National Measurement Office

WEIGHTS AND MEASURES

The Measuring Instruments (Liquid Fuels delivered from Road Tankers) Regulations 2006 (S.I. 2006 No. 1269)

as amended by

The Measuring Instruments (Amendment) Regulations 2010 (SI 2010 No. 2881)

The Measuring Equipment (Liquid Fuel delivered from Road Tankers) Regulations 1983 (S.I. 1983 No. 1390)

Guidance on Regulation

February 2012

Version 1

BIS Department for Business Innovation & Skills

Summary

This guidance covers all meter measuring systems in use for trade. **Part 1** of this document covers meter measuring systems covered by the Measuring Instruments Directive (MID) i.e. those put on the market on or after 1st October 2006. **Part 2** covers meter measuring systems under national control i.e. before the MID came into force and during the transitional period.

Nothing in this guidance should be construed as overriding, amending or deferring safety regulations and requirements issued by the Health and Safety Executive (in Northern Ireland the Health and Safety Executive for Northern Ireland), in connection with the conduct of persons and the condition and use of machinery and equipment on any premises.

The guidance is addressed to organisations that are required to comply with weights and measures law. Following the guidance is not in itself obligatory but, if you do follow it, this should help your organisation to meet its legal obligations.

Ultimately, only the courts can provide a definitive interpretation of the law. However, for further guidance on how to comply with the law, you can contact your local authority trading standards department who provide this service free of charge:
http://www.tradingstandards.gov.uk/advice/index.cfm - simply type in your postcode and press “go".

This guidance complies with the Government Code of Practice on Guidance and will be reviewed in October 2016.

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Revision History

Version number and date of change	Sections affected
Version 1	First issued February 2012 Updates existing guidance on 2006 MID Regulations (now Part 1) to comply with the BRE “Code of Practice on Guidance on Regulation” and has been expanded in Part 2 to cover the guidance on the Measuring Equipment (Liquid Fuel delivered from Road Tankers) Regulations 1983 (S.I. 1983 No. 1390)

Part 1: The Measuring Instruments (Liquid Fuels delivered from Road Tankers) Regulations 2006 (S.I. 2006 No. 1269), as amended by the Measuring Instruments (Amendment) Regulations 2010 (SI 2010 No. 2881) [Pages 4 to 30]

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Part 1: The Measuring Instruments (Liquid Fuels delivered from Road Tankers) Regulations 2006 (S.I. 2006 No. 1269), as amended by the Measuring Instruments (Amendment) Regulations 2010 (SI 2010 No. 2881)

1.1 FOREWORD

1.1.1 The Measuring Instruments (Liquid Fuel delivered from Road Tankers) Regulations 2006, SI 2006/1269, ("the Regulations"), as amended by the Measuring Instruments (Amendment) Regulations 2010, SI 2010/2881 ("the Amendment Regulations") implement Council Directive 2004/22/EC ("the Directive"), as amended by Commission Directive 2009/137/EC[1] ("the Amendment Directive"), in relation to the class of measuring instruments for liquid fuel delivered from road tankers within the category of measuring systems for continuous and dynamic measurement of quantities of liquids other than water ("meter measuring systems") covered by the Directive. The Regulations, as amended, provide for the harmonisation of laws on measuring systems on road tankers for liquids of low viscosity within Member States, thereby creating a single market for them.

1.1.2 Separate measuring instrument regulations have been made to implement each of the instrument types prescribed in the UK under the Directive. They have been written so that for each type of instrument (measure) their field of application and in-service control mirror the scope of regulations made previously under the Weights and Measures Act 1985 and the Weights and Measures (Northern Ireland) Order 1981. A further regulation relates to instruments covered by the Directive but not regulated within the UK[2]. This regulation provides a means by which UK manufacturers can be permitted to undertake conformity assessment procedures on these instruments. This will allow them to export to other Member States where the particular instruments are regulated.

1.1.3 There is also a distinction between measures relating to the measuring instruments when they are first placed on the market or put into use (which are governed by the Directive, as amended) and the in-service provisions which are derived from existing national provisions. The Regulations, as amended, therefore apply both at the point at which the instrument is placed on the market and in-service testing and subsequent repair and re-qualification.

1.1.4 This guidance covers the above Regulations as amended and the Amendment Regulations.

1.1.5 The Regulations came into force on 30 October 2006 after which date new designs of meter measuring systems placed on the market must comply with their provisions. The provisions of the Amendment Regulations must also be complied with from 1 June 2011 when they come into force. This guidance is intended to assist manufacturers, notified bodies and enforcement authorities in meeting the requirements of the Regulations.

[1] Commission Directive 2009/137/EC of the European Parliament and of the Council on measuring instruments in respect of exploitation of the maximum permissible errors, as regards the instrument-specific annexes MI-001 to MI-005

[2] The Measuring Instruments (Non-Prescribed Instruments) Regulations 2006 (S.I. 2006 No 1270) as amended by The Measuring Instruments (Amendment) Regulations 2006 (S.I. 2006 No 2625)

1.1.6 A similar system of approval and verification of instruments has been operating successfully for several years for non-automatic weighing instruments (NAWI) and manufacturers have benefited enormously from its introduction, through savings in costs on both approvals and verification, and through the widening of an easily accessible market. This should also be the case with the new Regulations.

1.1.7 There is significant input from WELMEC, the European Co-operation in Legal Metrology, to the understanding and interpretation of the Directive. WELMEC has already convened a number of working groups for this purpose, and the UK participates in WG10 on measuring equipment for liquids other than water. WELMEC considers questions of application and implementation, particularly in areas of technical uncertainty and acts as a forum for seeking advice from the European Commission on common issues. Information regarding WELMEC and its decisions and publications can be found at: www.welmec.org.

1.2 BACKGROUND

1.2.1 The Directive is a “New Approach” Directive and was adopted by the EC Council of Ministers and European Parliament in April 2004. It consists of 27 Articles, 14 annexes and 10 instrument specific annexes. Member States were required to implement the provisions of the Directive into their national law by 30 April 2006 and to apply the new legislation with effect from 30 October 2006.

1.2.2 The Directive extends to all measuring instruments listed in Article 1 of the Directive and provides that Member States may prescribe use of them for measuring tasks for reasons of public interest, public health, public safety, public order, protection of the environment, protection of consumers, levying of taxes and duties and fair trading where they consider it justified. Following a public consultation, it was decided that the UK prescription should apply to areas covered by existing regulations only.

1.2.3 The Directive is the second "New Approach" Directive adopted in respect of measuring instruments. The first was Directive 2009/23/EC (formerly 90/384/EEC) and relates to non-automatic weighing instruments and came fully into force in January 2003.

1.2.4 The Commission has issued guidance on “New approach” directives “Guidance on the implementation of directives based on the New and Global Approach” which can be found at :

http://ec.europa.eu/enterprise/policies/single-market-goods/files/blue-guide/guidepublic_en.pdf

1.2.5 The principals of the “New approach” are set out in the Commission Guidance as follows:

- Harmonisation is limited to essential requirements**.**
- Only products fulfilling the essential requirements may be placed on the market and put into use.
- Harmonised standards, the reference numbers of which have been published in the Official Journal and which have been transposed into national standards, are presumed to conform to the corresponding essential requirements.
- Normative documents drawn up by OIML and the list of the parts thereof corresponding to the essential requirements (in conformity with Article 16.1 of the Directive for which the Commission has published the references in the Official Journal.

- Application of harmonised standards or other technical specifications remain voluntary, and manufacturers are free to choose any technical solution that provides compliance with the essential requirements.
- Manufacturers may choose between different conformity assessment procedures provided for in the applicable directive.

1.2.6 The "New Approach" to Technical Harmonisation is an important part of the process for achieving the single market. It is intended to remove the technical barriers to trade caused by differing national laws. Directives agreed under the New Approach allow for the free movement, (placing on the market and putting into service) in the Community of goods that conform to the essential and other requirements of those Directives. Such products carry the "CE marking", and no Member State is allowed to refuse complying products access to its market. In this case all instruments covered by the Directive (as amended by Amendment Directive) have free movement throughout the Community.

1.2.7 The Amendment Directive was agreed on 10 November 2009 and entered into force on 1 December 2009. Member States were required to implement the Amendment Directive into their national law by 1 December 2010[3] and to apply the new legislation with effect from 1 June 2011.

1.2.8 Regulation 4 of the Amendment Regulations implements the Amendment Directive in respect of road tanker meter measuring systems for liquid fuel by amending the essential requirements so as to explicitly prohibit systematic exploitation of these instruments.

1.2.9 In the Regulations, as amended, it is important to distinguish between when instruments are first placed on the market or put into use and requirements that relate to in-service provisions. The first are requirements of the Directive, as amended; the second are national provisions and will therefore apply only to Great Britain.

1.2.10 The Directive provides an 'optionality clause'. This means that Member States may prescribe the category and range of applications for measuring instruments they wish to control. This will lead to a variation between Member States which will mean that for the same use, instruments in some Member States will be regulated, whereas in other Member States they will not.

1.3 PART 1 – PRELIMINARY

1.3.1 The Regulations, as amended, have been made using powers under the European Communities Act 1972 and, in relation to Part III, the Weights and Measures Act 1985. The Regulations, as amended, also extend to Northern Ireland except for Part III. Separate in-service regulations for Northern Ireland are covered by the Measuring Instruments (Liquid Fuel by Road Tanker) (Use for Trade) Regulations (Northern Ireland) 2007 (SR 2007/388).

CITATION AND COMMENCEMENT

Regulation 1

1.3.2 This gives the title of the regulations and states the coming into force dates of 30 May 2006 for the regulations listed in Regulation 1(2) relating to the designation of

[3] The Amendment Directive was implemented into UK law on 2 December 2010.

notified bodies for the purpose of the Regulations and 30 October 2006 for the remaining regulations.

1.3.3 Regulation 1 of the Amendment Regulations gives the title and coming into force date of 1 June 2011 of the changes to the Regulations.

INTERPRETATION

Regulation 2

1.3.4 The following definitions are important to consider if we are to understand the regulations.

- **Manufacturer** – This term means the person responsible for the conformity of a meter measuring system with the Regulations with a view to either placing it on the market under his own name or putting it into use for his own purposes, or both.

- **Authorised representative** - The manufacturer may appoint any natural or legal person to act on his behalf as an authorised representative. The authorised representative must be established in a Member State. The authorised representative must be authorised by the manufacturer in writing to act on his behalf. The manufacturer remains generally responsible for actions carried out by an authorised representative on his behalf.

- **Approved verifier** - This is a term used in Regulation 22, and means a person approved pursuant to section 11(A)(1) of the Weights and Measures Act 1985 (in Northern Ireland Article 9(3B) of the Weights and Measures (NI) Order 1981).

- **Inspector** – This is the term used in Regulation 21 and means an inspector of weights and measures appointed under section 72(1) of the Weights and Measures Act 1985 (in Northern Ireland Article 40 of the Weights and Measures (NI) Order 1981).

- **Importer/person responsible for placing on the market -** An importer (a person responsible for placing on the market), for the purposes of the Directive, is any natural or legal person established in the Community who places a product from a third country on the Community market. The importer must ensure that he is able to provide the market surveillance authority with the necessary information regarding the product, where the manufacturer is not established in the Community, and has no authorised representative in the Community. In line with Schedule 1 of the Interpretation Act 1978 a person includes a body of persons corporate or unincorporated in that it applies to both a natural or a legal person.

- **Notified Body** - This means:
  (a) the Secretary of State i.e. National Measurement Office (NMO) Services; or
  (b) a person designated under regulation 4;
  and who has been notified to the Commission and the other Member States pursuant to Article 11.1.

1.3.5 At the time of drafting this guidance the bi-lateral agreement between Switzerland and the European Community has not been amended to include the Measuring Instruments Directive. It is expected that this amendment will be made in due course.

