

**IGEM/GL/4 Edition 3
Communication XXXX**

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Gas system assets - Safety Management System

DRAFT FOR COMMENT

- 1 This draft Standard IGEN/GL/4 Edition 3 has been prepared by a Panel under the chairmanship of Rodney Hancox.
- 2 This Draft for Comment is presented to Industry for comments which are required by 20th November 2017, and in accordance with the attached Reply Form.
- 3 This is a draft document and should not be regarded or used as a fully approved and published Standard. It is anticipated that amendments will be made prior to publication.

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Attached is the Draft for Comment of IGEM/GL/4 Edition 3 – "Gas system assets - Safety Management System" and the associated comment form.

We wish to make it as easy as possible for those of you representing industry bodies to issue the draft to your Members. You can either forward this email with attachment complete or forward it without the attachment and invite them to visit our website via where the Draft and <http://www.igem.org.uk/technical-standards/standards-development/drafts-for-comment.aspx> Comment Form are posted.

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***Gas system assets - Safety Management
System (Draft for comment)***



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***Gas system assets - Safety Management
System (Draft for comment)***



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SECTION 1 : INTRODUCTION

1.1 This Standard supersedes IGE/GL/4 Edition 2, Communication 1743, which is obsolete.

1.2 This Standard specifies requirements for the safe management of assets associated with gas systems. In GB, this would mean systems that come within the scope of one or more of:

- Construction (Design and Management) Regulations (CDM)
- Gas Safety (Installation and Use) Regulations (GS(I&U)R)
- Gas Safety (Management) Regulations (GS(M)R)
- Management of Health and Safety at Work Regulations (MHSWR)
- Pipelines Safety Regulations (PSR)
- Pressure Systems Safety Regulations (PSSR).

It supplements guidance given in HSL21, HSL56, HSL80, HSL82, HSL122, HSL153, HSG65, HSG250 BS EN 15399 and BS EN 16348.

Note: For consistency with BS EN 15399 this standard uses the all-encompassing term "Gas Network Operator" (GNO) to include Licenced Gas Transporters, whether operating Distribution or Transmission networks or both and operators of private gas networks such as Housing Associations and the Ministry of Defence.

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 Transmission and Distribution Committee, and has been approved by IGEM's Technical Co-Ordinating Committee on behalf of the Council.

1.4 Many of the features of effective health and safety management are indistinguishable from the sound management practices advocated by proponents of quality and business excellence. Indeed, commercially successful companies often also excel at health and safety management, precisely because they bring efficient business expertise to bear on health and safety as on all other aspects of their operations.

1.5 The principles of sound health and safety management should be fully taken into account to ensure that the system can be constructed, maintained and operated safely and effectively. Guidance on these principles is set out in HSG65.

1.6 The Standard makes use of the terms "should", "shall" and "must". Notwithstanding Sub-Section 1.9:

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

Such terms may have different meanings when used in legislation, or Health and Safety Executive (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.

1.7 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 HSG48.

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 there are no better protective measures that can be taken other than relying on the exercise of "professional judgement" by "responsible engineers"
- 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 with 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.

1.9 Notwithstanding Sub-Section 1.6, 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.

1.10 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 House, High Street, Kegworth, Derbyshire, DE74 2DA. Such requests will be submitted to the relevant Committee. Any advice given by or on behalf of IGEM does not imply acceptance of any liability, nor does it relieve any party of their statutory obligations.

1.11 This Standard was published in To Be Advised.

SECTION 2 : SCOPE

- 2.1 This Standard specifies a framework for the safe management of assets associated with gas systems.
- 2.2 The specified framework covers all activities, including design, installation, operation, maintenance, management including the provision of an emergency service and decommissioning of assets associated with gas systems.
- 2.3 The specified framework is based on the Plan, Do, Check, Act framework identified in the current edition of HSG65, but with further requirements to make it gas industry-specific.
- 2.4 This Standard applies to all fuel gases, including but not limited to Natural Gas (NG), Liquefied Petroleum Gas (LPG), Biogas, Hydrogen and Towns Gas.
- 2.5 Italicised text is informative and does not represent formal requirements.
- 2.6 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 3 : LEGAL AND ALLIED CONSIDERATIONS

3.1 GENERAL

3.1.1 This Standard is set out against a background of legislation in force in Great Britain (GB) at the time of publication. Similar considerations are likely to apply in other countries where reference to appropriate national legislation is necessary. The principal items of legislation are outlined in Section 3.2.

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.

Health, safety and environmental legislation must be observed, especially those requirements which are concerned with the duties of employers, not only to their own employees, but also to members of the public who may be affected.

3.1.2 Unless otherwise stated, the current editions of legislation and Standards apply.

3.1.3 In the absence of specific legislation, it is essential that installations are designed, constructed, installed, operated and maintained so as to be safe.

3.1.4 The legislation appropriate to any particular installation will depend largely upon its location. Advice will need to be sought from the relevant Authorities.

3.2 LEGISLATION

3.2.1 Control of Pollution Act

This Act makes provision with respect to waste disposal, water pollution, noise, atmospheric pollution and public health.

3.2.2 Environmental Protection Act

This Act makes provision for the improved control of pollution arising from certain industrial processes, the collection and disposal of waste. It makes further provision in relation to such waste, and provides for the extension of the Clean Air Acts to prescribed gases.

An organisation's management system must be underpinned by a company policy on the environment.

Note: Further guidance can be found on the Environment Agency, Scottish Environment Protection Agency or Northern Ireland Environment Agency websites as appropriate.

3.2.3 Health and Safety at Work etc. Act (HSWA)

HSWA applies to all persons involved with work activities, including employers, the self-employed, employees, designers, manufacturers, suppliers, etc. as well as the owners of premises. It places general duties on such people to ensure, so far as is reasonably practicable, the health, safety and welfare of employees and the health and safety of members of the public who may be affected by the work activity.

An organisation's overall health, safety system must be underpinned by a company policy on health and safety.

3.2.4 **Confined Spaces Regulations**

These Regulations apply to a whole range of confined spaces. The supplier or designers of an enclosure and equipment within it is required to perform a risk assessment of the enclosure with respect to safe access and egress and to give clear instructions to operators on access/egress as well as to what actions to take in the event of a gas alarm occurring. Employers and the self employed should prevent entry into confined spaces unless avoidance is not reasonably practicable and unless there is a system of work which renders the work safe. They are also required to have specific emergency arrangements in place.

3.2.5 **Construction (Design and Management) Regulations (CDM)**

CDM place duties on clients, designers and contractors to ensure that health and safety is taken into account and managed effectively throughout all stages of a construction project.

Note: HSL153 provides an ACoP and guidance on CDM.

