embraces measurements and measuring instruments that are:

- used and in use for trade;
- used for regulatory purposes; and
- used for contractual purposes where a legal dispute is based on measurement.

In many economies, measurements for trade are defined to comprise measurements that determine the consideration of a transaction or a tax. Such measurements include measurements of the amount of product in a transaction as well as measurements of quality parameters of a product (such as grain protein and moisture measurements) that determine the consideration of the transaction. An example of a measurement in use to levy a tax is a measurement for the purpose of fuel excise payment.

Examples of regulatory measurements include traffic measurements of speed and breath alcohol content, measurements used to monitor the environment, and occupational health and safety measurements.

In many economies the requirements for traceability to primary standards of measurement (and thereby the SI system of units of measurement) is prescribed in legislation. Accordingly, where a dispute arises between two parties to a contract based on measurement and the dispute is dealt with by a court, the matter becomes legal metrology.

In summary, legal metrology concerns practical measurements made and used on a daily basis in the community. These measurements rely on the legal metrology infrastructure (metrological control systems and the legal traceability systems) embodied in the legislation of the economy.

4.2 Economic Benefits of Legal Metrology

Legal metrology bridges the two disciplines of metrology and the law. It aims to provide legal certainty to, and community confidence in, measurements, thereby minimising transaction and disputation costs and avoiding market failure. By this means legal metrology facilitates both national and international trade.

The economic benefits of legal metrology have been discussed in detail in the OIML Expert report E 2 “Benefits of Legal Metrology for the Economy and Society” (the [Birch Report](#)). It discusses the economic benefits under the headings:

- Reduced disputation and transaction costs
- Consumer protection
- Level playing field for commerce
- Effective stock control
- Control of fraud
- Full collection of government excise and taxes based on measurement
- Full national benefit for commodity exports
- Support of global trade in measuring instruments

- Increased compliance with regulatory requirements
- Sound evidential basis for the measurements
- Benefit/cost of metrology regulation can be greater than other policy options
- International Recommendations provide level playing field for sale of appropriate measuring instruments
- International Recommendations support global regulatory agreements

In summary, the economic benefits arise principally because legal metrology aims to remove the asymmetry of information between the trading parties, thereby providing greater transparency in transactions.

4.3 Social Benefits of Legal Metrology

The Birch Report points out that the benefits of legal metrology go beyond just economic benefits. While the economic savings associated with the social benefits can be very difficult to quantify, the savings associated with reduced injury and death can be very large indeed. The report discusses the social benefits of legal metrology under the headings:

- Support of a Civil Society
- Technological Education
- Reduction of deaths and injuries from accidents
- Improvement in the natural environment
- Improved health from standardisation of measurement and testing

For society, legal metrology provides confidence in measurements in areas related to health, safety, environmental monitoring, food safety, protection of consumer interests and law enforcement.

5 International Organization of Legal Metrology (OIML)

5.1 Role of OIML

The International Organization of Legal Metrology (OIML) is an intergovernmental treaty organization whose membership includes Member States, countries which participate actively in technical activities, and Corresponding Members, countries which join the OIML as observers. It was established in 1955 (see the Convention) in order to promote the global harmonization of legal metrology procedures. Since that time, the OIML has developed a worldwide technical structure that provides its Members with metrological guidelines for the elaboration of national and regional requirements for legal metrology applications regarding measuring instruments and packaging.

The OIML website contains details of the [Convention](#), the International Committee of Legal Metrology ([CICLM](#)) and the International Bureau of Legal Metrology ([BIPM](#))

5.2 OIML publications

A catalogue of [OIML publications](#) may be accessed on its website. These comprise recommendations (R), documents (D), vocabularies (V), basic publications (B), expert reports (E), guides (G) and seminar reports (S). The OIML recommendations are model regulations intended to be incorporated into the laws of member economies.

OIML also publishes a quarterly journal, the [OIML Bulletin](#). Issues from 1999 may be downloaded from the OIML website.

In addition to the published OIML recommendations, [committee drafts](#) of recommendations that are being developed or revised are available from the OIML website.

