

**Guidance on Gas Legislation
IGE/GL/1 Edition 2
with amendments Nov 2006
Communication 1718**

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

Planning of gas distribution systems of MOP not exceeding 16 bar



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SECTION 1 : INTRODUCTION

- 1.1 This Guidance supersedes IGE/GL/1 Edition 1, Communication 1626, which is obsolete.
- 1.2 This Guidance is part of a series of Institution of Gas Engineers and Managers (IGEM) publications providing practical guidance to support the Gas Safety (Management) Regulations (GSMR) and the Pipelines Safety Regulations (PSR). It has been drafted by an IGEM Panel appointed by IGEM's Gas Transmission and Distribution Committee, and has been approved by IGEM's Technical Co-ordinating Committee on behalf of Council.
- 1.3 Guidance is provided on the planning of distribution systems so that, as far as possible, continuity of gas supply is maintained to consumers on the system, and at sufficient pressure that their appliances continue to operate at all times unless load shedding has been initiated.
- 1.4 This Guidance raises the threshold of maximum operating pressure (MOP) for design purposes from 7 bar to 16 bar, to mirror European legislation and guidance in accordance with IGE/TD/3.
- 1.5 The relevant parts of this Guidance may be cited in the gas transporter's (GT's) safety case, but the Health and Safety Executive (HSE) will need to satisfy itself that the parts are appropriate and have been properly applied in each case.
- 1.6 New terms such as MOP, "maximum incidental pressure" (MIP) and "operating pressure" (OP) have been introduced to reflect gas pressure terminology used in European standards. These terms will arise in all relevant IGEM technical publications in future and, possibly, in other standards.
- 1.7 This Guidance make use of the terms "should", "shall" and "must" when prescribing particular procedures. Notwithstanding Sub-Section 1.9:
- 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 HSE Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.
- 1.8 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. 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.

- 1.9 Notwithstanding Sub-Section 1.7, this Guidance 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 Guidance being updated. Amendments to this Guidance will be issued when necessary and their publication will be announced in the Journal of the Institution and elsewhere as appropriate.
- 1.10 Requests for interpretation of this Guidance in relation to matters within its scope, but not precisely covered by the current text, should be addressed to IGEM, Technical Services, Holywell Park, Charnwood Wing, Ashby Road, Loughborough, Leicestershire, LE11 3GH. Such requests will be considered by the relevant Committee. Any advice given by or on behalf of IGEM does not imply acceptance of any liability for the consequences and does not relieve the responsible engineer of any of his or her obligations.

Amendments are shown throughout the document by ►◄.

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SECTION 2 : SCOPE

- 2.1 This Guidance is part of a series of IGE M publications providing practical guidance to support GSMR and PSR.
- 2.2 This Guidance contains advice on the planning and design of Natural Gas distribution systems (hereafter referred to as "systems") of MOP not exceeding 16 bar. The Guidance does not encompass the availability of gas entering the system. Its purpose is to ensure that there is sufficient transportation capacity.
- Note: Compliance with this Guidance ensures that, as far as is reasonably practicable, a system is able to maintain a minimum pressure at the maximum peak demand flow rate and that adequate arrangements are established to minimise the risk of a supply emergency (see Appendix 3).*
- 2.3 This Guidance includes the arrangements and agreements required between different GTs and Network owners at system boundaries, to ensure the continuity of gas flow.
- 2.4 This Guidance is intended to be used by competent persons in the planning and design of systems and for the ongoing monitoring and reinforcement of existing systems where appropriate.
- 2.5 This Guidance is intended to be used for systems as part of the Network (see IGE/G/1). Where a system is being designed to also contribute to diurnal storage provision for the overall Network using "linepack", it may be appropriate to consider applying IGE/GL/2. The Guidance does not embrace the physical design, construction, operation and maintenance of systems nor does it address environmental issues covered by legislation other than that mentioned in Section 3. Guidance on these matters is contained in IGE/TD/3.
- 2.6 All pressures are gauge pressures unless otherwise stated.
- 2.7 Italicised text is informative and does not represent formal Guidance.
- 2.8 Appendices are informative and do not represent formal Guidance unless specifically referenced in the main sections via the prescriptive terms "should", "shall" or "must".

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SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

- 3.1 This Guidance is set out against a background of legislation in force in GB at the time of publication. Similar considerations are likely to apply in other countries where reference to appropriate national legislation is necessary.

All relevant legislation must be applied and relevant ACoPs, official Guidance and referenced codes, standards, etc. shall be taken into account.

Note: Appendix 2 is relevant in this respect.

Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

- 3.2 Within the planning process, the principles of sound health and safety and environmental management shall be taken fully into account, to ensure that systems can be constructed, maintained and operated safely and effectively. Reference should be made to the Management of Health and Safety at Work Regulations (MHSWR) and the Construction (Design and Management) Regulations (CDM).

Note: Guidance on these principles is set out in HS(G)65 and HS(G)224 is the ACoP for CDM.

- 3.3 Systems designed to operate normally at a pressure exceeding 2 bar must comply with the Pressure Systems Safety Regulations (PSSR) and shall comply with IGE/GL/5.

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SECTION 4 : PLANNING PROCESS

Planning a system involves designing a suitable pipeline system to meet estimated consumer demands, given the limitations of any upstream system. This principle is true for a single pipe or for a fully integrated system, when reinforcing or extending an existing system, and planning a new system.

4.1 GENERAL

- 4.1.1 Information about the probable peak demand for each connected property should be obtained such that an adequately-sized service can be constructed that will meet the consumer's peak instantaneous demand (PID). In addition, consideration should be given as to the number of consumers who are likely to be drawing their PID during any consecutive six minute period in order that pipelines can be sized appropriately for the expected maximum six minute demand.

Note: The 1 in 20 peak six minute demand criterion is commonly used for the maximum design condition.

- 4.1.2 The size of pipe and associated equipment should be determined, either by applying a suitable flow equation to a simple pipe system or by using a sophisticated network analysis computer program to model a more complex integrated system.

4.2 PLANNING CRITERIA

4.2.1 General

Any system should be designed to meet the maximum demands placed upon it.

Note: Experience has shown that this is likely to be the maximum demand that will occur in any period of not less than 6 minutes, expressed as an hourly rate.

For systems of MOP $\leq$ 75 mbar where pressure differentials are shown to be in excess of 25 mbar, the design should be re-assessed to ensure that, under peak conditions, the minimum design pressure (DmP) in the system is achieved for the continued safe operation of gas appliances.

Note: In order to ensure this, it is recommended that further network analysis is carried out with the existing peak demand increased by 12.5%. Where it can be shown that DmP cannot be achieved, the system will require to be re-designed.

4.2.2 Non-typical systems

Certain systems show behaviour patterns that are not typical of systems in general. These include systems that have plant such as combined heat and power (CHP) and non-temperature-sensitive load, pressure management systems and compression. Careful consideration of the impact of these factors should be made when evaluating the system design.

4.2.3 Supplies to individual domestic consumers

The design flow rate should be based on the estimated maximum demand which should be assessed from BS 6400-1 or 2, as appropriate.

4.2.4 Supplies to groups of domestic consumers

Reference should be made to the information on the design flow rate given in Appendix 5, in the form of diversity curves, which relate the probable peak flow for groups of consumers.

4.2.5 Supplies to individual industrial and commercial consumers

The design flow rate should be assessed.

Note: In the absence of specific information, it may be possible to estimate the design flow rate from the predicted annual consumption, appliance details or floor area.

4.2.6 **Supplies to groups of industrial and commercial premises and buildings**

For the purposes of designing the overall system, allowance should be made for the effects of diversity (see Appendix 4). Diversity should be considered for the types of appliances within the premises, for example account should be taken of the method of operation of standby plant as well as diversity between similar premises. Also, it is possible that some commercial and industrial loads will have little impact during the period of Network peak demand.

In the absence of information on diversity, it should be assumed that the maximum flow would occur at the time of the system maximum design flow rate.

4.2.7 **Interruptible supply**

Where it is known that a consumer is developing an interruptible supply, the system should be designed to include the level of demand that will be supplied under peak six minute conditions, including the interruptible load. However, if it is known that, during the peak six minute period, the interruptible consumer definitely will not be supplied, the system may be analysed for the demand conditions that will apply immediately prior to the interruption occurring.

Note: If this indicates that demand would be higher than the peak six minute period demand with any interruptible supplies turned off, the system may be designed for these conditions.

Any system designed using these revised criteria should be tested for robustness against the theoretical peak.

4.3 **ELECTRICITY SUPPLY FAILURE**

4.3.1 Loss of public electricity supply depresses gas demand for the duration, but it should be noted that, on restoration of the electricity supply, the demand might show a sudden increase above design peak levels.

4.3.2 The consequences of gas distribution plant failure due to loss of electricity supply should be considered (see Appendix 3).

Note: A system need not be designed to meet the abnormal load conditions imposed by restoration of domestic electricity power supplies following a failure.