APPLICATION

Regulation 3(1)

1.3.6 These regulations apply to meter measuring systems in use for trade, as defined in section 7 of the Weights and Measures Act 1985 (in Northern Ireland Article 5 of the Weights and Measures (NI) Order 1981), which have been first placed on the market or put into service on or after the 30 October 2006. The Regulations have similar in-service provisions to those included in the existing regulations insofar as they are consistent with the Directive.

1.3.7 Whereas the 1983 regulations permitted sales for trade use in volume only, the Regulations now additionally permit trade sales in mass. All weighing machines were prescribed by The Weights and Measures Regulations 1963 (in Northern Ireland the Weights and Measures Regulations (Northern Ireland) 1967 and this included any instruments indicating mass units such as mass flow instruments. To rationalise the situation and maintain the status quo, the Regulations cover meter measuring systems making continuous and dynamic measurement of liquid fuel in a quantity greater than 100 kilograms. Although with most liquids 100 litres is not equal to 100 kilograms, it was decided to use this nominal value as the actual equivalent mass of 100 litres would be different for different fuels. The minimum volume measured is still 100 L and the minimum mass has been set at 100 kg for convenience.

Exclusions

Regulations 3(2) and 3(3)

1.3.8 These regulations do not apply to a meter measuring system which was first passed as fit for use for trade and stamped under the following regulations in respect of which a certificate of approval granted before 30 October 2006 is still in force:

- The Measuring Equipment (Liquid Fuel Delivered From Road Tankers) Regulations 1983
- Council directives 71/319/EEC, 71/348/EEC & 77/313/EEC as amended by 82/625/EEC.

1.3.9 A certificate of approval referred to in Regulation 3(2) or 3(3) and any authorised modification to that certificate shall have the effect that existing certificates of approval, issued under the above legal instruments, will remain valid until the date on which they expire but no later than 29 October 2016, and may be modified up to the date of expiry.

1.3.10 Thus, tankers may be built and stamped under these certificates until the certificates expire. A tanker may continue to be used indefinitely provided it complies with the expired certificate.

Regulations 3(4) and 3(5)

1.3.11 These Regulations do not apply to meter measuring systems that are used:

- to measure liquefied gases, e.g. LPG, LNG, lubricating oils, cryogenic liquid fuels (<153°C) and heavy liquid fuels (dynamic viscosity >100 mPa.s at 15°C) because of the technical problems associated with their measurement and control.

N.B. The 1983 Regulations' limit on (kinematic) viscosity was 100 mm^2/171s at 15°C. Kinematic viscosity = dynamic viscosity/density so the

two are numerically equal only for liquids of unit density. The threshold of 100 mPa.s has been set for convenience.

- in the refuelling of aircraft, ships or hovercraft because these operations are monitored by the parties concerned and because of access difficulties caused by security precautions at air- and sea-ports.

Regulation 3(6)

1.3.12 Meter measuring systems not in conformity with the Regulations may be displayed or presented at a trade fair, exhibition or demonstration if they are clearly marked to indicate that they are not compliant with the essential requirements of the Regulations and cannot be acquired or used until they have been made to comply by the manufacturer.

1.4 PART II - PLACING ON THE MARKET AND PUTTING INTO USE OF METER MEASURING SYSTEMS

1.4.1 Placing on the market and putting into use are defined in Regulation 2. Placing on the market means that a new type is made available for sale for the first time in a Member State. In order to be placed on the market, the type will need to have passed the appropriate conformity assessment module(s). Conformity assessment is undertaken by notified bodies. Before the instrument is first put into use by an end user, the instrument must be initially verified and stamped by a notified body. This could be a different notified body from that which undertook the conformity assessment.

REQUIREMENTS FOR PLACING ON THE MARKET AND PUTTING INTO USE

Regulation 4(1)

1.4.2 This regulation makes it an offence to place on the market or put into use an instrument to which the Regulations apply unless it:

a. Meets the essential requirements,
b. Has demonstrated conformity with these essential requirements and
c. Carries the CE marking, M marking and identification number of the notified body which carried out the conformity assessment.

1.4.3 In Regulation 4(1)(b), “its” refers to “the instrument’s”.

1.4.4 The terms placing on the market and putting into use are defined in the regulations and originate from the Directive. The requirements of Regulation 4(1) apply only to when instruments are first placed on the market or put into use. Any subsequent re-qualification is addressed by Part IV of the regulations.

1.4.5 It should be remembered that it is intended these regulations apply only to meter measuring systems that are being used for trade as defined in Section 7 of the Weights and Measures Act 1985 (in Northern Ireland Article 5 of the Weights and Measures (NI) Order 1981). This applies to instruments when they are first placed on the market or re-qualified.

COMPLIANCE WITH THE ESSENTIAL REQUIREMENTS

Regulation (5)(1)

1.4.6 Manufacturers can use more than one method to demonstrate compliance with the essential requirements. Regulation 5(1) lists some of these methods:-

a. using any technical solution that complies with the essential requirements;

b. correctly applying solutions set out in the relevant national standard; or

c. correctly applying solutions set out in the relevant normative document,

and selecting and following one of the conformity assessment procedures referred to in regulation 6.

Regulation 5(2)

1.4.7 This includes the presumption that instruments which conform fully or in part to relevant national standards or normative documents will be presumed to conform fully or in part to the essential requirements. Relevant national standards and normative documents for this purpose will be published by NMO, or the competent authority in another Member State. Normative documents for meter measuring systems identified by the Commission are published on the NMO website and can be found at: **http://www.bis.gov.uk/nmo**. Currently no harmonised standards exist in this field.

1.4.8 The appropriate OIML Recommendation for meter measuring systems is Recommendation R117 (Edition 1995), which can be found on the OIML web site at http://www.oiml.org.

1.4.9 Where conformity is only in part to relevant national standards or normative documents then either alternative, where available, should be used to give full conformity or other technical solutions should be provided. Other technical solutions could include the use of European standards that are not harmonised standards and international standards such as OIML Recommendations that are not normative documents.

Regulation 5(4)

1.4.10 Provides for ***devices*** which do not meet the essential requirements and which are not in use for trade. These may be connected to a meter measuring system without affecting the conformity of the instrument to the essential requirements. Such devices may not display or contain legal data because they would then be in use for trade and would have to meet the essential requirements. This could for example be printers or data storage devices for management purposes only. These devices are likely to carry their own CE marking under directives other than 2004/22/EC.

CONFORMITY ASSESSMENT PROCEDURES

Regulation 6(1)

1.4.11 The different conformity assessment procedures available to manufacturers are set out as modules in the annexes of the Directive. These are numbered A to H1. The options available to manufacturers for meter measuring systems are as follows:

B+D	B+F	G	H1
•	•	•	•

The options above represent:

- Type examination followed by declaration of conformity by the manufacturer based on formal quality assurance of the production process (including test and final inspection) as two separate processes (Modules B + D)

- Type examination followed by 3rd Party verification (Modules B + F)
- 3rd Party verification for one off 'bespoke' instruments which would otherwise need type examination (Module G)
- Design examination together with declaration of conformity by the manufacturer based on full formal quality assurance of the design and production process (including test and final inspection) as part of an integrated process (Module H1)

1.4.12 As an example, the manufacturer could submit his new type to a notified body for type examination under conformity assessment module B. Following the granting of a type approval certificate, the end user would submit the new meter measuring system for initial verification to a notified body authorised to undertake conformity assessment module F. Alternatively, if the manufacturer were an approved verifier, he could carry out the initial verification himself under module D.

1.4.13 For further information on conformity assessment procedures and other aspects regarding the interpretation of 2004/22/EC reference should be made to "Guide to the implementation of directives based on the New Approach and the Global Approach" This document can be found at the following website:

http://ec.europa.eu/enterprise/policies/single-market-goods/files/blue-guide/guidepublic_en.pdf

1.4.14 For Module F, under 4.1 and 5.2 the recommended tests to be carried out for initial and subsequent verification should identified together with the standards necessary to ensure traceability of measurement. This includes OIML R117 edition 2007, and OIML R117 edition 1995 and OIML D11 edition 2004 respectively.

1.4.15 The EU Commission, in relation to the Directive has published a list of normative references to normative documents in the Official Journal (2011/C 33/01 and 2006/C 269/01), which, in part, gives presumption of conformity to the essential requirements. This includes details on meter measuring systems in relation to OIML Recommendation R117 edition 2007, and OIML R117 edition 1995 and OIML D11 edition 2004 respectively. This information is available on the NMO web site or by reference to the EU website under the following two links:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2011:033:0001:0012:EN:PDF

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2006:269:0001:0028:EN:PDF

1.4.16 The normative references address all the relevant provisions of the Directive, i.e. both the general and instrument specific requirements, in relation to the corresponding paragraphs of the respective OIML Recommendation and make comments, in general terms only, of any differences.

1.4.17 WELMEC documents, published on the WELMEC website, set out as guidance full versions of these simplified tables with background information and comments for interested parties. Meter measuring systems are covered by document WELMEC 8.15, which can be found at: http://www.welmec.org.

1.4.18 It will be for the manufacturer and/or Notified Body to decide how to interpret the guidance.

Regulation 6(2)

1.4.19 Schedule 3 of the Regulations outlines the nature of the technical documentation that a manufacturer or his authorised representative must maintain. This information must be provided to a notified body to enable them to carry out the relevant assessment. This documentation must be provided in the language of the notified body or any other language acceptable to it in compliance with paragraph 10(1)(a) of Part II of Schedule 2.

1.4.20 The 2006 Regulations do not provide for manufacturers that 'self verify' to notify the Chief Inspector of Weights and Measures of details such as the location, certificate number and date of installation of a liquid fuel and lubricants measuring instruments. However, should the manufacturer wish to do so in the interests of openness, there is nothing to prevent this from happening.

DESIGNATION OF UNITED KINGDOM NOTIFIED BODIES

Regulation 7(1)

1.4.21 Under Article 11 of the Directive, notified bodies are required for the tasks relating to the conformity assessment of modules A to H1 (see paragraph 1.4.11 of this guidance for those relevant to meter measuring systems). The criteria for designation of these bodies in accordance with Article 12 are included in Schedule 2 Part 1 of the Regulations.

Regulation 7(2)

1.4.22 If an organisation meets the requirements in Schedule 2 Part I the Regulations permit the Secretary of State (NMO) to designate a person, whether that is a person resident or incorporated or carrying on a business in the United Kingdom or any other type of person e.g. a local weights and measures authority, to be a UK notified body. The definition of a notified body includes a person although it would appear unlikely that an individual person would be appointed. Where the designation is in respect of a particular description of a meter measuring system, the Secretary of State must be satisfied that the applicant meets the criteria as respects that instrument. As with the definition of an importer and in line with Schedule 1 of the Interpretation Act 1978, a person includes both a natural and a legal person. The application form for bodies applying to be designated as a United Kingdom notified body under Regulation 7 is available on the NMO website: www.bis.gov.uk/nmo

Regulation 7(3)

1.4.23 If a person applying to be a notified body operates an approved quality system under a relevant harmonised standard, e.g. EN 17025/17020 and EN45011/45012 he shall be presumed to meet the criteria of the Directive only to the extent that the standard corresponds with the criteria of the Directive. The application form for persons applying to be designated as a notified body under Article 11 and bodies wishing to extend their current status to include conformity assessment tasks in the Directive can be found on the NMO website: www.bis.gov.uk/nmo/regulation

Regulation 7(4)

1.4.24 Designations under the Regulations must be in writing which may be in either electronic or hard copy format. They may include conditions such as the scope of the designation.

Regulation 7(5)

1.4.25 In addition to the criteria in Schedule 2 Part I of the Regulations the Secretary of State may consider all relevant criteria to ensure that the designation criteria have been fully met prior to issuing a designation under Regulation 7. The functions of a notified body are set out in Regulation 8 and Part 2 of Schedule 2 to the regulations.

