

***IGEM/UP/11 Edition 2
Communication 1744***

Gas installations for educational establishments



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



***IGEM/UP/11 Edition 2
Communication 1744***

Gas installations for educational establishments



Price Code: C3S
© The Institution of Gas Engineers and Managers
IGEM House
26-28 High Street
Kegworth
Derbyshire, DE74 2DA
Tel: 0844 375 4436
Fax: 01509 678198
Email: general@igem.org.uk

Copyright © 2010, IGEM. All rights reserved
Registered charity number 214001

All content in this publication is, unless stated otherwise, the property of IGEM. Copyright laws protect this publication. Reproduction or retransmission in whole or in part, in any manner, without the prior written consent of the copyright holder, is a violation of copyright law.

ISBN 978 1 905903 19 1
ISSN 0367 7850
Published by the Institution of Gas Engineers and Managers

Previous Publications:
Communication 1704 (2004) – 1st Edition

For information on other IGEM Standards please visit our website, www.igem.org.uk

CONTENTS

| SECTION | PAGE | |
|----------------|--|---|
| 1 | Introduction | 1 |
| 2 | Scope | 5 |
| 3 | Legal and allied considerations | 6 |
| | <ul style="list-style-type: none"> ● 3.1 Health and Safety at Work etc. Act (HSWA) ● 3.2 Building Regulations and Standards ● 3.3 Confined Spaces Regulations ● 3.4 Construction, Design and Management Regulations (CDM) ● 3.5 Control of Asbestos Regulations ● 3.6 Control of Substances Hazardous to Health Regulations (COSHH) ● 3.7 Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) ● 3.8 Education (School Premises) Regulations ● 3.9 Electricity at Work Regulations ● 3.10 Gas Appliances (Safety) Regulations ● 3.11 Gas Cooking Appliances (Safety) Regulations ● 3.12 Gas Safety (Installation and Use) Regulations (GS(I&U)R) ● 3.13 Gas Safety (Management) Regulations (GS(M)R) ● 3.14 Management of Health and Safety at Work Regulations (MHSWR) ● 3.15 Pressure Systems Safety Regulations (PSSR) ● 3.16 Provision and Use of Work Equipment Regulations (PUWER) ● 3.17 Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (RIDDOR) | <ul style="list-style-type: none"> 6 6 7 7 7 8 8 8 9 9 9 9 9 10 10 10 10 11 11 |
| 4 | Competency | 12 |
| 5 | Gas pipework | 13 |
| 6 | Isolation of gas pipework and appliances | 19 |
| | <ul style="list-style-type: none"> ● 6.1 Emergency control valve (ECV) ● 6.2 Additional emergency control valves (AECVs) ● 6.3 Appliance isolation | <ul style="list-style-type: none"> 19 20 23 |
| 7 | Laboratories | 24 |
| 8 | Art, craft, design and technology | 26 |
| | <ul style="list-style-type: none"> ● 8.1 Fixed and non-moveable appliances <ul style="list-style-type: none"> ● 8.1.1 General ● 8.1.2 Selection of equipment or appliances ● 8.1.3 Installation of gas-fired equipment ● 8.1.4 Flues and chimneys ● 8.1.5 Special procedures for ceramic kilns ● 8.2 Portable equipment <ul style="list-style-type: none"> ● 8.2.1 Selection ● 8.2.2 Storage and siting of equipment ● 8.2.3 Use of equipment | <ul style="list-style-type: none"> 26 26 26 27 28 29 29 29 29 29 29 29 29 |

| | | |
|----|--|----|
| 9 | Food technology | 31 |
| 10 | Installing appliances | 32 |
| 11 | Ventilation | 34 |
| | • 11.1 General | 34 |
| | • 11.2 Food technology | 35 |
| | • 11.3 CO ₂ generated in a science laboratory | 37 |
| 12 | Electrical supplies and wiring | 39 |
| 13 | Testing, commissioning and maintenance | 40 |
| 14 | Advice to be given to the user | 42 |
| 15 | Emergencies | 43 |

APPENDIX

| | | |
|---|---|----|
| 1 | Glossary, acronyms and abbreviations, units | 44 |
| 2 | References | 46 |
| 3 | Pipework integrity systems | 50 |
| 4 | Properties of gases | 51 |

