

# **TOPIC INSPECTION PACK**

## **LPG Bulk Installations and Pipework**

**Version 1.3  
March 2011**

## Amendments log

Date of amendment and version number of reissued pack	Location of amendment	Details of amendment
July 2010  Version 1.2	Section 4 - Duties of Gas Supplier  Liaison Arrangements for Gas Supplier Issues	Significant changes to enforcement responsibilities
July 2010  Version 1.2	Table 1  Tank installation, second bullet	Deletion of:  (i.e. parallel, not at right angles or end to end)
July 2010  Version 1.2	Table 1  Pressure regulation and controls,  third bullet	Insertion of 'normally' before 'at point of entry into building'
July 2010  Version 1.2	Table 3	Further advice on inadequate security and fencing requirements
July 2010  Version 1.2	Table 3	Further information on location of emergency shut-off valve
July 2010  Version 1.2	Table A1	Clarification of meaning of LPG vessel capacity descriptions
July 2010  Version 1.2	Appendix 1  Entry of pipework into building	Further information on location of emergency shut-off valve
<b>March 2011 Version 1.3</b>		
2011  Version 1.3	Section 2 (Scope)	<ul style="list-style-type: none"> <li>– Inclusion of liquid phase guidance</li> <li>– Clarification of including entry point to buildings</li> <li>– Reference to NIHHS / COMAH thresholds</li> </ul>

		<ul style="list-style-type: none"> <li>– Reference to domestic LPG advice</li> </ul>
2011 Version 1.3	Section 3	Reference to revised work instruction
2011 Version 1.3	Section 4	<ul style="list-style-type: none"> <li>– Clarification of typical transition points (customer / supplier)</li> <li>– Clarification of typical responsibilities for PSSR examinations</li> <li>– Revised supplier liaison arrangements</li> </ul>
2011 Version 1.3	Table 1	Further information on requirements for UPSO/OPSO valves
2011 Version 1.3	Section 5	Reference to NIHHS / COMAH storage thresholds
2011 Version 1.3	Section 6	<ul style="list-style-type: none"> <li>– Advice re: requirements for security fencing moved to Appendix 6</li> <li>– Insertion of list of template notices in Appendix 4</li> </ul>
2011 Version 1.3	Table 3	<ul style="list-style-type: none"> <li>– Clarification of typical responsibilities for PSSR examinations</li> <li>– Revised reference to advice &amp; examples re: tank security (Appendix 6 Refers)</li> <li>– Clarification of IEE re: UPSO/OPSO valves</li> <li>– Addition: IEE for electrostatic protection measures (Appendix 6 Refers)</li> <li>– Addition: IEE for deficiencies in liquid phase pipework</li> </ul>

		<p>(Appendix 7 Refers)</p> <ul style="list-style-type: none"> <li>– Clarification of requirements for pipework entry into building</li> </ul>
2011 Version 1.3	Section 7	<ul style="list-style-type: none"> <li>– Clarification of specialist support arrangements</li> <li>– Introduces LPG WebCommunity resource and HELEX information</li> <li>– Deletion of reference to OC 286/105 (To be withdrawn)</li> <li>– Insertion of reference to IGEM/UP/2 Code of Practice</li> </ul>
2011 Version 1.3	Appendix 1	<ul style="list-style-type: none"> <li>– Clarification of UPSO/OPO requirements</li> <li>– Insertion of advice on avoiding corrosive soils and extreme temperatures when installing buried PE pipe</li> <li>– Clarification of requirements for pipework entry to buildings</li> <li>– Addition of reference to overhead power lines within points to check.</li> </ul>
2011 Version 1.3	Appendix 3	Deletion of reference to OC 286/105 (To be withdrawn)
2011 Version 1.3	Appendix 4	<p>Insertion – 5 Template notices :</p> <ul style="list-style-type: none"> <li>– PN for pipework in evidently poor condition</li> <li>– IN for inadequate control measures at bulk storage vessel</li> <li>– IN for replacement of buried metallic pipework</li> </ul>

		<ul style="list-style-type: none"> <li>– IN for examination / replacement of buried pipework of unknown composition</li> <li>– IN for replacement of metallic risers</li> </ul> <p>Deletion – IN for PSSR written scheme of examination</p>
2011 Version 1.3	<p>Appendix 6 (New Appendix)</p> <p>Topic Specific Requirements &amp; Factors Relevant to Initial Enforcement Expectation</p>	<p>Insertion – 4 Topics:</p> <ul style="list-style-type: none"> <li>– Security Fencing – LPG bulk storage tanks (Moved from Section 4)</li> <li>– Lack of UPSO/OPSO at industrial premises</li> <li>– Electrostatic Protection &amp; Earthing</li> <li>– Trees and Shrubbery within Separation Distance</li> </ul>
2011 Version 1.3	<p>Appendix 7 (New Appendix)</p> <p>Liquid Phase Service Pipework</p>	<p>Insertion –</p> <p>Guidance on liquid-phase pipework requirements</p>

**Note for Inspectors re Equality Impact Assessments**

Inspectors should be aware of who, in terms of diversity are the target group in the sector they are dealing with. It is not about treating everyone the same but about addressing individual requirements in relation to Gender, Age, Disability, Race, Religion and Belief, Sexual orientation and Transgender.

Inspectors should give consideration to and factor into their approach any issues that may surround their audience, such as literacy, English as a second language and disability (access needs).

Public bodies are legally required to eliminate unlawful discrimination and to promote equality of opportunity when organising campaigns, work programmes and policy proposals or reviews.

HSE must ensure the services we provide are accessible and meet the needs of those we serve and the Equality Impact Assessment Toolkit is a way of accessing how a policy/guidance/webpage/regulation affects individuals.

An Equality Impact Assessment (EIA) looks at the actual, potential or likely impact of a service, policy, project or significant change on different groups of people.

It is also important to include gender issues in workplace risk assessments, and 'mainstreaming' gender issues into risk prevention is now an objective of the European Community.

For further information, please see:

[http://intranet/diversity/impact assesement/index.htm](http://intranet/diversity/impact%20assesement/index.htm)  
<http://osha.europa.eu/en/publications/factsheets/43>

Or email the Diversity Team.

## **TOPIC PACK**

# **LPG BULK INSTALLATIONS AND PIPEWORK**

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## TOPIC PACK

### LPG BULK INSTALLATIONS AND PIPEWORK

#### 1. INTRODUCTION

This topic pack provides guidance for inspectors, visiting officers, RCOs and local authority enforcement officers on the inspection of LPG (liquefied petroleum gas) stored in fixed vessels together with the associated service pipework. (Typically this will be all pipework upstream of the emergency control valve, and should in any case include consideration of pipework entry points to buildings.) HSE inspectors should make enquiries about the safety of LPG installations as a Matter of Potential Major Concern (see OC 18/12); inspectors and local authority enforcement officers will be carrying out targeted inspections as part of the LPG pipework replacement programme (see below.)

#### 2. SCOPE

This guidance is aimed at tanks up to 10 tonnes LPG capacity in non domestic environments and **does not cover** LPG cylinders, or appliances and pipework installed within buildings. Whilst liquid phase LPG pipework is excluded from the scope of the pipework replacement programme, guidance is provided on the key relevant safety aspects. Guidance on large tanks may be found in the relevant UKLPG codes of practice.

Specific legislative requirements apply to sites where the total LPG inventory exceeds the following threshold values:

- 25 tonnes LPG capacity - Notification of Installations Handling Hazardous Substances (NIHHS) Regulations apply; and
- 50 tonnes LPG capacity - Control of Major Accident Hazards (COMAH) Regulations apply.

Whilst the general principles stated for safe bulk LPG storage remain valid, this guidance does not cover those specific hazards associated with large LPG inventories at such major-hazard sites. (e.g. the potential for sequential fire/explosion to multiple storage tanks.) Primary regulatory responsibility for the major hazards aspects of such sites rests with HSE Hazardous Installations Directorate (Chemical Industries Division.)

This guidance does not apply to domestic premises, including distribution networks and service pipework supplying residential caravans. However, LPG supplies to any communal buildings or caravan parks will be within scope as commercial LPG installations.

**In cases of doubt, particularly concerning significant risks from liquid phase pipelines, specialist advice should be sought.**

### 3. LPG PIPEWORK REPLACEMENT PROGRAMME (see <http://www.hse.gov.uk/gas/lpg.htm>)

On 16 July 2009, Lord Gill published his Inquiry Report into the explosion at the ICL Plastics factory in Glasgow in 2004, in which nine people died and 33 were injured. The report can be found on the ICL Inquiry website (<http://www.theiclinquiry.org/index.aspx>) LPG had leaked from a corroded underground metal pipe into the basement of the factory and then ignited causing an explosion which led to the catastrophic collapse of the four storey building. One of Lord Gill's recommendations was that there should be an action plan to identify sites with buried metallic LPG pipework, followed by its replacement on a systematic and prioritised basis with polyethylene.

HSE in conjunction with UKLPG (the body representing most LPG suppliers) has compiled a questionnaire which has been sent to gas users in order to identify those with buried metallic pipework and enable risk to be prioritized for a pipework replacement programme. It is anticipated that this programme will take up to four years to complete at all higher risk sites i.e. by the end of 2013. This long time scale is necessary to reflect the current capacity in the industry to carry out the replacement work.

Inspectors will be asked to visit a sample of the higher risk sites identified through the survey, to check the validity of the information supplied to the replacement programme and to ensure that appropriate action is being taken in line with the site risks. They should also address the safety of the overall bulk installation. Detailed work instructions are provided within OM 2011/08. This inspection campaign relates only to non-domestic installations, but there is other ongoing work to address the risks in domestic premises. UKLPG will be hosting a web based tool developed with HSE for self-assessment of domestic installations; this will be available at <http://www.uklpg.org/>. See also <http://www.hse.gov.uk/gas/lpg/ttac-corrosion-leak-lpg.pdf>)

The aim of the programme is that buried metallic pipework should be replaced, but dutyholders may assert that their pipework is in good condition and does not require replacement. In such cases, they should be required to demonstrate this through a strategy of inspection and maintenance devised by a competent person (see appendix 3.) In practice this will usually require exposing some if not all of the pipework for examination at which point it is likely to be more economical to replace it.

### 4. LEGAL FRAMEWORK

This topic pack does not set out a detailed consideration of all legal duties on gas users and suppliers but provides an indication of the more important areas that inspectors should be aware of when inspecting small bulk installations and associated pipework.

## Background

The majority of LPG tanks in the UK are operated and filled in exactly the same way, i.e. the LPG supplier provides the tank and associated fittings and the user enters into a contract with them for bulk LPG deliveries. In spite of this near universal arrangement, users (and sometimes suppliers) have common misconceptions as to who is responsible for different parts of the installation. These misconceptions remain when customers switch LPG suppliers.

Bulk tanks are usually owned and installed by the gas supplier (who also employs or contracts the delivery drivers) but fitting the service pipework and connecting up may well have been contracted out. Although different parties are involved in the installation, on completion ownership of the pipework usually passes to the site occupier via terms and conditions of the written contract. They have to maintain the pipework but may not be aware of this responsibility nor what they have to do in practice to meet it.

At present there is no uniform arrangement for demarcation of ownership. The transition point between supplier and user may be at the end of the LPG tank compound but is more commonly from the first pressure regulating valve or the vapour take-off valve.

As a consequence of the ownership arrangements, both users and suppliers have certain legal responsibilities towards the safety of the installation. This means that cooperation and coordination between both parties may be required to address certain aspects of safety and depending on the particular issue action may need to be taken by either the user or the supplier or sometimes both. Important factors to consider will include the contractual arrangements and extent of control.

The relevant legislation which needs to be considered includes:

- Health and Safety at Work etc Act 1974 (HSWA)
- Management of Health and Safety at Work Regulations 1999 (MHSWR)
- Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)
- Gas Safety (Installation and Use) Regulations 1998 (GSIUR)
- Provision and Use of Work Equipment Regulations 1998 (PUWER)
- Pressure Systems Safety Regulations 2000 (PSSR)
- Pipelines Safety Regulations 1996 (PSR)

Inspectors and local authority enforcement officers should first consider the safety aspects of the installation that rest with the user or are affected by their work activity e.g. tank impact by vehicles, and then move to consider issues which may be the responsibility of the supplier.

## DUTIES OF GAS USER

### **Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)**

These Regulations apply to work situations when a dangerous substance is present or liable to be present and presents a safety risk. In relation to LPG, the gas user has to:

- assess fire and explosion risks,
- take measures to eliminate or reduce identified risks,
- provide equipment and procedures to deal with emergencies
- give information and training to employees.