PROVISIONS SUPPLEMENTAL TO REGULATION 7

Regulation 9

1.4.26 The provisions deal with the publication of lists of notified bodies and the inspection of notified bodies. The Secretary of State will periodically carry out an inspection of UK notified bodies. The purpose of that inspection shall be to verify whether the notified body meets the notified body criteria and complies with any designation to which it is subject and complies with these Regulations. It is important to remember that although such an inspection may result in a visit to a manufacturer, it is the notified body that will be inspected, not the manufacturer.

Regulation 9(1)

1.4.27 The Secretary of State will publish a list which specifies for which instruments the notified body is designated and any conditions to which it is subject. These details will be available on the NMO website at http://www.bis.gov.uk/nmo/regulation.

1.4.28 The European Commission also publishes a list of notified body numbers which gives details of the notified body and the instruments on the New Approach Notified and Designated Organisations (NANDO) website. For the MID click on: http://ec.europa.eu/enterprise/newapproach/nando/

Search by Annex for the relevant declaration of conformity and then by instrument type. Search by country and then by notified body number to give name and for MID the instruments for which it has been notified and the applicable procedures/annexes.

1.4.29 This site will enable you to find the European notified bodies as well as third-country bodies designated under formal agreements [Mutual Recognition Agreements (MRAs), Protocols to the Europe Agreements on Conformity Assessment and Acceptance of Industrial Products (PECAs) and European Economic Area (EEA)] responsible for carrying out the conformity assessment procedures referred to in the application

FEES

Regulation 11

1.4.30 This Regulation permits notified bodies (which includes the Secretary of State) to impose such fees in connection with and incidental to the carrying out of conformity assessments or specific tasks as it may determine.

1.4.31 Section 56 of the Finance Act 1973 requires the Secretary of State to define by statute the fees he charges for certain tasks to be carried out in relation to EU commitments/obligations.

1.4.32 The Regulations do not govern the fees that may be charged by other notified bodies other than identifying broad parameters in which all notified body fees should be set. The Regulations do not govern other duties undertaken by the local authority relative to the Regulations i.e. in service inspection, subsequent re-qualification and market surveillance.

1.4.33 The Regulations do not govern the fees that may be charged by other notified bodies other than identifying broad parameters in which all notified body fees should be set. The Regulations do not govern other duties undertaken by local authorities relative to the Regulations i.e. in service inspection, subsequent re-qualification and market surveillance.

Regulation 11(4)
1.4.34 Provides that, in cases where fees (charged after work is completed or payment of fees is requested in writing) have not been paid within a period of 28 days, the notified body may give 14 days' notice in writing that the certificates or notification appropriate to the conformity assessment will be suspended until the fees have been paid.

MARKING AND IDENTIFICATION REQUIREMENTS

Regulation 12
1.4.35 The annex to this guidance describes the CE marking, supplementary metrology (M) marking and the identification number of the notified body concerned with the conformity assessment, which must be affixed to each instrument so as to be visible and legible. The M mark denotes that the instrument meets the requirements of the MID.

1.4.36 It should be noted the supplementary markings are different from those in the NAWI Directive 2009/23/EC (formerly Directive 90/384/EEC). For the purposes of the Directive the M marking does not have to be on a green background as it does under the NAWI Directive but it must be accompanied by the last two digits of the year in which it is affixed. See drawings in the annex to this guidance.

CONFORMITY WITH OTHER DIRECTIVES

Regulation 13
1.4.37 Where a meter measuring system falls within the scope of other directives which provide for affixing of the marking the CE marking affixed to the meter measuring system shall, in addition to conformity with the Measuring Instruments Directive, indicate conformity with those other directives.. Other directives, of which manufacturers should be aware, include the following:

- 89/336/EEC (amended by 91/263/EEC, 92/31/EEC and 2004/108/EC) on electro-magnetic compatibility, as implemented by The Electromagnetic Compatibility Regulations 2005 (as amended);

- 89/392/EEC (amended by 91/368/EEC, 93/44/EEC and 93/68/EEC) on machinery safety (for some but not all industrial products), as implemented by the Supply of Machinery (Safety) Regulations 2008 (SI 2008/1595); and

- 2006/95/EC on low voltage, as implemented by the Electrical Equipment (Safety) Regulations 1994.

This list is not exhaustive.

1.5 PART III – USE FOR TRADE OF METER MEASURING SYSTEMS

REQUIREMENTS FOR USE FOR TRADE

1.5.1 This part only applies to all meter measuring systems in use for trade once they have been placed on the market and put into use in Great Britain (see Part V regarding Northern Ireland). It applies irrespective of whether the instrument was attested under the Regulations or the corresponding regulations issued by another Member State.

1.5.2 This part of the Regulations is made under section 15 of the Weights and Measures Act 1985.This part of the Regulations prescribes the requirements for use for trade of meter measuring systems and, for the avoidance of doubt, prescribes meter measuring systems for the purposes of section 11(1) of the Act once put into use. The enforcement provisions of Part IV of the Regulations make reference to Regulation 14 in Part III by providing the inspector or approved verifier with the criteria under which a disqualification or re-qualification sticker may be applied to a meter measuring system. Only an inspector of weights and measures can apply a disqualification mark to a meter measuring system. The activities of an approved verifier are controlled by an approval issued by the Secretary of State under section 11A of the Weights and Measures Act 1985. Approved verifiers must apply to the Secretary of State to have any MID meter measuring systems covered by the Regulations that they propose to re-qualify added to the appendix that accompanies their approval.

Regulation 14

1.5.3 This Regulation requires the instrument to continue to meet the essential requirements in service. Schedule 1 other than the error limits specified in that schedule. It should be noted that many of the requirements of Schedule 1 will have been checked during the conformity assessment. For example, if module B has been used, many of the essential requirements will have been tested during the type examination. It may then only be necessary to check the conformity of the measuring instrument to the type approval certificate.

Maximum permissible error/Minimum measured quantity

Regulations 15 & 17

1.5.4 Where the manufacturer has specified a temperature range by marking the meter measuring system, usage outside the range is an offence. If no temperature range is specified the instrument may be used at any temperature.

1.5.5 The minimum measured quantity (MMQ), also known as the minimum delivery, is defined in Regulation 2 and is specified by the manufacturer following testing during development. The accuracy of the measuring system is checked for compliance with the MMQ requirements during conformity assessment.

1.5.6 Because the errors in small deliveries are likely to exceed the permitted limits, the error limits are relaxed for quantities up to twice the MMQ. The table in Part III states that the error allowance for deliveries up to and including twice the minimum measured quantity shall never be less than that allowed for the minimum measured quantity. The limits of error are illustrated in Figure 1 below.

Note that Regulation 15 specifies the *in-service* MPEs; the MPEs for *conformity assessment*, which are numerically equal, are specified in Schedule 1, paragraph 16.

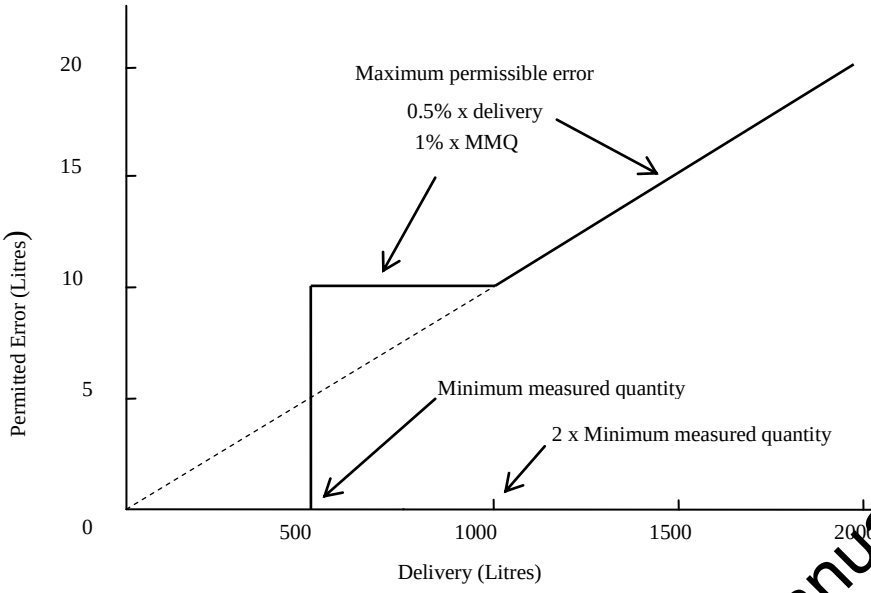


Figure 1: Example of permissible errors for Class 0.5

MANNER OF USE

Regulation 16

1.5.7 Regulation 16(1) Where the manufacturer has specified a temperature range by marking the meter measuring system, usage outside the range is an offence. The maximum and minimum rates of flow and the liquids of use should be stated in the type approval or design examination certificate and be marked on a plate adjacent to the meter. The approved rates of flow for the system take precedence and overrule any rates of flow for the meter.

1.5.8 Regulation 16(2) requires measuring systems to be used within the parameters that they have been designed and approved for. This includes their mechanical environment, electromagnetic environment and the liquid measured. Other parameters might include the maximum and minimum pressures of the liquid being measured or the viscosity of the liquid.

1.5.9 Regulation 16(3) requires the system to be set as close to zero as is practicable following any adjustments. This supersedes the requirement in the previous regulations to not have all the errors in excess or deficiency exceed 0.3% of the quantity delivered.

1.5.10 Regulation 16(4) requires every meter measuring system to be fitted with a ticket printing mechanism to provide an individual ticket. This is intended for driver controlled deliveries that are made in the absence of the customer. On large sites, several drops may be made for the same customer. In this instance, should a separate ticket be printed for each drop or may they be all printed on a single ticket for the single customer, with each drop individually identified? NMO believes that either interpretation is acceptable.

1.5.11 Regulation 16(5) requires some basic design features for systems. Regulation 16(5)(b) may not be satisfied if there is excessive hose dilation with old soft hoses used in full hose delivery systems.

1.5.12 Regulation 16(7) is a ‘catch all’ requirement to prevent the measuring system being used incorrectly in any way in addition to those specifically identified in elsewhere in the regulations.

1.6 PART IV - ENFORCEMENT

ENFORCEMENT AUTHORITY

Regulation 18

1.6.1 All enforcement of these regulations will be under the European Communities Act. The powers of the Weights and Measures Act (in Northern Ireland the Weights and Measures (NI) Order 1981 do not extend to enforcement for these regulations.

1.6.2 This regulation imposes a duty on every local weights and measures authority in Great Britain to enforce the Regulations within its area. (In Northern Ireland the enforcement authority is the Department of Enterprise, Trade and Investment.) It also authorises the Secretary of State to enforce Part II of the Regulations and for that purpose gives him the power to appoint any persons to act on his behalf. The power of the Secretary of State is independent of a weights and measures authority and is to ensure the Secretary of State is able to fulfil his obligations to conduct market surveillance. Those authorised by this regulation are referred to as “enforcement authorities”.

COMPLIANCE NOTICE PROCEDURE

Regulation 19

1.6.3 In cases where the enforcement authority has established that the CE marking and M mark have been inappropriately affixed for an instrument that has been placed on the market or put in to use, it may serve a notice on the manufacturer or his authorised representative requiring him to end the infringement. It must be noted that this power rests with an enforcement authority, not with an officer of that authority. It therefore does not limit the issuing of these notices to inspectors.

1.6.4 It should also be remembered that the application of the CE and the M markings confirm compliance with the essential requirements in Schedule 1 of the Regulations, as amended (see paragraph 16 ‘Accuracy classification and maximum permitted errors (MPEs)’, Schedule 1), when the instrument was placed on the market or put into use. This will include selecting and following one of the conformity assessment routes. Any contravention that falls outside of these definitions is not caught by the compliance notice procedure.