TABLE

| | | |
|---|--|----|
| 1 | Installation standards for domestic appliances | 32 |
| 2 | Typical natural gas compositions | 52 |

FIGURE

| | | |
|----|--|----|
| 1 | Relative natural gas and liquefied gas pressure levels for educational establishments | 2 |
| 2 | Exposed PE pipework is not permitted | 14 |
| 3 | Suggested in-floor duct ventilation system where external ventilation is not possible | 15 |
| 4 | Typical overhead boom system | 16 |
| 5 | Overhead boom system at false ceiling level | 16 |
| 6 | Gas pipework running through a ceiling void with joints, showing location of ventilation | 17 |
| 7 | CSST pipework with route identity marking | 18 |
| 8 | Primary meter installation showing the ECV on the inlet (left hand) side | 19 |
| 9 | Additional emergency control valve | 20 |
| 10 | Emergency stop button which can be shrouded | 21 |

| | | |
|----|--|----|
| 11 | An example of a laboratory bollard | 24 |
| 12 | An example of a high pressure gases warning sign | 25 |
| 13 | An example of a cabinet heater and blow torch | 25 |
| 14 | An example of a forge and brazing hearth | 26 |
| 15 | An example of a CO detector | 28 |
| 16 | Methods of provision of cooker stability | 33 |
| 17 | An example of a CO ₂ Monitor controller | 35 |
| 18 | Examples of hand held portable flammable gas and CO/CO ₂ detectors | 41 |
| 19 | Example of a weep by-pass system | 50 |
| 20 | Example of a pressure test system using a pressure switch or a pressure transducer | 50 |

SECTION 1 : INTRODUCTION

- 1.1 This Standard supersedes IGE/UP/11 Edition 1, Communication 1704, which is withdrawn.
- 1.2 This Standard has been drafted by a Panel appointed by the Institution of Gas Engineers and Manager's (IGEM's) Gas Utilization Committee and is published by the authority of the Council of IGEM.
- 1.3 This Standard provides requirements for those concerned with the design, installation, operation and maintenance of gas pipework, systems and appliances in educational establishments, including schools; colleges; universities and training facilities. It brings together:
- guidance, interpretation and clarification of legislation, Standards and Codes of Practice (CoPs) indicating the degree to which compliance is required, including those items that are applicable, and
 - current best practice and design in the installation and use of Natural Gas (NG) and liquefied petroleum gas (LPG) installations.
- 1.4 This Standard sets down the minimum requirements for safety in educational establishments, for architects, designers, science health and safety advisers, teaching and technical staff, in the operation of their systems and equipment. It is recognised that a risk assessment in some educational establishments may indicate a need for additional features such as larger valve handles, more easily accessible controls, signage in more than one language, in Braille, or lower levels of carbon dioxide (CO₂) within the teaching areas for specific health reasons. The responsibility for such measures lies with competent persons having responsibility for the design of the installation.
- Note: It is recognised that specialist laboratory demonstration equipment may be used. In such cases, a risk assessment is needed and the general principles of this Standard may be applied to ensure safety.*
- 1.5 IGEM/UP/11 Edition 2 has been prepared by IGEM's Panel comprising representatives from the Council of Gas Detection and Environmental Monitoring (CoGDEM), CLEAPSS, Department for Children, Schools and Families, Gas Safe Register and consultants.
- 1.6 Responsibility for safety in maintained establishments rests with the local authorities. In foundation schools, voluntary aided schools, academies, city technology colleges and independent schools, such responsibility rests with governing bodies or proprietors.
- In Private Finance Initiative (PFI) establishments safety in respect of the building and maintenance rests with the building provider, safety of the occupants rests with the user, but there are areas where both parties have to agree responsibilities.
- Any requirement in this Standard does not imply Government commitment to the provision of extra resources or funds.
- 1.7 This Standard sets down the minimum recommendations associated with gas safety in educational establishments. Some teaching areas may require a more comprehensive risk assessment than others either due to the use of specialized experimental equipment or of any special needs for the students or staff. This may be especially relevant to establishments providing resources for special educational needs. There is a requirement for "Accessibility for all".
- Students and staff ought be able to operate safety equipment and recognize alarm conditions by system design, visual or audible, with due consideration

being given to personal health and physical impairments. The requirement for larger handle valves, more easily accessible controls, multi-language signage, including Braille, for example, needs to be recognised and considered at the design stage.