Where the supplier has provided an installation that meets the relevant standards, then the duties that fall to the user will effectively be to keep it maintained in a safe condition, provide measures to deal with emergencies and make sure their own activities do not adversely affect the installation.

Hence the enforcement focus for inspectors and local authority enforcement officers should be on ensuring that users have in place the necessary control measures. Detailed guidance on expected standards is set out in Table 1 below.

### **Pressure Systems Safety Regulations 2000 (PSSR)**

PSSR aim to prevent serious injury from the hazards of stored energy in pressure systems, including pipelines conveying liquids or gases, above 0.5 bar. They do not deal with the fire and explosion risks from LPG.

Vessels and equipment (including pipework operating above 0.5 bar) should be the subject of a written scheme of examination, drawn up by a competent person. This will include fittings and pipework up to the second stage regulator, but will **not** include buried pipework as there is no reasonably foreseeable danger from the release of stored energy

**Note:** Although these duties fall on the user of a pressure system, under regulation 3(5) and Schedule 2, a person supplying an installed system for lease or hire may take over responsibility by written agreement. Commonly, LPG suppliers will retain responsibility for the examinations and written scheme. The results of any examination should be available to the customer.

### **Provision and Use of Work Equipment Regulations 1998**

Service pipework is work equipment, which is exposed to conditions causing deterioration liable to result in a dangerous situation; the gas user is therefore required to maintain and inspect the service pipework owned by him.

### **Gas Safety (Installation and Use) Regulations 1998 (GSIUR)**

GSIUR cover LPG storage vessels and pipework **only** where the premises themselves are covered by the Regulations - mainly in domestic and certain commercial premises e.g. offices, shops, hotels, public buildings such as schools, hospitals and similar places. With the exception of Regulation 37 (see below under suppliers duties) GSIUR do **not** apply where LPG is being used for the purposes of an industrial process carried out on industrial premises (including agricultural premises, factories, mines, quarries, sewage treatment works and temporary gas installations as part of a construction activity), but **do** apply (see Regulation 2(4)) to parts of industrial premises which are used for domestic or residential purposes or as sleeping accommodation.

The definition of “gas fittings” in Regulation 2(1) includes LPG service pipework (pipework from storage vessel to outlet of the ECV) and installation pipework (pipework downstream of the ECV to the appliance). This means anyone carrying out gas work (itself defined in Regulation 2(1)) on installation or service pipework in premises to which GSIUR apply must fulfill the criteria in Regulation 3 i.e. be competent and, if in business, be Gas Safe registered.

### DUTIES OF GAS SUPPLIER

The gas supplier may have duties under various regulations (MHSWR, DSEAR, PUWER and GSIUR) and HSW Act including s3, arising both from the initial installation of the tank and pipework and as part of its ongoing relationship with the site as its gas supplier. These duties may include

- ensuring the initial integrity of the installation,
- ensuring that the separation distances have been met, and a DSEAR assessment has been carried out,
- providing adequate information to the user about the risks of LPG (HSW s6(4))
- ensuring that delivery is carried out safely,
- advising the user of their ongoing responsibilities.

The measures to be taken by the gas supplier should be identified and recorded in the gas supplier’s risk assessments (MHSW and DSEAR).

The potential duties can usefully be split between:

1. Enabling the user to comply by:
  - Ensuring the integrity of the installation before first supplying gas.
  - Providing information and advice to gas users that includes:
    - Hazards and properties of LPG
    - Clear demarcation as to who is responsible for what.
    - Suppliers must make it clear that users have responsibility for:
      - maintaining the service pipework
      - protecting the tank and pipework from vehicle impact,
      - controlling the presence of ignition sources,
      - keeping the tank area clear of combustible material.

## 2. Continuing duties of the LPG supplier

### a) In relation to the tank and pipework owned by the supplier

- Ongoing checks on the installation and pipework owned by the supplier including:
  - Pressure Systems Safety Regulations (PSSR) inspections in accordance with a written scheme.
  - Annual routine inspection of the tank, storage site and pipework in the vicinity as set out in UK LPG Code of Practice 1 part 3, (which advises they may be carried out by the delivery driver.)
  - Driver visual checks - the driver should have clear guidelines about action to take in the event of serious concerns about an installation (including when not to deliver.)
  - Keeping suitable records
- Safe systems of work when delivering gas
- Providing an emergency service to deal with notified escapes of gas under GSIUR regulation 37 at any premises for which they are the gas supplier.

### b) In relation to service pipework owned by the user or other third party

- To undertake an assessment of risks arising from the supply of LPG, through service pipework not owned by them, in order to identify measures to be taken to comply with relevant statutory provisions (including HSWA duties.)
- May include making reasonable enquiries of the user (or owner/occupier) to ascertain the state of the service pipework in order to decide whether LPG can be supplied safely.

Additionally, inspectors may encounter LPG networks not contained wholly within the premises occupied by a single undertaking i.e. an LPG vessel with a distribution network supplying several premises e.g. metered estates. These are subject to the Pipelines Safety Regulations 1996 and Regulation 13 which requires the pipeline operator (usually the gas supplier) to maintain the pipeline in good repair.

### GAS SUPPLIERS: ENFORCEMENT RESPONSIBILITY & GENERAL LIAISON ARRANGEMENTS (See also OC 440/28)

#### **HSE**

By virtue of the Health and Safety (Enforcing Authority) Regulations 1998, HSE have regulatory responsibility for gas suppliers, including in relation to premises to which they supply gas. Whilst there is no uniform demarcation of responsibilities between gas suppliers and users, most commonly suppliers have responsibility for all equipment upstream of the first pressure regulating valve or the vapour take-off valve.

Suppliers have legal duties under various regulations (MHSWR, DSEAR, PUWER, GSIUR) as well as the HSW Act. Such duties may arise from both the initial installation of the tank and pipework (e.g. ensuring compliance with tank separation distances) and ongoing duties concerning the continuing supply of LPG (e.g. ensuring safe systems of work for LPG delivery).

FOD is responsible for enforcing the Gas Safety (Installation and Use) Regulations 1998 (GSIUR) Regulation 6(7), which places requirements on installers for the safe siting of LPG vessels at premises subject to GSIUR.

### **Local Authorities**

Since local authorities have no powers as regards regulatory action against suppliers, any significant action, including **all formal enforcement**, must be undertaken by HSE. Local authority enforcement officers should therefore contact HSE through their enforcement liaison inspector or partnership manager (as locally agreed) whenever such action against suppliers is being contemplated.

## **SUPPLIER LIAISON ARRANGEMENTS: LPG PIPEWORK REPLACEMENT INSPECTION VISITS**

### **HSE (FOD/HID)**

The following advice clarifies the agreed division of responsibilities between HID and FOD for action against suppliers arising from the targeted LPG pipework replacement inspections.

### **SIGNIFICANT SITE-SPECIFIC SUPPLIER ISSUES**

HID is responsible for dealing with the HSW duties of gas suppliers, including in relation to premises which they supply with gas. Whilst HID retain the overall lead for HSE engagement with LPG suppliers, agreement has been reached that action (including formal enforcement) at **individual site level** regarding **specific defects with the site installation** will be taken by FOD.

If inspectors are considering enforcement action against LPG suppliers regarding service pipework, this should first be discussed with FODNWHQ Legal and Enforcement Section.

### **Arrangements: Major LPG Suppliers**

To facilitate a co-ordinated approach, HID lead inspector arrangements are in place for the four largest LPG suppliers: BP Gas, Calor, Flogas and Shell Gas. These companies have each provided central contact points for any significant site-specific issues. Such matters would include fundamental concerns over bulk tank location and separation distances, or circumstances where inspectors are contemplating serving prohibition notices which would affect the user's continued supply.

Inspectors should, in the first instance, approach the above suppliers through their designated central contact in relation to significant, site-specific concerns within their remit. If there are any difficulties in achieving resolution at local level, inspectors should contact FODNWHQ, who can escalate the matter centrally with the supply companies.

**To maintain an effective regulatory relationship with suppliers, it is vital for HID lead inspectors to be kept informed of significant FOD interactions with suppliers relating to any particular site.** FOD inspectors are thus requested to ensure that the relevant HID leads are advised of any serious supplier-related concerns. Where formal enforcement action is being contemplated, then the lead HID inspector should be contacted in advance to discuss the matter.

Updated contact details for the supplier contact points and HID lead inspectors are maintained on the HSE [LPG Inspection Programme Web Community site](#). This is accessible to all HSE staff.

### **Arrangements: Other LPG Suppliers**

For other LPG suppliers, whilst lead inspector arrangements are not yet in place, HID nonetheless retain primary regulatory responsibility. To ensure a consistent and proportionate approach, a supplier engagement strategy is being developed between FOD and HID. Full details of this, and any supplementary arrangements will be published on the [LPG Inspection Programme Web Community](#) as they become available. In the interim, FODNWHQ will act as the central liaison point, and should be informed of any significant interactions with those LPG suppliers not covered by lead inspector arrangements. Again, where formal enforcement action is being contemplated, FODNWHQ should be contacted in advance to discuss the matter.

### **Primary FOD NWHQ Contact:**

Dave Charnock  
FODNWHQ Operational Strategy Section  
Carlisle  
VPN: 539 4115

## **ADDRESSING SYSTEMIC SUPPLIER ISSUES**

HID retain the lead for ongoing engagement with LPG suppliers to address national issues emerging from the LPG Inspection Initiative. Various systemic problems have been raised with suppliers (and trade association) and improvements sought, for example in relation to:

- the adequacy of pre-delivery driver checks and defect reporting
- achieving installation standards as set out in the UKPG Codes of Practice, including tank location
- driver training
- written schemes of examination under the Pressure Systems Safety Regulations 2000

- “like for like” tank exchanges

FOD NWHQ, in conjunction with HID lead inspectors, have undertaken central interventions to each of the major LP G suppliers. As a consequence, there exists a clear and robust shared understanding of the standards required during installation and delivery. Supplier performance in relation to such systemic issues will continue to be centrally monitored.

Unless specifically requested following consultation with HID / FOD NWHQ, FOD inspectors should not take formal enforcement against any supplier in relation to such systemic issues, or matters not specific to an individual installation; these will generally be dealt with through HID. Where serious concerns exist, these should be communicated to HID lead inspectors (where such arrangements are in place) and also provided to FOD NWHQ for consideration as part of the central intervention approach. Such consideration will include determination of how these concerns are best brought to the supplier’s attention.

**Table 1 Summary of control measures and legal requirements**

ISSUE	EXPECTATION	LEGAL REQUIREMENTS	COMMENT	REFERENCES/GUIDANCE
Tank installation	<ul style="list-style-type: none"> <li>• Separation from boundaries, buildings, fixed source of ignition (including overhead power lines) in accordance with UKLPG COP (may be less with fire walls)</li> <li>• Adequate separation from other tanks and positioned such that their integrity is not compromised</li> <li>• Standing on stable base</li> <li>• Good ventilation around tank</li> <li>• No open drains, (unless fitted with a water trap), culverts etc within separation distance</li> </ul> <p><b>Underground tanks</b></p> <ul style="list-style-type: none"> <li>• Located such that manhole and pressure relief valves are in well ventilated position and appropriately separated from buildings, boundaries etc.</li> </ul>	<p>GSIUR Regulation 6(7)<sup>1</sup></p> <p>HSW Act s 2</p> <p>HSW Act s 3</p> <p>DSEAR Regulation 6</p>	<p>User</p> <p>Gas supplier</p> <p>Prevention of formation of explosive atmosphere</p>	<p>UKLPG COP 1 Parts 1,2</p>

ISSUE	EXPECTATION	LEGAL REQUIREMENTS	COMMENT	REFERENCES/GUIDANCE
Integrity	Test data plate on vessel showing <ul style="list-style-type: none"> <li>• Date of manufacture</li> <li>• Relevant manufacturing standard</li> <li>• Test pressure</li> </ul> Documentation of examination in accordance with written scheme	PSSR Regulations 8,9  PSSR Regulation 3(5), Schedule 2	May also show date of last test  Where agreed in writing, duties discharged by tank owner	UKLPG COP 1 Part 3
Vessel protection	<ul style="list-style-type: none"> <li>• Appropriate security</li> <li>• Protection from impact e.g. vehicles</li> </ul> <p><b>Underground tanks</b></p> <ul style="list-style-type: none"> <li>• The tank position should be permanently indicated, usually by marker pegs positioned in the ground, and vehicle overrun prevented</li> </ul>	GSIUR Regulation 6(7) <sup>1</sup>  HSW Act s 2  HSW Act s 3  DSEAR Regulation 6	User  Gas supplier  Avoidance of release	UKLPG COP 1 Parts 1, 2, 4