IMMEDIATE ENFORCEMENT ACTION

Regulation 20

1.6.5 An enforcement authority has powers to take action pursuant to this Regulation where it has reasonable grounds for considering either:

(a) that the requirements of a compliance notice procedure have not been complied with or

(b) that a meter measuring system which has been placed on the market or put into use, does not bear one or more of the CE marking, the M marking and the identification number of the notified body which carried out the conformity assessment procedure in respect of the instrument; or

(c) a meter measuring system bearing the CE marking and the M marking does not meet all the essential requirements when placed on the market, or properly installed and put into use in accordance with the manufacturer's instructions.

1.6.6 The Secretary of State will publish particulars of any notice issued withdrawing a certificate or notification. It is expected that this will take the form of advice to trading standards officers/interested parties and published on the NMO website (www.bis.gov.uk/nmo).

1.6.7 There is no explicit statement in the regulations regarding the prevention of use for trade with broken sealing devices. However, such use is prohibited under regulation 20 (1)(c) because the system would not comply with the essential requirements – Schedule 1, 10(2) requires the securing of hardware compartments that are critical for the metrological characteristics of the system.

DISQUALIFICATION

Regulation 22

1.6.8 It should be noted that the errors that the instrument must comply with are those in the Table of Part III of the Regulations not those specified in the Schedule 1, although in practice they are equal.

1.6.9 The disqualification mark will not be a sticker in all cases and may include other methods of obliteration of the marks where this would be more appropriate.

1.6.10 In cases where an instrument has been altered and the inspector has been notified in writing of the alterations, a disqualification sticker/mark will be required in all cases where the instrument no longer meets the essential requirements.

1.6.11 Because of possible problems with the use of stickers on road tankers, obliterating sealing devices is also permitted as a more durable means of indicating disqualification. Striking off the seals is permitted but not encouraged as a disqualification method because obliteration demonstrates disqualification whereas the end-user could ascribe missing seals to other causes.

1.6.12 Stickers may be used where they remain clearly visible and are not washed off or obscured with mud or dirt. Acceptable examples are:

a. Place the stickers or seals on the system data plate, subject to the above provisos.

b. Place the stickers on a "history plate" in a suitable environmental housing on the tanker or in the cab.

1.6.13 As stated in paragraph 1.4.37 above, only inspectors of weights and measures are permitted to apply disqualification stickers/marks but re-qualification may be undertaken by an inspector or an approved verifier (Regulation 23).

RE-QUALIFICATION

Regulation 23

1.6.14 It is important to contrast this process with that relating to initially placing a measure on the market for the first time which requires the involvement of a notified

body. Re-qualification may be by an inspector of weights and measures or by an approved verifier, e.g. the manufacturer or a repairer.

1.6.15 Re-qualification is the process by which either an inspector or an approved verifier assesses compliance of the instrument after it has or could have been disqualified and returned to conformity with the essential requirements. This means that the mpes will be those applicable to first placing the instrument on the market.

1.6.16 Where obliteration of sealing devices has been used as the method of disqualification, re-qualification would be the renewing and stamping of the seals.

TESTING OF METER MEASURING SYSTEMS

1.6.17 The Regulations do not stipulate a test procedure for conformity assessment or verification. It only stipulates that an instrument must comply with the essential requirements. The use of a harmonised standard or normative document will demonstrate compliance with the essential requirements. The reference for normative documents covering meter measuring systems is given in the section describing regulation 5(2) above.

1.6.18 Where third party testing is carried out in accordance with Module F, the test requirements would normally be specified in the harmonised standard or normative document. In the absence of these documents, the Notified Body is responsible for specifying the appropriate tests to be used for the purposes of Sections 4.1 and 5.2 of Annex F to the Directive.

1.6.19 Note that paragraph 9(5) of Schedule 1 states that test procedures for any special equipment or software needed to control measuring tasks must be described in the operating manual. This applies for both conformity assessment and verification.

Regulation 24

1.6.20 This regulation, being part of Part IV (Enforcement), relates only to the testing carried out by the inspector in relation to his duties as an enforcement officer when he makes an in-service inspection of the measuring system. It does not apply to testing for conformity assessment or verification.

Regulation 24(1)

1.6.21 Requires the person in control of the equipment to provide such assistance as necessary to enable the inspector to carry out his duties. In most cases, this normally means allowing access to the equipment and co-operation of site staff so that inspection of the equipment can take place, test deliveries can be made and the liquids returned to storage. However, the regulation gives the inspector the power to require reasonable assistance in a number of specific and non-specific ways. This helps to ensure the inspector cannot be prevented from carrying out his duties without very good reason. The reference for normative documents covering meter measuring systems is given in the section describing regulation 5(2) above.

Regulation 24(3)

1.6.22 Whilst this regulation does not stipulate in detail which liquids may be used as test liquids, the following options may be used as a guide:

a. The actual liquid that the equipment is intended to deliver should be used for testing purposes e.g. diesel, heating oil, etc. This will be the situation encountered in

the majority of cases. If petrol were to be metered, the petrol used during testing would need to be the same in terms of whether it was leaded or unleaded as that with which the equipment will eventually operate, since different types of petrol may produce different test results.

b. A different liquid may be used if it has properties that replicate in all respects relevant to testing those of the liquid fuel that the equipment is intended to deliver. It is most important that the liquid is matched for viscosity, or if not, that a reliable correction factor be applied. The lubricating abilities and surface tension of the test liquid should also be closely matched to the liquid which the equipment will be used to measure. Such liquids include special liquids manufactured by oil companies for use as a test liquid. Such test liquids often have a viscosity that differs from the actual liquid by a factor of two or more. Before they may be used for testing, the inspector should establish through, say, the manufacturer's documentation that the test liquid is suitably matched. Such documentation might cover intercomparison tests on a number of meters, using the actual liquid to be dispensed and the test liquid. If results show a repeatable difference between the two liquids, a correction should be applied when calibrating the meter with the test liquid.

Regulations 24(5) to 24(7)

1.6.23 Require the test liquid to be returned to the storage tank or container from which it was drawn or placed in another suitable container provided by the site controller. When requested, the inspector should provide a signed and dated statement of the liquids withdrawn during testing. The inspector should leave the site safe and secure by closing and securing any tanks and containers opened during the inspection and replacing any broken seal with the inspector's own seal.

TRACEABILITY

1.6.24 The instruments and standards used in testing must be traceable to national standards. The hierarchy of traceable standards used is shown in Table 1 and Figure 2.

Type	Uncertainty (±)
Primary volumetric measure (gravimetric determination)	0.01%
Secondary measure (local standard) - proving tank, multiple filling, to NMO 7313	0.02%
Reference meter to NMO 7330	0.05%
Trader's meter (MID)	0.2% Class 0.3 0.3% Class 0.5 0.6% Class 1.0

Table 1: Hierarchy of volume standards and traceability

ENFORCEMENT TESTING

1.6.25 Enforcement tests aim to check conformity to the type approval or design examination certificate. The inspector will check the correct operation of the complete meter measuring system and/or its constituent parts such as:

a. Pre-set test
b. Gas eliminator test

c. Hose dilation test (full hose systems only)
d. Ticket printer test
e. Blow down test (empty hose systems only)

1.6.26 Before testing, it is important that all sealing arrangements described in the type approval or design examination certificate are adhered to. Whilst a broken seal does not mean a fraud has been committed, it does invalidate the metrological control on the equipment.

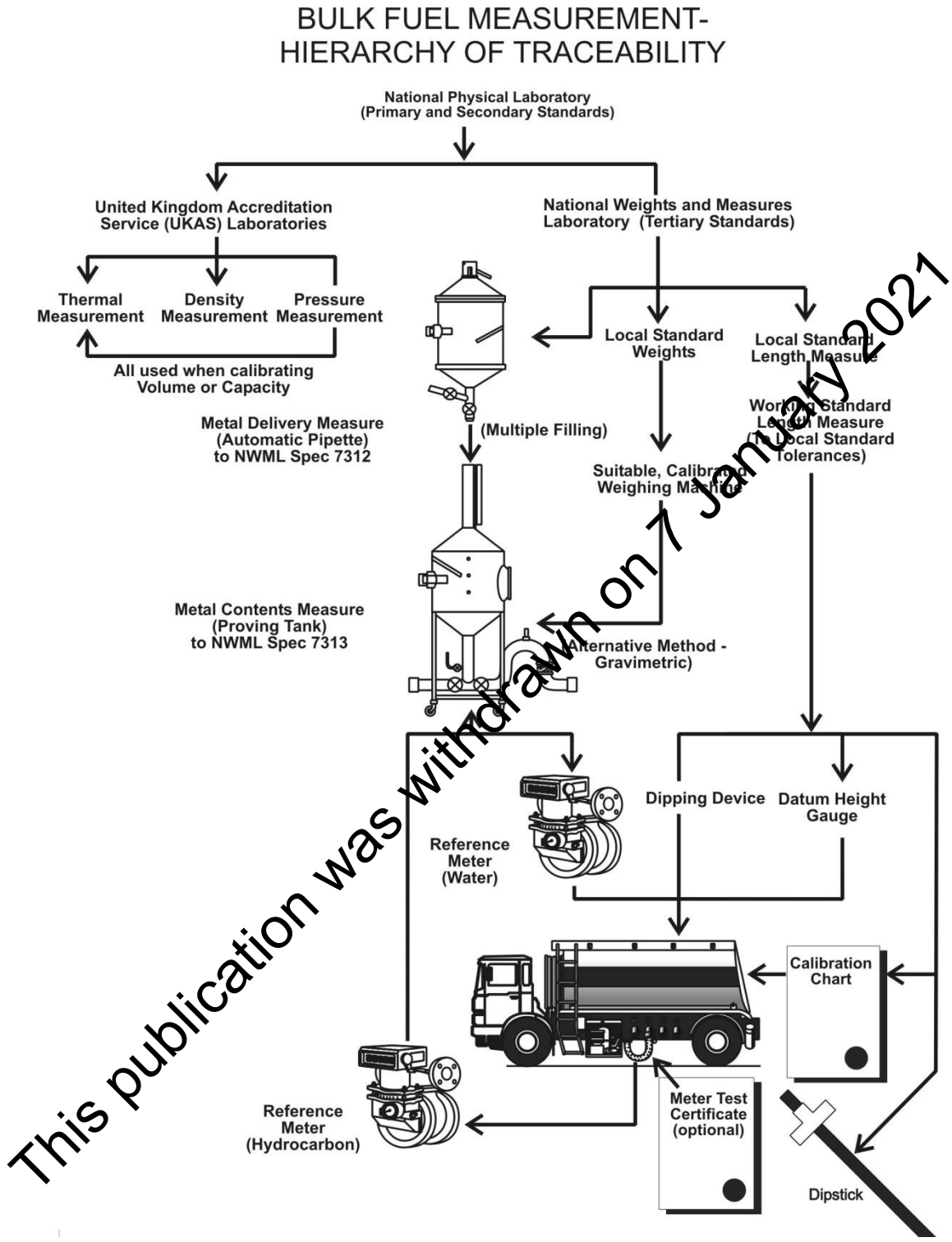


Figure 2: Hierarchy of standards for calibrating road tankers[4]

[4] Courtesy of Tees Valley Measurement

UNAUTHORISED APPLICATION OF AUTHORISED MARKS

Regulation 25

1.6.27 Any meter measuring system in use for trade but not marked with the notified body number, CE mark and M mark and put in use on or after 30 October 2006 may be disqualified unless it can be demonstrated that the instrument is not subject to the Regulations, as amended.

POWERS OF ENTRY AND INSPECTION

Regulation 26(1)

1.6.28 It is important to consider the definition of Enforcement Officer. It is either an inspector as defined in the Weights and Measures Act 1985 (in Northern Ireland the Weights and Measures (NI) Order 1981), or a person appointed by the Secretary of State to act on his behalf to enforce Part II of the Regulations, as amended.

1.6.29 It should be noted that this Regulation give an enforcement officer the authority to inspect and test a meter measuring system but it is only an inspector of weights and measures that may reject the instrument if it is found not to comply with the Regulations, as amended. The enforcement authority does have the power to issue a compliance notice (regulation 19) or take immediate enforcement action (regulation 20) if the requirements of those regulations are not met.