3.2.6 **Control of Substances Hazardous to Health Regulations (COSHH)**

COSHH require employers to assess the health risks associated with the use of and exposure to substances which are hazardous to health. Primarily, COSHH relate to health and safety at work but chemical data gathered for COSHH may also be useful when assessing environmental effects.

COSHH require:

- a written risk assessment prior to using substances which may be hazardous to health
- consideration to the properties, health effects and form of these substances. Various amendments have required specific attention be given to carcinogens, asthmagens and biological agents.

The 2004 amendments implement a new framework for occupational exposure limits and bring together eight principles of good practice.

3.2.7 **Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)**

DSEAR are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. DSEAR require that risks from dangerous substances are assessed, eliminated or reduced. DSEAR contain specific requirements to be applied where an explosive atmosphere may be present and require the provision of arrangements to deal with accidents, emergencies etc., provision of information, training and use of dangerous substances. DSEAR also require the identification of pipelines and containers containing hazardous substances.

DSEAR require an employer to classify gas installations into hazardous and non hazardous areas.

In particular:

- Where a dangerous substance is or is liable to be present at the workplace, the employer shall make a suitable and sufficient assessment of the risks to his employees which arise from that substance
- where an explosive atmosphere may occur at the workplace sufficient information to show:
 - (i) those places which have been classified into zones (Regulation 7)

- (ii) equipment which is required for, or helps to ensure, the safe operation of equipment located in places classified as hazardous
- (iii) that any verification of overall explosion safety required has been carried out
- (iv) the aim of any co-ordination required (Regulation 11) and the measures and procedures for implementing it.

3.2.8 **Electricity at Work Regulations**

These Regulations apply to a wide range of electrical work, from overhead power lines to the use of office computers and batteries and include work on gas equipment using electrical energy.

The Regulations are concerned with the prevention of danger from electric shock, electric burn, electrical explosion or arcing or from fire or explosion initiated by electrical energy.

The Regulations impose duties on every employer, employee and self-employed person and require that persons engaged in electrical work be competent or be supervised by a competent person.

Note: HSR25 provides guidance on the Regulations.

3.2.9 **Environmental Permitting Regulations (EPR)**

These Regulations replace the system of waste management licensing in Part II of the Environmental Protection Act and the Waste Management Licensing Regulations, and the system of permitting in the Pollution Prevention and Control (England and Wales) Regulations, with a new system of environmental permitting in England and Wales.

The Regulations provide a single, streamlined, risk-based framework for permitting and compliance. They introduce the possibility of a single permit and regulator for some sites, and standard permits, which are easier to obtain.

In Scotland, the Waste Management Licensing Regulations and Pollution Prevention and Control (Scotland) Regulations apply.

3.2.10 **Gas Safety (Installation and Use) Regulations (GS(I&U)R)**

GS(I&U)R are relevant statutory provisions of HSWA setting out general and detailed requirements dealing with the safe installation, maintenance and use of gas systems, including gas fittings, appliances and flues.

Note: GS(I&U)R do not apply to certain premises (see HSL56 Guidance Notes 28 and 29). However, where they do not apply, the principles of GS(I&U)R need to be applied, notwithstanding that the requirement for Gas Safe Registration need not be applied.

GS(I&U)R place responsibilities on those installing, servicing, maintaining or repairing gas appliances, pipework etc. as well as suppliers and users of gas.

GS(I&U)R define the gas supplier for both NG and LPG. HSL56 provides guidance on those definitions, in particular for the more complicated case of LPG supplied from storage vessels and from cylinders.

GS(I&U)R define the type of work that requires persons carrying out such work, or their employers, to be an "approved class of person". In Great Britain and the Isle of Man, this means registration under the Gas Safe Register scheme. Other schemes apply, at the time of writing, in Northern Ireland, Guernsey and Jersey and persons working in these places need to be aware of the appropriate registration scheme in place at the time of work.

The gas operative must check the safety of any appliance or pipework they install or work on and take appropriate action where they find faults. Where the premises are let or hired out, the landlord or hirer has special responsibilities to ensure that any operative they use for the gas fitting, service or maintenance or safety is a member of an approved class of persons and is competent to carry out such work. If any serious fault is found, the operative must inform both the landlord/hirer, as well as the user, so that such faults can be rectified before further use. Reference shall be made to the requirements contained in the Gas Industry Unsafe Situations Procedures.

GS(I&U)R place responsibilities on LPG suppliers to deal with escapes of LPG. For NG, GS(M)R apply (See Sub-section 3.2.11).

Note: Advice on dealing with gas escapes is contained in IGEM/SR/29.

3.2.11 **Gas Safety (Management) Regulations (GS(M)R)**

GS(M)R place obligations on gas conveyors to have an approved Safety Case, which will include to:

- have an emergency service provider (ESP)
- convey gas that is within specification
- report incidents.

Note: HSL80 provides a guide to GS(M)R.

GS(M)R place specific duties on GNOs or their ESPs, for dealing with gas escapes from pipes on their networks. Their primary duty is to make the situation safe. They are responsible not only for dealing with escapes from their own pipes, but also for dealing with escapes from gas fittings supplied with gas from pipes on their network. In GS(M)R, the term "gas escapes" includes escapes or emissions of carbon monoxide (CO) from gas fittings.

The ESP has specific duties to:

- provide a continuously staffed and free telephone service to enable persons to report gas escapes and
- pass such reports on to the person who has the responsibility for dealing with the escape.

In addition, there are duties imposed on gas suppliers and GNOs to notify the ESP should they, rather than the ESP, receive a report of an escape from the consumer.

GS(M)R require GNOs to investigate fire and explosion incidents upstream of the emergency control valve (ECV) and to send a report of the investigation to HSE. GNOs are also required to investigate fire and explosion incidents downstream of the ECV, but this is limited to establishing whether the seat of the fire or explosion was in an appliance and, if so, which one, or in the meter installation or installation pipework.

Responsibility for investigating RIDDOR reportable incidents as a result of an escape of CO from incomplete combustion of gas from a gas fitting, is placed on gas suppliers. HSE must be notified before such investigations commence.

Note 1: Advice on dealing with gas escapes is contained in IGEM/SR/29.

Note 2: Advice on investigating gas escapes and incidents is contained in IGEM/GL/8.

3.2.12 **Management of Health and Safety at Work Regulations (MHSWR)**

MHSWR impose a duty on employers and the self-employed to make assessments of risks to the health and safety of employees, and non-employees affected by their work. They also require effective planning and review of protective measures.

3.2.13 **Pipelines Safety Regulations (PSR)**

PSR provide a means of securing pipeline integrity by ensuring that a pipeline is designed, constructed and operated safely. PSR apply to all Network pipes operated by a GNO. Installations can vary in size and complexity, and installation designers need to give due consideration to the operating pressure (OP) and required gas flows.

