

MRA LPG

Code of Practice A2:2008

Bulk Vessels

Examination and Inspection

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This guidance is not an authoritative interpretation of the Law, but if you do follow the Guidance, you will normally be doing enough to comply with the Law.

Malta Resources Authority Officials may refer to this Guidance as illustrating good practice.

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This Code has been prepared by the Malta Resources Authority in consultation with the Malta Environment and Planning Authority (MEPA), the Malta Standards Authority (MSA), the Occupational Health and Safety Authority (OHSA), the Civil Protection Department (CPD) and Enemalta Corporation (EMC).

Before publication, the contents of this document were sent out for wide consultation to all stakeholders with an interest in the transportation, storage or use of L P Gas. Many of the comments received have been incorporated in the document.

The aforementioned Authorities believe that the contents of this Code demonstrate good practice in the L P Gas Industry and commend its use.

**The MRA
LPG Code of Practice A2**

Examination and Inspection

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Section 1: Introduction, Scope and Application

1.1 Introduction

1.1.1 Objective of this Code

This Code has been prepared for the guidance of those involved in the safe practice of storing and handling of LPG in bulk at fixed installations in the Maltese Islands.

- Other relevant Standards and Codes are listed in Appendix D.
- This Code of Practice adopts the recommendations of BSI, CEN and ISO for the presentation of numeric values. The thousand separator is therefore a space (e.g. one million is represented as 1 000 000) and the decimal separator is a comma (e.g. one point five is represented as 1,5).

1.1.2 Definition of LPG

In this Code the term *LPG* means commercial butane and commercial propane in accordance with BS 4250: 1997 or equivalent and mixtures thereof, including un-odorised product.

LPG forms flammable mixtures with air in concentrations of between approximately 2 % and 10 %. It can, therefore, be a fire or explosion risk if stored or used incorrectly.

- Other properties are given in Appendix B.

1.2 Scope

The Code gives guidance for:

- Items to be included in written schemes of examination of bulk LPG vessels having a capacity of 150 kilograms or more, or, any six or more interconnected portable LPG cylinders;
- Items, operating at pressures in excess of 0.5 bar gauge, to be included in written schemes of examination of distribution systems up to the consuming equipment;
- marking of bulk LPG vessels having a capacity of 150 kilograms or more, or any six or more interconnected cylinders, following examination and issuing reports on the examination;
- keeping of records of examination for bulk LPG vessels having a capacity of 150 kilograms or more, or any six or more interconnected cylinders;

- the routine inspection of bulk LPG vessels having a capacity of 150 kilograms or more, or any six or more interconnected cylinders, and their associated equipment;
- periodic inspection of equipment associated with bulk LPG vessels or LPG cylinders on a header.

This Code of Practice assumes that the system has been designed and installed in accordance with the MRA LPG Codes of Practice A1 and A3 and other relevant LPG Codes of Practice or equivalent Standards.

This Code of Practice does not cover:

- refrigerated storage and its associated equipment;
- transport vessels;
- burners and their associated equipment;
- inspection, testing and maintenance of hoses for the transfer of LPG in bulk which are the subject of the MRA LPG Code of Practice D1;
- other aspects of the installation which may also require periodic inspection (electrical work equipment, equipment in zoned areas, air compressors etc.).

1.3 Legal Requirements

In addition to the general requirements of the Health and Safety at Work Places (L.N. 36 of 2003), LPG installations are to abide to the LPG Market Regulations LN 249 of 2008.

An important requirement of these regulations is that the user of the system has a written scheme for periodic examination.

The scheme must either be drawn up by a competent person, or be certified as suitable by a competent person. Examination must then be carried out by a competent person within the intervals specified in the scheme.

The competent persons drawing up or certifying the scheme and those carrying out subsequent examination need not be the same.

The user of the pressure system is required to establish the safe operating limits for the system (for example: pressure, temperature and vacuum rating). This

information needs to be available to the competent person carrying out the examination in accordance with the written scheme.

If the competent person carrying out the examination is of the opinion that the pressure system will give rise to imminent danger he must notify the owner / user within fourteen days.

Hazardous places are defined as places in which an explosive atmosphere may occur in such quantities as to require special precautions to protect the health and safety of the workers concerned.

Employers and the self-employed must:

- carry out a risk assessment where a dangerous substance is or is liable to be present in the workplace;
- provide technical and organisational measures to eliminate or reduce as far as reasonably practicable the identified risks;
- provide equipment for procedures to deal with accidents and emergencies;
- provide information and training to employees;
- classify places where explosive atmospheres may occur into zones and mark the zones where necessary.

Under the Control of Major Accident Hazard Regulations 2003 (COMAH) there is also a general duty on operators at establishments with more than 50 tonnes of LPG to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment. Operators with more than 200 tonnes of LPG on their establishments are required to demonstrate, in a Safety Report, that adequate safety and reliability have been incorporated into the design, operation and maintenance of the installation and its equipment.

1.4 Definitions

1.4.1 Competent Person

A competent person means a person approved by the MRA who holds a warrant to practice the profession of an engineer under the Engineering Profession Act or the equivalent professional qualification as provided under the Mutual Recognition of the Qualifications

Act, and who has suitable training, sufficient knowledge, experience and skill in gas technology as approved by the Authority.