5.3 OIML basic certificates

The [OIML Certificate System](#) was introduced in 1991 to provide the possibility for a manufacturer to obtain an OIML Certificate and a Test Report indicating that a given instrument type complies with the requirements of the relevant OIML Recommendation.

OIML Certificates, now known as OIML *Basic* Certificates, may be accepted by national metrology services on a voluntary basis. This simplifies the type approval process for manufacturers and metrology authorities by eliminating costly duplication of application processes and approval testing. The details of the system are contained in OIML publication [B 3](#) (with amendment [B 3-Amend](#)).

Issuing authorities for OIML Basic Certificates need not have third party accreditation or peer review of their test facilities. Test reports by manufacturers for their own measuring instruments may be used by issuing authorities.

5.4 The OIML MAA

More recently, the OIML has developed a [Mutual Acceptance Arrangement \(MAA\)](#) which is related to OIML Type Evaluations. This Arrangement and its framework are defined in OIML [B 10-1](#) (with amendment [B 10-1-Amend](#)) and [B 10-2](#).

The implementation of the MAA began in January 2005 and currently covers measuring instruments related to OIML R 60 (Load cells), OIML R 76 (Non-automatic weighing instruments) and OIML R 49 (Water meters intended for the metering of cold potable water and hot water) – fields in which a large number of OIML Certificates of Conformity are issued.

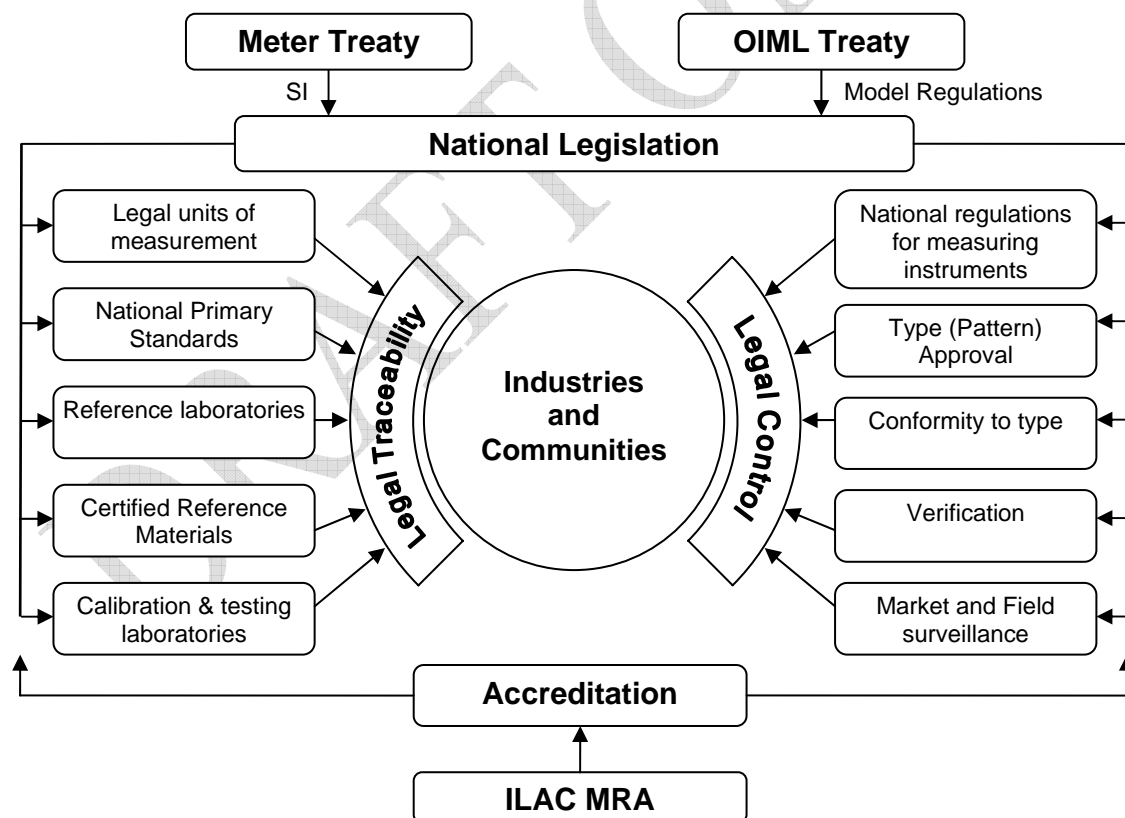
The aim of the MAA is for the participants to accept and utilize Tests Reports validated by an OIML Certificate of Conformity. To this end, participants in the MAA are either Issuing Participants or Utilizing Participants. Issuing Participants are Issuing Authorities which will issue OIML Certificates of Conformity under the MAA. Utilising Participants accept and utilise the Tests reports associated with these OIML Certificates to issue, for instance, national type approvals.