Note: HSL82 provides guidance on PSR.

In particular, PSR require that the operator ensures no fluid is conveyed in a pipeline unless the pipeline has been designed so that, as far as is reasonably practicable, examination and maintenance may be carried out safely. PSR also require that the operator ensures that a pipeline is maintained in an efficient state, in efficient order and in good repair.

3.2.14 **Pressure Systems Safety Regulations (PSSR)**

PSSR impose duties on designers, importers, suppliers, installers and user or owners to ensure that pressure systems do not give rise to danger. This is done by the correct design, installation and maintenance, provision of information, operation within safe operating limits and, where applicable, examination in accordance with a written scheme of examination drawn up or approved by a competent person (as defined by PSSR).

Relevant fluids for the purpose of this document would be gas at a pressure of 0.5 barg and above. A pressure system would include bulk storage tanks, pressure vessels, pipelines and protective devices. Once the pressure in the pipework drops below 0.5 barg, and the user/owner can show clear evidence that the system does not contain, and is not liable to contain, a relevant fluid under foreseeable operating conditions, then that part of the system is no longer covered by PSSR. This is likely to be the case after the pressure relief valve associated with a pressure reducing valve which takes the pressure to below 0.5 barg, for example at the entry to a building.

The definition of a pressure system includes 'a pipeline containing a relevant fluid'. The Regulations do not apply to any pipeline and its protective devices in which the pressure does not exceed 2bar above atmospheric pressure (or 2.7bar above atmospheric pressure if the normal pressure does not exceed 2bar and the overpressure is caused solely by the operation of a protective device).

For clarity, this exception excludes from the Regulations gas distribution pipelines provided that: (a) the operating pressure does not exceed 2 bar above atmospheric pressure; and (b) a protective device prevents the pressure from exceeding a maximum of 2.7 bar above atmospheric pressure in the event of a temporary pressure excursion occurring.

Note: More information is available in HSL122 and some information is presented in the HSE free leaflets INDG261 and INDG178.

3.2.15 **Provision and Use of Work Equipment Regulations (PUWER)**

Work equipment has a wide meaning and includes tools such as hammers, laboratory apparatus, for example Bunsen burners, ladders, photocopiers, lifting equipment and machinery for use at work.

PUWER place duties on employers in relation to selection, suitability, maintenance, inspection, installation, instruction, training, prevention of danger and control of equipment.

Note: More information on PUWER can be found in HSL22. Free leaflets include INDG291 and INDG229.

3.2.16 **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)**

RIDDOR require employers, self employed people or those in control of work premises to report certain work related accidents, diseases and dangerous occurrences.

Other people have duties to report certain gas incidents which may not appear to be work related:

- death or major injury arising out of the distribution, filling, import or supply of NG or LPG should be reported by the conveyor for NG and the filler, importer or supplier for LPG
- dangerous gas fittings (as defined in RIDDOR) should be reported by a "member of a class of persons".

Specified injuries, death and dangerous occurrences must be notified immediately, either by telephone or electronically, to the enforcing authority by the "responsible person" as defined by RIDDOR. Reports can be made to the Incident Contact Centre by:

- telephone on 0845 300 9923
- via a link from HSE website at www.hse.gov.uk.

Note : IGEM/GL/8 provides guidance on the reporting and investigation of gas-related incidents.

SECTION 4 : FRAMEWORK OF A MANAGEMENT SYSTEM

- 4.1 For any Management System, a framework shall be clearly defined and implemented.
- 4.2 An organisation's strategy objectives are supported by the framework, which should:
- enable future activity to take place in a consistent and controlled manner;
 - protect and enhance assets and company image;
 - optimise operational efficiency;
 - develop and support the employees and the organisation's knowledge base;
 - contribute to more efficient use and allocation of capital and resources;
 - maximise the safety of the public;
 - maximise the safety of personnel;
 - protect the environment.
- 4.3 Each activity shall be managed in accordance with the framework. HSG65 describes the Plan, Do, Check, Act process for the management of health and safety. The methodology can be described briefly as follows:
- **Plan:** Establish the objectives and processes necessary to deliver results in accordance with the organisation's policies. Identify control systems. Develop an Action Plan.
 - **Do:** Identify and assess risks. Organise activities to implement the processes.
 - **Check:** monitor and measure processes against Action Plan with particular reference to policies and objectives, report results, investigate accidents, incidents and near misses.
 - **Act:** take actions to improve performance, including updating the Action Plan as appropriate.

The methodology is depicted diagrammatically in Figure 1 below.:

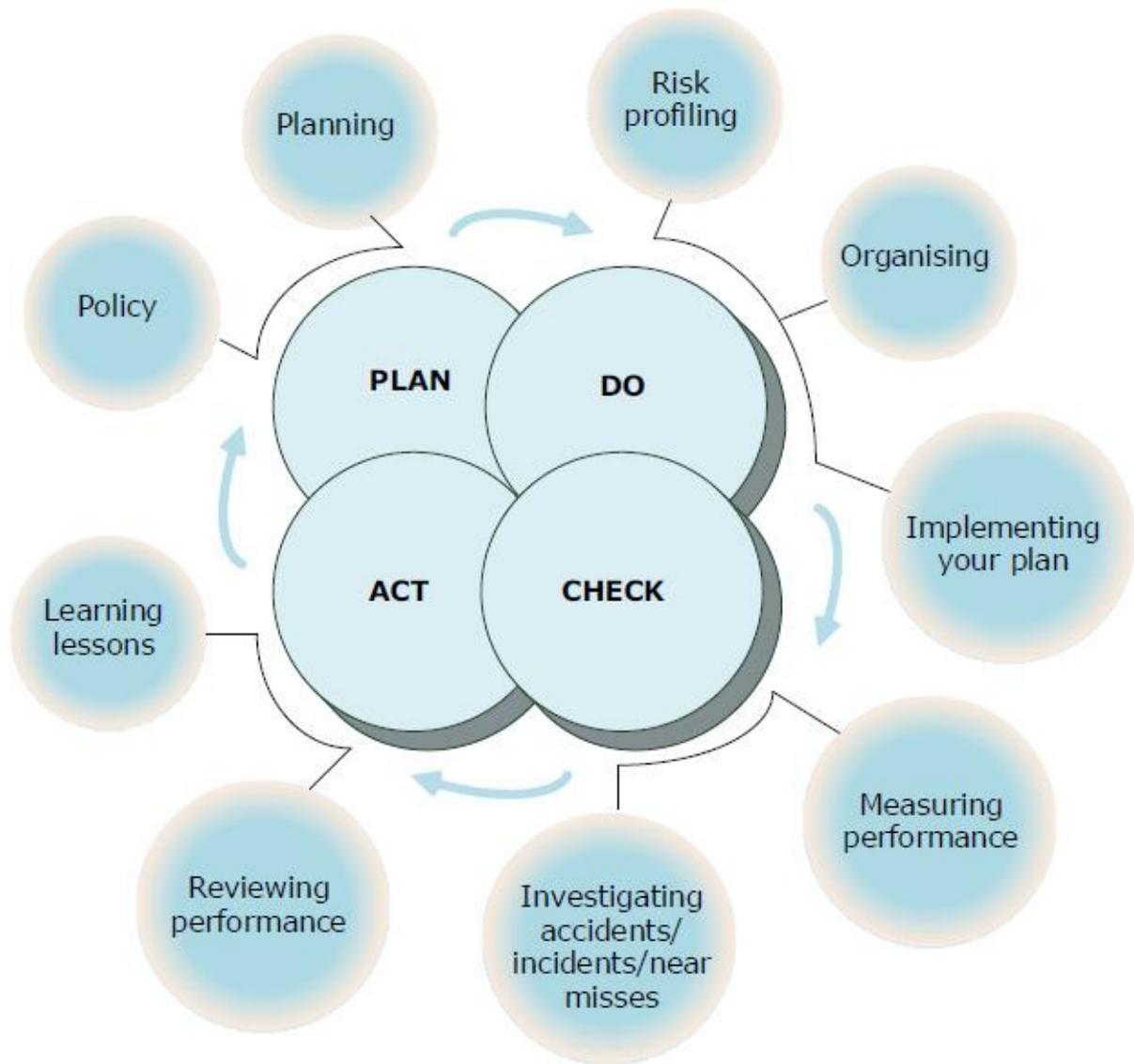


FIGURE 1 – A RISK MANAGEMENT PROCESS MAP – THE PLAN, DO, CHECK, ACT CYCLE FROM HSG65

SECTION 5 : LEADERSHIP, POLICY, SCOPE AND PLANNING OF THE SAFETY MANAGEMENT SYSTEM

- 5.1 The GNO's senior management shall provide visible and active leadership in developing and maintaining a culture which supports the management of safety. The senior management shall:
- define a safety policy in which overall objectives and a commitment to maintain and improve safety performance are stated clearly;
 - appoint specific management personnel who shall have defined roles, responsibilities and authority for ensuring the safety management system is established, implemented, maintained and reported upon.
- 5.2 The safety policy should, amongst other considerations include:
- Asset Management – covering the whole life cycle of the asset from construction/acquisition through operation and maintenance to decommissioning and disposal;
 - Health and Safety;
 - Environmental;
 - Quality.
- 5.3 The policy should be communicated effectively and in a form that is easily understood and implemented.
- 5.4 The responsibilities and the arrangements for identifying hazards or other consequences of non-compliance, assessing risks and controlling them should be detailed within the policy.
- 5.5 The policy shall recognise that compliance with the policy is an integral part of the business performance and a prime responsibility of management at every level. It should include a commitment to high standards of compliance, with regard to all matters being attained throughout the company and clearly place the management of the policy and associated procedures with line management.
- 5.6 In order to achieve the required safety and reliability of the gas assets the GNO shall consider the associated hazards, risks and processes within its Safety Management System. The main processes are illustrated in Figure 2 below:

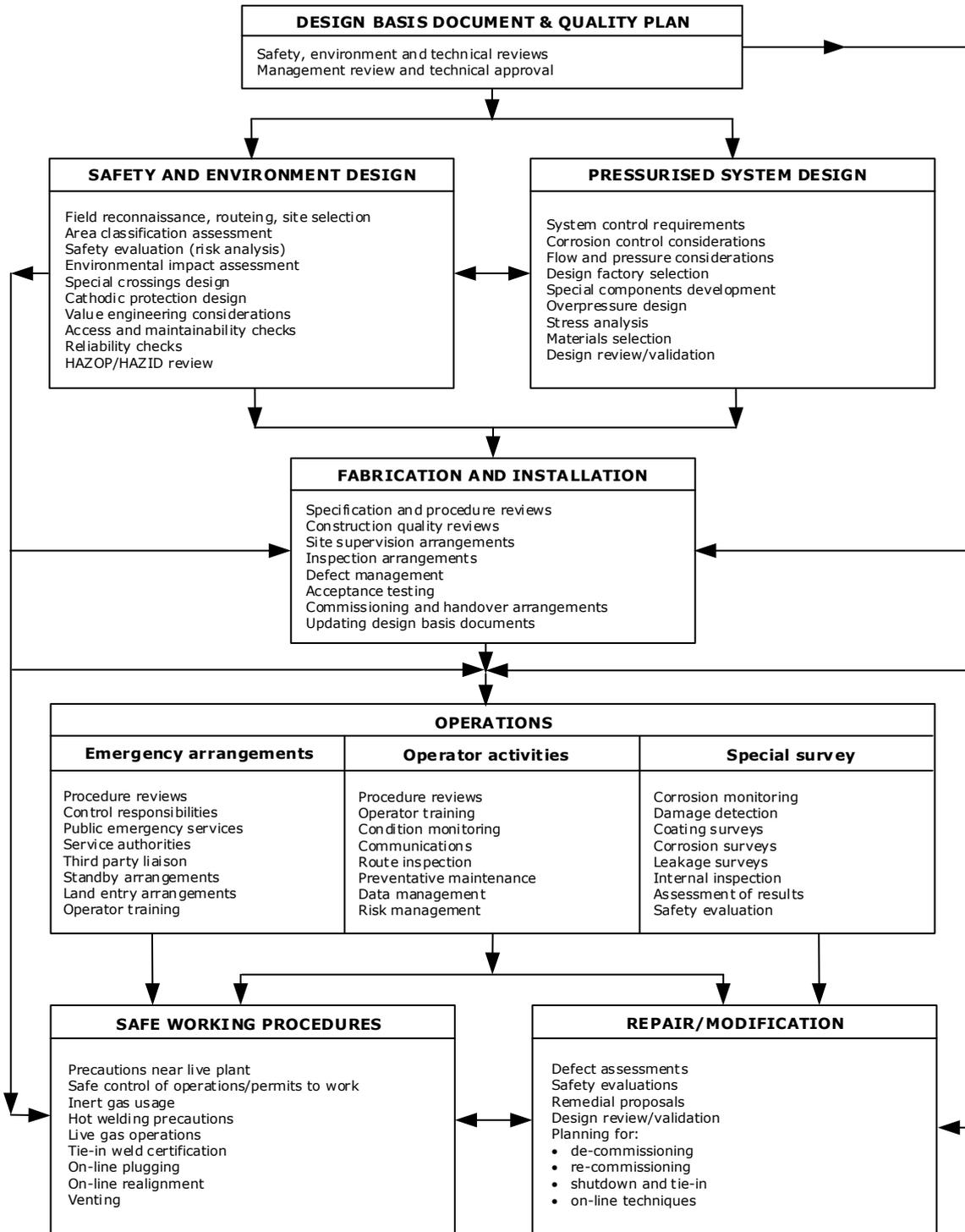


FIGURE 2 : MAIN PROCESSES RELATING TO THE INTEGRITY OF PIPELINES AND OTHER GAS ASSETS THROUGH THEIR LIFE CYCLES

5.7 The enabling processes which support the main processes described in Figure 2 above will typically comprise the following:

- Training;
- Purchasing;
- Communications;

- Documentation;
- Regulatory compliance;
- Innovation.