ISSUE	EXPECTATION	LEGAL REQUIREMENTS	COMMENT	REFERENCES/GUIDANCE
Pressure regulation and controls	<ul style="list-style-type: none"> <li>• First stage regulator as close as possible to service outlet connection on tank</li> <li>• UPSO/OPSO (under pressure shut off/over pressure shut off) valves fitted at second stage regulator</li> <li>• Emergency shut off valve suitably marked, normally at point of entry into building</li> </ul>	<p>HSWA s2,3</p> <p>DSEAR Regulation 6(1)</p> <p>GSIUR Regulation 14(2)<sup>1</sup></p> <p>GSIUR Regulation 9(2)(3)(4)<sup>1</sup></p>	<p>UPSO/OPSO valves required at premises subject to GSIUR. At certain other premises (see appendix 1) there is no UPSO by design, and a flame failure device on the appliance, or the use of other reasonably practicable means of preventing gas leaks and explosions, should be required.</p>	<p>UKLPG COP 1 Parts 1,2</p>
Ignition sources	<ul style="list-style-type: none"> <li>• No combustible materials within separation distance</li> <li>• Tank not sited directly beneath overhead power lines</li> <li>• Earthing arrangements for tank and deliveries</li> <li>• 'No smoking/no naked flames' signs in place</li> <li>• Use of explosion-protected equipment in zones</li> </ul>	<p>HSW Act s 2, 3</p> <p>DSEAR Regulation 6</p> <p>DSEAR Regulation 7</p>	<p>Avoidance of ignition sources</p> <p>Zone classification</p>	<p>UKLPG COP 1 Parts 1,2</p> <p>UKLPG COP 1 Part 1 App.B2</p>

ISSUE	EXPECTATION	LEGAL REQUIREMENTS	COMMENT	REFERENCES/GUIDANCE
Mitigation	<ul style="list-style-type: none"> <li>• Fire extinguishers and training to tackle small fires</li> <li>• Emergency procedures, including arrangements for isolation at tank</li> <li>• Suppliers emergency notice on tank</li> <li>• Training and supervision</li> </ul>	HSWA s2,3  GSIUR Regulation 37  DSEAR Regulation 8  MHSWR Regulation 8	All premises  Arrangements to deal with incidents and emergencies	UKLPG COP 1 Parts 1,2
Delivery	<ul style="list-style-type: none"> <li>• Hard standing for delivery vehicle</li> <li>• Electrical bonding</li> <li>• Site arrangements for delivery</li> <li>• Prevention of overrun for underground tank</li> <li>• Procedures for driver, checks to be carried out before filling, when not to fill tank e.g. because installation is at risk</li> </ul>	HSW Act s 2  DSEAR Regulation 6  HSW Act s 3	User  Avoidance of release  Gas supplier	UKLPG COP 1 Parts 1,2,3 UKLPG COP 2

ISSUE	EXPECTATION	LEGAL REQUIREMENTS	COMMENT	REFERENCES/GUIDANCE
Integrity and maintenance of service pipework	<ul style="list-style-type: none"> <li>• Of suitable material</li> <li>• Protected from corrosion and damage as necessary</li> <li>• Inspection regime as required (<b>pressure testing alone not sufficient</b>)</li> </ul>	<p>HSW Act s 2,3</p> <p>DSEAR Regulation 6</p> <p>PUWER Regulation 5, 6</p> <p>GSIUR Regulation 7<sup>1</sup></p>	<p>Avoidance of release</p> <p>Work equipment exposed to conditions causing deterioration inspected at suitable intervals</p> <p>Installed so as to be protected from damage and corrosion</p>	<p>UKLPG COP 22</p> <p>UKLPG COP 1 Part 3</p>
Installation pipework entering building	<ul style="list-style-type: none"> <li>• Sleeved as it passes through wall, sleeve sealed to structure</li> <li>• Entry above ground</li> <li>• No passage through unventilated void unless continuously sleeved, with sleeve ventilated to safe place</li> </ul>	<p>HSW Act s2,3</p> <p>DSEAR Regulation 6</p> <p>GSIUR Regulation 19<sup>1</sup></p>	<p>Prevention of formation of explosive atmosphere</p>	<p>UKLPG COP 1 Part 2</p> <p>UKLPG COP 22</p>

<sup>1</sup> Where GSIUR applies

## 5. ENFORCEMENT ALLOCATION (see also 0C 124/11)

**Table 2**

Situation	Allocation	Comment
Caravan site operated by HSE enforced occupier on own premises e.g. farm	HSE	
Caravan site for holiday or residential accommodation	LA for site operator and holiday lets	Individual domestic accommodation is HSE enforced
Accommodation for casual farm or construction workers	HSE	
Hotels	LA	
Residential care homes	LA	
Nursing homes Health Care	HSE	Enforcement allocation may have been transferred in some areas
Gas work by person who does not normally work on premises (any)	HSE	Irrespective of premises allocation
Domestic premises	HSE	

### Major Hazard Sites

Specific legislative requirements apply to sites where the total LPG inventory exceeds the following threshold values:

- 25 tonnes LPG capacity - Notification of Installations Handling Hazardous Substances (NIHHS) Regulations apply; and
- 50 tonnes LPG capacity - Control of Major Accident Hazards (COMAH) Regulations apply.

This may particularly occur at sites with a large number of geographically remote bulk LPG tanks. Primary regulatory responsibility for the major hazards aspects of such sites rests with HSE Hazardous Installations Directorate (Chemical Industries Division.)

Should such a site be encountered, this should be referred to FOD NWHQ.

#### Contact:

Dave Charnock  
FOD NWHQ Operational Strategy Section  
Carlisle  
VPN: 539 4115

## 6. ENFORCEMENT MANAGEMENT MODEL AND ENFORCEMENT GUIDANCE

### Actual risk

The actual risk from a leak of LPG from pipework or tank, or from a fire impinging on the tank is of possible multiple serious personal injuries (or deaths) as an explosive/flammable concentration of gas from a leak can accumulate in a building or area and be ignited – either directly injuring persons from the blast or from secondary effects e.g. building collapses.

### Benchmark

The benchmark standards are for:

- 1) The LPG tank to be installed in accordance with relevant codes of practice including:
  - a) Separation distances
  - b) Adequacy of ventilation
  - c) Impact protection
  - d) Security
  - e) Avoidance of sources of ignition and combustible materials
  - f) No open drains, gullies, ducts etc in vicinity
- 2) Buried metallic service pipework (including all metallic risers) should be either:
  - a) Replaced with buried polyethylene pipes/a suitable proprietary pipework system OR
  - b) Routed above ground and protected from corrosion and mechanical damage OR
  - c) Corrosion protected and inspected at such sufficient frequency that any degradation is identified and remedied in good time before it compromises the safety of the installation (see Appendix 3 for required standard)
- 3) Above ground pipework should be;
  - a) Protected from damage and corrosion (i.e. not in direct contact with pipework, concrete, brickwork etc)
  - b) Adequately supported
  - c) Subject to an appropriate inspection and maintenance strategy

so that in all cases there is a nil/negligible chance of a significant injury occurring.

### Risk gap

Using the risk gap tables in the EMM for multiple casualties, the risk gap is extreme.

## **Initial enforcement expectation**

### 1) Tanks

Given an extreme risk gap and an established standard (codes of practice), the initial enforcement expectation is an Improvement Notice where there is evidence of significant failure to meet standards set out in the code of practice (e.g. a cumulative list of deficiencies.)

### 2) Pipework

Given an extreme risk gap and a defined standard (PUWER), the initial enforcement expectation is an Improvement Notice where there is evidence of buried, metallic LPG pipework in poor or unknown condition or where there is no strategy for inspection, examination and maintenance.

If there is clear evidence that the pipe is significantly corroded or damaged and liable to leak, thus resulting in a risk of serious personal injury, then a prohibition notice will be appropriate.

See Table 3 for list of situations providing an indicative Initial Enforcement Expectation

## **Dutyholder factors**

Where the dutyholder can provide evidence that pipework replacement is already scheduled in line with their risk ranking in the replacement programme, an IN may not be required, although inspectors should still confirm that adequate action has been taken. The enforcement decision will depend on the information provided by the dutyholder on which the risk ranking has been undertaken and actual site conditions, or additional factors, identified by the inspector.

## **Strategic factors**

It is expected that the action taken will protect vulnerable groups, including members of the public, who may be exposed to risks from LPG installations that have not been appropriately installed and/or adequately maintained. It is in the public interest that LPG installations incorporating buried, metallic LPG pipes of poor or unknown condition are re-routed, replaced or inspected, examined and maintained.

There may be circumstances where an alternative course of action is considered appropriate depending on the nature of the installation e.g.

- the effect on vulnerable people such as residents of a nursing home, where cutting off heating, without adequate alternatives arranged, may cause significant risk. Replacement/action is still necessary but should

be planned (i.e. temporary heating provided) to ensure that additional risks are not created

- a shop or house sited below the installation where a leakage of LPG could accumulate

The action should support the pipework replacement strategy in order to promote scheme compliance whilst focusing the limited industry resource on the highest risk sites. See also Page 20 - note on timescales for Improvement Notices

**Table 3: Initial enforcement expectation**

- Subject to the discretion of the individual inspector applying the Enforcement Policy Statement (EPS) to decide whether other enforcement action in a particular case may be appropriate **and**
- prior to consideration of any dutyholder and strategic factors that may modify the enforcement decision
- See also note 3 below re prosecution

This table has regard to the Gas Industry Unsafe Situations Procedure 6<sup>th</sup> edition (TRIM ref 2009/175241) applied under GSIUR by Gas Safe Registered engineers

Situation	Initial enforcement expectation	Comment
<b>STORAGE VESSEL</b>		
No evidence of tank examination in accordance with a written scheme	Improvement notice	Duty falls on tank user but is usually carried out by supplier where they own the tank. Some suppliers do not provide copies of the examination scheme to users, but details of the last and next scheduled examinations should be available (e.g. date due stamped on a plate.)
Inadequate separation distance from boundary, building, fixed source of ignition, firewall. Lack of ventilation	Improvement notice/letter  Prosecution <sup>3</sup>	Dependent on actual risk. Although duty falls on user, actions may involve gas supplier, who will also have duties if they installed the tank.
Inadequate security	Letter/Improvement notice	Risk based, dependent on likelihood of interference ( See Appendix 6
Lack of impact protection	Improvement notice	Where vehicle impact foreseeable.
Open drains/gulleys etc within vessel separation distances	Improvement notice	
Combustible materials around tank	Improvement notice/letter	Dependent on risk. For advice on trees, shrubbery etc. refer to Appendix 6

<b>Situation</b>	<b>Initial enforcement expectation</b>	<b>Comment</b>
No suitable delivery arrangements	Letter/Improvement notice	May include requirements on supplier.
No/inadequate emergency arrangements	Letter/Improvement notice	
Lack of suitable and sufficient information, instruction and training	Letter/Improvement notice	
Lack of 'no smoking/no naked flames' signs	Letter.	
Lack of fire fighting equipment for incidental fires e.g. dry powder fire extinguisher	Letter	Consider whether need to inform fire and rescue authority (see OC 217/06)
No/defective primary or secondary regulator	Prohibition notice <sup>1</sup>	User to contact gas supplier
No UPSO/OPSO fitted at premises subject to GSIUR	Improvement notice	User to contact gas supplier
At premises not subject to GSUIR, no UPSO fitted <b>and</b> no alternative reasonably practicable means of preventing explosions, e.g. flame failure device on the appliance.	Improvement Notice  PN to be considered if evident significant risk	See Appendix 6.
Lack of required electrostatic protection and earthing arrangements	Letter/Improvement Notice	Risk based, see Appendix 6.
<b>SERVICE PIPEWORK</b>		
Above ground service pipework not protected from foreseeable damage	Improvement notice/letter	Dependent on risk
Above ground service pipework showing signs of corrosion or damage	Improvement notice  Prohibition notice <sup>1</sup>	If obvious corrosion, liable to leak
Above ground service pipework not subject to strategy for inspection, examination and maintenance	Letter/Improvement notice  Prohibition notice <sup>1</sup>	Dependent on risk  If obvious corrosion, liable to leak