1.6.30 The powers under regulation 26(1) should be contrasted with those existing in relation to the Non-Automatic Weighing Instruments Regulations 2000, as amended. The latter give an authorised officer an extra power to inspect relevant quality systems. A similar power has not been included in these regulations. This means that an enforcement officer will not have the power to look at the quality systems that a manufacturer or approved verifier may be using when engaging in conformity assessment procedures of their own instruments. Where this becomes a necessity, such action may be authorised as part of a market surveillance exercise.

1.6.31 It should be noted that there is no provision in these regulations that allows a person to refuse to give information if it may incriminate them. This should be contrasted with the NAWI regulations, which do contain such a provision.

PENALTIES FOR OFFENCES

Regulation 28

1.6.32 The enforcement provisions for these Regulations, as amended, have been made under the European Communities Act the maximum penalty is a fine not exceeding level 5 on the standard scale levied on summary conviction. The scale has 5 levels, each corresponding to a certain amount. This means that the level of fines can be updated by changing the value of each level, without the need to amend the legislation relating to each separate offence. The current values of the standard scale are section 37 of the Criminal Justice Act 1982, which provides as follows:

Level on the scale	Amount of fine
1	£200
2	£500
3	£1,000

4	£2,500
5	£5,000

1.6.33 This penalty avoids the threat of imprisonment previously applicable to offences made under the Weights and Measures Act 1985.

1.7 PART V - MISCELLANEOUS AND SUPPLEMENTAL

ADAPTATIONS FOR NORTHERN IRELAND

Regulation 33

1.7.1 The Regulations, as amended, apply to Northern Ireland, subject to Schedule 5. This means that these amended Regulations apply the requirements relating to placing on the market to the whole of the UK. However, the in-service provisions relate to Great Britain. Northern Ireland will make in-service provisions for meter measuring systems.

THE ELECTROMAGNETIC COMPATIBILITY REGULATIONS 2005

1.7.2 The Electromagnetic Compatibility Directive was implemented in the UK by the Electromagnetic Compatibility Regulations 2005 (S.I. 2005 No 281) and applies to all electronic instruments. The MID specifically provides ***immunity*** requirements in relation to instruments within its scope and therefore the implementing regulations have been disapplied for meter measuring systems and all other MID instruments by Regulation 33 of S.I. 2006 No 1258, the Measuring Instruments (Automatic Gravimetric Filling Instruments) Regulations 2006. The EMC Regulations 2005 remain in force for all road tanker measuring systems not subject to these regulations i.e. all those instruments that are not regulated whether because the instrument type is not regulated in the UK or because it is a regulated instrument but is not in use for trade. The EMC Regulations continue to apply to meter measuring systems for ***emissions***.

ANNEX

MARKING AND INSCRIPTIONS

Regulation 12(3)

Supply of Stickers

The Secretary of State has decided that it is necessary to provide a long-term, professional solution to resolve the difficulties that have arisen in securing a consistent good quality source for the supply of the metrology stickers that local authorities and others require to fulfil their statutory obligations for both initial verification, disqualification and subsequent re-qualification activities.

A new solution has been identified which will enable NMO to produce printed versions of the stickers described below on demand. The system has the capability to incorporate the specific identification data required in thermal printed form. This solution will replace the current stop-gap solution introduced in 2006 to allow for the changes to the marking requirements in the MID which meant that, when re-qualifying an instrument, an inspector has to apply both his number and the year of re-qualification in manuscript on a modified NAWI sticker using a “permanent” marker. It has become clear that these marks were not sufficiently permanent so as to withstand the harsh cleaning requirements in some conditions of use particularly in the food preparation sector.

The new stickers have been tested and performed well in a harsh cleaning environment and have been found to meet the requirements applicable in the food industry.

It is the opinion of the Secretary of State that the following stickers should be required to be used for the statutory marks. The new stickers are 12.7 mm x 11.1 mm.

It is not envisaged that the Weights and Measures (Prescribed Stamp) Regulations 1968 (SI. 1968/1615) will need to be amended as re-qualification is carried out under the provisions of these regulations.

The Green M metrology mark, and the CE mark for initial verification which are the responsibility of the instrument manufacturer will not be supplied centrally.

The new stickers will also be relevant to local authorities who are notified bodies and to approved verifiers under the regulations. Commercial organisations which need to obtain supplies are invited to contact stickers@nmo.gov.uk to discuss availability and prices.

The Secretary of State (NMO) has determined that there will be benefits arising from a change of process with the stickers produced centrally and supplied by NMO directly to local authorities. To that end the decision has been made to supply a limited quantity of stickers free of charge to all inspectors. The stickers used for re-qualification of NAWI and MID instruments will be supplied overprinted with the inspector’s number and on an annual basis with the year also overprinted. Stickers can also be overprinted with the relevant Notified Body/Approved Verifier numbers on request.

If you have a requirement for a larger quantity , or you are not a local authority, please contact stickers@nmo.gov.uk. It will be possible to agree terms under which larger numbers/other stickers can be provided (at a cost).

STICKER 1 – RE-QUALIFICATION

Inspector or

This is all white label printed on which with the prescribed crown and the information for Inspector's number will be overprinted using thermal printing technology for use for NAWI and MID instructions.

Approved Verifier

This is all white label printed on which with the prescribed crown and the information for Approved Verifier number will be overprinted using thermal printing technology.

STICKER 2 – DISQUALIFICATION

This is a plain white label bearing the prescribed crown mark which has been printed with the disqualification mark No overprinting is required.

STICKER 3 - NOTIFED BODY IDENTIFICATION NUMBER FOR INITIAL VERIFICATION

NB 0126

This is a plain white label in which the Notified Body number has been overprinted using a thermal printer. It is not a requirement for the number to be pre-fixed by NB.

Other marks and requirements for MID instruments

1. The CE marking consists of the symbol “CE” according to the design laid down in paragraph I.B(d) of the Annex to Decision 93/465/EEC. The CE marking shall be at least 5 mm high.
2. The M marking consists of the capital letter “M” and the last two digits of the year of its affixing, surrounded by a rectangle. The height of the rectangle shall be equal to the height of the CE marking. The M marking shall immediately follow the CE marking.
3. The identification number of the notified body concerned shall follow the CE marking and the M Marking.
4. The CE marking and the M marking shall be indelible. The identification number of the notified body concerned shall be indelible or self destructive upon removal. All markings shall be clearly visible or easily accessible.

Directive 2004/22/EC does not itself contain diagrams for any of these marks although **the CE mark** is prescribed by reference to paragraph 1.B(d) of the Annex to Decision 93/465/EEC.

Possible Examples of Article 17 Markings required by the MID Directive

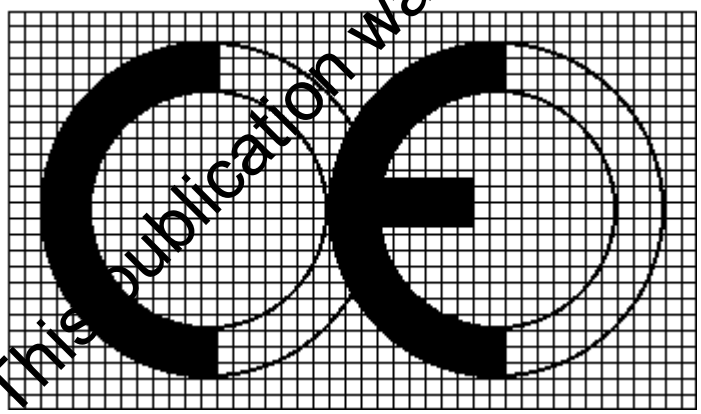
CE M 06 XXXX

CE Mark	**Supplementary metrology mark**	**Identification number of the notified body**
At least 5 mm high	Rectangle height the same as CE 'Immediately follows' CE	'Follows' CE and Supplementary metrology mark

CE
M 06
XXXX

CE M 06
XXXX

"The CE mark must not be less than 5mm in its vertical height, and the proportions maintained. It is generally shown on a grid in the guidance booklets, as below (the grid does not form part of the marking and is for information only):



This mark looks the same as some previous marks, but there are subtle changes, and it should be studied closely. It should be noted, for example, that the C and E are not formed by perfect semi-circles, i.e. the top and bottom arms extend one square beyond the semi-circles, and the middle arm of the E stops one square short.

The graphic is not made available for download from any official sources, but can be obtained in a wide variety of file formats from commercial organisations, sometimes freely available for download.

As far as **the M mark** is concerned the manufacturer applying the mark has freedom over the design provided that the M marking meets the criteria set down in Paragraph 2 of Schedule 4 of Directive 2004/22/EC, as to being surrounded by a rectangle also containing the last two digits of the year of affixing, and is placed immediately after the CE mark.

Similarly **the Notified Body** must place its mark, or authorise the manufacturer to do so on its behalf, so that it follows the CE and M markings.

The identification number of the notified body concerned shall follow the CE marking and M marking.

When a road tanker consists of a set of devices operating together, the markings shall be affixed on the instrument's main device.

When a meter measuring system making continuous and dynamic measurement of liquid fuel consists of a set of devices operating together, the markings shall be affixed on the instrument's main device.

The CE marking and the M marking must be indelible. The identification number of the notified body concerned must be indelible or self-destructive upon removal. All markings shall be clearly visible or easily accessible.

The Directive does not specify in detail the form and appearance of all the various markings. It has therefore been necessary to decide on the details that will apply under the Regulations as indicated in the examples statutory marks above.

Part 2: The Measuring Equipment (Liquid Fuel delivered from Road Tankers) Regulations 1983 (S.I. 1983 No. 1390) [Pages 31 to 49]

Contents

Part 2: The Measuring Equipment (Liquid Fuel delivered from Road Tankers) Regulations 1983 (S.I. 1983 No. 1390)

2.1 PART I - BACKGROUND TO THE REGULATIONS

2.1.1 It is a more than half a century since the measuring equipment used for dispensing liquid fuel in quantities not exceeding 20 gallons was first controlled by regulation. Solid fuel has been subject to statutory control for a much longer period, for O'Keefe states in 'The Law of Weights and Measures' that the measure of coals appeared first to have been regulated by Parliament in the year 1421.

2.1.2 The first regulations concerning measuring equipment used for making deliveries of liquid fuel in bulk from road tankers were issued in December 1979 (SI 1979:1720), with the complementary reference meter regulation (SI 1979:1719). SI 1979:1720 was amended in 1980 (SI 1980:1993), the main effect being to postpone the implementation dates by 12 months.

The latest Measuring Equipment (Liquid Fuel Delivered from Road Tankers) Regulations (SI 1983:1390) have now been issued and cover the development of contents gauging systems.

2.1.3 The need for such legislation was foreseen by the Hodgson Committee when it stated in its Report on Weights and Measures Legislation (Cmmd 8219 - May 1951):

> We therefore recommend .... that all wagons and dipsticks in service for bulk sales of fuel oils .... should be verified and stamped ....

2.1.4 The Regulations are the result of recommendations made by a working party. Advice was taken from experts in trade, industry, local authorities and other government departments in formulating the requirements. Representative bodies were consulted on the proposed legislative provisions. With the widening use and increasing cost of hydrocarbon liquid fuels, it may be thought to be timely by the public generally, if tardy by some, that the measuring systems used to dispense them are now to be under statutory control.

2.2 PART II - STATUS AND PURPOSE

2.2.1 This guidance has been prepared with a broad purpose in mind: it is intended for the guidance of all who are concerned with applying or observing the new controls; local authorities, government departments, trade and industry.

2.2.2 This guidance provides:

(a) a brief insight into the origins of the regulations;
(b) comment upon the particular requirements and reasons for them;
(c) identification of the systems of measurement subject to the new controls;
(d) description of how the controls may operate in practice;
(e) general guidelines on the setting up of testing and verification centres, and
(f) descriptions of the equipment and the test methods to be used for proving the measuring systems.