5.8 Provision shall be incorporated within the safety management system to:

- Ensure the safe operation of the assets;
- Monitor its condition;
- Ensure safe and effective maintenance;
- Deal effectively and responsibly with incidents and emergencies;
- Develop and maintain all required competencies.

5.9

Planning is essential to ensure that an organisation's efforts are effective. Planning shall address the following areas:

- identifying hazards, assessing risks, and deciding how they will be eliminated or controlled;
- complying with applicable legislation, for example but not restricted to PSR, PSSR, GS(M)R, DSEAR, CDM and COSHH;
- agreeing measurable targets with managers and supervisors;
- providing a purchasing and supply policy which takes hazard and risk into account;
- Managing contractors including validation and mobilisation;
- design of equipment and procedures;
- emergency and incident procedures;
- safe systems of work;
- co-operation with other organisations;
- setting standards of performance.

Note: The following are examples of the systems which can be put in place:

- *use of IGEN Standards, (see Appendix 2 for a list of relevant standards);*
- *risk assessments covering a wide range of operational and support activities;*
- *permit to work systems;*

- *assessments of working conditions;*
- *noise assessments;*
- *emergency procedures;*
- *waste management;*
- *maintenance of plant and equipment;*
- *assessments of substances hazardous to health.*

SECTION 6 : RISK ASSESSMENT, ORGANISING AND IMPLEMENTING

6.1 GENERAL

In order to make the organisation's policies effective, it is necessary to gain the commitment of the staff involved. This shall involve the following key steps:

- identifying and documenting the competency requirements;
- allocating specific responsibilities to specific competent people;
- ensure that those people are competent to carry out that work, and have access to any required advice and information;
- ensure that various levels of staff co-operate, so that work is carried out effectively and correctly;
- ensure that proper communication channels are available to advise people on the hazards and preventive measures connected with their work, and to provide channels for people to discuss particular concerns.

6.2 A risk register should be established, summarising important data and information from risk assessments with a view to assisting management in monitoring, controlling and managing the identified hazards, their risk levels, the associated control measures and review dates.

6.3 The significant findings of any risk assessment should include a succinct description of:

- significant hazards identified;
- existing control measures in place, and the extent to which they control the risks
- the population which may be affected by the significant risks, including particularly vulnerable groups;
- prioritising the risks – risk rating.

Note: IGEM/G/7 provides information on risk assessment techniques.

6.4 The protective and preventive measures described should reflect the hierarchy of risk control principles, namely:

- (a) risks identified have been eliminated where practicable or, where not practicable,
- (b) risks have been addressed at source by engineering controls and other engineering solutions or, where not practicable,
- (c) suitable systems of work, appropriate procedures and checks have all been compiled.

6.5 COMPETENCE AND TRAINING

6.5.1 Recruitment and training procedures should ensure that employees are not placed in jobs that are beyond their abilities. Procedures should identify training needs, in particular:

- on recruitment;
- where people are transferred to new duties;

- where there are plant and equipment changes;
- where there are new or changed systems of work;
- where any other changes occur that might introduce new risks.

6.5.2 Special attention should be given to the training of persons who deputise for others. Arrangements shall exist to provide competent cover for absence from work, particularly for persons with critical risk responsibilities.

6.5.3 The competency of persons should be reviewed, verified and recorded periodically. There should be refresher training, to ensure that skills are maintained.

6.5.4 GNO's shall

- have a documented process for determining competency that details minimum competency requirements, e.g. training, experience, knowledge, understanding, qualifications, professional registration, etc., as appropriate;

Note: See Appendix 1 for a definition of competence.

- establish and maintain sufficient current, valid, credible and authentic evidence to demonstrate that individuals are competent to undertake their assigned role in the discipline or sub-discipline, by:
 - ensuring that the minimum documented competencies are satisfied;
 - ensuring that personnel are trained and qualified for the work they carry out;
 - a suitably Competent Person undertaking a documented assessment of persons performing roles for which competencies have been set;
 - arranging for the review of individuals' ongoing competencies by a suitably Competent Person. These competence reviews shall be documented and recorded.
- have a training programme which is adequate to close any competency gaps in place.

6.6 **MANAGEMENT OF CONTRACTORS**

6.6.1 GNOs shall have a procedure in place to ensure that contractors are and will continue to be competent to design, construct, operate and maintain gas assets that will be, and remain fit for purpose.

6.6.2 GNOs shall include safety management within their policy for selecting competent contractors.

6.6.3 Within GB, and where work being contracted out falls within the scope of CDM, the entire process, from inception to completion, is subject to the highly structured approach required by that legislation. Even where work is not within the scope of CDM, many of the principles and practices set therein are worth following. For example, there should be procedures to ensure, at the pre-tender stage, that prospective contractors are made fully aware of the project's requirements, in particular:

- any significant risk;
- the standards to be applied to control those risks;
- other requirements, such as the arrangements for setting and monitoring performance standards and for compliance with project conditions.

6.6.4 Other topics that should be considered are:

- Quality Plan requirements;
- pre-start meetings;
- site induction training;
- procedures for the submission, vetting and amendment of method statements;
- procedures for the continuing exchange of information;
- supervisory arrangements;
- site waste management plan;
- accident and dangerous occurrences procedures;
- emergency procedures.

Note: Further guidance can be found in HSG159.

6.7 **PROVISION OF INFORMATION**

6.7.1 Effective internal information flow should be established to enable the organisation's policy and aims of management to be understood and effectively implemented. Systems should communicate key information such as:

- plans, standards, procedures;
- factual information that will help to secure the involvement and commitment of people;
- reports on performance.

6.7.2 Comprehensive systems should, as required, consist of a variety of formal and informal means of communication, which together ensure an adequate flow of information up, down and across the organisation, for example:

- visible behaviour by managers and others;
- the written word;

- face-to face communication.