Situation	Initial enforcement expectation	Comment
No emergency shut off valve (ECV) fitted	Improvement notice	ECVs are normally located external to the building being supplied, but in some situations it may be desirable for the ECV to be positioned internally, as close as possible to the point where the service pipe enters the building.
Buried metallic pipework, in poor /unknown condition with no strategy for inspection, examination and maintenance, no questionnaire returned for risk ranking	Improvement notice <sup>2</sup>  Prohibition notice <sup>1</sup>  Prosecution <sup>3</sup>	Replacement/inspection strategy as in Appendix 3  If obvious corrosion, liable to leak
Buried metallic pipework, in unknown condition but questionnaire returned. Evidence that action planned in line with risk ranking, no additional risk factors	Letter confirming planned action with follow up to ensure action complete	Additional risk factors not considered in ranking exercise should require review of timetable
Buried metallic pipework, in poor condition but questionnaire returned. Action planned in line with risk ranking, no additional risk factors	Improvement notice  Prohibition notice <sup>1</sup>	If obvious corrosion, liable to leak
Buried metallic pipework, in poor/unknown condition, questionnaire returned but with no action planned in line with risk ranking	Improvement notice <sup>2</sup>  Prohibition notice <sup>1</sup>  Prosecution <sup>3</sup>	If obvious corrosion, liable to leak
PE risers with no GRP (glass reinforced plastic) sleeving or sleeving damaged	Improvement notice or prohibition notice <sup>1</sup>	Depending on the age of the pipe a prohibition notice may be more appropriate as the pipe strength will have been seriously degraded by UV light
Steel risers not subject to inspection, examination and maintenance strategy	Improvement notice for replacement (preferentially)	Consistent with other buried metallic pipework. Note that

Situation	Initial enforcement expectation	Comment
		risers are prone to corrosion at the ground/air interface and the horizontal/vertical transition point. Appendix 3 refers.
PE service pipework entry entering building without suitable gas tight metallic sheath	Improvement notice	
Liquid Phase LPG pipework-deficiencies	Improvement Notice	Refer to Appendix 7 for information.
<b>INSTALLATION PIPEWORK AT BUILDING ENTRY</b>		
Pipework entry not sleeved, sleeve not sealed	Improvement notice	Gas Industry Unsafe Situations Procedure would not indicate IN for <u>installation</u> pipework, but IN may be appropriate where there is potential for pipework leak to track into building
Unsleeved pipework passes through unventilated void or basement	Improvement notice	Require the pipe to be examined for corrosion and then rerouted for above ground entry into the building
	Prohibition notice	If corrosion is present - specialist advice is needed.

### **1 Prohibition notices:**

It may be necessary to serve a deferred prohibition notice where action by the gas supplier is required in order to control the identified risk e.g. relocating a tank. In other circumstances, isolation may be sufficient to control the risk

### **2 Improvement notices:**

When setting timescales for the replacement of buried pipework, inspectors and local authority enforcement officers should bear in mind the limited availability of competent fitters to carry out the work ; 6 months is suggested dependent on site conditions, age of the pipework (where known) and system pressure.

Substantial works, and particular tank relocations, require planning and may necessitate liaison between customers, suppliers and other bodies such as utilities companies or local planning authorities. This should be considered when agreeing timescales for such work.

### **3 Prosecution:**

Where widespread and significant deficiencies are identified and the attitude of management is, or has been, inadequate, and the EPS tests are met then prosecution as well as the most suitable Notice(s) should be considered.

### **Template Notices**

Appendix 4 contains the following template notices:

1. PN for obviously corroded or damaged pipework liable to leak (NB - may need to be deferred to allow supplier to attend and make safe)
2. IN for inadequate control measures for LPG vessel
3. IN for replacement of buried metallic pipework in poor/unknown condition
  
4. IN for examination/ replacement of buried pipework of unknown composition
5. IN for replacement of metal risers.

### **7. FURTHER GUIDANCE AND ASSISTANCE**

#### **Specialist support**

It is anticipated that the information in this topic pack and the guidance listed below should be sufficient for inspectors and local authority enforcement officers to deal with most situations they encounter. Where specialist resource is essential, e.g. to provide expert opinion for a notice appeal or advise on liquid phase systems, local authority enforcement officers should contact their enforcement liaison inspector or partnership manager (as agreed locally) and HSE inspectors should contact their local mechanical engineering specialist (for pipework integrity issues) or corporate process safety specialist.

The specialist resource to support the inspection programme is limited. Inspectors should discuss any proposed request for specialist advice in advance with their line managers. Any necessary support request should be clearly prioritised. It is anticipated that specialist resource will always be available to support appeals against Notices, prosecutions, or to give urgent advice where Prohibition Notices are being considered on site.

#### **HSE WebCommunity– LPG inspection programme**

A WebCommunity has been established to provide HSE field staff with the latest information on this programme. The aim of this Community is: to provide a resource for field staff involved in the Inspection Campaign; to act as a

central repository for relevant up-to-date guidance and advice; and to facilitate feedback from operational staff to the Programme co-ordination team. Similar information is being provided to Local Authority officers via the HELEX extranet site.

### HSE guidance

1. Dangerous Substances and Explosive Atmospheres, Dangerous Substances and Explosive Atmospheres Regulations 2002, Approved Code of Practice and Guidance L138 HSE Books 2003 ISBN 0 7167 2203 7.
2. Safe Use of Work Equipment, Provision and Use of Work Equipment Regulations 1998, Approved Code of Practice and Guidance L22 HSE Books ISBN 0 7176 1626 6.
3. Safety in the Installation and Use of Gas Systems and Appliances, Gas Safety (Installation and Use) Regulations 1998, Approved Code of Practice and Guidance L56 HSE Books ISBN 0 7176 1635 5.
4. Management of health and safety at work, Management of Health and Safety at Work Regulations 1999 Approved code of Practice and Guidance, L21 HSE Books ISBN 0-7176-2488-9
5. Safety of pressure systems, Pressure Systems Safety Regulations 2000 Approved Code of Practice, L122 HSE Books ISBN 0-7176-1767-X
6. OC 440/28 The Gas Safety (Installation and Use) Regulations 1998, the Gas Safety (Management) Regulations 1996 and the Pipelines Safety Regulations 1996
7. OC 18/12 Matters of Evident Concern and Major Potential Concern
8. OC 440/34 Gas safety in touring caravans, motor caravans, caravan holiday homes and residential park homes
9. Leaflet INDG428 'Inspecting and maintaining or replacing buried metallic pipework carrying LPG vapour'
10. CS4 Use of LPG in small bulk tanks
11. OC 124/11 Health and Safety ( Enforcing Authority) Regulations 1998 A-Z Guide to allocation
12. HID Safety Report Assessment Guidance (Technical Aspects) - Inspection/ Non-Destructive Testing

### External Guidance

(HSE inspectors can access UKLPG Codes of practice through the intranet)

8. UKLPG COP 1: Bulk LPG Storage at Fixed Installations, Part 1: Installation and operation of vessels located above ground, 2009 edition
9. UKLPG COP 1: Bulk LPG Storage at Fixed Installations, Part 2: Small Bulk Propane Installations for Domestic and Similar Purposes, January 2003 edition

10. UKLPG COP 1: Bulk LPG Storage at Fixed Installations, Part 3: Examination and Inspection; 2006 Edition.
11. UKLPG COP 1: Bulk LPG Storage at Fixed Installations, Part 4: Buried or Mounded LPG Storage Vessels; 1999 Edition (2001 amendment).
12. UKLPG COP 2: Safe handling and transport of LPG in Road Tankers and Tank containers by road, 2007 edition
13. UKLPG COP 22: LPG Piping systems - Design and Installation; 2002 Edition.
14. UKLPG User Information Sheet 15 "Inspection and Maintenance of LPG Pipework at Commercial and Industrial Premises" March 2007 Edition.
15. API 570 Piping Inspection Code "Inspection, Repair, Alteration and Re-rating of in service piping systems in the Process Industries" 2nd Edition 1998.
16. UKLPG website is <http://www.uklpg.org/>
17. IGEN/UP/2 Edition 2 (Installation pipework on industrial and commercial premises)

## APPENDIX 1

### AIDE MEMOIRE

#### Properties of LPG

LPG is used for heating and operating industrial processes in a wide range of premises. Bulk LPG consists of propane or butane, under pressure as a liquid, so that it can be stored in reduced volume.

LPG vapour is heavier than air and does not disperse easily. It will sink to the lowest level available and may accumulate in areas such as cellars, pits or drains. It forms flammable mixtures in air at concentrations between 2% and 10% and can therefore be a significant fire and explosion hazard if stored or used incorrectly.

#### LPG Installation

Siting of the tank should be in accordance with separation distances in table A1 below.

#### Table A1 SMALL SCALE BULK LPG INSTALLATION

Distances from Buildings, Boundaries and Sources of Ignition.

Nominal LPG Capacity			Minimum separation distances of above ground vessels	
			A	B
Capacity of any single vessel		Capacity of all vessels in a group		
LPG (Tonnes)	Water (typical) (Litres)	LPG (Tonnes)	(Metres)	(Metres)
0.05 – 0.25	150 – 500	0.8	2.5	0.3
>0.25 – 1.1	500 – 2,500	3.5	3.0	1.5
>1.1 – 4	2,500 – 9,000	12.5	7.5	4.0
>4 – 60	9,000 – 135,000	200	15.0	7.5

**A** From buildings, boundary, property line or any fixed source of ignition.

**B** As A, but with a fire wall.

#### Fire walls

Where the separation distances cannot be met, a fire wall may be positioned closer to the tank on one side. Its purpose is to protect the tank from thermal

radiation from a fire nearby and it should be imperforate and of solid masonry, concrete or similar construction. It should be at least 2 m high or as high as the top of the pressure relief valve (PRV) on the tank (whichever is the greater), sited between 1m and 3m from the nearest point of the vessel. The width of the fire wall should be such that the distance between the vessel and a boundary, building, property line, or fixed source of ignition measured around the ends of the fire wall is equal to or greater than the distance specified in column A in Table A1 above for the nominal LPG capacity involved

Typical small scale installations are illustrated together with their fittings and attachments in Figures A1 – A4. Definitions of the various features are included in the glossary (appendix 2)

### **Pressure regime**

The storage vessel pressure of up to 9 bar is reduced in two stages:

**1<sup>st</sup> stage regulator**, mounted on the storage vessel reduces the pressure to an intermediate pressure of 0.75 – 2 bar dependent on volume of use and pipework sizing

**2<sup>nd</sup> stage regulator** reduces pressure to the operating pressure (for many appliances) of 37mbar. This can be mounted either on the storage vessel or on the wall of the building. It can also be an integral part of an UPSO/OPSO valve

### **Valves**

**Service valve** controls the high pressure stage, usually sited under a locked cover on the tank

**Pressure relief valve (PRV)** on top of the tank, provided with a cover to prevent water ingress. There should be no building openings directly above the pressure relief valve (see diagram A4)

**USPO** (under pressure shut off valve)/ **OSPO** (over pressure shut off valve) protect the installation and appliances from under and over pressure situations. Although these valves may not have been fitted on all commercial installations, they should normally be required consistent with the associated risk. However there are some industrial applications where equivalent protection is provided by controls at the appliance.

**USPO/ OSPO valves are required at all premises subject to GSIUR.**

### **Service pipework**

Service pipework until the 1980s /early 1990s was metallic e.g. of copper or steel. Steel pipework was usually galvanised to protect against corrosion. It was also often wrapped with anti-corrosion tape (known by a trade name as Denso tape) for additional corrosion protection, but to be effective this tape

must be correctly prepared and applied. Other corrosion protection methods included coating with bitumen for cast iron pipes, plastic sleeves, and cathodic protection. The efficiency of corrosion protection deteriorates over time and the rate of pipe corrosion will depend on a number of factors including soil type and moisture levels. For example, as highlighted in the ICL Inquiry report, pipework nearest the building is the most likely to corrode due to the soil having a higher moisture content

PE pipework should not be laid in chemically corrosive soils, such as those containing tars, oil, plating, dry cleaning fluids, etc. nor should it be exposed to extremes of temperature encountered, for example, near a steam main. Para 8.4.2.4 of IGEM/UP/2 Edition 2 (Installation pipework on industrial and commercial premises) refers.

It should also be noted that although replacement LPG tanks may have been installed at sites, the original pipework is less likely to have been changed and may therefore be older than the tank. It may be difficult to establish the pipework installation date due to changes in site personnel, and a lack of accurate records

It is therefore not possible to predict the life expectancy of metallic pipes and they are now subject to the risk based replacement plan described earlier.