4.4 **SOURCE PRESSURE**

4.4.1 In general, a system should be designed to operate with maximum possible pressure differential in order to make the best use of the available pressure, having regard to effect of pressure on any leaking, mechanically-jointed, iron systems. However, the effect of turbulence due to high velocities on systems of $MOP \leq 75$ mbar should be considered when pressure differentials in excess of 25 mbar are expected.

Note: Where it is not possible to modify the Smooth Pipe Law (see IGE/TD/3) to model the reduced efficiency of pipe flow, a crude rule of thumb assessment of the impact of turbulence can be made by increasing demands by 12.5%.

4.4.2 When consumers are connected directly to pressure tiers of $MOP > 75$ mbar, the available pressure for the connection should reflect that which is necessary to also maintain downstream supply commitment to other consumers and connected systems. The pressure regulating installation (PRI) should be

designed such that it is capable of meeting the requirements of the downstream system at the minimum available inlet pressure.

- 4.4.3 Where the demand on a downstream system is known not to follow a normal temperature-sensitive profile, the upstream GT should specify a range of source pressures available at the point of connection at different periods of the day or during seasons of the year, in order to accommodate the upstream operating strategy into the downstream design (see Section 5).

4.5 **DESIGN MINIMUM PRESSURE (DmP)**

- 4.5.1 GTs should ensure that the system design minimum pressure (DmP) is documented and included within their safety case. This will ensure that downstream installers of meter installations and installation pipework are able to design their facilities with an appropriate pressure drop that will ensure safe operation of appliances under the declared system DmP.

Where a greater pressure is required than can be delivered based on the declared system DmP, consideration should be given to providing this on either a reasonable endeavours basis or by contractual agreement. In these circumstances, the GT should consider the duty of the system over a published planning horizon.

- 4.5.2 The requirements of BS 6400-1 and 2, as appropriate, should be taken into account when planning Network extremity pressures. Any system should be constructed in accordance with IGE/TD/3. It should be designed to ensure that, under maximum system demand conditions, the pressure at the end of the Network is sufficient to meet the minimum specified in the safety case.

4.6 **PRESSURE REGULATION**

- 4.6.1 Reference should be made to IGE/TD/13 for PRIs on the Network and to IGE/GM/6, IGE/GM/8 and BS 6400, as appropriate, for regulator installations associated with primary meter installations.

- 4.6.2 MOP inside a domestic building should not, normally, exceed 75 mbar but, where a higher pressure is considered, account should be taken of any risks involved.

- 4.6.3 Where it is known that a gas compressor or booster is to be used to increase pressure, the affected GT(s) must be given the details to assess the impact and agree to safety devices. Reference should be made to IGE/UP/6 and IGE/UP/2.

4.7 **CHANGES IN PLANNING PARAMETERS**

The ramifications of any change to an operational system, which may result in a change to the system design parameters, should be assessed before implementation. Any proposed change to previously-agreed planning parameters should be discussed between upstream and downstream GTs (see Section 5) and meter asset managers (MAMs). As a consequence, it may be necessary to re-visit the complete planning cycle (see Section 9).

GTs and MAMs shall be aware of legal, contractual requirements resulting from "material changes" and the obligation to re-submit the safety case.

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SECTION 5 : SYSTEM BOUNDARY INTERFACES

This section describes the arrangements and agreements required between different GTs at system boundaries to ensure integrity of gas supply.

5.1 GENERAL

5.1.1 GTs should consider upstream pressure availability, downstream pressure requirements and demand requirements in order that a suitable design of the downstream system can be achieved to meet consumer requirements. The impact of the design shall be tested against the upstream GT's planning horizon such that future expectations of the upstream system can be accommodated in the overall system design.

5.1.2 Where valves are not included at the boundary between both systems, sufficient length of pipe should be installed that will enable isolation of the downstream system in the event of an emergency on that system.

5.1.3 GTs should agree and formally document, and maintain a record of, the ownership of components and operating parameters at the connection point. Where any activity occurs that may result in alteration(s) to the connection point or any temporary or permanent changes to the flow through the connection point, the organisation making alterations should advise the other party of their intent and agree proposals to ensure that there is no degeneration of the integrity of the connection.

5.2 SPECIFIC

5.2.1 The system connection should be designed in accordance with appropriate standards and with the agreement of the two GTs.

Any PRI, including its isolation valves and control equipment, should be designed and installed in accordance with IGE/TD/13.

Any strategic valve should be designed and installed in accordance with IGE/TD/3.

5.2.2 GTs should liaise regarding the safe operating limits of both the upstream and downstream systems. Attention is drawn to requirements of relevant legislation, for example PSSR.

Note: The obligation to exchange information on the protection of systems also applies to the operator of systems downstream of the ECV, for example CHP operators.