6.7.3 Leading by example helps to promote a positive culture towards safety, the environment and quality. Irrespective of what may be laid down in writing or elsewhere, people tend to act in a way that accords with their perception of what is most important to their management. Among the methods used to signal commitment and a positive culture, the following should be given special consideration:

- carrying out regular walkabouts by managers (these are not detailed inspections, but they allow managers to demonstrate their interest, and enable them to see examples of both good and poor performance);
- holding meetings of all parties involved, to address business and safety risk issues and ensuring that they are supported by senior management;
- ensuring managers become actively involved in accident/incident/near miss/non-conformance investigations, with the level of seniority being determined by the seriousness of the event.

6.7.4 The important written communications should be seen as:

- organisation's policy statements;
- organisational roles and responsibilities;
- related BS EN ISO and IGEM Standards, management and work procedures and method statements ;
- documented organisational performance standards.

Detail should be proportionate to the degree of complexity and risk, and should recognise the intended audience.

All documents shall be subject to a rigorous document control process to ensure superseded documents do not remain in circulation and used in error.

6.7.5 Face-to-face discussion, with emphasis on the open and honest exchange of views, supports other communication activities by enabling people to ask questions and make a personal contribution. Walkabouts by managers, and formal consultative meetings such as safety and quality committees make a contribution, but there are other systems that can be used. Examples that should be considered are:

- planned meetings used for receiving information and for disseminating information throughout the organisation;
- making health, safety, environment and quality agenda items on all routine management meetings;
- workplace talks at appropriately regular intervals, at which supervisors can discuss business and safety risk issues with their teams, remind them of critical risk and related control measures, and reinforce the training effort. Such meetings also give people the opportunity to make their own suggestions for improving performance.

6.7.6 A GNO must have processes in place to communicate with external stakeholders whose activities could affect the safe management and operation of the gas network or who would be affected by an incident on the gas network. Such processes include:

- Provision of plans to third parties working in the vicinity of pipelines and other apparatus;

Note: IGEM/SR/18 and PAS 256 provide appropriate guidance.

- Communication with Gas Suppliers, Shippers, other GNOs, consumers, etc. to minimise the risk of or to deal with a gas supply emergency;

- Communication with Local Authorities, Emergency Services etc. to deal with the consequences of a gas supply emergency.

Note: IGEM/GL/9 and HSL80 provide appropriate guidance.

6.8 **DESIGN**

6.8.1 The design process shall take into account

- the elimination or reduction to a practical minimum of the identified risks expected to arise during the life cycle of the asset;
- the associated inspection/monitoring, maintenance and control systems;
- specified design inputs, especially those contained within relevant IGEN standards;
- future planning and developments;
- modelling tools;
- security of supply;
- regulatory compliance;
- approval and validation and where deemed applicable, independent appraisal mechanisms (see IGEN/GL/5);
- the need for clear and unambiguous work instructions and drawings by construction or maintenance or decommissioning personnel;
- control of on-site variations or deviations and unforeseen situations;
- strength and tightness testing.

6.9 **OPERATION OF THE ASSETS**

6.9.1 The GNO shall have monitoring systems to verify pressures, flows, gas quality and odourisation at key points throughout the network or other asset as appropriate. The GNO shall determine and document those key points, their associated parameters and nominal operating ranges.

6.9.2 In addition, the GNO shall maintain 24/7 systems to receive information coming in from:

- The general public;
- Operational staff;
- Fire, police and ambulance services;
- Other interested parties.

6.9.3 The GNO shall have adequate plant protection procedures to handle third party works and enquiries.

6.10 **INSPECTION AND MAINTENANCE**

6.10.1 The GNO shall undertake inspection and maintenance activities, including preventative and corrective maintenance, on its assets.

Note 1: See Regulation 13 of Pipeline Safety Regulations;

Note 2: IGEM/TD/13 provides guidance on the inspection and maintenance of pressure reduction equipment, IGEM/TD/1 and IGEM/TD/3 provide guidance on the inspection and maintenance of pipelines and IGEM/G/5 provides guidance on the inspection and maintenance of pipes in multi occupancy buildings;

Note 3: IGEM/SR/29 provides guidance on dealing with reported escapes.

6.11 **EMERGENCY PLANS**

6.11.1 The GNO shall establish, document, implement and maintain procedures to identify and respond to emergencies. Emergencies include:

- Gas escapes;
- Fire and explosion;
- Low pressure or loss of supply due to water ingress;
- Low pressure or loss of supply due to malfunctioning equipment, excess demand or third party interference;

Note: such incidents may be national, regional or local.

- CO reports.

6.11.2 Emergency response shall be available 24 hours per day, 365 days per year. Emergency simulation exercises shall be carried out periodically to test emergency response especially where actual emergencies are very infrequent in practice.

6.12 **RECORDS**

Appropriate records shall be created and retained to demonstrate conformance with the management system and compliance with appropriate legislation.

SECTION 7 : MONITORING PERFORMANCE

7.1 Monitoring of performance shall be carried out. The absence, or low incidence, of accidents, incidents, near misses and other non-conformances does not, in itself, guarantee that risks are under control and will not lead to problems in the future.

7.2 Monitoring assesses how effectively risks are being controlled and indicates how well the management system is working. It should include planned, routine, inspections and checks to ensure preventative and protective measures are in place (statistical measures may also be used). Results referenced to appropriate key performance indicators should be reported on a regular basis at a suitable level of responsibility.

Note: A typical monitoring/inspection checklist is included in Appendix 3.

7.3 Failure statistics should be regularly reviewed. The statistics should be collated and analysed. Consideration could be given to assessing:

- third party damage;
- public reported failures/gas escapes;
- failure identified during programmed survey/inspection activities;
- Severity of consequences of the incidents.

The GNO management team should have targets for reducing failure and look to continuously improve the asset by reference to key performance indicators.

7.4 Procedures should set out the minimum requirements for the reporting and investigation of incidents, accidents, near misses and ill health occurrences with respect to the public, employees, contractors or the gas system. Investigations should identify immediate causes, root causes and make recommendations for improvement. Completion of actions should be monitored using an action plan updated on a regular basis.

Note: Reference can be made to IGEN/GL/8.

SECTION 8 : AUDITING

- 8.1 Audit and performance review constitute the feedback loop which enables the organisation to maintain and develop its ability to manage to the fullest extent. Systems should be designed to assess the total system, for example the safety management, the gas system integrity and the emergency plans. Typically, audits are carried out by competent people and, preferably, people outside the line management chain.
- 8.2 Organisations shall ensure that audits of the management system are conducted at planned intervals to:
- determine whether it complies with this Standard;
 - ensure it is properly implemented and maintained;
 - ensure it is effective in meeting the organisation's policy objectives;
 - ensure it provides appropriate information to the organisation's management;
 - assist in providing for continuous improvement.
- 8.3 The following key elements shall be considered when arranging audits:
- audit schedule and scope.
A plan should be provided to identify all facilities, operations, suppliers, contractors and management systems which are to be audited. A schedule should then be constructed, based on the audit frequency identified in the audit policy. It may be necessary to consider some or all of the following to ensure realistic durations for audit:
 - auditing a different part of the organisation at each audit session, while ensuring that the total organisation is audited within the audit frequency;
 - defining which elements the auditor(s) shall include, and those elements for which the auditor(s) may use their discretion;
 - sample size.