The MAA is a much more formal arrangement for issuing and utilising type approval test reports than the OIML Certificate System. For each category of measuring instrument, a Committees of Participation Review (CPR) is established. These have been established for the previously mentioned categories of measuring instruments and it is intended that the number of categories and corresponding committees will grow. There are comprehensive rules for the acceptance of issuing authorities into a CPR that include third-party accreditation or peer review of the member’s testing facilities. The use of manufacturer’s test results is not permitted.

6 National Legal Metrology Infrastructure

6.1 Legal Metrology Infrastructure Overview

The aim of a legal metrology infrastructure is to support community confidence in measurements for regulation or trade. It does this by ensuring that both regulatory and trade measurements are fit-for-purpose, thereby reducing transaction costs and, in the case of measurements made for trade, minimising the risk of market failure. The infrastructure comprises metrological control elements and traceability elements. These are shown in the diagram below.



6.2 Traceability Infrastructure

6.2.1 The Convention of the Metre

The 1875 Convention of the Metre created the International Bureau of Weights and Measures (BIPM), the General Conference on Weights and Measures (CGPM) and the International Committee for Weights and Measures (CIPM).

The Convention, modified slightly in 1921, remains the basis of international agreement on units of measurement. The Convention now has fifty-three Member States, including all the major industrialized countries.

6.2.2 Legal Units of Measurement

Each economy needs to prescribe national legal units of measurement. The units specified should be based on the SI units of measurement with possible additions that may be used in certain circumstances to facilitate international trade. The use of the units shall not cause ambiguity in measurements, in trading or in the labelling of pre-packages. It is usual to prescribe the SI units of measurement as national legal units of measurement together with a list of prefixes and rules for combining units with prefixes and other units of measurement.

6.2.3 National standards of measurement

In order to realise the national legal units of measurement, each economy prescribes that national primary and other standards are to be maintained by a nominated organisation. Often it is not possible for a single organisation within an economy to maintain primary standards of measurement for all legal units of measurement. For example the primary standard for radiation is often maintained by a separate organisation. Also, some economies may need to make legal provision to recognise overseas standards of measurement as the means of providing legal traceability for some of their national legal units of measurement.

6.2.4 Traceability pathways

The measurement legislation of an economy should prescribe pathways by which measurements made for trade or regulatory purposes may be shown to be traceable to the national primary standards of measurement or primary methods and thereby facilitate the provision of evidence in courts of law. The national metrological control system should ensure that measurements made for legal purposes are made by reference to, by comparison with, or by derivation from, the relevant national standards or references through established pathways. These pathways include appropriate primary methods of measurement, primary and reference standards of measurement, certified reference materials (CRMs) and certified measuring instruments.

The production, selection and use of the CRMs should be in accordance with relevant OIML, ISO or other international guidelines or regional guidelines. In general, CRMs should be produced by national metrology institutes or other accredited organizations for CRM production. Where traceability is established through the use of certified measuring instruments, the instruments should be certified by a competent body that has third-party accreditation by an ILAC signatory. All of the verifying or certifying

bodies should demonstrate competence through participation in proficiency testing programs.