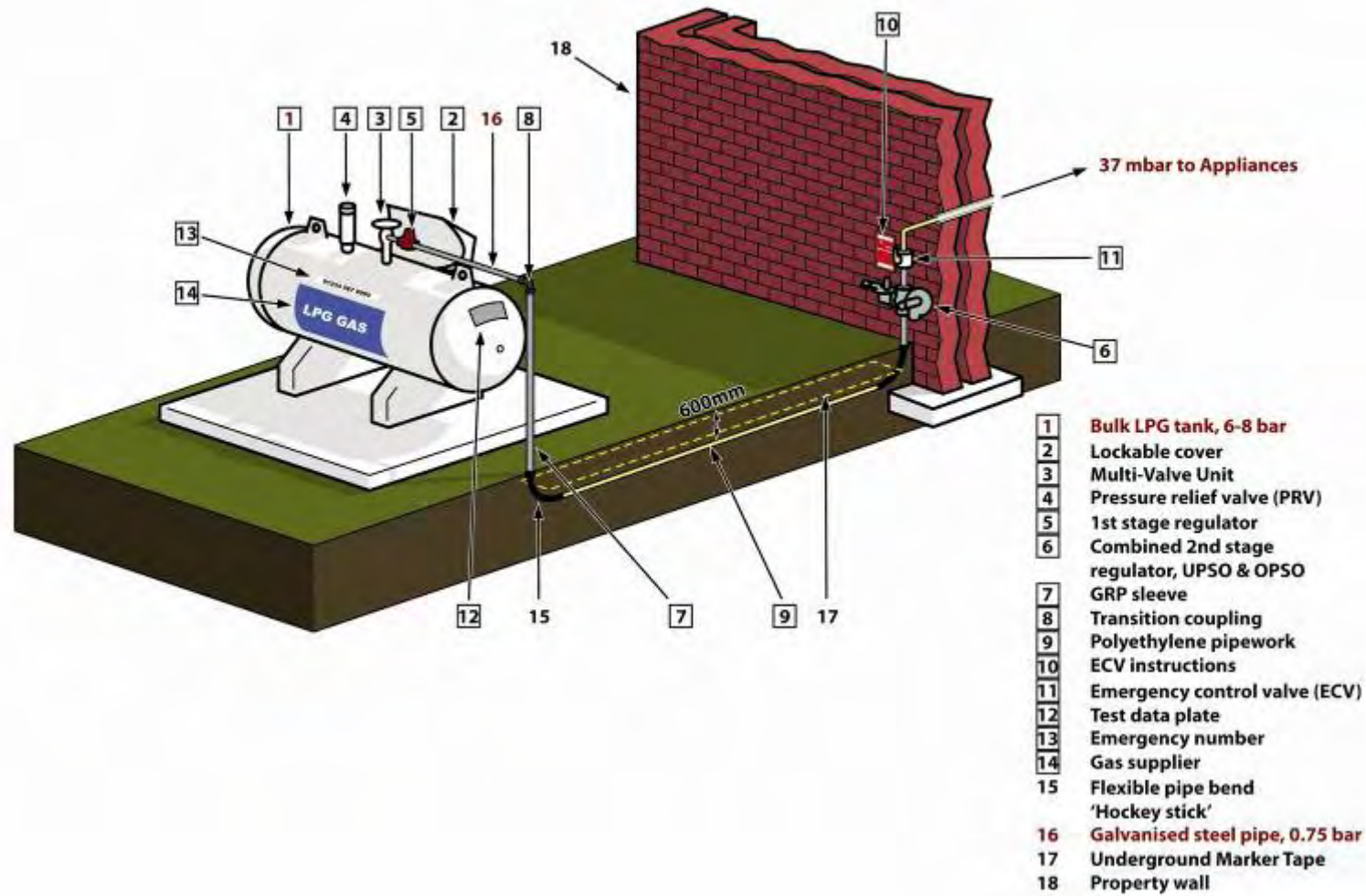
Steel risers: When polyethylene pipework was first introduced, the practice was to use it for the buried section (it degrades when exposed to sunlight) with metallic risers at either end. Later, the industry used polyethylene risers protected by GRP sleeves. Steel risers should be treated in the same way as other buried metallic pipe work and replacement is the preferred option, or if not then they should be subject to an inspection, examination and maintenance strategy (which will necessitate exposure to establish condition.)

### **Entry of pipework into building**

A suitably marked ECV should be fitted. This is normally sited at the point of entry to the building where LPG is to be used.

Pipework should, wherever practicable, enter a building above ground level, and should be sleeved, with the sleeve sealed to the structure internally to ensure any leaking gas escapes to atmosphere. In exceptional circumstances, it is permissible for pipework to enter through a floor via a continuous gas-tight sleeve. Specific requirements apply, which are detailed within IGEM/UP/2 *Installation pipework on industrial and commercial premises*. Pipework should not pass through an unventilated void, unless it is itself contained in a ventilated duct.

### Typical Small Scale LPG Bulk Installation





1

Bulk tank



2

Lockable cover  
For the protection of  
combined multi-valve unit



3

Multi-Valve unit  
With LPG fill connection, vapour off-take  
valve, maximum fill bleed valve + 1st  
stage regulator



4

Pressure relief valve (PRV)



5

1st stage regulator



6

Combined 2nd stage  
regulator, UPSO & OPSO

Figure A2



Figure A3

**Note:**

**For tanks up to 1.1 tonnes (2,500 litres) capacity the fire wall may form part of the building wall as shown. Where part of the building is used for residential accommodation the wall should be imperforate and of 60 minutes fire resisting construction. For larger tanks the separation distances in Table A1, column A apply**

## Points to check

### Storage vessel

- What is the tank condition? Are there any signs of corrosion?
- Is the tank adequately ventilated and the right distance from buildings, boundaries, overhead power lines, etc?
- Is there a 'no smoking/no naked flames' sign in place
- Are there any combustible materials close to it such as LPG cylinders, grass and vegetation, wooden pallets?
- Is the tank protected from damage such as vehicle impact?
- Consider if anyone unauthorised could interfere with the tank. The cover over the tank control valve should be locked. Who has the key? Does it need a security fence?
- Look for any drains, culverts, ducts or low lying areas where LPG gas could accumulate, or track into buildings.
- Is the vessel bonded to an earthing point?
- Is there hard standing for the delivery tanker and can the driver see both the tank and his vehicle?
- Do the notices on the tank tell the occupier what to do if there is a gas leak?
- Does the site have a plan for dealing with a leak or fire that could affect the tank?
- Have employees received information, instruction or training e.g. on the properties of LPG, the need to keep the tank clear of combustible materials etc, and emergency actions?

### LPG service pipework

1. Check that any visible pipework is
  - adequately supported
  - protected from damage
  - not in contact with other surfaces (spacers should be used to keep pipework away from concrete, brickwork, etc), pipework or conduit
  - (for polyethylene pipework) protected from UV degradation (i.e. sleeved with protective material such as GRP)
  - free from obvious signs of corrosion or damage
  - provided with cathodic protection (for metallic pipework)
2. If the buried pipework is polyethylene, is it connected to steel risers? Are they subject to an inspection, examination and maintenance strategy and known to be in good condition?
  - If not, pursue replacement.
3. Has the site completed and returned a questionnaire?
  - If not then follow the flowchart in Figure A5, considering also risk factors listed below and need for possible enforcement action (see also Table 3: Initial enforcement expectation)
  - If the site has completed the questionnaire and has buried metallic pipework, check the validity of the questionnaire and whether there are any additional risk factors - as outlined below - that have not been considered
4. Are there any factors that may create additional risk of physical damage to the pipework, e.g.

- Is the age of the pipework over 15 years (i.e. pre 1993)?
    - Make enquiries about when LPG was first supplied to the site and assume that is the age of the pipework unless there is evidence that it has been replaced. Even if the tank has been replaced, the pipework may not have been changed at the same time
  - Does traffic pass over the pipework route, or is the ground liable to movement?
  - Are there signs of excavations or building work near the pipe?
  - Has the ground been resurfaced since the pipe was laid and might this have disturbed it?
5. Are there any factors that may increase the likelihood or consequences of fire and explosion in the event of a leak, e.g.
- What pressure is the gas in the pipework? (medium pressure above 75mbar increases the risk)
  - What route does the pipework take to the building entry point – is it direct (lower risk) or does the pipework run parallel to the building (higher risk)?
  - How does the pipework enter the building?
    - Is it below ground level?
    - Is the pipework sleeved as it passes through the wall?
  - Could vulnerable people e.g. nursing home residents with limited mobility be affected by a leak?
  - Does the building have a basement or below ground service ducts where gas could accumulate?
  - Are there occupied buildings sited below the level of the installation where the gas could migrate?
6. Does the site plan to replace buried metallic pipework?
- Is the date in line with the LPG suppliers plan?
  - Is the timescale appropriate given any previously unidentified risk factors?
  - Consider whether the site should take interim measures such as implementing an inspection and maintenance strategy, whilst awaiting replacement.

**Replacement of service pipework should only be undertaken by competent persons. Where GSIUR apply they should be Gas Safe registered specifically with competency to work on LPG systems**

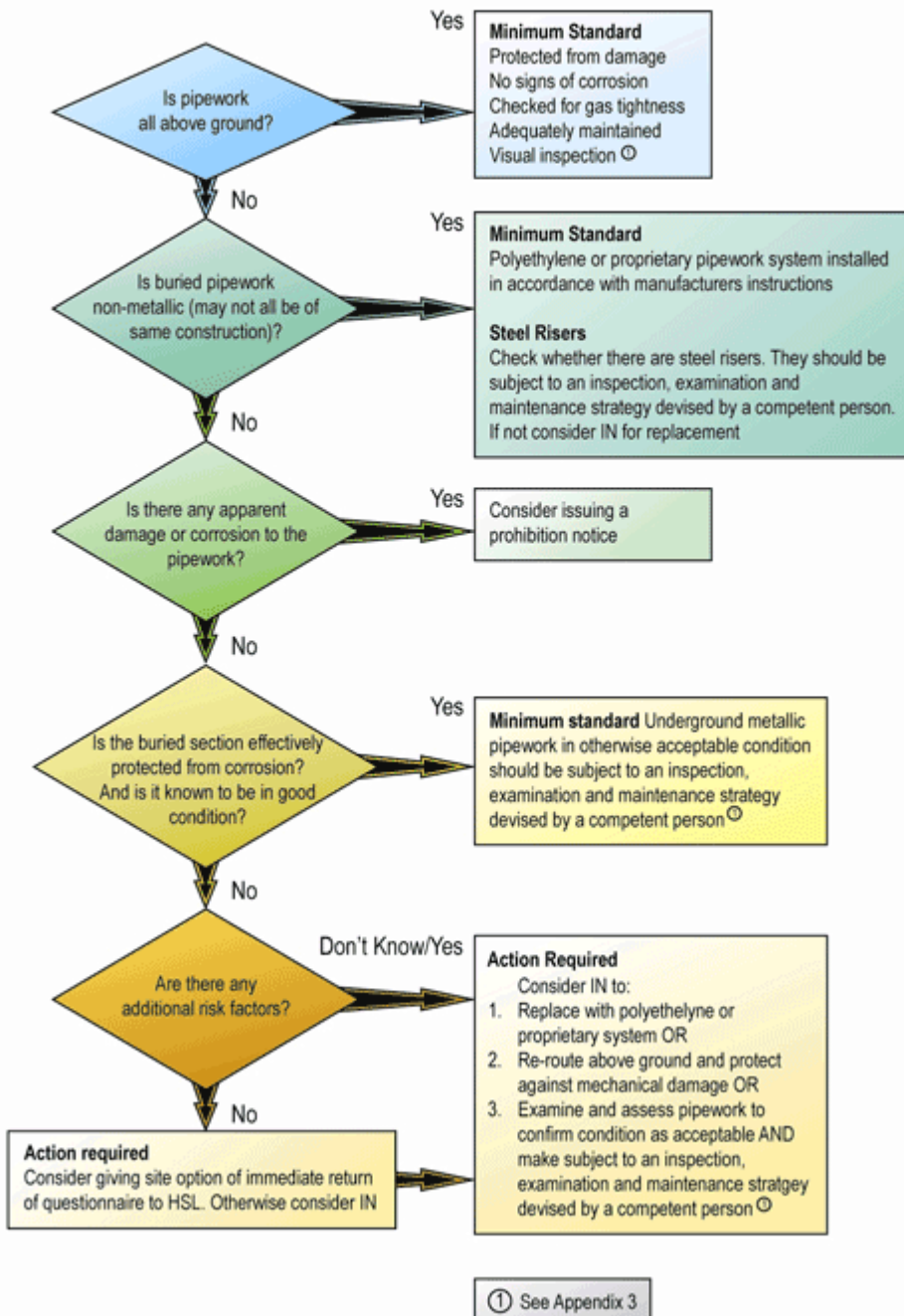
7. Where the pipework is subject to an inspection and maintenance strategy, establish:
- how accurate or reliable the strategy is
  - how representative of the whole LPG pipework system the information is
  - whether or not the strategy includes a visual inspection of underground pipework and assessment of its condition over the expected lifespan of the pipe, including its planned replacement in the future.