Note: A typical check list to assist in determination of schedule and scope is given in Appendix 3.
 - audit resources
The plan should identify how the auditor(s) are to be selected, including the competencies required and how they are ensured.
Note: See Appendix 5 for competence of auditors.
 - audit protocols
Proper audit protocols should be observed. Examples are:
 - reasonable requests for information should be met in a timely manner;
 - where possible, existing check lists, pro-formas, etc. should be used.
 - action plans resulting from audit
A consistent basis should be used for action plans, to cover responsibilities, completion dates, reporting requirements and monitoring of implementation.
Note: A checklist that could be used to audit an organisation's gas safety case is in Appendix 4.
- 8.4 The audit process should involve a detailed assessment of the management system, along with the level of compliance with policies and procedures. Where necessary corrective actions are identified and corrected within a determined timescale. Completion should be monitored using an action plan, updated as required.

SECTION 9 : REVIEWING PERFORMANCE AND LESSONS LEARNT

- 9.1 Review should take account not only of the results of audits, but also of the information gathered through proactive and reactive monitoring. Lessons learned from the performance review shall be documented, communicated effectively to the organisation and acted upon.
- 9.2 The key elements of safely managing gas assets should be addressed by considering the following:
- policy – its extent and adequacy;
 - the organisation, including:
 - the allocation of responsibilities and the adequacy of arrangements to secure control;
 - the adequacy of the arrangements to secure the involvement of all employees ;
 - the adequacy of both internal and external communication arrangements;
 - the adequacy of the arrangements to secure the competence of all employees and contractors.
 - planning and policy implementation including:
 - overall control and direction of the organisation;
 - setting standards – their adequacy and relevance;
 - the allocation of resources to implement standards;
 - the extent of compliance with standards and their effectiveness in managing the safety of the assets;
 - long-term improvement in accident and incident performance.
 - monitoring systems – their adequacy and relevance;
 - performance reviewing systems and the ability of the organisation to learn from experience and improve performance.
- 9.3 The key elements of gas system asset integrity can be addressed by considering the following:
- design and commissioning;
 - operating procedures and method statements;
 - permitry and work control procedures;
 - provision of accurate records;
 - asset and process modifications;
 - control of resources (including the system, materials, personnel & contractors);
 - security;
 - decommissioning.
- Note: See Figure 2.*
- 9.4 The key elements of contingency planning can be addressed by considering the following:
- the consequences of potential hazards i.e. consideration of “what if” questions;
 - the actions to be taken in the event of such circumstances;
 - implementation of procedures;
 - Simulation of credible incidents.

APPENDIX 1 : GLOSSARY, ACRONYMS, ABBREVIATIONS AND UNITS

GLOSSARY

- Asset gas system including the personnel, property, plant and equipment.
- Competence The combination of skills, knowledge and understanding to perform consistently to current recognised Standards.

All other definitions are given in IGEM/G/4 which is freely available:

- as a CD, with the purchase of any IGEM Standard, upon request
- by downloading a printable version from IGEM's website www.igem.org.uk.

Recommended and legacy gas metering arrangements are given in IGEM/G/1 which is freely available:

- with the purchase of any IGEM Standard, upon request
- by downloading a printable version from IGEM's website.

Downloading from the website ensures access to the latest version.

ACRONYMS AND ABBREVIATIONS

ACoP	Approved Code of Practice
CDM	Construction (Design and Management) Regulations
CO	carbon monoxide
COSHH	Control of Substances Hazardous to Health Regulations
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
EPR	The Environmental Permitting Regulations
ECV	emergency control valve
ESP	emergency service provider
GB	Great Britain
GS(I&U)R	Gas Safety (Installation and Use) Regulations
GS(M)R	Gas Safety (Management) Regulations
GNO	Gas Network Operator
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc. Act
IGEM	Institution of Gas Engineers and Managers
LPG	Liquefied Petroleum Gas
MHSWR	Management of Health and Safety at Work Regulations
NG	Natural Gas
OP	operating pressure
PSR	Pipelines Safety Regulations
PSSR	Pressure Systems Safety Regulations
PUWER	Provision and Use of Work Equipment Regulations.
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations.

UNITS

- barg bar gauge.

APPENDIX 2 : REFERENCES

A2.1 LEGISLATION

- Control of Pollution Act (Amendment) Act 1989
- Environment Act 1995
- Environmental Protection Act 1990
- Health and Safety at Work etc. Act 1974
- Confined Spaces Regulations 1997
- Construction (Design and Management) Regulations 2015
- Control of Major Accident Hazard Regulations 2015
- Control of Substances Hazardous to Health Regulations 2002, as amended 2003 and 2004
- Dangerous Substances and Explosive Atmospheres Regulations 2002
- Electricity at Work Regulations 1989
- Environmental Permitting (England & Wales) Regulations 2007
- Environmental Protection (Duty of Care) Regulations 1991
- Gas Acts 1986 & 1995 as amended
- Gas Safety (Installation and Use) Regulations 1998
- Gas Safety (Management) Regulations 1996
- Hazardous Waste Regulations 2005
- Management of Health and Safety at Work Regulations (Amendment) 2006
- New Roads and Street Works Act 1991
- Oil and pipelines Act 1985
- Pipelines Safety Regulations (Amendment) 2003
- Pollution Prevention and Control (England and Wales) Regulations 2000
- Pollution Prevention and Control (Scotland) Regulations 2000
- Pressure Systems Safety Regulations 2000
- Provision and Use of Work Equipment Regulations 1998
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- Site Waste Management Plans Regulations 2008
- Special Waste Regulations 1996
- Traffic Management Act 2004
- Waste Management Licensing Regulations 1994.

A2.2 HSE PUBLICATIONS

- GS4 Safety Requirements for Pressure Testing
- GS6 Avoiding danger from overhead power lines
- HSR25 Memorandum of guidance on the Electricity at Work Regulations 1989
- HSG47 Avoiding danger from underground services
- HSG48 Reducing error and influencing behaviour
- HSG65 Successful Health and Safety Management
- HSG150 Health and safety in construction
- HSG159 Managing contractors
- HSG245 Investigating accidents and incidents

- HSG250 Guidance on permit to work systems
- HSL21 Management of health and safety at work
- HSL22 Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998
- HSL56 Safety in the installation and use of gas systems and appliances
- HSL80 A guide to the Gas Safety (Management) Regulations 1996
- HSL82 A Guide to the Pipelines Safety Regulations 1996
- HSL122 Safety of pressure systems. Approved code of practice
- HSL138 Dangerous substances and explosive atmospheres (ACOP)
- HSL153 Managing health and safety in construction. Approved code of practice
- INDG178 Written schemes of examination. Pressure Systems Safety Regulations 2000
- INDG229 Using Work Equipment Safely
- INDG261 Pressure Systems – Safety and You
- INDG291 Simple Guide to the Provision and use of Work Equipment Regulations 1998.