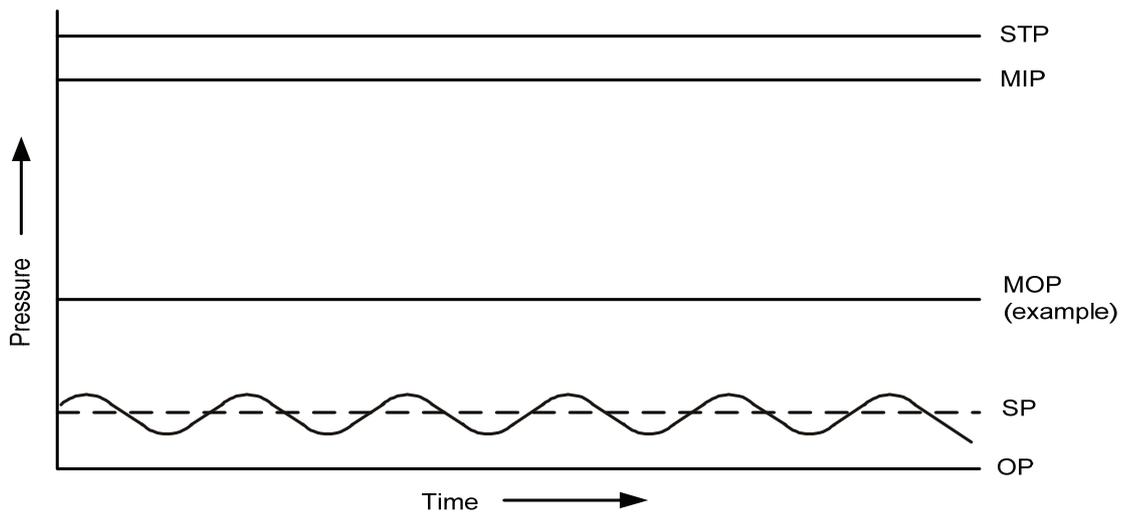
Note: More advice can be sought on this subject from CLEAPSS School Science Service, Brunel University, Uxbridge, UB8 3PH.

1.8

This Standard reflects current best practice. As a general principle, this Standard does not duplicate national/international legislation or Standards. However, where appropriate, additional guidance; interpretation and clarification have been provided. Applicable references for legislation, Standards, etc. are listed in Appendix 2.

Note: Terms such as maximum operating pressure (MOP) and operating pressure (OP) have been adopted to reflect gas pressure terminology used in European standards. IGEM/G/4 defines these terms. These terms will arise in all relevant IGEM Standards in future and, possibly, in other Standards.

For a new system of installation pipework, the onus is on the designer to establish both the maximum incidental pressure (MIP) and MOP. For an existing system of installation pipework, the onus is on the designer/owner of the system to ensure that any increase in pressure within the system will not result in OP exceeding MOP of the system and on the gas transporter/meter asset manager (GT/MAM) to ensure that any change in their pressure regimes due to fault conditions will not jeopardise the safety of the downstream system. This involves effective communication between the GTs/MAMs and system designers/owners (see Figure 1).



For Natural Gas:

| | | | |
|-----|---|-----------------------------|---------------------------------|
| STP | = | strength test pressure | typically 82.5 mbar |
| MIP | = | maximum incidental pressure | typically 75 mbar |
| MOP | = | maximum operating pressure | typically not exceeding 28 mbar |
| SP | = | set point of the regulator | typically 21 mbar |
| OP | = | operating pressure | typically 19 to 21 mbar |

Note 1: This is extracted from IGE/TD/13 and simplified for the purposes of IGEM/UP/11.