1.4.2 Examination

A careful and critical scrutiny of a pressure system or part of a pressure system in or out of service as appropriate, using suitable techniques, including testing where appropriate, to assess:

- (a) its actual condition; and
- (b) whether, for the period up to the next examination, it will not cause danger when properly used if normal maintenance is carried out, and for this purpose "normal maintenance" means such maintenance as it is reasonable to expect the user or owner to ensure is carried out independently of any advice from the competent person making the examination.

the results of which are recorded.

1.4.3 Periodic Inspection

An inspection of an installation, other than those parts covered by the written scheme of examination, the results of which are recorded.

1.4.4 Routine Inspection

An external inspection carried out at intervals more frequent than, and in addition to, examination or periodic inspection.

It should include the visible parts of the vessel, its fittings and other equipment associated with the bulk storage facility.

1.4.5 Written Scheme of Examination

A document, prepared, or certified as being suitable by, a competent person, containing information relative to a pressure system containing at least the following information:

- those parts of the system which are to be examined, including, but not necessarily limited to the pressure vessel, its safety devices and mountings;
- the identification of the item of plant or equipment;
- the nature of the examination required, including the inspection and testing to be carried out on any protective devices;
- the preparatory work necessary to enable the item to be examined safely;
- the date by which the initial examination for newly installed systems (if appropriate) is to be completed;
- the maximum interval between examinations;

- the critical parts of the system which, if modified or repaired, should be examined by a competent person before it is used again;
- the safe operating limits;
- the name of the competent person certifying the written scheme; and
- the date of the certification.

1.5 References

This Code of Practice incorporates by dated or undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed in Appendix D. For dated references, subsequent amendments to or revisions of any of their publications apply to this Code of Practice only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

Section 2: Examination and Inspection

2.1 General

This Code of Practice describes three levels of assessment of bulk LPG storage at fixed installations:

- examinations;
- periodic inspections;
- routine inspections.

Disassembly or removal of items of plant whilst any part of a system is under pressure is potentially hazardous and shall not be permitted unless carried out in accordance with a written work instruction and the absence of pressure on or in that item of equipment has been verified. This will necessitate a full knowledge of the construction, operation and assembly of the part to be disassembled or removed.

Attention is particularly drawn to the need for careful consideration of:

- Plugging or capping of the outlets of single isolation valves;
- Product contained in pipework between isolating valves;
- Relief valve check devices;
- The design of ball valves;
- Vessel isolation;
- Electrical isolation;
- Requirements for purging and, if necessary, subsequent ventilation.
 - MRA LPG Code of Practice A4 gives further guidance.
- Work in confined spaces.

Modification or repairs to an installation for whatever purpose including change of duty should comply with the requirements of the MRA Codes of Practice A1 and A3 whichever is relevant.

2.2 Examinations

Examinations described in this Code form the basis of an examination by a competent person in accordance with the written scheme of examination required under (i) authorisations issued under the LPG Market Regulations, LN 249 of 2008 and (ii) in the draft Bulk LPG Regulations (Installation and Use) Regulations. They may be undertaken all or in part by the operator, a contractor or inspection authority, or by the LPG supplier provided they fulfil the duties of a competent person and are sufficiently independent from the interests of all other functions. Only one competent person can be responsible for carrying out the examination in accordance with the written scheme of examination, even though he may call upon the services of others.

Examination of LPG vessels and associated pressure systems should be carried out in accordance with the written scheme and Sections 3, 4 and 5, Examination intervals must be no greater than those defined by the competent person in the written scheme.

Appendix A suggests examination intervals. The Competent Person drawing up the Written Scheme of Examination may vary these intervals, if justified, by taking into account all the particular circumstances of each case, including the history of previous examinations.¹

Any defects observed should be assessed by a competent person. Any repairs required as a result of the examination, and any modifications or changes to safe operating limits, must be completed within the time limit specified in the report.

Safe operating limits should not be less than those specified in the MRA LPG Codes of Practice A1 and A3.

Defects should be assessed by a suitable method². Particular care should be taken where passive fire protection is employed.

Following review the Competent Person may decide that the period between examinations should be altered for example as the age of the plant increases.

Note. In many cases LPG storage vessels are not normally subject to fatigue loading, stress corrosion cracking or general internal corrosion. In these cases the likelihood that cracks will develop in service will be low. This may be reflected in the choice of inspection methods and frequencies.

¹ Further guidance can be obtained in standards such as BS EN 12817:2002, BS EN 12818:2002, BS EN 12819:2002 and BS EN 12820:2002.

² BS 7910:2005 gives guidance on the assessment of defects.

2.3 Inspections

Inspections described in this Code may be undertaken all or in part by the operator, a contractor or inspection authority, or by the LPG supplier. Where the duties are shared between such organisations the respective areas of responsibility should be clearly identified to ensure that the entire installation is adequately covered.

There should be a procedure in place to ensure that any necessary remedial action identified by the inspection is taken within an appropriate time scale. Any defect which may affect the safety of the installation should be reported to a competent person for assessment.

2.3.1 Periodic Inspections

Periodic inspections of LPG installations should be carried out at defined intervals in accordance with Section 5 and a written procedure, by an appropriately trained person and the results recorded. There should be a procedure in place to ensure that any necessary remedial action identified by the inspection is taken within an appropriate time-scale. (Appendix A suggests inspection intervals).

2.3.2 Routine Inspections

Routine inspections of LPG installations should be carried out in accordance with Section 6, by an appropriately trained person. There should be a procedure in place to ensure that any necessary remedial action identified by the inspection is taken. Inspection intervals should be defined.

