



Report to Procurator Fiscal

ICL Expert Evidence

Guidance

**Penny Taylor, BEng(Hons), CEng, MChemE
Principal Specialist Inspector
Health & Safety Executive
Process, Materials and Systems Safety Corporate Topic
Group**

Date: 27th November 2006

Revised September 2008

Scope and introduction

1. This report provides my opinion on the details in the ICL Expert Evidence Factual Report on Guidance and refers to the paragraph numbers in that document.

Opinion on external guidance

Summary

2. The guidance available at the time of installation demonstrates that there was sufficient industry knowledge to identify a suitable standard for an underground pipe installation with regards to corrosion protection, location and entry point into buildings.
3. In my opinion a survey for leakage, as required by the guidance for underground pipework operating at low pressure, would not be interpreted as a need to excavate. It is most likely that a survey for leakage would take the form of leak test, use of gas detection equipment or a pressure test. In my opinion such a survey for leakage would only have identified a leak; it could not have identified a deteriorated pipe prior to failure and may not have detected a minor leak. I do not believe that the condition of the underground pipework and its suitability for use until the next survey would be determined by a survey for leakage.
4. The risk from the pipework must be assessed in order to determine the frequency of the survey. In order to determine the risk from pipework, the competent person would need to consider the installation and design standards, ground loading, aggressiveness of the environment, pipework location and any actual or inferred information relating to current integrity of the pipework. In my opinion a competent person would need to excavate parts of the existing pipework to form a judgement on the standard of installation and current integrity unless the installation has good records covering the design and installation standards, ground loading history and soil corrosivity. Once the risk had been determined the frequency of inspection could be decided.
5. The later Codes are based on the presumption that the pipework had been installed to acceptable standards, usually the LP Gas Association (or LPGITA) Codes of Practice covering design and installation. In my opinion if pipework was known, or found by excavation, not to meet these standards the guidance on inspection methods and frequency could not automatically be followed; a full assessment of the risks would be required.

Installation Standards

6. In paragraph 12 of my ICL Expert Evidence Factual Report on Guidance I discuss the relevance of IGE Communication No. 563; in my opinion information on external corrosion protection, trench and backfill requirements would have been equally applicable to LPG.
7. In paragraph 19 I conclude that the guidance available at the time of installation demonstrates that there was sufficient industry knowledge to identify a suitable standard for an underground pipe installation with regards to corrosion protection, location and entry point into buildings.
8. IGE Communication 563 wrapping requirements are covered in paragraph 34 of my factual report where it states the wrapping should overlap the existing wrapping for at least 2 inches. It is my opinion that this would indicate that upon completion, unless it is otherwise protected from corrosion, the whole length of the pipe is wrapped (not just the joints).
9. In paragraph 50 I note that IGE/TD/4 2nd Edition's (1981) stipulates that service pipes should not be installed in an unventilated void space. This guidance would not have been in place in the early 1970's which I was told was likely to have been the time the yard was raised. However the requirements for sleeving and sealing at building entrances was covered in the previous incarnations of the IGE document (No. 563 and IGE/TD/4 [1973]) and by the early 1970's the hazard of LPG collecting in low areas was identified in the LPGITC Code of Practice, Fire Protection Association Document, Safety, Health and Welfare Booklet No 30 and the Institute of Petroleum Model Code of Safe Practice part 9.
10. Paragraph 52 of my factual report covers the 3rd edition of IGE/TD/4 (1994) and specifically its extended scope to cover LPG (as a 3rd family gas). Previous versions of TD/4 were intended for the mains gas industry and IGE/TD/4 3rd Edition states that previous recommendations may not be satisfactory with 3rd family gases. However in my opinion the standards indicated in earlier issues of IGE/TD/4 address the following that are equally applicable to pipes carrying natural gas or LPG: risks associated with external corrosion of underground pipes, risks associated with the pipes being below ground and risks associated with the pipes entering unventilated voids.
11. In my opinion to comply with the guidance available at the time of installation the pipework should have been corrosion protected e.g. with bitumen wrapping and installed in a trench backfilled with material free from rocks, etc. The pipework as it enters the building should be sleeved with the space between the pipe and sleeve sealed at both ends to prevent the passage of gas and the sleeve sealed to the building structure likewise. Prior to commissioning the pipework should be pressure tested and checked to ensure it is free from damage to the corrosion protection (e.g. visually or by a holiday test).