6.3 Metrological Control System

6.3.1 National regulations for measuring instruments

Most economies are members or corresponding members of OIML. OIML develops international model regulations (known as recommendations) that are concerned with the tolerances within which legal measuring instruments should operate even when subjected to the application of influence factors such as temperature and humidity variations, line-borne and radiated electromagnetic interference and power supply variations. The intention is to replicate the real-life environment within which measuring instruments will need to operate and provide measurements within acceptable tolerances.

OIML Document [D1](#), “Elements for a Law on Metrology”, describes the types of measurement regulation that each economy will need to prescribe. In particular, each economy will need to prescribe national regulations for measuring instruments used for trade or regulation. These should be based on OIML recommendations that are freely available for download from the [OIML website](#) (see References). Signatories of the Convention on Legal Metrology are morally bound to adopt OIML recommendations as their national requirements for measuring instruments used for trade or regulatory purposes.

These recommendations are now being developed in three parts. The first part contains the specifications for the class of measuring instrument. The second part contains the tests to be undertaken to check that a measuring instrument design meets the specifications. The aim of this part is to minimise the risk of misinterpretation of the specifications. The third part contains the test report format. The aim of this part is to minimise the risk of misinterpretation of the tests themselves and to facilitate the acceptance of test results between economies.

The regulations of an economy also need to prescribe the power for the administering authority to undertake testing for type approval, grant approval to measuring instrument designs and certify measuring instrument of approved types. Traditionally each administering authority undertakes type approval testing. However, not all authorities have access to the necessary test facilities and approval test results may be accepted from an issuing authority under the OIML MAA or from another economy with which there is a mutual recognition arrangement.

Note, under the European Measurement Instrument Directive (MID), there are several options for type approval. One option is self declaration based upon a manufacturer’s quality system. This has the advantage for manufacturers of reducing approval costs and in principle the manufacturer’s quality system should provide the mechanism to ensure that production line measuring instruments also meet the requirements of the national regulations.

6.3.2 Type approval or conformity of type to national requirements

The aim of type (or pattern) approval is to test the quality of a measuring instrument design to ensure that an instrument of that design will retain its calibration for an appropriate period of time under conditions of use likely to be encountered in normal operation.

Type approval is the process of testing the design of a measuring instrument against the national regulations for that class of measuring instrument. Typically one or several instruments are tested by an approval authority to ensure that measurements do not vary by more than the maximum permissible error as influence quantities such as temperature, humidity and electromagnetic interference are varied through ranges specified in the national regulations.

The national regulations should make it an offence for a manufacturer to falsely represent that a class of measuring instrument has been approved or to falsely represent that a measuring instrument is in accordance with an approved type.

6.3.3 Conformity to type (CTT) of production instruments and systems

The aim of the legal metrology infrastructure and the associated type approval process is not only to ensure that an instrument that was submitted for testing by a manufacturer can meet the national regulations for a particular class of measuring instrument but that all production instruments of an approved type meet the regulations.

However, there have been many cases reported where production instruments have not conformed to the approved type. In these situations the application of legal sanctions can be a blunt instrument that can lead to undesirable consequences. For example the application of a fine or the withdrawal of an approval may have the unintended consequence of putting the supplier (manufacturer or importer) out of business thereby removing the possibility that the supplier could remedy the situation. This could mean that innocent traders who purchased instruments on the basis of their approval would not be able to use the instrument, nor would they be able to seek restitution.

A preferred approach is to introduce a program of surveillance that would minimise the risk of non-conformance. This could be based on the quality system of the manufacturer's production system and include a light level of sampling of production instruments to ensure that the quality of manufacture is being maintained. It would not be necessary to carry out full type approval testing of sampled instruments. It would be sufficient to test only those influence factors where the original approval testing revealed that non-conformity was most likely.

6.3.4 Initial verification or at installation

The aim of verification is to ensure that a measuring instrument used for legal purposes (regulation or trade) operates within the specified maximum permissible errors prior to initial usage and throughout its lifetime.