**Pressure testing alone is not sufficient.**

An inspection, examination and maintenance strategy should meet the standards set out in Appendix 3

**Although a site may have such a strategy in place, which may be regarded as a reasonably practicable alternative means of compliance, site occupiers should be advised that in the longer term, replacement is likely to be necessary and is the recommendation of Lord Gill's report**

Figure A5 Flow Chart For Considering LPG Service Pipework  
Where survey has not been completed



<b>APPENDIX 2 GLOSSARY</b>	
Bulk tank	Fixed storage vessel containing LPG under pressure. Size usually over 1 tonne
Denso tape	Proprietary non-woven synthetic fibre fabric (tape) impregnated and coated with natural compound based on saturated petroleum hydrocarbons and inert silicon based fillers wrapped around metallic pipework to inhibit corrosion
Cathodic protection	A technique for protecting metal pipes from electrolytic corrosion by making the metallic structure the cathode of an electro-chemical cell, either by applying an electromotive force directly or by putting it in contact with a more positive electropositive force.
ECV	Emergency control valve (shut off valve)
Emergency number	This telephone contact number is to be found on the bulk tank. It is to be dialled in an emergency situation to contact the gas supplier.
Firewall	Purpose built wall to primarily safeguard the LPG installation from heat radiation emitted from a foreseeable fire beyond the nearby site boundary, property line or building.
First stage regulator	Reduces the bulk tank LPG pressure to a medium pressure, usually 0.75 – 2 bar
Fittings	Term used to describe valves, regulators, pipe elbows associated with the LPG installation
Gas supplier	Firm contracted to supply the LPG and fill the bulk tank when required. They will also normally be the tank owner.
Gas user	The person(s) who also usually owns and has the responsibility for all the pipework and fittings downstream of the first stage regulator fitted on the LPG tank
GRP	Glass reinforced plastic (glass fibre/resin mix)
LPG	Liquefied petroleum gas – propane or butane
LPG cylinder	Portable vessels usually up to 47kg containing LPG under pressure
LPG installation	Describes the complete LPG setup; from bulk tank, through service pipework to ECV
LPG tank compound	Designated area around bulk tank that provides a secure compound/environment for the tank
MDPE (PE)	Medium density polyethylene pipe – used underground to transport vapour phase LPG from the bulk tank to the ECV. Must be covered by GRP sheathing above ground.
OPSO	Over Pressure Shut-Off valve. This device must be re-set by the gas supplier if it trips out and shuts off the gas supply when over-pressure conditions prevail.
Pressure relief valve (PRV)	Valve fitted to top of Bulk Tank to relief internal pressure if this increases due to external influences
Second stage regulator	Reduces the medium pressure (0.75 bar – 4 bar) provided by the first stage regulator to the usual working pressure of 37 mbar serving the LPG fired appliances.
Service pipework	Pipework carrying vapour phase gas from fixed vessel to the outlet of the ECV
Sheathing	Outer cover (usually GRP) placed over the yellow polyethylene service pipe to prevent degradation by UV rays from sunlight and mechanical damage
UPSO	Under Pressure Shut-Off valve. This device may be re-set by the gas user if it trips out and shuts off the gas supply

## **APPENDIX 3 INSPECTION, EXAMINATION AND MAINTENANCE STRATEGIES**

### **Above ground pipework**

An inspection and maintenance strategy for above ground pipework should be based on a risk assessment that considers

- Operating pressure
- Size of pipe
- Materials of construction
- Age of pipework
- Any corrosion protection
- Potential failure modes

It should include

- A regular visual inspection for corrosion and damage, especially where pipework passes through supports.
- Checks on
  - the condition of supports
  - any repairs or modifications have been carried out
  - any changes near the pipework to ensure they do not affect operation or safety
- Gas tightness test at the designated operating pressure

### **Buried metallic pipework (including steel risers)**

#### **Strategy requirements**

1 An inspection, examination and maintenance strategy should be devised to ensure the continuing integrity of the buried metallic pipes and ensure that any deterioration is detected and remedied in good time.

2 The strategy should be devised by a competent person (for example, Institute of Corrosion, Pipelines Coating Inspector, Level 2) who should undertake the following:

- An initial visual inspection of the underground LPG pipework sufficient to establish its condition and the condition of any corrosion protection e.g. coating, wrapping, sleeving or cathodic protection
- An assessment of the ground conditions and their likely effect on the condition of the pipe and its corrosion protection
- An assessment of the required frequency of inspection given the pipe specification, failure modes, age, condition, location and environment of the pipe, including the operating pressure and phase of LPG in the pipe, identifying any immediate remedial measures required
- An assessment of the required inspection methods (examinations, tests and measurements) to be performed at each inspection. This may include non-destructive testing techniques outlined in the HID Safety Report Assessment Guidance (Technical Aspects)- Inspection/ Non Destructive Testing or in the API 570 Piping inspection code

3 The strategy should include the safe systems of work for carrying out the inspections and any resulting maintenance. It should include precautions for avoiding danger from underground services and preventing damage to the underground pipe and protective coatings.

4 After each inspection, the competent person should review the strategy and inspection frequency and amend as required. The inspection frequency should be based on the condition of the pipe at the initial inspection and other factors, including, but not limited to, those outlined above, taking into account relevant industry inspection codes and standards, e.g. API 570

5 The strategy should also outline the policy for replacement of the buried metallic pipes with the replacement frequency based on the same factors as those considered for the inspection strategy.

N.B. This strategy should not be confused with the requirement for a statutory written scheme of examination for a pressure system required under the Pressure Systems Safety Regulations which relates to risks associated with pressure.

## **Methods of inspection and test**

### **Gas tightness test (also referred to as pressure test)**

A gas tightness test of the pipework (and specifically the buried pipework) will highlight any leaks that require immediate attention. However, such a test will not indicate the exact location of the leak, nor the condition of the pipework. Any test that suggests that the system is leak free is not necessarily proving that the system is gas tight as the ground conditions at the time of the test may provide a gas tight barrier; in such cases, an inspection strategy, including a visual inspection, is still required.

### **Leakage survey**

A leakage survey carried out using a gas detector is not considered an effective indication of integrity of the pipework because the LPG vapour will accumulate at low points e.g. in drains and gullies or remain in porous ground, where it may not be registered by gas detector sensors.

### **Excavation of pipe work and visual inspection**

It is not considered good practice to excavate a live pipe i.e. containing LPG. Often, when the ground or pipework has been disturbed, a corroded pipe can fail (sometimes catastrophically) causing a significant release of gas. Where excavating along the pipe cannot be avoided, safe digging practices should be used e.g. using hand tools, excavating alongside the pipe rather than above it, and then exposing the pipe by horizontal digging, supporting the pipe if necessary. If there is a likelihood of a gas release, further precautions may be required, e.g. monitoring the LPG concentration in the excavation. HSG 47 "Avoiding Danger from Underground Services" gives further advice.

### **Cathodic protection**

Methods to check the continued effectiveness of cathodic protection include measuring pipe to soil potentials and anode or transformer current outputs.

## TEMPLATE NOTICES FOR GAS USERS IN NON DOMESTIC PREMISES

### **1. PN for obviously corroded or damaged pipework liable to leak (NB - may need to be deferred to allow supplier to attend and make safe)**

#### **I am of the opinion that the following activities namely**

The use of service pipework for the conveyance of liquefied petroleum gas (LPG) on your site from tank serial no XXXXXX

#### **Involve a risk of serious personal injury, and that the matters which give rise to the said risks are**

The apparent significant damage to/corrosion of\* sections of the pipework to the extent that a leak may develop

\* delete as required

#### **And that the said matters involve contravention of the following statutory provisions**

Health and Safety at Work etc Act 1974 sections 2 (1) and 3 (1),  
The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) regulation 6(1)  
Provision and Use of Work Equipment Regulations 1998 regulation 5 (1)

#### **Because**

You have failed to control the risks from a dangerous substance, namely liquefied petroleum gas (LPG) in that you have not taken reasonably practicable measures to avoid its uncontrolled release as you have not maintained the service pipework in good repair

### SCHEDULE

Compliance with this notice may be achieved by completing Item (1) **OR** item (2)

#### ITEM 1

Replace the damaged LPG pipework with pipework suitable for the location, adequately supported, and protected from mechanical damage and corrosion and devise an inspection, examination and maintenance strategy to ensure its on-going integrity and that any deterioration is detected and remedied in good time.

#### **OR:**

#### ITEM 2

Any other equally effective measures to remedy the said contraventions

## 2. IN for inadequate control measures for LPG vessel

...you are contravening ... the following statutory provisions:

Health and Safety at Work etc Act 1974 sections 2 (1) and 3 (1),  
The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) regulation 6(1).

...the reasons for my said opinion are:

You have not ensured that risk of a fire or explosion involving LPG stored in your bulk tank is either eliminated or reduced so far as is reasonably practicable in that (insert specific matters e.g. combustible material is stored within the separation distance).

### SCHEDULE

In order to comply with the Notice, you should (*select as appropriate*):

1. Provide a minimum separation distance of  $x^1$  metres from the vessel outline to buildings, boundary/property lines and any fixed sources of ignition;  
*<sup>1</sup>dependent on tank size, (see table 1)*

AND

2. Remove weeds, long grass, shrubs and combustible material from the area within the separation distance; chemical weed killers (such as sodium chlorate) or any other method which might provide a source of ignition should not be used.

AND

3. Fit a water trap or otherwise suitably seal to any open drains, gullies or ducts within the separation area which would permit access and passage of LPG vapours

AND

4. Provide suitable barriers around the tank to minimise the risk of damage from vehicle impact;

AND

5. Provide fixed signage prohibiting smoking and use of naked flames within the separation distance. These should comply with the Health and Safety (Safety Signs and Signals) Regulations 1996, be durable, clearly visible and legible to all;

AND

6. Provide a clear line of sight for a person delivering LPG to the tank from the position to control the product transfer to both the receiving vessel and the delivery vehicle;

AND

7. Provide appropriate earthing arrangements for the tank and delivery vehicle

AND

8. Provide a secure 2 metre high wire mesh or otherwise suitably ventilated fence around the LPG tank installation

OR

9. Any other equally effective measures to remedy the said contraventions

### 3. IN for replacement of buried metallic pipework in poor/unknown condition

...you are contravening ... the following statutory provisions:

Health and Safety at Work etc Act 1974 sections 2 (1) and 3 (1),  
The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) Regulation 6(1)  
Provision and Use of Work Equipment Regulations 1998 Regulation 5(1), 6 (2).

...the reasons for my said opinion are:

Liquid petroleum gas (LPG) is conveyed on your site from a bulk storage tank (serial no XXXX) via buried metallic pipework of unknown condition; such buried metallic pipework is subject to deterioration unless provided with effective corrosion protection and evidence has not been provided (e.g. from inspection and examination) that demonstrates the ongoing integrity of the pipework so that LPG can be conveyed via such pipework without risk of leakage

#### SCHEDULE

Compliance with this notice may be achieved by completing **EITHER** item (1) **OR** item (2) **OR** item (3) **OR** item (4).

- (1) Replace the buried metallic LPG pipework with buried polyethylene pipework or a proprietary pipework system which should be installed in accordance with manufacturers' instructions.

**OR:**

- (2) Re- route the LPG pipework above ground with protection against mechanical damage, and devise an inspection, examination and maintenance strategy to ensure its integrity and that any deterioration is detected and remedied in good time.

**OR:**

- (3) Devise an inspection, examination and maintenance strategy to ensure the continuing integrity of the buried metallic pipes used to convey LPG and ensure that any deterioration is detected and remedied in good time. The strategy should be devised by a competent person (for example, Institute of Corrosion, Pipelines Coating Inspector, Level 2) who should undertake the following:
  - (a) An initial visual inspection of the underground LPG pipework sufficient to establish its condition and the condition of any corrosion protection e.g. coating, wrapping, sleeving or cathodic protection;
  - (b) An assessment of the ground conditions and their likely effect on the condition of the pipe and its corrosion protection;
  - (c) An assessment of the required frequency of inspection given the pipe specification, failure modes, age, condition, location and environment of the pipe, including the operating pressure and phase of LPG in the pipe, identifying any immediate remedial measures required;
  - (d) An assessment of the required inspection methods (examinations, tests and measurements) to be performed at each inspection.