Section 3: Examination of Storage Vessels and Vaporisers

3.1 General

Examination of storage vessels must be carried out by a competent person in accordance with national Legislation. The vessel or vaporiser must be positively identified before any examination. This should be established from the date plate/ vessel markings or stampings, manufacturer's information or information of previous examinations. For a vessel that cannot be identified by one of the methods then the vessel should not be used.

Where appropriate, the written scheme of examination must provide for an examination to be carried out before the pressure system is used for the first time. Thereafter, the report of examination must specify, within the limits set by the scheme, the date after which the system must not be operated without further examination.

A suggested frequency for periodic examination, assuming that routine inspection is carried out in accordance with Section 6, is given in Appendix A.

3.2 Examination methods

The method of examination is at the discretion of the Competent Person drawing up the written scheme. The methods which may be employed for the examination of vessels include:

- Visual External Examination;
- Hydraulic Test;
- Ultrasonic Thickness Testing;
- Visual Internal Examination (by entry or by optical probe or other means);
- Acoustic Emission;
- Radiography;
- Magnetic Particle Inspection;
- Other appropriate non-destructive testing methods.

3.3 Above Ground Vessels

3.3.1 Vessels up to and including 4 tonnes LPG capacity

Examination should include, as minimum:

- Visual examination of external surfaces and all welds for signs of defects such as; damage, corrosion, cracking, erosion, deformation, leakage etc.;

- Examination of safety devices in accordance with Section 4;
- A check of wall thickness or condition by internal visual examination or a wall thickness survey (e.g. by the use of an ultrasonic thickness meter)

3.3.2 Vessels exceeding 4 tonnes LPG capacity

- Visual examination of external surfaces and all welds for signs of defects such as; damage, corrosion, cracking, erosion, deformation, leakage etc.;
- Examination of safety devices in accordance with Section 4;
- A check of wall thickness or condition by internal visual examination or a wall thickness survey (e.g. by the use of an ultrasonic thickness meter). The survey should include areas where corrosive or erosive degradation may occur.

Depending on the vessel's duty and application, the Competent Person may need to consider additional examinations such as:

- Specific crack detection methods on welds for example a proportion of the internal main seam welds, a proportion of internal T-junctions, nozzle attachments welds and higher stress areas around saddle horns etc..

3.3.3 Marking

After satisfactory examination the date of the examination must be marked on data plate. For ease of interpretation date marking should be restricted to:

- a) month and year e.g. 7/99;
- b) quarter and year e.g. 4q/99;
- c) year e.g. 99.

Following examination a report must be issued. (See Section 7).

3.4 Underground/Mounded Vessels

Examination of Underground/Mounded vessels should include:

- A visual check of exposed surfaces;
- Examination of fittings in accordance with Section 5;
- Where cathodic protection is provided, verification of the operation of sacrificial anodes or impressed current systems in accordance with a written procedure, suppliers/installers instructions and, where applicable, appropriate British or European

Standards and replacement as necessary. Records should be maintained to allow comparisons of the readings obtained so as to allow investigation of any anomalous readings (see also 7.2);

- In all cases the inadequacy of the condition of the pressure retaining boundary of the vessel for future service must be ascertained in a manner directed by the competent person;
- Where a vessel is provided with a man-way or where cathodic protection is not provide, adequate wall thickness should be confirmed by an internal visual examination and *either* a wall thickness check or a hydraulic test.
 - Where internal examination is not reasonably practicable the external surfaces of the vessel should be exposed for examination as directed by the competent person.

3.4.2 Marking

After satisfactory examination the date of the examination must be marked on data plate. For ease of interpretation date marking should be restricted to:

- d) month and year e.g. 7/00;
- e) quarter and year e.g. 4q/00;
- f) year e.g. 2000.

Following examination an examination report must be issued. (See Section 7).

3.5 Vaporisers

As a minimum examination of vaporisers should include:

- Examination of accessible surfaces and welds for signs of defects such as damage, corrosion, cracking, erosion, deformation, leakage etc. Special attention should be paid to flame impingement areas of direct fired equipment;
- Hydraulic testing of LPG part to design pressure;
- Examination of fittings in accordance with Section 4;
- A check for the satisfactory operation of such items as level controls, heat input controls, emergency valves (other than pressure relief valves), flame supervision devices, pressure controllers, etc. should be checked. Particular attention should be paid to safety devices such as solenoid valves and other items which may not be called upon to function in normal operation;
- A check that any pilot and main burner systems are clean and well adjusted;

- A check for LPG leakage under operating pressure, using leak detection fluid or equivalent for leak detection;

Safety Note: LPG may contain small quantities of extraneous matter which can collect and settle in the vaporiser vessel and/or in the outlet pipework and pipework after the downstream regulator. Great care should be taken in removal and disposal of accumulated material.

3.6 Vessel Attachments

Safety Note: Care should be taken when removing pipework flange bolts to ensure that bolts attached to other fittings are not inadvertently disturbed.

Vessel attachments such as flanges, flange bolts and threaded connections should either be:

- Replaced;
- Checked for correct fitting, corrosion and damage. Items found unacceptable should be replaced or repaired.
- Gaskets which are disturbed during such operations should be replaced.

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Section 4: Examination of Storage Vessel Fittings

4.1 General

Examination of storage vessel fittings must be carried out by a competent person.