For Liquefied Petroleum Gas:

| | | | |
|-----|---|-----------------------------|---------------------------------|
| STP | = | strength test pressure | typically 165 mbar |
| MIP | = | maximum incidental pressure | typically 150 mbar |
| MOP | = | maximum operating pressure | typically not exceeding 45 mbar |
| SP | = | set point of the regulator | typically 37 mbar |
| OP | = | operating pressure | typically 32 to 45 mbar |

Note 2: 1 mbar = 100 Pa

FIGURE 1 - RELATIVE NATURAL GAS AND LIQUEFIED PETROLEUM GAS PRESSURE LEVELS FOR EDUCATIONAL ESTABLISHMENTS

- 1.9 This Standard makes use of the terms “must”, “shall” and “should”, when prescribing particular procedures. Notwithstanding Sub-Section 1.12:
- the term “must” identifies a requirement by law in Great Britain (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.

Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Code of Practice (ACOPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

- 1.10 It is now widely accepted that the majority of accidents in industry 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 better 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 HSG48.

- 1.11 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 responsibilities. Employers must:

- have done everything to ensure, as far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement
- have done everything to ensure, so far as 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 beyond their competence. There should be written procedures defining the extent to which “responsible engineers” can exercise their judgement. When “responsible engineers” are asked to undertake tasks which deviate from this, they should refer the matter for higher review.

These principles equally apply to designated/delegated employees, contractors, etc.

- 1.12 Notwithstanding Sub-Section 1.9, this Standard does not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. Where new and better techniques are developed and proved, they should be adopted without waiting for modification to this Standard. Amendments to this Standard will be issued when necessary, and their publication will be announced in the Journal of IGEM and other publications as appropriate.

- 1.13 Requests for interpretation of this Standard in relation to matters within its scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEM, IGEM House, 26-28 High Street, Kegworth, Derbyshire, DE74 2DA and will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by, or on behalf of, IGEM, this does not relieve the responsible engineer of any of his or her obligations.
- 1.14 This Standard was published in July 2010.

SECTION 2 : SCOPE

2.1 This Standard covers the design, installation, operation, and maintenance of gas pipework, systems and appliances used for teaching purposes in educational establishments, including schools; colleges; universities and training facilities.

Note: IGEM/UP/1101 provides guidance on the operational issues for gas systems and appliances.

2.2 This Standard assumes general compliance with other relevant Standards such as IGEM/UP/2, IGE/UP/1 (or IGE/UP/1A or IGE/UP/1B, as appropriate), IGE/UP/12, BS 6891, BS 6172 and BS 6173 and provides additional requirements as considered necessary in educational establishments.

2.3 This Standard applies to the installation, alteration, replacement, servicing and maintenance of new and existing pipework and appliances.

Note 1: Gas meter installations are not covered in this Standard. IGE/GM/6, IGE/GM/8 or BS 6400 apply, as appropriate.

Note 2: LPG storage is not covered. Guidance is provided in UKLPG CoP 1 and UKLPG CoP 7.

2.4 This Standard covers piped gas supplied:

- from gas distribution systems such as a NG distribution system or a LPG central bulk storage system
- through independent LPG supplies i.e. either a cylinder or an individual bulk storage vessel.

Note: Gas canisters are not covered.

2.5 This Standard applies to 1st, 2nd and 3rd family gases, as defined in BS EN 437.

Note: 1st, 2nd and 3rd family gases can be heavier than air. 2nd family gases include lighter-than-air gases such as NG and manufactured substitutes (hereafter referred to as NG). 3rd family gases include heavier-than-air gases such as LPG and sometimes further defined as propane or butane, and in the vapour phase.

2.6 This Standard does not cover gas installations in an individual domestic dwelling integral with an educational establishment. However, the installation of domestic gas appliances in an educational establishment itself is covered.

2.7 This Standard does not cover the primary design requirements for central heating and domestic hot water plant, for which reference to IGE/UP/10 is necessary. However, it does address automatic isolation valves (AIVs) and other safety features for educational establishments.

2.8 This Standard does not cover central catering installations for which reference to BS 6173 is necessary.

2.9 This Standard does not cover the installation and use of specialist test and demonstration apparatus. For such apparatus, a competent person is required to ensure the apparatus is fit for purpose. In addition, such apparatus may only be operated by a competent person.

2.10 This Standard does not cover training and assessment facilities for gas operatives.

2.11 All pressures are gauge pressures unless otherwise stated.

2.12 Italicised text is informative and does not represent formal requirements.

2.13 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms "should", "shall" or "must".