

Odorant systems for gas transmission and distribution



*Founded 1863
Royal Charter 1929
Patron: Her Majesty the Queen*



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and distribution***



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SECTION 1 : INTRODUCTION

- 1.1 This Standard supersedes IGE/SR/16, Communication 1418, which is obsolete.
- 1.2 This Standard applies for personnel involved in the design, construction, installation, testing, operation, maintenance and de-commissioning of plant used for the odourisation of Natural Gas and Liquefied Petroleum Gas (LPG). It is based on almost 50 years experience of odouring Natural Gas in Great Britain (GB) and Northern Ireland.
- 1.3 This Standard is published by the Institution of Gas Engineers and Managers (IGEM). It has been drafted by an IGEM Panel appointed by IGEM's Gas Safety and Environment Committee, and has been approved by IGEM's Technical Co-ordinating Committee on behalf of the Council.
- 1.4 For Natural Gas, the characteristic smell of early supplies was due to small amounts of organic sulphur compounds present in gases from the southern North Sea basin, such as those from the Leman field. Subsequent supplies, in particular those from the northern North Sea, were found to contain little "indigenous" sulphur compounds and it was found necessary to add small amounts of odorant in order to impart a characteristic smell. Odorants are added to Natural Gas for reasons of public safety so as to alert members of the public to leaks of gas. Following privatisation of the gas industry in GB, the introduction of the Gas Safety (Management) Regulations (GS(M)R) in 1996 placed a formal obligation on gas transporters (GTs) to convey gas that meets certain gas quality requirements. One such requirement was that gas must be treated with a "suitable stenching agent" so as to ensure it has a "distinctive and characteristic" odour. Furthermore, the Regulations require that the odour "shall remain distinctive and characteristic when the gas is mixed with gas which has not been so treated". However, the requirement for Natural Gas to have a distinctive and characteristic odour does not apply when the gas is at a pressure of exceeding 7 bar.

For LPG in its refined state, the gas is normally odourless. Published standards, for example UKLPG Technical Fundamentals, call for LPG to have a characteristic odour, to enable leaks to be easily detected. This is usually achieved by addition of a stenching agent.

Note: Further information is contained in BS 4250 and PGN 1/15 (04).

- 1.5 A characteristic odour is achieved by selection of an appropriate odorant that imparts an odour that is generally recognisable by members of the public as "gassy" and less likely to be confused with other smells, such as drains, sewers etc. The current odorant employed by GTs in the United Kingdom (UK), for Natural Gas is odorant NB, a blend of t-butyl mercaptan (TBM) and dimethyl sulphide and for LPG is ethyl mercaptan tetrahydrothiophene (THT).

Note: For information on other odorants that may be used, refer to BS EN ISO 13734.

- 1.6 A distinctive odour is achieved by selection of an appropriate concentration of odorant in the supplied gas. Addition of odorant so as to achieve, for a mixture of 1% Natural Gas in air (0.4% LPG in air), an odour intensity of 2 olfactory degrees on the Sales scale is widely accepted as achieving this requirement. This enables a leak to be detected well before the gas concentration in air reaches the lower flammability limit (LFL) (around 5% for Natural Gas and 2% for LPG).
- 1.7 Where a supplied gas contains toxic components, the addition of odorant generally enables a leak to be noticed before the concentration of the toxic component reaches an unacceptable level.

1.8 The constituents of the odorant used need to be closely specified and careful monitoring is necessary to ensure that consistent odour levels are present.

Note: This may be achieved by suitable quality control at the suppliers and not necessarily by chemical analysis.

1.9 Odorant liquids are volatile, flammable and of noxious smell. Uncontained odorant constitutes a hazard and is environmentally unacceptable.

1.10 New terms such as maximum operating pressure (MOP) have been introduced to reflect gas pressure terminology used in European standards. These terms will arise in all relevant IGEM Standards in future and, possibly, in other standards.

1.11 This Standard makes use of the terms "should", "shall" and "must" when prescribing particular requirements. Notwithstanding Sub-Section 1.14:

- the term "must" identifies a requirement by law in GB at the time of publication
- the term "shall" prescribes a procedure which, it is intended, will be complied with in full and without deviation
- the term "should" prescribes a procedure which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

1.12 The primary responsibility for compliance with legal duties rests with the employer. The fact that certain employees, for example "responsible engineers", are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities. Employers must:

- have done everything to ensure, so far as it is reasonably practicable, that "responsible engineers" have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement
- have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review
- not require "responsible engineers" to undertake tasks which would necessitate the exercise of professional judgement that is not within their competence.

Note: There should be written procedures defining the extent to which "responsible engineers" can exercise their professional judgement. When "responsible engineers" are asked to undertake tasks which deviate from this, they should refer the matter for higher review.

1.13 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted in a more appropriate manner to avert them.

It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. To assist in this, it is recommended that due regard be paid to HS(G)48.

1.14 Notwithstanding Sub-Section 1.11, this Standard does not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. New and improved practices may be adopted prior to this Standard being updated. Amendments to this Standard will be issued when necessary and their publication will be announced in the Journal of IGEM and elsewhere as appropriate.

1.15 All pressures are gauge pressures unless otherwise stated.

- 1.16 Italicised text is informative and does not represent formal requirements.
- 1.17 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms "should", "shall" or "must".

SECTION 2 : SCOPE

- 2.1 This Standard covers the safety aspects of handling bulk supplies of odorant for gas systems (see Sub-Section 2.2) and safety aspects of the design, construction, installation, testing and commissioning of plant for its storage and injection. It also deals with the operation, maintenance, de-commissioning, internal inspection, modification and repair of odorant plant.
- 2.2 This Standard covers odorants for Natural Gas and LPG supply pipes. Each clause applies for both gas types unless otherwise amended or supplemented by the text.
- 2.3 This Standard applies in full to new odorant installations. For existing installations, requirements on re-commissioning, operation, maintenance and de-commissioning apply. It is recommended that existing installations be assessed for compliance with the other aspects of this Standard, for example "plant design" and upgraded if and as appropriate, for example to comply with recent legislation such as the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) (see clause 3.2.6) and the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (EPS) (see clause 3.2.7) and attainment of safety integrity targets.
- 2.4 Small scale odourisation is of a specialist nature requiring a "non-routine operation" and is not within the scope of this Standard. However, guidance is provided in Appendix 4.
- 2.5 This Standard does not address temporary systems i.e. those systems used for short term contingencies to ensure continuity of odourised gas supply. However, it is recommended that such temporary systems be constructed and operated in accordance with the principles of this Standard. Reference to appropriate standards, for example IGE/GL/6, is also recommended for this non-routine operation.