The International Vocabulary of Terms in Legal Metrology (VIML) defines verification as:

“2.13 verification of a measuring instrument.

procedure (other than type approval) which includes the examination and marking and/or issuing of a verification certificate, that ascertains and confirms that the measuring instrument complies with the statutory requirements.”

The legal metrology infrastructure of an economy should make provision for initial and subsequent verification of measuring instruments. While every measuring instrument used in legal metrology should be verified at, or prior, to installation, subsequent verification may be periodic, based on feedback from marketplace surveillance, or through appropriate sampling practices. Instruments that comply with statutory requirements and are verified should be suitably marked to indicate their status. The marking shall be removed in the event that the instrument is found unsatisfactory in giving reliable measurement results, or needs repairing or re-verification.

Verification is usually carried out by trade measurement inspectors or private organisations licensed for that activity. With the notable exception of utility meters, initial verification is usually undertaken at installation. The advent of electronic instruments has meant that at installation or in-field it is no longer feasible for trade measurement verifiers to carry out an evaluation of pattern conformity. They can usually only check the documentation or marking of the instrument and carry out a visual inspection and a calibration check.

6.3.5 Market surveillance

The legal metrology infrastructure of an economy should make provision to monitor the performance of measuring instruments in use to ascertain that they continue to comply with regulatory requirements during service, or to detect deviations at an early stage so that the instrument can be removed from service. Instruments that have been relocated, after repairing, or have been subjected to extreme external influence should undergo re-verification before being used.

Subject to the responsibilities stipulated in relevant regulations, verification or re-verification of instruments should be carried out by government inspectors or licensed verifiers. A licensed verifier is typically an organization with recognized expertise and a quality system under an established framework of accreditation, third party review or auditing. The organizations could be legal metrology institutes, private organizations or even the manufacturers of the instruments.

The auditing or review of the competence of licensed verifiers should be carried out at regular intervals and an audit schedule should be formulated by the auditing/reviewing body. Such schedule should be harmonised with relevant international practices or recommendations. The auditing/reviewing body should keep a list of competent verifiers of instruments for public reference.

Generally, the legal metrology framework of an economy should have provision for random auditing and verification of the measuring instruments used by traders to ensure that the instruments to be used comply with regulatory requirements. There should be appropriate corrective actions on the part of the trader in event that a non-conformance is identified, and follow-up action should be taken by the auditor(s) to ensure compliance before the measuring instruments can be released for use in the market. To ensure transparency, the authority and terms of reference of the authorized government organization should be defined in legislation.

The law enforcing body should maintain a database of verifications and audits and keep track of the performance of the measuring instruments of traders. Good practice would be to strengthen monitoring measures for traders with frequent non-conformance performance. The auditing body may consider making recommendations for traders to minimize failures of their measuring instruments.

The legal metrology framework should have provision that measuring instruments and pre-packages in the market are regularly audited and checked by authorized personnel to prevent market failure. Measuring instruments should perform the expected functions as marked on the instrument or declared by the user. Similarly pre-packages must comply with their labelled descriptions. The legal framework should include offences for any misrepresentation or false labelling, and appropriate sanctions should be taken against such transgressions.

In the case of utility meters, the large number of meters installed means that individual auditing of meters is not practicable. However a system should be put in place to ensure that utility meters in use in the field conform to their prescribed performance. The legal metrology framework should have provision for in-field statistical sampling and auditing of utility meters. Such auditing should be carried out by authorized organizations on a planned schedule and should cover all utility meters controlled under the regulations. The auditing should also be carried out under special circumstances such as complaints or when the performance of the meters is in doubt.

In general, the testing laboratory responsible for verifying utility meters should be accredited under a quality system in compliance with the ISO/IEC 17025; measurement standards used for verifying instruments should be traceable to the national legal units of measurement with appropriate uncertainties.

6.4 Infra-technologies

Tassey [1] has introduced the term infra-technologies to describe:

“a varied set of technical tools that includes measurement and test methods, artefacts such as standard reference materials that allow these methods to be used efficiently, scientific and engineering data bases, process models and the technical basis for both physical and functional interfaces between components of systems technologies such as factory automation and communications.”