The strategy should also include the safe systems of work for carrying out the inspections and any resulting maintenance, and include any precautions for avoiding danger from underground services and preventing damage to the underground pipe and protective coatings.

The strategy should include a provision for the competent person to review, after each inspection, the strategy and inspection frequency and amend as required. The inspection frequency should be based on the condition of the pipe at the initial inspection and other factors, including, but not limited to, those outlined above, taking into account relevant industry inspection codes and standards, e.g. API 570 Piping Inspection Code 'Inspection, Repair, Alteration and Re-rating of in service piping systems in the Process Industries'.

The strategy should also outline the policy for replacement of the buried metallic pipes, with the replacement frequency based on the same factors as those considered for the inspection strategy.

**OR:**

(4) Any other equally effective measures to remedy the said contraventions

#### **4. IN for examination / replacement of buried pipework of unknown composition**

**...you are contravening ... the following statutory provisions:**

Health and Safety at Work etc Act 1974 sections 2 (1) and 3 (1),

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) Regulation 6(1)

Provision and Use of Work Equipment Regulations 1998 Regulation 5(1), 6 (2).

**...the reasons for my said opinion are:**

Liquid petroleum gas (LPG) is conveyed on your site from a bulk storage tank (serial no XXXX) via buried pipework of unknown composition and condition; such pipework is subject to deterioration unless constructed from corrosion-resistant material (such as polyethylene) or provided with effective corrosion protection. Evidence has not been provided (e.g. from inspection and examination) that demonstrates the ongoing integrity of the pipework so that LPG can be conveyed via such pipework without risk of leakage

#### **SCHEDULE**

To comply with this notice,

#### **EITHER**

(1) Undertake such investigations as are necessary to determine the composition and condition of the buried LPG pipework.

#### **AND**

(2) For those components of the buried pipework (including riser pipes) which are determined to be metallic by (1) above:

#### **EITHER**

a. Replace the buried metallic components of the LPG pipework with buried polyethylene pipework, or a proprietary corrosion-resistant pipework system installed in accordance with manufacturers' instructions.

#### **OR:**

b. Re- route LPG pipework above ground with protection against mechanical damage, and devise an inspection, examination and maintenance strategy to ensure its integrity and that any deterioration is detected and remedied in good time.

#### **OR:**

c. Devise an inspection, examination and maintenance strategy sufficient to ensure the continuing integrity of the metallic components of the buried LPG pipework, and to ensure that any deterioration is detected and remedied in good time. The strategy should be devised by a competent person (for example, Institute of Corrosion, Pipelines Coating Inspector, Level 2) who should undertake the following:

(i) An initial visual inspection of the underground LPG pipework sufficient to establish its condition and the condition of any corrosion protection e.g. coating, wrapping, sleeving or cathodic protection;

(ii) An assessment of the ground conditions and their likely effect on the condition of the pipework and its corrosion protection;

(iii) An assessment of the required frequency of inspection given the pipe specification, failure modes, age, condition, location and environment of the pipe, including the operating pressure and phase of LPG in the pipe, identifying any immediate remedial measures required;

(iv) An assessment of the required inspection methods (examinations, tests and measurements) to be performed at each inspection.

The strategy should also include the safe systems of work for carrying out the inspections and any resulting maintenance, and include any precautions for avoiding danger from underground services and preventing damage to the underground pipe and protective coatings.

The strategy should include a provision for the competent person to review, after each inspection, the strategy and inspection frequency and amend as required. The inspection frequency should be based on the condition of the pipe at the initial inspection and other factors, including, but not limited to, those outlined above, taking into account relevant industry inspection codes and standards, e.g. API 570 Piping Inspection Code 'Inspection, Repair, Alteration and Re-rating of in service piping systems in the Process Industries'.

The strategy should also outline the policy for replacement of the metallic components, with the replacement frequency based on the same factors as those considered for the inspection strategy.

**OR:**

(3) Implement any other equally effective measures to remedy the said contraventions

## 5. IN for replacement of metallic risers

**...you are contravening ... the following statutory provisions:**

Health and Safety at Work etc Act 1974 sections 2 (1) and 3 (1),

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) Regulation 6(1)

Provision and Use of Work Equipment Regulations 1998 Regulation 5(1), 6 (2).

**...the reasons for my said opinion are:**

Liquid petroleum gas (LPG) is conveyed on your site from a bulk storage tank (serial no XXXX) via buried pipework having metallic components (including riser pipes); such metallic components are subject to deterioration unless provided with effective corrosion protection. Evidence has not been provided (e.g. from inspection and examination) that demonstrates the ongoing integrity of the metallic components so that LPG can be conveyed via such pipework without risk of leakage

### SCHEDULE

To comply with this notice,

#### **EITHER**

(1) Replace the buried metallic components of the LPG pipework (including riser pipes) with polyethylene pipework protected where necessary against ultraviolet degradation, or with a proprietary corrosion-resistant pipework system installed in accordance with manufacturers' instructions.

#### **OR:**

(2) Re- route LPG pipework above ground with protection against mechanical damage, and devise an inspection, examination and maintenance strategy to ensure its integrity and that any deterioration is detected and remedied in good time.

#### **OR:**

(3) Devise an inspection, examination and maintenance strategy sufficient to ensure the continuing integrity of the metallic components of the buried LPG pipework, and to ensure that any deterioration is detected and remedied in good time. The strategy should be devised by a competent person (for example, Institute of Corrosion, Pipelines Coating Inspector, Level 2) who should undertake the following:

(i) An initial visual inspection of the underground LPG pipework sufficient to establish its condition and the condition of any corrosion protection e.g. coating, wrapping, sleeving or cathodic protection;

(ii) An assessment of the ground conditions and their likely effect on the condition of the pipework and its corrosion protection;

(iii) An assessment of the required frequency of inspection given the pipe specification, failure modes, age, condition, location and environment of the pipe, including the operating pressure and phase of LPG in the pipe, identifying any immediate remedial measures required;

(iv) An assessment of the required inspection methods (examinations, tests and measurements) to be performed at each inspection.

The strategy should also include the safe systems of work for carrying out the inspections and any resulting maintenance, and include any precautions for avoiding danger from underground services and preventing damage to the underground pipe and protective coatings.

The strategy should include a provision for the competent person to review, after each inspection, the strategy and inspection frequency and amend as required. The inspection frequency should be based on the condition of the pipe at the initial inspection and other factors, including, but not limited to, those outlined above, taking into account relevant industry inspection codes and standards, e.g. API 570 Piping Inspection Code 'Inspection, Repair, Alteration and Re-rating of in service piping systems in the Process Industries'.

The strategy should also outline the policy for replacement of the metallic components, with the replacement frequency based on the same factors as those considered for the inspection strategy.

**OR:**

- (4) Implement any other equally effective measures to remedy the said contraventions

## APPENDIX 5 EXAMPLE INSTALLATIONS



### Faults:

Poor ventilation due to sloping ground behind tank  
Dead grass around tank should be cleared  
Covered duct (below crash barrier) has gaps allowing ingress of leaking gas.  
Duct leads into adjacent building:

### Solution:

IEE would be IN to relocate tank.



Note drain pipe on end of building:



Open drain and entry into building

## Pipework

### Illustrations of corrosion on galvanised pipe



1. Zinc layer is partly consumed though still protecting large areas but isolated small spots of rust may be visible - warrants a further inspection within the short to medium term future.



2. Significant areas of rusting and/or numerous sites of rusting where the zinc has been fully consumed and the steel beneath is obviously corroded. Significant corrosion such as this would give cause for concern



3. Little or no zinc remaining with widespread corrosion of the steel and extensive rust formation. A further stage of corrosion such as this would again give cause for concern



4 Service pipework in direct contact with concrete – note corrosion at edge, - Denso-taped metal riser connected to sleeved metallic pipe. System taken out of use immediately and pipework replaced. IEE would be PN.

## APPENDIX 6: Topic Specific Requirements & Factors Relevant to Initial Enforcement Expectation (TABLE 3)

### 1. Security Fencing: LPG bulk storage tanks

The UKLPG Codes contain requirements for the adequate security of bulk LPG tanks. This advice is intended to help inspectors and local authority enforcement officers to apply these requirements in a consistent way, particularly to LPG tanks in remote locations, e.g. on farms.

Table 3 gives the initial enforcement expectation as follows:

Situation	Initial enforcement expectation	Comment
<b>STORAGE VESSEL</b>		
Inadequate security	Letter/ Improvement notice	Risk based, dependent on likelihood of interference

Inspectors will always need to make a judgement on the likelihood of public access and the nature of the individuals who might be near the installation and what they might do (and compare a rural setting, say, to an urban industrial setting where the risk of vandalism etc. may be higher). Inspectors will then apply the Enforcement Policy Statement (EPS) after consideration of dutyholder and strategic factors, to decide whether enforcement action may be appropriate.

The fencing requirements are given in the UKLPG COPs, and COP 1 Part 1 (section 2.6.3) gives some conditions whereby these requirements may be relaxed for vessels of less than 4 tonnes capacity. However, the COP states that this relaxation should not be applied where the public have uncontrolled access.

When deciding whether the public have uncontrolled access, inspectors should consider the following:

- There is a presumption that some form of fencing is required unless it can be demonstrated that it is not needed.
- The purpose of security fencing is to prevent unauthorised access/tampering; potential access is a factor that has to be taken into account on a case by case basis.
- Who might be able to get access to the tank and how? Give strong consideration to the possibility of access by members of the public. Pragmatically, reasonable practice ability requires an element of foreseeability regarding public access, rather than an actual history of tampering. The presence of a public footpath / right of way (rather than the general right to roam) and hence a greater likelihood of people being there, may be a decisive local factor.

- If no secondary fencing is required in the immediate vicinity of tanks, is access to valves otherwise prevented? E.g. lockable cover, wire meshing underneath between skids etc).
- Does any perimeter fencing provide a suitable barrier (not acceptable for tanks >4 tonne)? If so how? – e.g. tests in LPG CoP, likelihood of trespassers.

The following examples illustrate the above points, but they are not exhaustive. Inspectors will need to consider site-specific circumstances for each LPG installation and, if required, obtain process safety specialist assistance when deciding on the most appropriate course of action.

In all these examples it is presumed that the covers are kept locked with the key positioned in a secure place that can be accessed easily in the event of an emergency.

**Example 1:** Rural location. 2 x 2 tonne LPG bulk storage vessel - both have lockable covers. LPG is used to heat a chicken shed. The vessels have a plug on the drain connections. Remote from a public highway / footpath. No other occupied buildings within the vicinity. No fence required.

**Example 2:** Urban location. 2 x 2 tonne LPG bulk storage tanks - both have lockable covers. The vessels have a plug on the drain connections. Sited to the rear of an industrial unit. The company premises have a 2m perimeter fence. The public are not permitted to the rear of the premises, which is enforced by employees. No additional fence required for the LPG tank.

**Example 3:** Rural location. 2 tonne LPG tank with lockable cover sited on a farm in a field which is downhill from the farmhouse and other occupied buildings. There is a public footpath adjacent to the tank, though no evidence of trespassing / break-ins in the area. Fence required. Initial enforcement expectation: letter.

**Example 4:** Urban location. 2 x 0.5 tonne LPG storage tanks with lockable covers, used to heat a public library incorporating a coffee shop, which is located in the centre of a small market town. The public are likely to be within the immediate vicinity of the LPG tanks. The premises are open between the hours of 9am and 5.30pm, and there is no CCTV monitoring provided on the premises covering the LPG tanks. Fence required. Initial enforcement expectation: improvement notice.

## 2. Lack of UPSO/OPSO

**USPO/ OPSO valves are required at all premises subject to GSIUR.**

However, in some large industrial premises (e.g. poultry sheds heated by a small number of large heaters,) the increased demand for LPG as the heaters fire up could cause an UPSO to operate, shutting off the fuel supply and the heaters and putting the lives of the poultry at risk. Given that the LPG-fired equipment has flame failure devices (this would be a requirement,) and that

there is generally a low exposed human population, the risk of a dangerous incident is likely to be very low. Therefore, it appears reasonable not to require UPSOs in this situation. However, where there is no UPSO, it is essential that there are other reasonably practicable measures in place to prevent gas leaks and explosions, such as having appliances fitted with a flame failure device.

The onus is on the dutyholder to justify the absence of UPSO/OPSO valves from service pipework to any industrial premises not subject to GSIUR.