Positive identification of the safety devices must be established from the data plates, markings or stampings before any examination. Unidentified fittings must be assessed by a competent person and safe operating limits established. These should not be less than those specified in the MRA LPG Codes of Practice A1 or A3. A written scheme of examination must be established before any examination is undertaken.

Where appropriate, the written scheme of examination must provide for an examination to be carried out before the pressure system is used for the first time. Thereafter, the report of examination must specify, within the limits set by the scheme, the date after which the system must not be operated without further examination.

A suggested frequency for examination, assuming that routine inspection is carried out in accordance with Section 6, is given in Appendix A.

4.2 Pressure Relief Valves

No attempt to remove a relief valve from a vessel under pressure should be made unless it is fitted with a suitable check device. The type and construction of the check device needs to be identified and the manufacturer's instructions for the safe removal of the relief valve fully understood. These devices should include positive means of confirming that the check device has closed before unscrewing the relief valve proceeds to an otherwise dangerous stage. The use of special tools to remove relief valves from check devices is recommended.

Relief valves should be compatible with the check device. They should ensure that the device is fully open when the relief valve is correctly fitted and fully closed before the relief valve threads can disengage from the device.

A relief valve should not be removed from a multi-port or check-device whilst a vessel is under pressure unless a suitable serviceable replacement is immediately fitted.

Before installation the test date and other details stamped on the replacement relief valve body should be checked to ensure suitability for use in the application.

Relief valves should be replaced with new or reconditioned units set at a pressure not less than the vessel maximum working pressure but not above the vessel design pressure.

Following installation the pressure relief valve should be checked to ensure that it is correctly fitted.

Any vent stack should be checked before being refitted.

Any vent stack pipe which is not corrosion protected should be replaced by a pipe which is galvanised or otherwise protected against corrosion.

The tops of vent pipes should be protected by a rain cap.

4.3 Pipe Work

Pipework at commercial and industrial premises operating at pressures greater than 0.25 bar shall be subject to the draft Bulk LPG Regulations (Installation and Use) Regulations.

Incorrectly installed or maintained LPG pipework can give rise to a number of hazards other than the release of stored energy, such as fire and explosions. Section 5 gives guidance of inspection of pipework.

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Section 5: Periodic Inspection of Equipment Other than that Covered in Sections 3 and 4

5.1 General

Items subject to routine inspection, excluding parts covered by the written scheme of examination, should also be subject to periodic inspection. In addition to the items in Section 6 the equipment given in 5.2 to 5.13 should be included.

- A suggested frequency for periodic inspection, assuming that routine inspection is carried out in accordance with Section 6, is given in Appendix A.

There should be a procedure in place to ensure that any necessary remedial action identified by the inspection is taken within an appropriate time scale. Parts not deemed fit for purpose should be repaired and if necessary revalidated or replaced prior to the system being brought back into service.

5.2 Shut-Off Valves

Shut-off valves, including remotely operated types, and vessel attachments should be checked for effective operation, corrosion and damage or replaced.

Before installation the details of the shut-off valves and vessel attachments should be checked to ensure suitability for use in the application.

Following installation, shut-off valves and vessel attachments should be checked to ensure that they are correctly fitted.

5.3 Pipework

5.3.1 General

An inspection regime for pipework should be established taking into account:

- The phase of LPG in the pipe (liquid or vapour);
- The operating pressure;
- The high liquid flows which might result in erosion of the pipewall;
- The size of the pipe;
- Materials for construction;
- The location (above or below ground)
- How long it is likely to be / has been in service;
- The type of corrosion protection;
- Potential failure modes;
- For Buried pipes:

- Ground connections
- Type of backfill
- Proximity to occupied buildings (including any likelihood of accumulation in the building if a leak occurs);
- Traffic passing over the pipe
- If there have been any excavations near the pipe

5.3.2 Visual Inspection

Above ground pipework should be inspected for corrosion and damage. Particular care should be paid to pipework where it passes through supports, this may necessitate the removal of sections of thermal insulation.

Pipework supports should be checked to ensure that they are secure and in a satisfactory condition.

Thermal insulation should be inspected for damage. Suspect areas should be removed to allow inspection of the pipe.

5.4 Product Transfer System

Pumps, compressors and associated equipment such as strainers should be inspected in accordance with the manufacturer's instructions, or other schedule prepared by a competent person. Particular attention should be paid to seals and lubrication.

5.5 Hydrostatic Relief Valves

No attempt should be made to remove the hydrostatic relief valve from an LPG system unless the system has been fully depressurised.

Hydrostatic relief valves should be replaced with new or reconditioned units set at a pressure of not less than the maximum working pressure but not more than the design pressure of the equipment they are protecting:

Before installation the test date and other details stamped on the hydrostatic relief valve body should be checked to ensure suitability for use in the application.

Following installation the hydrostatic relief valve should be checked to ensure that it is correctly fitted and provided with a rain cap.

5.6 Electrostatic Protection

Electrostatic protection systems earthing and bonding points should be inspected visually.

5.7 Electrical Equipment

All ancillary electrical equipment including cables and connections, particularly flameproof connections, switches etc. should be inspected to ensure they are in satisfactory condition in accordance with manufacturer's/installer's instructions or other schedules prepared by a person competent in electrical matters.³

5.8 Fire Precautions

Fire extinguishers should be checked, tested and maintained at regular intervals according to the manufacturer's instructions, or other schedule prepared by a competent person.⁴

Firewater hoses, nozzles, fire pump water spray systems and initiating systems (e.g. air lines) should be checked for correct operation in accordance with supplier's instructions or other schedules prepared by a person competent in fire protection systems.