2.3 PART III - SCOPE OF THE REGULATIONS

2.3.1 The Regulations apply only to measuring equipment for use for trade in making deliveries of liquid fuel in quantities in excess of 100 litres (or 20 gallons) from road tankers

(Regulation 3(1))

Exclusions

2.3.2 The equipment used for the following transactions is expressly excluded from control by the regulations:

(a) the supply of liquefied petroleum gas, lubricating oils and heated oils because of the technical problems associated with their measurements and control; and

(b) the refuelling of ships, hovercraft and aircraft because these operations are monitored by the parties concerned and because of access difficulties caused by security precautions at air and seaports.

(Regulations 3(2))

2.4 PART IV - STANDARDS AND TESTING EQUIPMENT

Provision of services

2.4.1 It is expected that only a few Weights and Measures Authorities will be providing facilities for testing road tanker compartments. Others may delegate the function, by agreement under Section 101 of the Local Government Act 1972, to one of those authorities. Alternatively Weights and Measures Authorities may use industrial calibration facilities at manufacturers' or other trade premises in their area which are available to them where it is deemed appropriate to do so - see Sections 5 and 11 of the 1963 Act as amended and Part VIII of these notes.

2.4.2 Most authorities will test and stamp replacement dipsticks against a calibration chart; a procedure which will offer a quick and convenient service to road tanker operators at little capital cost to the authority.

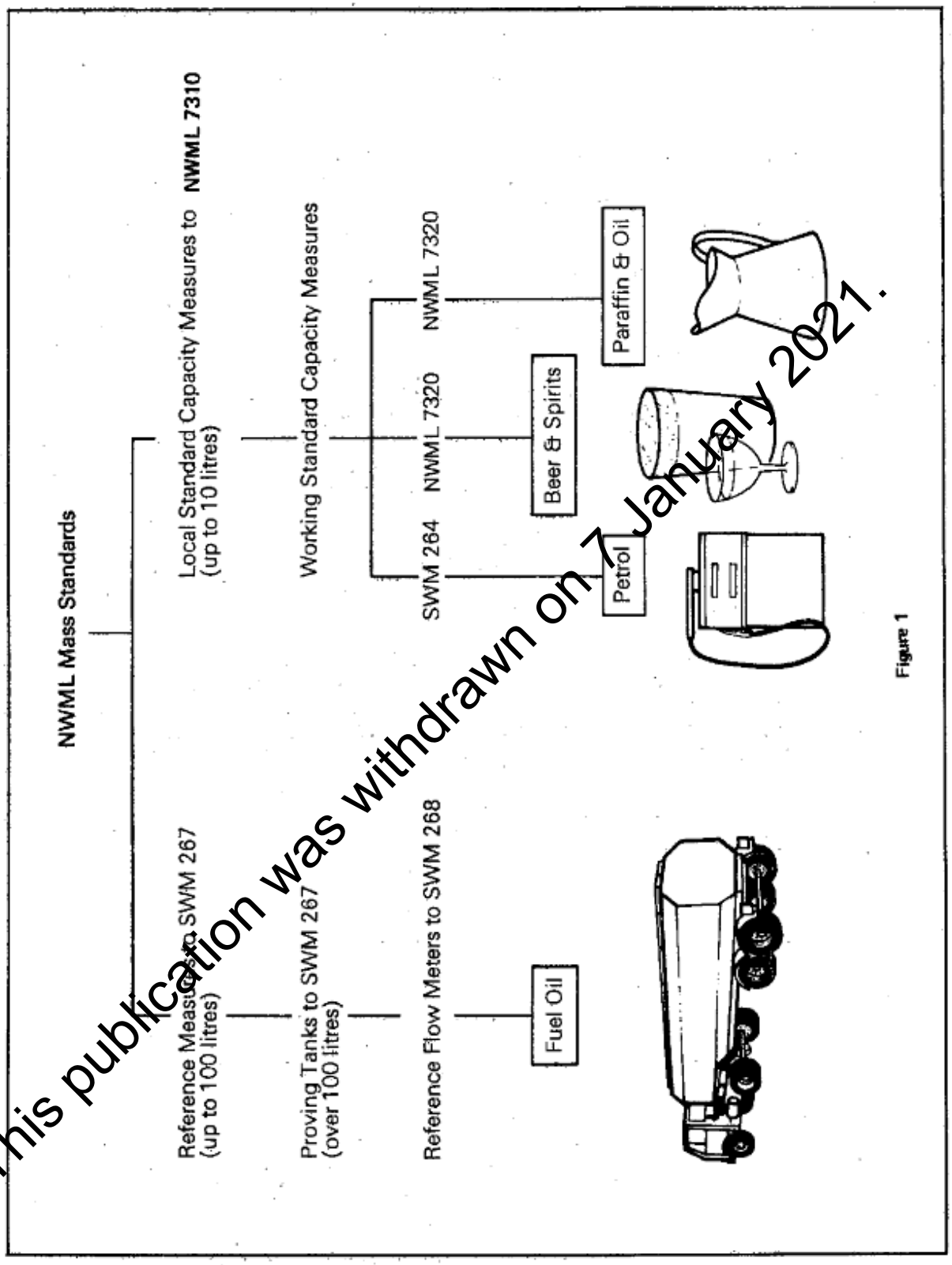


Figure 1

Most authorities will test and stamp meter measuring systems.

Types of Equipment - Volumetric standards

2.4.3 Figure 1 shows the hierarchy of traceability of volumetric measurements.

Reference meters should be checked against a volumetric standard which should hold at least one minutes delivery of the meter under test. The volumetric standard should be constructed in accordance with the Departmental specification SWM 267 for proving tanks. Such proving tanks may either be local standards, calibrated by the Department, or working standards calibrated by means of an appropriate local standard of the metal delivery measure type in accordance with Departmental specification SWM 267.

2.4.4 A reference meter used as testing equipment should be of the positive displacement type. Departmental Specification SWM 268 specifies the requirements for such a meter. When purchasing such a meter, the manufacturer should be informed that a reference or master meter is required, and of its intended use.

2.4.5 A meter used in a fixed installation using water at a single flowrate for calibrating road tanker compartments should be tested, preferably before use, in that installation under the conditions under which it will be used.

Reference meters used to test truck-mounted meters should be subject to a full calibration at two-yearly intervals. The recommended practice is to do 5 repeat runs at 10 per cent, 20 per cent, 40 per cent 60 per cent, 80 per cent and 100 per cent of the maximum flowrate of the meter.

The validity of the calibration of a reference meter must have been checked within 6 months of its use by testing at one flowrate on one liquid.

Types of Equipment - Linear measures

2.4.6 The errors on a linear measure used for testing dimensions on dipstick measuring equipment should not exceed 0.25 mm per whole metre or part of a metre. As this degree of accuracy is equivalent to that specified for a local standard, a linear measure used for this purpose should be tested against a local standard which has a certificate on which errors are quoted.

2.4.7 Measures of length for checking dipsticks should either be of EEC Class I and bear the mark of initial verification or have an attested accuracy of 0.25 mm per metre. Rigid linear measures of length verified to EEC Class I accuracy are available commercially.

Linear measures used for testing dipsticks should be suitably mounted for convenience in use. The graduations on the dipstick and the linear measure should be adjacent to avoid errors of parallax.

2.4.8 The use of measuring systems based on diffraction gratings, lasers or other suitable forms of proven accuracy and stability is permitted

(Regulation 54)

Standards and traceability

2.4.9 The hierarchy of standards and traceability is shown in the following table:

	Uncertainty of measurement (±)	Tolerance (±)
Primary volumetric measure (gravimetric	0.01 per cent	0.02 per cent

determination)		
Secondary measure (proving tank, multiple filling) to SWM 267	0.01 per cent	Not applicable, erro always stated
Reference meter to SWM 268	0.05 per cent	Not applicable, erro always stated
Trader's meter dipstick	0.02 per cent	0.5 per cent

2.4.10 Strict attention must be paid to minimising sources of error because the ratios between the uncertainty of measurement and the tolerance, and between the various levels in the hierarchy, are less than in other fields of measurement (eg length and mass).

2.5 PART V - METER MEASURING SYSTEMS

2.5.1 A meter measuring system is defined as a system which incorporates a mechanical flowmeter, usually of the positive displacement type and also includes ancillary equipment such as the anti-swirl device, pump, gas extractor or separator, filter, indicator and hosereel.

Principles of construction

2.5.2 Meter measuring systems are subject to pattern approval under Section 12 of the Act, hence they are not specified in such detail as dipstick measuring systems. As pattern approval will be obligatory it is expected to lead to some standardisation of design.

2.5.3 It should be borne in mind that the obligation - which comes into force on 1 July 1984 - to introduce only equipment which has been pattern approved, passed as fit for use for trade and stamped can be met (in the case of meter measuring systems not using electronic devices) through EEC procedures which are quite separate. Council Directive No 77/313/EEC on measuring systems for liquids other than water provides for EEC pattern approval and EEC Initial verification of such meter measuring systems.

2.5.4 EEC pattern approval of such systems granted by any Member State dispenses with the need for separate approval under Regulation 14(1). In the United Kingdom such systems will then be subject to the EEC initial verification instead of the testing requirement of Part IV of the Regulations.

2.5.5 The provisions concerning these EEC prcedures are set out in Regulations (1) which should be studied in conjunction with Directive No 77/313/EEC and also the Directives on meters and their ancillary equipment, Nos 71/319/EEC 71/348/EEC and 82/625/EEC(2).

2.5.6 Before pattern approval of meter measuring systems becomes obligatory on 1 July 19$4 for new systems and 1 July 1987 for existing systems, the inspector will be assessing such systems to see that they are not constructed in a manner which facilitates fraudulent use.

Recommendations are provided in the following table for guidance in judging whether or not a system complies with this requirement. It should be noted that the recommendations in the table apply to meter measuring systems currently fitted to road tankers. Some of the requirements may not be applicable to certain types of contents gauging systems.

1 The Measuring Instruments (EEC Requirements) Regulations 1980, SI 1980 No 1058, available from HMSO or through booksellers.

2 Available from HMSO Agency Section PO Box 276, London SW8 5DT quoting the following details:

Directive No 71/319/EEC on meters, OJ No L202 of 6.9.71
Directive No 71/348/EEC on ancillary equipment, OJ No L239 of 25.10.71
Directive No 77/313/EEC on measuring systems, OJ No L105 of 28.4.77
Directive No 82/625/EEC on measuring systems, OJ No L252/10 of 27.8.82

Fraudulent use	**Recommendations**
Advancing the meter (without discharge of fuel) Metering air Prohibited by Regulation 11(b)	It shall not be possible to advance the indicator of the meter manually or by the passage of air. Where a pipe runs from the gas separator to avent: (a) the vent pipe from the gas extractor should not permit the interruption of the escape of gas; this may be achieved by rigid pipework or armoured flexible hose (b) Joints should be kept to a minimum. If any are required (for maintenance purposes) they should be sealed by an inspector (c) The vent should be difficult to block. Alternatively the system may be vented back into the compartment, where access to the vent should be difficult (d) The pipe and vent must be of adequate bore so that air separation is effective at all flowrates.
Using a combination of wet and dry hose deliveries on the same hose	A hose system shall be either wet or dry. (Not both on the sam hose). A notice adjacent to the meter should state whether the meter measuring system is to be operated as a dry hose or wet hose system eg: <u>Wet Hose System</u> — Hose reel should be full before and after delivery <u>Dry Hose System</u> — Hose reel should be emptied after each delivery A wet hose shall have a valve on the end and shall remain full.

Fraudulent use	Recommendations
	A dry hose shall not have a valve or closure device on the end which could permit the retneiton of a significant quantity of liquid fuel in the hosereel.
By-passing the meter	With a meter measuring system it should not be possible to by-pass the meter and discharge liquid through the hose reel without advancing the totaliser. Non-metered deliveries through a separate outlet are acceptable if the tanker has a dipstick measuring system.
Making only part of a delivery P:rinted ticket Regulation 36A(2)(b)	Means shall be provided to prevent the ticket being removed until a delivery is completed.
Draining a wet hose	The delivery nozzle should incorporate an anti-milking valve.