Inspection and Maintenance

12. I covered the maintenance section of LPGITA Code of Practice 1 (1974) in paragraphs 20 to 22 of my factual report. Whilst the original ICL installation in 1969 would not have been subject to this edition of the guidance the change and repositioning of the tank will have necessitated the commissioning of the new tank and connection to the existing pipework. In my opinion re-siting a tank would have constituted a new installation and therefore the comprehensive instructions covering maintenance to be provided at commissioning should have been provided at that time.
13. Paragraph 20 of my factual report covers the statement (in LPGITA Code of Practice 1 (1974)) that buried pipelines be surveyed for leakage at a frequency dictated by the risks associated with their location, pressure of operation and aggressiveness of the environment. Paragraph 101 of my factual report contains more detail and covers the statement that where they convey vapour at 2 bar or more buried pipelines should be surveyed at least yearly and this may include a repeat of the pressure test carried out at installation.
14. Paragraph 22 of my factual report covers the statement (in LPGITA Code of Practice 1 (1974)) that all fittings not specifically covered should be checked at intervals not exceeding one year. I take 'all fittings not specifically covered' to mean those items not given a set interval between checks. This appears to me to be contrary to the risk based approach to frequency outlined earlier in the same document.
15. Factual report paragraph 23 covers inspection requirements in LPGITA Code of Practice 1 Part 3 (1986). The Code reiterates the risk-based approach to identifying the frequency at which the underground pipework should be surveyed for leakage but states that the system should have been designed and installed in accordance with LPGITA Code of Practice 1 parts 1 or 2. The guidance goes on to give a 10 year maximum frequency for a leakage survey (which may be a repeat of the pressure test) for an installation operating at 5 bar or above designed and installed to the relevant Code, however this is not applicable to the installation at ICL which was operating at 1.5 bar. The LPGITA guidance is prescriptive in the types of inspection and is based on the assumption that the installation standard is known and acceptable; it does not discuss non-standard installations. In my opinion the Code is not intended to be sufficient if the actual standard of the installation is lower than those given by LPGITA Codes of Practice 1 part 1 or 2 as appropriate.
16. In paragraph 24 I discussed HSG34 which required the installation to be maintained to an acceptable standard with the objective of maintaining the safe operating limits, and emphasis to be placed on features affecting the integrity of the installation. The standard expressed is goal setting. HSG 34 develops the detail of maintenance further, but in

reference to underground pipework it deals only with pipe carrying liquid. No specific mention is made of pipes carrying vapour however paragraphs 182 and 183 refer to the installation rather than the vessel but 'installation' in this context is not defined in HSG34. I cannot comment on what 'installation' was intended to cover in HSG34 because I was not involved in its production nor have I seen any documents which cover the intended meaning.

17. In paragraph 26 I stated that I reviewed guidance over the period 1959 to 2004 and the first mention of inspection and maintenance of pipework occurred in 1965. The inspection and maintenance guidance current between 1965 and 2004 aimed to ensure the continuing integrity of the system. The inspection and maintenance prescribed for underground pipework operating below 5 bar would only have surveyed for leakage, there was no requirement to excavate and examine the condition of the pipe or the corrosion protection. The frequency of such survey is based on the risk associated with the installation (location, operating pressure and environment) and in addition the inspection and maintenance prescribed assumes that the system was installed to relevant codes. It may therefore have been necessary to excavate and examine the pipe in order to determine the installation standard and risk associated with it.
18. I discuss routine inspection of pipework in LPGITA Code of Practice 1: part 3 (1986). In my opinion the questions to be answered (covered in paragraph 123) would not have identified the condition of the underground pipework.
19. Paragraph 127 of my factual report discusses Section 6.2.1 of CoP1 part 1 (1998). Although not stated explicitly in my opinion in order to assess the risk the soil conditions and the condition of the original pipe installation need to be known or determined and this may involve excavation. Furthermore the inspection requirement is based on the original installation being in accordance with Codes 1 part 1 or 1 part 2 as appropriate and if this is not the case in my opinion the risk assessment should evaluate the adequacy of the inspection regime in addition to its frequency.

Changes to guidance production

20. Paragraph 230 in section 3 of my factual report covers the decision to withdraw HSE guidance and work with LPGA to agree some of their codes of practice. I have no first hand knowledge of the decision and reasons to produce joint guidance.

Opinion on benefits/ challenges with joint guidance

21. Section 3 of my factual report (paragraphs 229 to 231) covers HSE's involvement in the LPGA Codes of Practice. I have worked closely with LPGA on their codes for four years. In my opinion the main benefit of joint guidance is agreement of standards by both HSE and industry with

both parties using the guidance as good practice. In my opinion, for such a partnership to be sustained some compromises will need to be made in order to reap the benefits of a common set of guidance documents and to maintain buy-in from the industry. However I believe that the compromises I have reached with LPGA during my time as technical lead for LPG have not reduced the standard of safety.

22. I have had direct involvement in reviewing and agreeing a number of Codes of Practice including LGPA CoP 1 part 1 (February 2004) and CoP 1 part 3 (to be published late 2006/ early 2007). The process of review is iterative and can be time consuming. HSE forms a central role initially suggesting modifications based on HSE Inspectorial experience and legislative changes then commenting on the initial amendments compiled by LPGA from their members and other stakeholders. As topic lead I consulted widely within HSE including Utilities sector, Safety Unit, Policy Directorate and the operating divisions, including regulatory inspectors and specialist inspectors of various disciplines. All drafts are reviewed and comments discussed; HSE will then send the draft for comment to external stakeholders such as other relevant trade associations and professional bodies, other government departments and trade unions.

Penny Taylor