Alarm systems should be tested regularly.

Weeds, long grass and any readily combustible material should be kept clear from an area within the separation distance from any LPG vessel of up to 2 500 litres water capacity and 6m of larger vessels. (See MRA LPG Code of Practice A1). If weed killers are used, chemicals such as sodium chlorate which are a potential source of fire danger should not be selected for this purpose.

Note: Where the owner of the installation is not the site operator, the two parties should agree who takes the responsibility for the above items, bearing in mind the duties under fire legislation fall mainly on the operator.

5.9 Pressure Gauges (where fitted)

Gauges should be checked for operation in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.10 Excess Flow Valves, Non-Return Valves

³ Further guidance can be found in BS 5345, BS 7671 and BS EN 60079-17 or equivalent standards.

⁴ Further guidance can be found in BS 5306 Part 3 or equivalent.

Excess flow valves and non-return valves should be checked for freedom to operate in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.11 Temperature Gauges (where fitted)

Gauges should be checked for operation in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.12 Pull-Away/Breakaway Couplings

Couplings should be checked for operation in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.13 Contents Gauge

Gauges should be checked for operation in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.14 Fixed Liquid Level Gauge

Gauges should be checked for operation in accordance with manufacturer's recommendations or a written procedure, or replaced.

5.15 Regulators and Associated Safety Devices

The condition of regulators and any associated safety devices should be checked in accordance with a written procedure, or they should be replaced. Written procedures will need to reflect any limitation imposed by the manufacturer. In many situations the customer/site operator will own and have the responsibility for the regulator and any associated safety devices. Regulators are provided as part of the equipment necessary for the distribution of gas and the operation of appliances and as such should be regularly inspected.

Section 6: Routine Inspection

6.1 General

Routine inspections should be carried out in accordance with a written procedure which should include a procedure for the reporting of anomalies. There should be a procedure in place to ensure that any necessary remedial action identified by the inspection is taken within an appropriate time scale.

- Routine inspection should take place at least annually but on many sites, particularly vapour off-take installations, it may be convenient to carry these out as part of routine filling procedures.

6.2 Items to be Covered in Routine inspection

Where applicable the items listed below should form part of an inspection. Acceptance criteria may depend on site conditions.

6.2.1 Storage Site

- A check that the area around bulk vessels is free of flammable/combustible materials.
- A check that the area immediately around the bulk vessel is clear of excessive vegetation.
- A check that there have been no obvious changes to the bulk vessel installation or immediate surroundings and that there is no obvious ground movement.
- A check that natural ventilation is still adequate.
- A check that the condition of concrete pads and piers is satisfactory.
- A check that there are no signs of differential settlement.

6.2.2 Condition of LPG Vessel

6.2.2.1 Above ground

A check that there are no signs of corrosion, significant paintwork deterioration or other damage on:

- the vessel;
- its supports;

- any fire resisting coatings.

6.2.2.2 Underground/Mounded

- A check that there are no signs of corrosion or damage to the visible parts of the vessel.

6.2.3 Vessel Fittings

- Relief valves should be checked to ensure they do not contain water and that drain holes are clear.
- If relief valve vent pipes are not corrosion-resistant, or if rain caps are missing, the pipes should be removed to check that operation of the relief valves is not affected by corrosion or debris. Missing rain caps should be replaced.
- A check that any multi-port relief valve manifold clapper mechanisms operate effectively.
- A check that valve hand wheels or levers are free to move the valve stem.

IMPORTANT - The dangers of interrupting gas supply in use must be taken into account when checking a valve operation.

- A check that contents gauging overflow protection and/or stop-fill devices are effective.
- A check that pressure gauges and gauge isolating valves are functional.
- A check that there are no signs of physical damage to fittings.
- A check that there are no obvious signs of leaks.

6.2.4 Vessel Hood (where applicable)

- A check that the hood is in a satisfactory condition and capable of being locked.

6.2.5 Earthing and Static Bonding Arrangements (where applicable)

- A check that any earthing rod is in position and securely connected to the vessel.
- A check that there is an earthing point or bonding connection for use by the bulk delivery tanker.

6.2.6 Pipe work and Associated Equipment in the Vicinity of the LPG Vessel

- A check that the external condition of visible pipework and associated equipment such as filters, pumps, compressors etc. is satisfactory and that there are no signs of corrosion or physical damage.
- A check that pipework supports are secure and in a satisfactory condition.

Note: The point of contact between support and piping needs particular attention.

- A check that there are no signs of damage to thermal insulation.
- A check that there are no obvious leaks.
- A check that hydrostatic relief valve caps are in place.

6.2.7 Storage Compound Protection (where applicable)

- A check that fencing is in good condition.
- A check that there are at least two outward opening gates and that these are free to open correctly.
- A check that protective kerbs, barriers etc. are in good condition.

6.2.8 Warning Notices

- A check that statutory notices on the vessel and compound (where applicable) are up to date and readable from the separation distances given in the MRA LPG Code of Practice A1.

6.3 Vaporisers

- A check for the satisfactory operation of such items as level controls, heat input controls, emergency valves (other than pressure relief valves), flame supervision devices, pressure controllers, etc. Particular attention should be paid to safety devices such as solenoid valves or other items which may not be called upon to function in normal operation.
- A check that any pilot and main burner systems are clean and correctly adjusted.
- A check for LPG leaks under operating pressure, using leak detection fluid or equivalent.