In the context of this document, the term is used to embrace all of the accreditation and quality system processes, test procedures and skills development necessary to support the national legal metrology infrastructure.

6.4.1 Accreditation of type approval laboratories

OIML advises that national authorities carrying out type approval should be accredited by an ILAC MRA signatory to ISO/IEC Guide 65. This is to provide confidence amongst stakeholders that the full approval procedure has been carried out according to the national regulations.

Where a laboratory is carrying out type approval testing on behalf of an approval authority, it is recommended that the laboratory be accredited by an ILAC MRA signatory to ISO/IEC 17025 in order to provide confidence in the test results. In this regard, the OIML Mutual Acceptance Arrangement (MAA) requires that issuing authorities are accredited to ISO/IEC Guide 65 or peer reviewed in order to provide confidence in the test results amongst accepting authorities.

6.4.2 Accreditation of verifying authorities of standards of measurement

The standards used by government inspectors or licensed private verifiers for the verification or re-verification of trade or legal measuring instruments need to be verified (calibrated). This verification needs to be carried out in a traceable manner and with an uncertainty that is suitable for the intended use of the standards.

The laboratories that verify these standards are usually appointed under the national legislation for that purpose and one of the conditions of appointment should be accreditation to ISO/IEC 17025 for that purpose. The laboratory is empowered to issue certificates of verification under the national legislation that will be accepted in a court of law as evidence of the information contained in them.

6.4.3 National instrument test procedures

To ensure that both government and private verifiers carry out the verification of measuring instruments correctly and in a consistent manner, it is recommended that each economy prepare national test procedures for measuring instrument verification. Suitable procedures are available from several member economies.

6.4.4 Quality systems for licensed verifiers

Many private companies that are licensed to carry out verifications of measuring instruments used for trade will already have a quality system that has been accredited by an ILAC signatory. However, other private sector applicants for the verification of measuring instruments may be sole traders or small companies that cannot afford the accreditation costs. In these circumstances the national authority may accept a lesser quality system that is audited by a government inspector suitably trained for that activity.

6.4.5 Training and competence assessment

Both government inspectors and private sector verifiers of measuring instruments will need training in the use of the national test procedures. Each economy may develop such training independently or take advantage of APLMF training provided from time to time at various venues within the region. It is recommended that economies introduce assessment of competence following such training. Assessment procedures are available from several APLMF economies.

6.5 Public Measurement Services (public weighbridges)

Public weighbridges are high capacity weighing devices used by the public, typically for weighing vehicles or livestock. National regulations are needed to control the requirements and issue of licenses for operators of public weighbridges. The authorised government organisation should maintain a register of public weighbridge licenses.

The aim of the regulations is to avoid conditions that may lead to incorrect use or fraud. To this end, the regulations also need to prescribe requirements for the weighbridge (relating to location, installation and pits), for their use and for the presentation the result (ticket).

6.6 Metrological control of pre-packages

Metrological control of pre-packages is needed to prescribe and control labelling requirements and package quantities.

In October 2006, OIML held a seminar on the role of prepackaging in international trade. Whereas in the past most international food trade was in bulk commodities, today the majority of international trade is in prepackaged goods.

The seminar provided guidance for OIML Technical Committee TC6 on packaging on how to proceed with the development of an international mark (equivalent to the European e-mark). It also requested TC6 to revise [OIML R 79](#) on labelling to consider exemptions for marking wine bottles on the principal display panel and to revise the recommendation on measuring container bottles.

6.6.1 Methods for determining the quantity contained by pre-packages

There are several methods of determining the quantity of product in a package. The two most common are the average quantity system (AQS) and the minimum (or marked) quantity system.