### **3. Electrostatic Protection Measures & Earthing**

The term “electrostatic protection” concerns the means for ensuring that no electrostatic potential exists which could give rise to danger, e.g. an electrical spark during connection or disconnection of the bulk tanker supply hose during refilling operations.

The term “earthing” has a specific meaning associated with electrical installations, this advice reflects the terminology used within the UKLPG Codes of Practice.

Generally, the tank filling area should be considered as a hazardous area during tanker offloading operations due to the risk of leakage due to worn/failed couplings, hose failure, etc. In order to adequately control the risk of ignition of any potential leak, it is essential that the tanker and tank are at the same electrical potential during the refilling operation. This can only be demonstrated if there is a properly engineered means by which tanker and tank can be electrically bonded together prior to offloading commencing.

Electrostatic protection is required for **all** LPG tanks, and an Improvement Notice should be considered where appropriate electrostatic protection measures are not in place. (See below:)

#### **Vessels above 1 tonne capacity (2200 litres)**

All LPG storage vessels above 1 tonne capacity should be permanently bonded to an effective earthing point to prevent the accumulation of static electricity. Generally, this will be achieved via an earthing rod. This earthing point should be located so as to facilitate connection to the bulk tanker via its own earthing/bonding cable before LPG delivery connections are made.

The electrical bonding should be mechanically sound and protected against foreseeable causes of damage (no excess wire length, not running across an area required for access, etc). There should be test records to prove that the bonding point is effective. Tests should be frequent enough that the earth continuity is unlikely to be lost between tests. Tanker drivers should perform a visual check of the installation, including the earthing point, before commencing offloading.

#### **Vessels up to 1 tonne capacity**

As an alternative to the above method, a bonding connection may be provided on the tank itself to which the bulk tanker can directly connect its

earthing/bonding cable before LPG delivery connections are made. Ideally, the bonding connection would be a dedicated brass or copper stud, but may be provided via a lifting lug or leg. In any case, it must be a corrosion-free and unpainted metal part via which the bulk tanker can achieve a secure electrical connection.

Where there is no evidence that a bonding clamp or other engineered electrical bonding means can be used effectively (e.g. clamp marks on thick paintwork or plastic parts etc.) then an Improvement Notice should be considered. A dedicated equipotential bonding connection point should be provided which can be provided as providing a good electrical connection with the tank. This should be accessible, and maintained free from corrosion which may impair its function.

### **Buried or Mounded Tanks**

A bonding connection providing bare metal contact with the bonding cable from the LPG road tanker should be attached or connected to the vessel.

Buried earth rods should not be used or connected to buried or mounded storage vessels using cathodic protection, either for electro-static dissipation or for the earthing of electrical equipment. Electric pumps should be earthed through the electric supply system.

### **Earthing Requirements**

Site earthing is required for all sizes of storage vessel when fitted with electrical equipment, with the primary requirement being protection against electric shock. The earth should be adequate to ensure that electrical protection devices operate in the event of a fault. BS 7671 provides guidance on this. Test reports should be available for inspection. This is not the same as the equipotential bonding required for the dissipation of static electricity.

### **References & Further Information**

More detailed information can be found in:

Section 5 of the UKLPG Code of Practice 1, *Bulk LPG Storage at Fixed Installations; Part 1: 2009: Design, Installation and Operation of Vessels Located Above Ground*; and

Section 3 of the UKLPG Code of Practice 1, *Bulk LPG Storage at Fixed Installations; Part 4: 2008: Buried / Mounded LPG Storage Vessels*.

## **4. Trees and Shrubbery within Separation Distance**

The expected standards regarding the proximity of trees, shrubs etc. to LPG installations are established within UKLPG Code of Practice 1 part 1 – 2009. In particular, the following requirements should be noted:

**2.3.1.9** No part of the storage vessel should be located directly beneath any part of the structure of the premises or extension from it, for example roof eaves, car ports, etc., nor beneath overhanging tree branches.

**2.3.1.10** Weeds, long grass, deciduous shrubs and trees, and any combustible material should be removed from an area within the separation distance for vessels not exceeding 1,1 tonnes LPG capacity, or within 6m for larger vessels. Chemical weed killers (such as sodium chlorate) or any other method which might provide a source of ignition should not be used in these areas.

**2.3.1.11** Where a visual screen is required for LPG vessels, e.g. at domestic installations, this should not interfere with ventilation and should be located at one side of the vessel only. For the purpose of such screening, evergreen shrubs or trees or a non-flammable open ranch type fence may be located 1m from vessels not exceeding 2,2 tonnes LPG capacity or 6m for larger vessels.

In determining appropriate enforcement action, a judgement will always be required as to the extent of any departure from established standards, and the associated level of risk. The following factors should be considered in making such judgements.

- **Combustible Materials:** Trees, shrubs, grasses etc. have the potential to generate significant amount of combustible material. (e.g. through leaf-fall, or in drying out during summer months.) The accumulation of such materials, and the foreseeable event of them being involved in a fire could threaten the LPG installation and its contents. It is therefore vital that duty holders have adequate systems in place to minimise the potential for such materials to build-up within the minimum separation distances specified in Table 1 of UKLPG COP 1 Part 1 - 2009. This may require a robust systems for removal of weeds and long grass away from LPG tanks on a regular basis. The removal of combustible materials such as pallets and spent vehicle tyres also applies where they are allowed to build-up within the proximity of an LPG installation.
- **Ventilation:** Even when trees and shrubs may be planted for aesthetic / screening reasons, around an LPG installation, they should not impair the availability of ventilation necessary around the installation. The Code of Practice allows for screening to a single side only. Shrubs and trees to multiple sides within the separation distance are likely to impair ventilation to an unacceptable degree, and should thus be removed.
- **Potential For Impact Damage:** High winds and other factors may cause trees branches to fall, which could cause significant damage to LPG tanks and pipework. Tanks should not be situated beneath overhanging branches, and steps should be taken to prune back any such trees.
- **Potential for Damage to Buried Pipes:** Trees and shrubs may have extensive root systems, which could potentially cause damage to buried pipework, and in extreme cases to areas of hard standing etc. supporting

bulk storage tanks. Inspectors should be aware of this issue when considering the proximity of trees and shrubs, and ensure that dutyholders have adequate arrangements to manage any such risks.

### **Action**

Ultimately, the question as to whether trees, shrubs or other foliage represent such a severe hazard that HSE must insist on their removal requires the judgement of the field inspector.

Dense shrubbery, completely surrounding and very close to an LPG tank would both represent a serious fire risk and impair ventilation. As such this would be a clear issue meriting enforcement action. However, the presence of a single evergreen tree to one side and some distance away from a similar tank would not necessarily merit the same response. Any enforcement decisions should be made on the strength of specific risks relevant to the installation. It is not possible to provide definitive guidance for all circumstances.

## APPENDIX 7: LIQUID PHASE SERVICE PIPEWORK

### Background

LPG exists as a gas at normal temperatures and pressures, but can be liquefied under moderate pressure. The LPG will return to vapour if the pressure is released. Leaks from liquid phase pipework are considered more hazardous than those from vapour phase lines for the following reasons:

- Liquid phase lines operate at much higher pressures than vapour phase lines, typically 7bar for propane;
- Liquid phase LPG occupies approximately 1/250<sup>th</sup> of the vapour volume, so a relatively small leak from a liquid phase LPG supply can quickly produce sufficient vapour to create a flammable concentration.

Where an installation requires a liquid LPG feed, the storage and delivery of LPG will be in liquid form.

### Applications

The use of liquid phase LPG is much more restricted than vapour-phase. In commercial and industrial premises, liquid phase supplies may typically be required for the following applications:

- As a fuel for motor vehicles (Autogas etc.) including retail road fuel outlets.
- As a fuel for fork lift trucks and similar plant.
- To supply large-scale burners having a high calorific output, in particular:
  - Grain driers
  - Kilns (e.g. brick manufacture)
- As a propellant for aerosols.
- For the filling of portable LPG cylinders.

Also, there are a small number of LPG distribution networks (metered estates) which use *vaporisers* to provide the needed gas volumes. These therefore have a liquid phase pipeline between the bulk storage tank(s) and the vaporiser. The pipework between the storage tank(s) and vaporiser is generally above ground.

### LPG Installations and Associated Pipework

Irrespective of whether a liquid or vapour phase supply is required, supply tanks should be sited in accordance with the established separation distances for vapour phase LPG supplies. These are listed in UKLPG Code of Practice 1, Part 1: 2009, Section 2.

Within domestic and light commercial premises, such as pubs, restaurants and offices, installation pipework should not carry liquid phase LPG nor carry vapour at a nominal operating pressure greater than 37mbar. One indication

that a tank is supplying LPG in liquid phase is that the supply pipework may originate from the bottom of the storage tank, rather than the top.

#### Liquid Phase Supply

#### Vapour Phase Supply

All LPG service pipework should be designed and installed in accordance with the appropriate standards. **Due to the higher pressures involved in transporting LPG in liquid phase, polyethylene (PE) pipes are not considered suitable for use as service pipework.**

NB. A periodic inspection programme is required for all liquid phase pipework.

The table below indicates the types of pipework suitable for liquid phase use.

Pipework material	Above ground	Below ground
Cast iron	Unsuitable	Unsuitable
Copper	Unsuitable	Unsuitable
Polyethylene	Unsuitable	Unsuitable
Carbon steel	√	Not recommended*
Stainless Steel	√	√
Proprietary systems	√	√

\* Currently, UKLPG Code of Practice 22 permits the use of carbon steel below ground. However, it is not the preferred option, and stainless steel or a suitable proprietary system should be encouraged. Where carbon steel is utilised for below ground liquid-phase supplies, it should be laid in a shallow open masonry or concrete lined trench, and must be protected against corrosion e.g. by zinc coating and painting and should be subject to a robust inspection regime. Where essential the trench can be backfilled with clean sand, in which case corrosion protection in the form of cathodic protection is essential; bitumen based wrappings alone are not sufficient

#### Proprietary Pipework Systems

A number of proprietary systems are available which are suitable for liquid-phase applications. In particular, the *BRUGG/Flexwell* system is frequently used. Whilst designed for use in the retail fuel sector, its use is becoming more widespread in commercial applications. It is semi-flexible with inherent corrosion protection. The design-life of the product is considered by the manufacturers to be 30 years.

#### Pipework Routing

**Where possible, liquid phase LPG service pipework should be located above ground.** This enables the service pipework to be inspected more easily over its lifetime.

Pipework containing LPG in the liquid phase or the vapour phase at nominal operating pressures greater than 2 bar should not be routed into or through

buildings unless necessary for process purposes, e.g. aerosol filling, engine testing, in that building.

Wherever liquid phase LPG may be trapped e.g. between closed valves or check valves, protection against the pressure exceeding the design pressure of the system should be provided. Further guidance is provided within UKLPG Code of Practice 22, *LPG Piping System – Design and Installation*.

Where pipework carrying liquid phase LPG is installed below ground, the following apply:

### **Below Ground Liquid Phase Pipework**

- The pipework design should make allowance for any additional loading or constraints imposed;
- Corrosion protection should be provided where necessary, for example, cathodic protection;
- Piping should be run, adequately supported and laid, in a shallow open concrete or masonry lined trench with open grid covers, where necessary, to allow safe movement of pedestrians;
- If necessary, trenches may be backfilled with an inert, non-corrosive material free from abrasive particles likely to damage corrosion protection;
- Protection should be provided in the form of load bearing slabs or covers for those sections of trench over which traffic passes or where superimposed loads will occur;
- All pipe joints should be welded;
- As an alternative to running a liquid filled pipe in a concrete or masonry trench, the pipe may be run within a separate pipe sleeve. This sleeve should be sealed to the inner pipe at both ends and the space between the two should be monitored to detect leakage, normally by detecting a pressure change. The outer sleeve should terminate above ground or in a suitable inspection pit;
- Isolation valves should be provided at both ends of the underground section;
- The route of the pipe-run should be recorded and, where practicable permanently marked;
- Piping conveying inert or flammable liquids may be laid in the same trench, but those containing corrosive substances, toxic materials or steam should not be;
- It is recommended that electric cables are not laid in the same trench as LPG piping. Electric cables may be laid in the same trench if protected by an outer pipe or sleeve.
- Pipelines, fittings and hoses conveying liquid phase LPG should have electrical continuity and be effectively connected to earth. This may mean the fitting of electrical bonding straps across connecting joints.

### **Additional Information: Grain Dryers**

UKLPG publish an information sheet containing recommended safe practice in the use of LPG fired grain dryers. This is available at:

<http://www.uklpg.org/uploads/DOC4D42E4EE3FE73.pdf>