Manner of use

2.5.7 The maximum and minimum rates of flow and the liquids of use will normally be stated in the certificate of pattern approval and be marked on a plate adjacent to the meter. The approved rates of flow for the system take precedence and overule any rates of flow for the meter.

2.5.8 Positive displacement meters tend to be more generous (over deliver) at low rates of flow and on thinner (less viscous) liquids. These effects are normally small in relation to the trade tolerance on a meter but may be significant when the calibration of a meter approaches the prescribed limits of error.

2.5.9 The regulations are designed to prevent exploitation of the tolerance, eg a very precise meter being adjusted to the extreme limit of the 0.5 per cent tolerance.
(Regulation 56(l)(b))

2.5.10 Every meter measuring system must incorporate a ticket printing mechanism to provide an individual delivery ticket for each delivery made. This is intended for the customer. (EEC directives require that, on a road tanker, the printing of the ticket shall be coupled to the resetting to zero of the indicator.) The printed ticket may carry either a zero and a number indicating the quantity delivered or two totaliser numbers from which the quantity delivered may be calculated.
(Regulations 17 36(2))

2.5.11 A road tanker should not be driven between deliveries with a ticket in the ticket printer.

Stamping

2.5.12 Meter measuring systems may be tested using:
a) capacity (volumetric) standards

b) a reference meter

The use of capacity standards would give the greater accuracy, due to their stability, but this method is not normally appropriate for testing vehicle mounted meter measuring system. It would be used for calibrating reference meters.

2.5.13 A reference meter is more convenient in that it can be connected in series with the vehicle-mounted meter and the liquid circulated back into the tanker compartment. Corrections must be applied for the known errors in the reference meter. These will be dependent on the flowrate and therefore a meter calibration curve is essential. Other corrections can be applied to meter calibration results. These include:

- corrections for viscosity
- corrections for temperature
- correction for pressure

These are less important as they will affect both the meter under test and the reference meter in the same way (although not necessarily by the same amount). Care should be taken to ensure that:-

a) the temperature difference between the meters is minimised by circulating liquid through the system to achieve temperature stability before testing starts;

b) there is no significant difference in pressure between the meters due to blocked filters or other restrictions in the pipework.

The uncertainty in the calibration of reference meters is 0.05%, which is one-tenth of the trade tolerance. Corrections less than 0.05% may therefore be considered to be not significant.

2.5.14 A minimum delivery is specified for a meter measuring system as the errors on deliveries smaller than the specified minimum, inherent in such systems, are likely to exceed the permitted limits. The limits of error permitted on the minimum delivery is one per cent. This applies up to twice the minimum delivery, as shown in the figure.

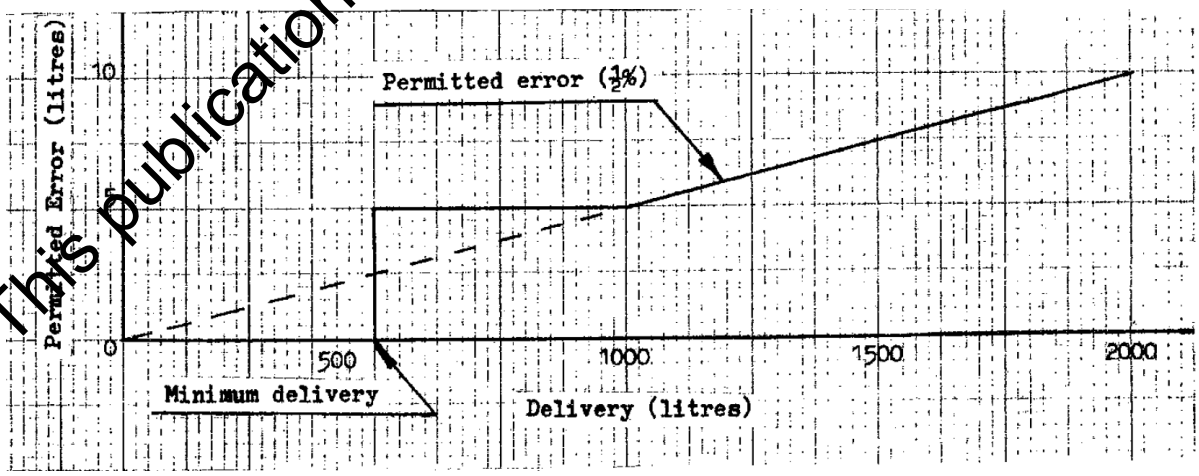


Figure 2

Inspection

2.5.15 It should be noted that the limits of error in excess for a meter measuring system are doubled to 1 per cent before the stamp falls to be

obliterated, but that no similar allowance for wear is made on dipstick measuring systems.

(Regulations 56, 62)

2.5.16 The temporary use of a system with a broken seal to permit for example the freeing of a jammed ticket is allowed, providing the integrity of the calibrating mechanism is not violated and that prior notice has been given.

(Regulation 66)

2.5.17 The temporary use of a system with a broken seal on a vent pipe from the gas extractor is allowed to permit the installation of a stamped meter and gas extractor assembly which has been tested in a similar system.

(Regulation 65)

2.6 PART VI - CONTENTS GAUGING SYSTEMS

2.6.1 A contents gauging system is any measuring system, other than a meter measuring system or traditional wooden dipstick measuring system. Such systems usually employ electronic means for determining and indicating the quantity of liquid fuel delivered and as such, are subject to pattern approval under Section 12 of the Act.

2.6.2 The certificate of pattern approval will contain all the necessary details of construction, manner of use and methods of testing. Contents gauging systems will be required to have a ticket printer.

(Regulations 11 and 12)

2.7 PART VII - DIPSTICK MEASURING SYSTEMS

2.7.1 The regulations define a dipstick measuring system as any measuring equipment comprising a compartment with a datum surface and an associated dipstick with a datum face. The majority of dipstick measuring systems are used for the delivery of petrol.

Principles of construction

2.7.2 These regulations require that the cross-sectional area of a dipstick does not exceed 5cm² ie 25 per cent of the minimum cross-sectional area of the dipstick guide tube. This requirement is incorporated to minimise the 'piston in a cylinder' effect which can produce errors when a dipstick is inserted too quickly.

(Regulations 21 and 30)

2.7.3 A common. form of dipstick guide tube now coming into use for petroleum spirit is an aluminium extruded section with a slot into which a gauze strip allows the petrol level to be indicated on the dipstick. A 75mm diameter dipstick guide tube is more satisfactory than a 50 mm one, and a continuous slot is an improvement upon regularly spaced holes.

(Regulation 30)

2.7.4 A crosspiece is usually an assembly of two zinc alloy die castings. In order to eliminate the effect of mismatch and casting taper, they should be machined as a matched pair.

(Figure 4) (Regulation 21)

2.7.5 The tank number should remain constant throughout the life of the vehicle. Some operators prefer to use their fleet number. This is not prohibited and either number may be marked on either side of the blade of the dipstick at the cross-piece end. The tank number is, however, compulsory.

(Regulation 23)

2.7.6 The 50 mm line is to enable any movement of the cross-piece to be readily detected.

(Regulation 27)

2.7.7 What constitutes a reasonable and convenient scale?

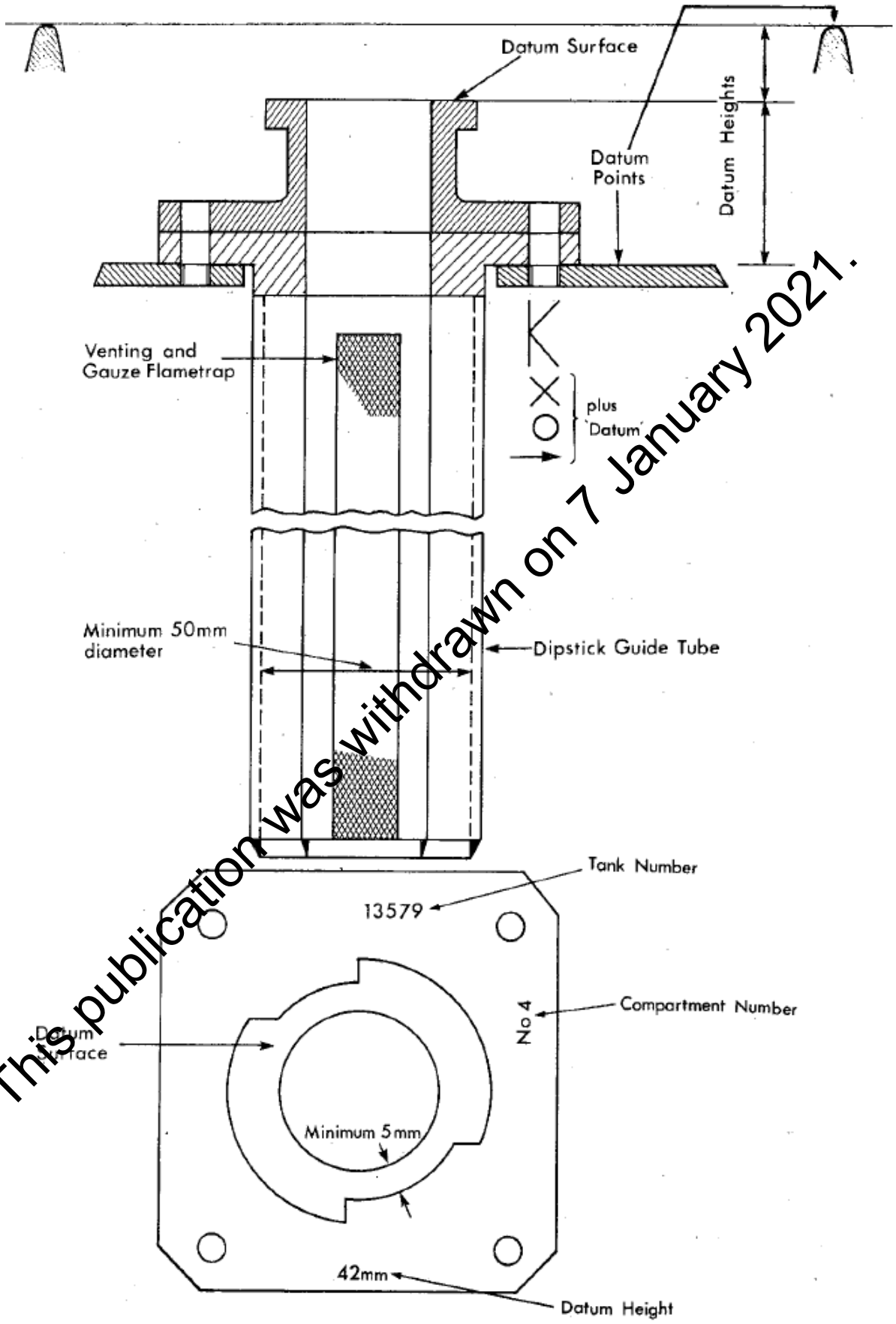
If the scale marks are too close together, there can be confusion as to which line the numbers refer, therefore the numbers should not extend more than 50% of the distance between the lower edges of two adjacent scale marks. If 6mm high figures are used, this means that the minimum practical spacing is 18mm. If larger figures are used, the minimum spacing is increased (eg 8mm figures; 22mm spacing).

The conversion from gallons to litres resulted in some nonstandard compartment sizes, eg 1000 gallons 4540 litres. Similarly a 3500 litre compartment may be graduated in 200 litre increments. On tankers in service before 1 January 1981, it is permissible to have an additional scale mark to indicate the full capacity.