- The minimum quantity system provides for no shortfall in the quantity contained in packages of the same kind and stated quantity. This method, and variants of it, may be used by inspectors in the marketplace to check for short measure.
- The AQS is an internationally agreed method for determining the measurement of packaged goods with constant nominal content. It provides

for the confirmation of goods sold by weight, measure or number by utilising sampling standards based on those developed by the OIML and contained in recommendation [R 87, “Quantity of product in prepackages”](#). It is intended to be used in large scale packaging plants where goods (e.g., breakfast cereals) are packed in the same quantity in large numbers.

6.6.2 International or regional mark

Sometimes both systems are used together in order to allow inspectors to check in retail stores and still allow packers to use AQS for large-scale production including exports. However, if an inspector were to check a single package packed under AQS in a supermarket, the package could possibly fail the minimum quantity requirements. Therefore where the two systems are used together, there should be a mark to indicate which system is being used. In Europe an “e-mark” is used to indicate that the AQS system has been used and such packages can only be checked at the packing house or a storage facility where a sufficient number of packages is available.

OIML Technical Committee TC6 is currently developing requirements for use of an equivalent international mark.

6.6.3 Unit pricing and standardised package sizes

In the past most economies had standardised sizes for prepackaged goods. This allowed consumers to make meaningful price comparisons. However, with the advent of unit pricing on supermarket shelves, this is no longer necessary. This type of unit pricing should not be confused with the unit price required to be marked on random weight packages, for example in supermarket delicatessens.

7 National Legislation

7.1 Role of legislation

In his presentation to the OIML 2007 Seminar on D 1, “Elements for a Law on Metrology”, John Birch noted that:-

“Metrology legislation is central to the development of a metrology system. In developing or revising measurement legislation the following features of measurement legislation need to be taken into account.

1. It ensures the consistency of measurements by giving legal standing to the national standards and units of measurement, and requires all measurements used for legal purposes to be traceable to these national standards and only legal units to be used.
2. By providing a legal definition of traceability and by certifying working standards it provides a sound evidential basis for measurements. This is essential for the effective operation of trade measurement enforcement and has become increasingly important with legal challenges to regulatory requirements based on measurement, particularly traffic speed measurement, breathalyzers and

environmental measurements. It avoids the difficulties that can be encountered when lawyers in court cases attempt to define the meaning of measurements i.e. “lawyers’ metrology” rather than legal metrology.

3. By having well defined requirements and an enforcement mechanism, it minimizes fraud in transactions based on measurements.
4. Legislation and enforcement will also provide trust and confidence in measurements, which will significantly reduce transaction costs and contribute to the social capital and maintenance of a civil society. The Nobel economic Laureate Kenneth Arrow stated [#]:

‘Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence.’

5. The legislative requirement for traceability, together with certification of working standards, can provide an effective mechanism for overcoming fragmentation of the measurement system and coordinating the measurement activities of regulatory authorities.
6. Legislation also defines the commitment of government to the metrology system. Generally this is a more durable commitment than policy, however it does need to be supported by evidence of the utility of the metrology system.
7. Legislation can unify the national measurement system and contribute to the development of a global measurement system.”

In summary, national legal metrology authorities can provide a sound evidential basis for trade and regulatory measurements by providing for the verification and certification of standards of measurement, measuring instruments and reference materials under national measurement legislation. Such certification provides legal traceability, without which measurements may be incorrectly interpreted by the courts using such rules as the English common law “presumption of accuracy of notoriously accurate scientific instruments”.

7.2 Scope of legislation

The major elements of measurement legislation are listed below.

7.2.1 Prescription of units of measurement

- Based on SI System of units. Refer to [BIPM SI Brochure](#) for details.
- Maintained and developed under the Treaty of the Metre.

7.2.2 Standards of measurement

- Hierarchy of standards of measurement: Primary, Secondary, Reference, etc.
- Inspectors (trade measurement) standards of measurement
- Accuracy of standards of measurement expressed as maximum permissible uncertainty.
- Requirements for verification certificates for standards of measurement.