Section 7: Records and Reports

7.1 General

The user of an installed pressure system must keep records or copies of them in accordance with the conditions of authorisations issued under the LPG Market Regulations, LN 249 of 2008 or as indicated in the draft Bulk LPG Regulations (Installation and Use) Regulations.

7.2 Records of Examinations

Records of Examination must be kept until superseded.

Records of modifications must be kept for the life of the vessel.

Records of previous Examinations containing information which will materially assist in assessing whether:

- the system is safe to operate;
- any repairs or modification to the system can be carried out safely;

must be kept for the life of the vessel.

7.3 Reports of Examinations

7.3.1 General

When the competent person has carried out an examination he must:

- make a written report of the examination;
- sign or otherwise authenticate it;
- date it;
- send it to the user.

7.3.2 Sending of the Report.

The report must be sent as soon as is practicable after completing the examination and in any event to arrive:

- (a) within 28 days of the completion of the examination (or, in the case of integrated installed systems where the examination is part of a series, within 28 days of the completion of the last examination in that series); or
- (b) before the date specified in the previous report;

whichever is sooner.

If the competent person is the user the requirement to send the report to the user or owner does not apply, but he must complete the report within the times above.

7.3.3 Content of the report

Suggested items for inclusion in the report include the following:

- name and address of owner;
- address, location of system and name of user (if different from owner);
- identification of system or parts examined;
- parts not examined;
- result of the examination;
- any repairs needed and the time scale for completion;
- any changes in the safe operating limits and the date by which they should be made;
- any change in the written scheme of examination;
- date by which the next examination must be completed;
- other observations;
- safe operating limits;
- where the most recent examination due was postponed the names of appropriate members of the competent person's and the user's/owner's organisation, the date of giving the relaxation and the new date by which the examination was to be completed;
- date examination took place;
- name and address of competent person;
- signature; and
- date of report

7.3.4 User Responsibilities

The user must ensure that the system is not operated after:

- (a) the date specified under paragraph 3.1 and 4.1 unless the repairs or modifications specified under that paragraph have been completed, and the changes in the established safe operating limits so specified have been made; or
- (b) the date specified under paragraph 3.1 and 4.1 (or, if that date has been postponed under paragraph 7), the postponed date unless a further examination has been carried out under the scheme of examination.

7.3.5 Postponement

The date specified in a report under paragraph 3.1 and 4.1 may be postponed to a later date by agreement in writing between the competent person who made the report and the user if:

- (a) such postponement does not give rise to danger;
- (b) only one such postponement is made for anyone examination; and

- (c) such postponement is notified by the user or owner in writing to the MRA premises at which the pressure system is situated, before the date specified in the report under paragraph 3.1 and 4.1.

Where the competent person is the user the reference to an agreement in writing does not apply, but the notification to the MRA must include a declaration that the postponement will not give rise to danger.

7.3.6 Action in case of imminent danger

If the competent person carrying out the examination is of the opinion that the pressure system or part of the pressure system will give rise to imminent danger unless:

- repairs or modifications are carried out; or
- suitable changes to the operating conditions are made;

he must:

- make a written report to user to that effect identifying the system and specifying the repairs, modifications or changes concerned;
- he must also send a copy to the enforcing authority within 14 days of the completion of the examination.

The user of the pressure system shall ensure that the system (or, if the report only affects a discrete part of the system, that part) is not operated.

7.4 Records of Periodic Inspections

Records of periodic inspections should be kept until superseded.

Appendix A: Examination Intervals

A.1 Examinations

The frequencies indicated may be varied by the Competent Person in the Written Scheme on the basis of a combination of experience, statistical data or equipment suppliers' recommendations.

Item	Examination Frequency	Clause
Vessels - Above ground	At 10 years	3.3
Vessels - Underground with cathodic protection	Annual At 10 years	3.4 (Cathodic Protection only) 3.4
Vessels - Underground without cathodic protection	At 5 years	3.4
Vaporisers		
Direct fired Vaporisers	Annual	3.5
Indirectly heated Vaporisers	At 5 years	3.5

Item	Examination Frequency	Clause
Vessel fittings Pressure relief valves	At 5 years* * Note: For internal valves or external valves to MRA LPG Code of Practice D2 with stainless steel springs, the frequency may be increased up to a maximum of 10 years in accordance with the manufacturers guaranteed service life, or where sufficient service performance data is available to satisfy the competent person that the longer service life is justified.	4.1
Pipework Fittings Hydrostatic relief valves	At 10 years	5.5

A.2 Periodic Inspection

Item	Frequency	Clause
Above ground pipework	Subject to risk assessment	5.2
Underground pipework	Subject to risk assessment	5.3
Fire precautions (equipment)	See BS 5306 part 3:2003	5.8
Other Items	10 years	5

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Appendix B: Safe Handling and Properties of LPG

B.1 Safe Handling of LPG

The liquid petroleum gas which is generally available in Malta consists of a mixture of Butane and Propane (70-80% and 30-20% respectively) according to MSA EN 589 depending on the season. These component gases of the present LPG mixture may be made available for sale and use as separate products in accordance with BS 4250:1997 or equivalent.

The mixture is normally supplied in cylinders up to 25 kg capacity and has a much lower vapour (or cylinder) pressure than propane.