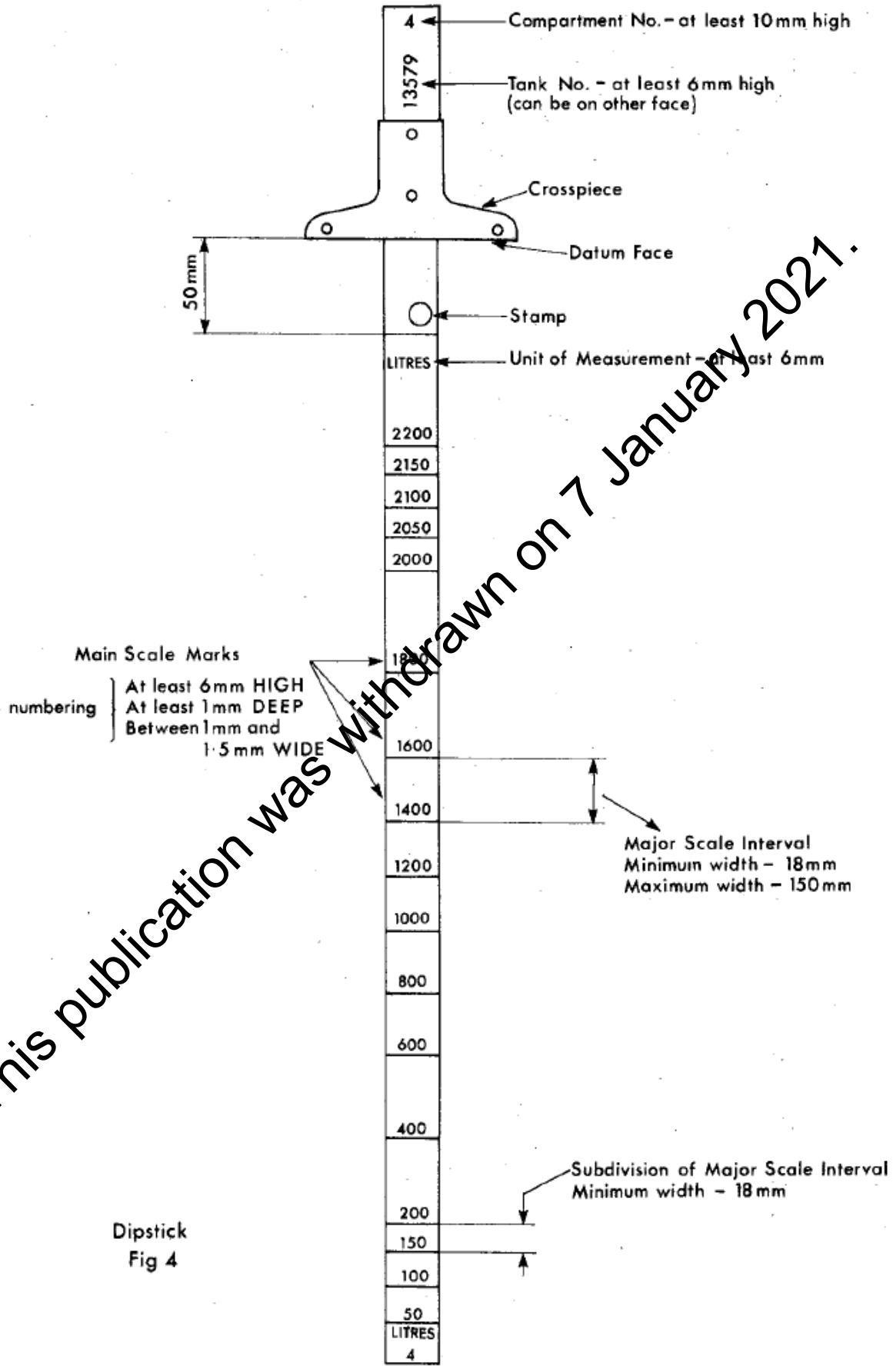
The bottom two and top three major scale divisions may be subdivided, providing that all the subdivisions are of equal value, are numbered and do not contravene the 18mm and 50% rule.

2.7.8 A dipstick calibrated with only a maximum capacity mark may only be used for full compartment deliveries.

(Regulation 28)



Dipstick Guide Tube and Datum Surface Fig 3



Dipstick
Fig 4

2.7.9 For a dipstick measuring system to function correctly it is important that the compartment is designed correctly. The following notes give guidance on some aspects of compartment design:

a) No air should be trapped on filling or liquid retained on emptying. This point must be considered in the design of baffles and stiffeners.

b) Dividers between compartments should be designed to minimise deflection. The effect on liquid level will be greater on small compartments adjacent to large compartments. The liquid level should not alter by more than 4mm when the adjacent compartment(s) are empty or full. Compartments will be calibrated and tested using water, which is denser than hydrocarbon fuels.

c) Compartments should be symmetrical where possible. The direction of curvature of dividers should therefore be considered accordingly.

d) The dipstick and diptube should lie as near as practicable to the longitudinal and transverse centre lines of the compartment to minimise the effect of tanker tilt on the dipstick reading. Dipstick storage tubes, where fitted, should be positioned away from the transverse centre line of the compartment to avoid confusion.

e) The dipstick should reach to within 20mm of the bottom of the compartment below the diptube and should also show a wet dip when the compartment contains ½% of its nominal volume of liquid. Where necessary, dip sumps should be provided in compartments with sloping bottoms.

Road tankers coming into service after 1 July 1983 should comply with the above criteria. Certain relaxations apply to existing tankers. Tankers in service before 1 July 1980 are allowed 25mm instead of 20mm, tankers in service before 1 July 1983 only have to comply with the 20mm or the l% requirement. Such tankers may continue in service until 31 December 1993

(Regulations 20, 29 and 35)

2.7.10 Manifolds are provided for convenience in making large deliveries from more than one compartment, their use obviating the need to connect the delivery hose to the faucet or outlet valve of each compartment in turn. However, a manifold also facilitates the transfer of liquid from one compartment to another, so it is necessary to prevent its misuse. There are a number of ways in which this can be achieved, including:

(a) ensuring that only one faucet valve is open at a time, orensuring that all faucet valves once opened remain open until all compartments are empty, or

(b) fitting non-return valves in the faucets.

All these methods ensure that liquid fuel is not transferred from one compartment to another when a delivery is being made. The regulations require that 'means shall be provided to prevent liquid from flowing from one compartment into another'; adequate foot valves satisfy this requirement, and such a transfer is prohibited.

Manner of use

2.7.11 The regulations restrict the use of a dipstick to the compartment with which it is identified. There is, therefore, a prohibition of dipsticks bearing scale

marks on opposite faces relating to two different compartments, and the use of dipsticks with compartments with which they are not identified.

Regulation 19)

2.7.12 The 20 mm requirement is a safeguard to prevent an apparently dry dip being taken when a significant quantity of liquid remains in a compartment. It is believed that any significant shortening of a dipstick would be relatively easy to detect.

(Regulation 20)

2.7.13 Deliveries should be planned so that dipsticks are always read at a scale mark. Readings between scale marks may be necessary in the case of a frustrated delivery when the customer's tank cannot take the whole of the requested delivery.

(Regulation 33)

TESTING AND STAMPING

2.7.14 Calibration charts for dipstick measuring systems are produced at regional calibration centres, the measuring procedures of which are co-ordinated by a liaison committee. Road tanker compartments are usually calibrated with water, using a reference meter which is regularly calibrated against a volumetric standard.

(Regulation 52)

2.7.15 Tanks submitted for testing should be clean internally, as any deposits on the internal walls will affect the accuracy of calibration. The exterior of the tanks should be reasonably clean for convenience in testing and so that statutory markings are clearly visible.

(Regulation 55)

2.7.16 The calibration chart should be given to the person submitting the road tanker for calibration. This will enable the user to obtain a stamped dipstick by submitting the dipstick, the chart and the compartment to any Trading Standards Department. The calibration chart should be kept in the locality in which the vehicle operates. A copy of the calibration chart should be retained by the testing authority.

(Regulation 52)

2.7.17 The regulations permit the stamping of a spare dipstick at the time of the initial calibration or at the time of stamping a replacement dipstick. The facility of having a spare dipstick can save road tankers operating in remote areas being out of commission while replacement dipsticks are obtained.

(Regulation 52)

2.7.18 The minimum delivery of a dipstick measuring system is restricted from 1 July 1987 to approximately of the capacity of the compartment to ensure that the volumetric error due to tolerance on the scale marks does not exceed the same limit as that prescribed for meter measuring systems.

(Regulations 6 and 33{2))

Inspection

2.7.19 It should be noted that the limits of error in excess for a meter measuring system and a contents gauging system are doubled (to 1 per cent) before the stamp falls to be obliterated, but that no such allowance for wear is made on dipstick measuring systems.

(Regulations 56, 62)

2.7.20 The nominal capacity of and minimum delivery from each compartment may be marked adjacent to each faucet valve or combined with the advice relating to dipsticks to be read at scale intervals only, as shown in Figure 5. The minimum delivery figure should be rounded up to an amount which can be read on the dipstick.

The notice should be permanent, legible and conspicuous.

Permanent	Durable adhesive labels are acceptable.
Legible	On a combined notice, the minimum size of lettering and numbering should be 7 mm. Where individual notices are positioned on or near each faucet valve, larger numbers should be used (10 mm minimum).
Conspicuous	A combined notice should be related to the size of the tanker and 250 mm x 100 mm (10" x 4") is a recommended size, although inspectors may use their discretion in respect of stocks of existing notices.

(Regulation 33)

COMPARTMENT	1	2	3	4	5	6
CAPACITY (LITRES)	5000	3000	3000	3000	3000	5000
Minimum delivery by dipstick (Litres)	1500	900	900	900	900	1500
DIPSTICKS SHOULD BE READ AT SCALE MARKS ONLY						

Figure 5

2.7.21 Dipstick guide tubes are sometimes removed and replaced for maintenance purposes. In such cases the datum height must be checked to ensure that the correct thickness of washers has been replaced. The datum point may be:

(a) a point or area on the outside surface of the compartment shell,
(b) a portion of the flange to which the manlid is bolted,
(c) the plane formed by the top of the valance.

The datum point(s) should be identified permanently by a benchmark symbol, a cross, an arrow, or the centre of a circle. The word 'datum' can be marked in paint, by impression, by an adhesive label or other durable means. The datum height can be measured to the datum surface either from a straight edge across identified points on the valance or from the datum surface on the top of the dipstick guide tube to a datum point on the compartment.

(Regulation 32)

2.8 PART VIII - SUGGESTED CRITERIA FOR TESTING FACILITIES

2.8.1 Facilities for testing tanker compartments and reference meters should satisfy certain criteria for standards, staff, procedures and environmental conditions.

Standards and testing equipment

2.8.2 All standards and testing equipment used should be of appropriate accuracy, material and form in accordance with Regulations and Specifications. They should be traceable to local or national standards and should be recalibrated at appropriate intervals to maintain confidence in the accuracy of measurement.

Staff

2.8.3 Ancillary staff should be of an appropriate grade and experience. Some formal training in the principles of metrology is desirable, although some staff may have acquired the necessary expertise through experience. An appreciation of the causes of error in volumetric measurement is essential.

Procedures

2.8.4 There should be written procedures for the calibration of tanker' compartments and reference meters. The procedures should draw attention to the causes of inaccuracies and the precautions that should be taken to minimise them. Amendments to procedures should be made in writing.

Environmental Conditions

2.8.5 Temperature stability is of prime importance in volumetric calibrations:

The reservoir of liquid should be at the same temperature as the ambient temperature of the place of test.

The temperatures of the liquid used in the calibration should be monitored.

If the coefficients of expansion of the testing equipment and the compartment or the reference meter under test are similar, the actual temperature of the liquid is not significant providing it does not change during each test

This is particularly important with hydrocarbons, which have a coefficient of expansion which is 5 to 7 times that of water.

Significant temperature changes are of the order of:-

Operation	Temp change
Calibrating a tanker compartment using water	3ºC
Calibrating a tanker compartment using hydrocarbon	0.5ºC
Calibrating a reference meter using hydrocarbon	0.1 ºC

If these figures are exceeded, the test should be repeated, or corrections made.

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