7.2.3 Traceability

- Requirement that measurement for a legal purpose must be traceable.
- Specification of traceability pathways to national legal units of measurement (based on SI) by means of various national standards of measurement.
- Requirements for appointment of private bodies to verify standards of measurement for legal purposes (verifying authorities)

7.2.4 Type (pattern) approval for trade (and regulatory) measuring instruments

- Specification of testing, approval and certification requirements.
- Appointment of approval authorities.
- Requirements for conformity to type.

7.2.5 Traditional trade measurement provisions

- Definition of “in use for trade” to embrace quality measurements, excise and freight.
- Requirements for initial verification and re-verification.
- Field surveillance (in-service inspection).
- Trade measurement offences.
- Prescribe certain articles must be sold by measurement (meat, alcohol)
- Appointment of private licensees for verification of measuring instruments.
- Appointment of public weighbridge licensees.

7.2.6 Trade measurement inspectors

- Appointment, qualifications and identification of inspectors.
- Powers, responsibilities and obligations of inspectors – powers of entry, search and seizure.

7.2.7 Trade measurement sanctions

- Education and warnings.
- Infringement notices.
- Strict liability offences.
- Fault element offences.
- Enforceable undertakings.

7.2.8 Provisions for pre-packages

- Shortfall offences.
- AQS (OIML R 87)
- Other systems (e.g. minimum quantity) if appropriate.
- Labelling requirements (OIML R 79)

7.3 Modernisation of legislation

- Developments to embrace MAA and statistical control
 - Pattern (type) approval and trade measurement sufficiently broad to allow acceptance of MAA test results for pattern approval
 - Statistical in-service inspection of utility meters
 - Statistical validation of overseas initial verifications of utility meters.

8 References

8.1 Publications

1. Gregory Tassej, *The Roles of Standards as Technology Infrastructure*, NIST, October 1993, 12 pages.

8.2 Web Links

Web Pages	
OIML Website	http://oiml.org/
OIML Publications Catalogue	http://oiml.org/publications/
OIML Bulletin	http://oiml.org/bulletin/
OIML Introduction and Structures (CIML)	http://oiml.org/about/presentation.html
OIML Committee Drafts	http://www.oiml.org/download/cds.html
BIML (International Bureau of Legal Metrology)	http://oiml.org/about/biml.html
OIML <i>Basic</i> Certificate System	http://www.oiml.org/certificates/
OIML MAA (Mutual Acceptance Arrangement)	http://www.oiml.org/maa/
ILAC - International Laboratory Accreditation Cooperation	http://www.ilac.org/
ISO –International Organization for Standardization	http://www.iso.org/
IEC - International Electrotechnical Commission	http://www.iec.ch/
BIPM, SI Brochure	http://www.bipm.org/en/si/si_brochure/

Selected OIML Publications

Note: These links are provided for ready access, but are subject to change as publications are revised. Refer to the OIML web page for latest revisions.

B 1	OIML Convention	http://www.oiml.org/publications/B/B001-e55.pdf
B 3	OIML Certificate System for Measuring Instruments	http://oiml.org/publications/B/B003-e03.pdf http://oiml.org/publications/B/B003-Amend-e06.pdf
B 10-1	Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations (MAA)	http://oiml.org/publications/B/B010-1-e04.pdf http://oiml.org/publications/B/B010-1-Amend-e06.pdf
B 10-2	Checklists for Issuing Authorities and Testing Laboratories carrying out OIML Type Evaluations	http://oiml.org/publications/B/B010-2-e04.pdf
D 1	Elements for a Law on	http://oiml.org/publications/D/D001-e04.pdf

	Metrology	
D 9	Principles of metrological supervision	http://oiml.org/publications/D/D009-e04.pdf
E 2	The Birch Report	http://www.oiml.org/publications/birch_study.html
R 87	Quantity of product in prepackages	http://oiml.org/publications/R/R087-e04.pdf
R 79	Labeling requirements for prepackaged products	http://oiml.org/publications/R/R079-e97.pdf
V 1	International vocabulary of terms in legal metrology (VIML)	http://oiml.org/publications/V/V001-ef00.pdf
V 2	International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM)	http://oiml.org/publications/V/V002-200-e07.pdf

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