The combustion of LPG produces carbon-dioxide (CO₂) and water vapour, but sufficient air should be available. Inadequate appliance flueing and/or ventilation, or poor air-gas mixing e.g. due to lack of servicing, can result in the production of toxic carbon monoxide.

Everyone concerned with the storage and handling of LPG should be familiar with the following characteristics and potential hazards: -

- (a) LPG is stored as a liquid under pressure. It is almost colourless and its weight is approximately half that of an equivalent volume of water.
- (b) LPG vapour is denser than air, butane is about twice as heavy as air and propane about one and a half times as heavy as air. Consequently, the vapour may flow along the ground and into drains, sinking to the lowest level of the surroundings and be ignited at a considerable distance from the source of leakage. In still air vapour will disperse slowly.
- (c) LPG can form a flammable mixture when mixed with air. The flammable range at ambient temperature and pressure extends between approximately 2 % of the vapour in air at its lower limit and approximately 10 % of the vapour in air at its upper limit. Within this range there is a risk of ignition. Outside this range any mixture is either too weak or too rich to propagate flame. However, over-rich mixtures can become hazardous when diluted with air.

At pressures greater than atmospheric, the upper limit of flammability is increased but this increase with pressure is not linear.

- (d) Escape of even small quantities of the liquefied gas can give rise to large volumes of vapour/air mixture and thus cause considerable hazard. A suitably calibrated explosimeter may be used for testing the concentration of LPG in air.

A NAKED FLAME SHOULD NEVER BE USED TO SEARCH FOR A LEAK.

- (e) At very high concentrations in air, LPG vapour is anaesthetic and subsequently an asphyxiant by diluting or decreasing the available oxygen.

- (f) Commercial LPG is normally odourised before distribution by the additional of an odourant such as ethyl mercaptan or dimethyl sulphide, to enable detection by smell of the gas at concentrations down to one-fifth of the lower limit of flammability (i.e. approximately 0,4 % of the gas in air). However in certain cases where the odourant may be detrimental to a process (for example in aerosol applications) the LPG is not odourised.
- (g) Escape of LPG may be noticeable other than by smell. When the liquid evaporates, the cooling effect on the surrounding air causes condensation and even freezing of water vapour in the air. This effect may show itself as frost at the point of escape and thus make it easier to detect an escape of LPG. Because the refractive index of LPG differs from air, leaks can sometimes be seen as a shimmering.
- (h) Owing to its rapid vaporisation and consequent lowering of temperature, LPG, particularly liquid, can cause severe frost burns if brought into contact with the skin. Personal protective equipment (e.g. hand and eye protection) should be worn if this hazard is likely to occur.
- (i) A container, which has held LPG and is empty may still contain LPG in vapour form and is thus potentially dangerous. In this state the internal pressure is approximately atmospheric and if a valve is leaking or is left open, air can diffuse into the container forming a flammable mixture and creating a risk of explosion; alternatively, LPG can diffuse to the atmosphere.

Note: These properties are general characteristics of LPG and items such as (h) should not occur in normal cylinder usage.

B.2 Typical properties of commercial LPG

	Commercial Butane	Commercial Propane
Relative density of liquid at 15 °C	0,57 to 0,58	0,50 to 0,51
Imperial gallons/ton at 15 °C	385 to 393	439 to 448
Litre/tonne at 15 °C	1 723 to 1 760	1 965 to 2 019
Relative density of gas compared with air at 15 °C and 1 013,25 mbar g	1,90 to 2.1 0	1.40 to 1,55
Volume of gas (litres) per kg of liquid at 15 °C and 1 013,25 mbar g	406 to 431	537 to 543
Volume of gas (ft ³) per lb of liquid at 60 °F and 30 in Hg	6,5 to 6,9	8.5 to 8,7
Boiling point at atmospheric pressure °C approx.	-2	-45
Vapour pressure for products at their maximum specified vapour pressure (gauge)		
Temp. °C		
-40	bar g	bar g
-18	-	0,5
0	*	2,3
15	0,9	4,5
38	1,93	6,9
45	4,83	14,5
Latent heat of vaporisation (kJ/kg) at 15°C	5,86	17,6
Latent heat of vaporisation (Btu/lb) at 60 °	372,2	358,2
Specific heat of liquid at 15°C (kJ/kg deg C)	160	154
Sulphur content per cent weight	2,386	2,512
Limits of flammability (percentage by volume of gas in a gas-air mixture to form a combustible mixture)	Negligible to 0,02	Negligible to 0,02
Calorific Values:	Upper 9,0	Upper 10,0
<i>Gross</i>	Lower 1,8	Lower 2.2
(MJ/m ³) dry		
(Btu/ft ³) dry		
(MJ/kg)	121,8	93,1
(Btu/lb)	3 270	2 500
<i>Nett</i>	49,3	50,0
(MJ/m ³) dry	21 200	21 500
(Btu/ft ³) dry	112,9	86,1
(MJ/kg)	3 030	2 310
(Btu/lb)	45,8	46,3
Air required for combustion (m ³ to burn 1m ³ of gas)	19 700	19 900
	30	24

*Minimum Commercial Butane vapour pressure at -18

Appendix C: Typical LPG Installation Examination Report

Examination Report Reference No.	
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Date of Inspection	
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Date of Report	
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Owner LPG Installation	Name						
	Address						
Tel		Fax		Mobile		Email	

Site of Installation	Responsible Person						
	Address						
Tel		Fax		Mobile		Email	

Tank Compound details			
Category of installation	Commercial/Industrial		Domestic
No. of tanks			
Capacity each tank			
Total capacity			
Type of Installation	Mounded / Buried		Above Ground
Tank Supplier / Brand			
Serial number's			
CE Mark			
Year of Manufacture			
Tank Installer			
Last test carried out on vessel	Date.:	By whom	
Type of test carried out on vessel	Date :	By whom	
Visual examination of external surfaces or welds			
Has any alterations been carried out since last inspection / certification (Please state in notes or supply documentation.)			

MRA DRAFT FOR CONSULTATION PURPOSES - NO LEGAL VALUE

Accessories fitted on tank	Safety valve		Rated		Seal	
	Vent on safety valve					
	Fill point					
	Contents gauge					
	1 st stage regulator					
	Pressure gauge after 1 st stage reduction					
	2 nd stage regulator					
	Pressure gauge after 2 nd stage reduction					
	Contents temperature gauge					
	Corrosion protection anodes					
	Shut off valve/s	Manual	Auto			
	Excess flow valve					
	Pressure Relief Valve					
	Further Notes					

Safety Ancillaries	Warning signage				
	Electrical points / ignition sources in vicinity				
	Earth electrode		Resistance		
	Earth impedance test certificate attached				
	Fire / Gas Dispersion wall/s				
	Weep hole / Louvers / Adequate Ventilation				
	Fence / gates / locks				
	Bollards/ Protection from Vehicles				
	Vessel area covering				
	Bowser Access				
	Electro Static Protection				
	Flame Proof Protection				
	Fire Precautions / Emergency Procedures				
	Further Notes				

MRA DRAFT FOR CONSULTATION PURPOSES - NO LEGAL VALUE

System details	Vaporizer installed		Type	Hot water	
	As per codes			with Boiler	
				Electric	

Pipework	liquid line	Material		Pressure tested	
	vapour line outside premises	Material		Pressure tested	
	vapour line inside premises	Material		Pressure tested	
	Pressure test certificate/s attached				

safety ancillaries on pipe line	Earthing			
	2nd stage regulator		Indoor	
			Outdoor	
	Pressure Gauge mbar			
	Emergency shut off valves		Manual	Auto
	Leakage sensor			
	Piping Installed By			
Further Notes				

Next Examination Scheduled	
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Examination Engineer	Name	ING.
	Qualifications	
	Warrant No.	
	Signature	

Appendix D: References

British Standards

BS 4250:1997	Specification for commercial LPG.
BS 5306 Part 3:2003	Fire extinguishing installations and equipment on premises. Code of practice for selection, installation and maintenance of portable fire extinguishers.
BS 7671:2008	Requirements for electrical installations in buildings. IEE wiring regulations.
BS 7910:2005	Guide to methods for assessing the acceptability of flaws in metallic structures.

MSA Standards

MSAEN 60079-14:2003	Electrical apparatus for explosive gas atmospheres. Electrical installations in hazardous areas (other than mines)
MSAEN 60079-17:2007	Explosive atmospheres. Electrical installations inspection and maintenance.
MSA EN 12817:2002	LPG equipment and accessories. Inspection & re-qualification of LPG tanks up to and including 13m ³ over ground.
MSA EN 12818:2002	LPG equipment and accessories. Inspection & re-qualification of LPG tanks up to and including 13m ³ under ground.
MSA EN 12819:2002	LPG equipment and accessories. Inspection & re-qualification of LPG tanks greater than 13m ³ over ground.
MSA EN 12820:2002	LPG equipment and accessories. Inspection & re-qualification of LPG tanks greater than 13m ³ underground.

MRA LPG CODES OF PRACTICE	
<u>Number</u>	<u>DESCRIPTION</u>
<u>GROUP A - BULK VESSELS</u>	
A1	Design and Installation
A2	Examination and Inspection
A3	Buried/Mounded LPG Storage Vessels
A4	Purging LPG Vessels and Systems
A5	LPG Central Storage and Distribution Systems for Multiple Consumers
<u>GROUP B - SMALL CYLINDERS STORAGE AND FILLING</u>	
B1	Storage of Full and Empty Vessels
B2	Recommendations for the Safe Filling of LPG Cylinders at Depots
B3	Hazard Information and Packaging for Commercial LPG Cylinders
<u>GROUP C - LPG DRIVEN MACHINERY</u>	
C1	Autogas Installations
C2	The Safe Use of LPG as a Propulsion fuel for boats, yachts and other craft
C3	Automotive LPG Refuelling Facilities
C4	Gas Installations for Motive Power on Mechanical Handling and Maintenance Equipment
<u>GROUP D - ANCILLARY EQUIPMENT</u>	
D1	Hoses for the Transfer of LPG in Bulk: Installation, Inspection, Testing & Maintenance
D2	Safety Valves
D3	Valves for Transportable LPG Containers
D4	Flow rates up to 80 litres/min in Installations dispensing Road Vehicle Fuel
D5	Flow rates above 80 litres/min between Mobile Equipment and Fixed LPG Storage
D6	LPG Piping Systems: Design & Installation
<u>GROUP E - LPG CYLINDER USAGE AT DIFFERENT PREMISES</u>	
E1	The Use & Storage of LPG in Cylinders at Residential Premises
E2	The Storage and Use of LPG on Construction Sites
E3	Use of Propane in Cylinders at Commercial and Industrial Premises