A2.3

IGEM STANDARDS

- IGEM/G/5 Gas in multi occupancy buildings
- IGEM/G/7 Risk assessment techniques
- IGEM/G/8 Handling, transport and storage of PE pipe and fittings
- IGEM/GL/1 Planning of gas distribution systems of MOP not exceeding 16 bar
- IGEM/GL/2 Planning of transmission and storage systems of MOP exceeding 16 bar
- IGEM/GL/5 Procedures for managing new works, modifications and repairs
- IGEM/GL/6 Permitry for the safe flow of gas
- IGEM/GL/8 Reporting and investigation of gas related incidents
- IGEM/SR/4 Variable volume gasholders storing lighter than air gases
- IGEM/SR/14 Fixed volume storage of lighter than air gases
- IGEM/SR/15 Integrity of safety-related systems in the gas industry
- IGEM/SR/16 Odorant systems for gas transmission and distribution
- IGEM/SR/18 Safe working practices to ensure the integrity of gas pipelines and associated installations
- IGEM/SR/22 Purging operations for fuel gases in transmission, distribution and storage
- IGEM/SR/23 Venting of natural gas
- IGEM/SR/25 Hazardous area classification of natural gas installations
- IGEM/SR/28 Trenchless techniques
- IGEM/SR/29 Dealing with gas escapes
- IGEM/TD/1 Steel pipelines for high pressure gas transmission
- IGEM/TD/2 Assessing the risks from high pressure natural gas pipelines
- IGEM/TD/3 Steel and PE pipelines for gas distribution
- IGE/TD/4 PE and steel gas service and service pipework
- IGEM/TD/12 Pipework stress analysis for gas industry plant

- IGEM/TD/13 Pressure regulating installations for natural gas, liquefied petroleum gas and liquefied petroleum gas/air.
- IGEM/TD/16 Biomethane injection
- IGEM/TD/17 Steel and PE pipelines for biogas distribution.
- IGEM/TD/101 Adoption of pipe systems etc.
- IGEM/UP/7 Gas installations in timber framed and light steel framed buildings
- IGEM/G/6 Gas supplies to mobile dwellings

A2.4

BRITISH STANDARDS (ABBREVIATED TITLES)

- BS EN 15399 Safety management system for gas distribution
- BS EN 16348 Safety management system for gas transmission
- BS ISO 55000 Asset Management
- BS EN ISO 9001 Quality management systems
- BS EN ISO 14001 Environmental management systems
- BS EN ISO 19011 Quality and/or environmental management systems auditing
- BS OHSAS 18001 Occupational health and safety
- PAS 256:2017 Buried Assets – capturing, recording, maintaining and sharing of location information and data - code of practice

APPENDIX 3 : TYPICAL CHECK LIST FOR REVIEWING AND AUDITING

A3.1 POLICY AND ORGANISATION

Confirm that there are current policy statements and organisational structures in place.

A3.2 PROCEDURES

Evaluate the organisation's work procedures and method statements including, but not limited to:

- design
- construction
- modifications
- operation
- commissioning and decommissioning
- maintenance
- permitry and work control procedures
- complaints
- deviations and variations
- testing
- call handling
- emergency procedures
- contingency plans.

A3.2 MONITORING

Consider the following questions during a site inspection and follow up where appropriate. Does:

- the construction comply with the design?
- the construction comply with the appropriate method statements?
- any access seem inadequate for escape?
- the appearance of the site suggest any maintenance problems?
- the appearance of the site suggest any corrosion problems?
- the appearance of the site suggest any leakage problems?
- the appearance of the site suggest any items of equipment being inadequately supported?
- any relief valve appear to be in poor condition?
- any vent appear to be badly located?
- any bund wall appear to be in poor condition?
- any item of plant appear to be inadequately labelled?
- any lifting equipment appear to be in poor condition?

A3.3 TECHNICAL AUDIT

Ensure technical audits are undertaken by people with the appropriate knowledge and understanding.

A3.3.1 **Standards and Codes of Practice**

Check and physically inspect that the assets are being reviewed/audited against the latest edition of the appropriate Standard and/or Code of Practice. Record deviations and compliance issues.

A3.3.2 **Documentation**

Evaluate the following items as appropriate:

- design specification
- design calculations
- "as-built"/"as-modified" engineering drawings. Typically, these include:
 - piping and instrumentation diagrams
 - engineering line diagrams
 - hazardous area classification drawings
 - utilities plans
 - electrical schematics
 - plot plans
 - civil engineering drawings
 - mechanical engineering drawings
 - machinery drawings.
- process flow diagrams
- vendor manuals
- permitry
- test certificates
- work issues and recording documents
- legislative documentation, e.g. NRSW/Traffic Management Act
- management system requirements.

A3.3.3 **Key items**

Identify any inadequacies in the following areas:

- gas Safety Case
- design specification
- compliance with legislation
- compliance with CDM (Health and Safety plans etc)
- organisation structure
- communications
- documentation
- training
- competency
- work controls, including permitry (see IGEM/GL/6 and HSG250)
- contingency procedures
- records – statutory
- incidents recording
- monitoring processes
- lessons learned
- machine guarding
- means of access/egress
- lighting

- fire fighting equipment
- fire protection and detection
- fire safety inspection reports
- gas detection
- protective clothing and equipment
- structural integrity
- pollution controls
- dangerous substances – controls, storage, handling, etc.
- environmental controls
- welfare arrangements
- security arrangements.

A3.3.4 **Fitness for purpose**

Identify any inadequacies in the following areas:

- testing records and certification
- inspection records and certification
- pressure vessels
- pressure regulating devices
- relief valves
- slam-shut valves
- pipework
- storage tanks
- vent flaps
- instrumentation
- vent silencers
- lifting equipment
- earthing facilities testing
- anti-static devices testing
- electrical trip and overload testing
- trip testing
- compliance with hazardous area classifications.

A3.4 **FEEDBACK**

The person or persons carrying out the review/audit need to report their findings/recommendations to the person responsible for authorising any remedial work.

A3.5 **FOLLOW UP**

The person responsible for authorising remedial work needs to ensure that the findings/recommendations are addressed.

APPENDIX 4 : SAFETY CASE ASSESSEMENT GUIDANCE

The following gas Safety Case checklist is published by HSE on its website within the Gas Safety (Management) Regulations 1996 "Safety Case Assessment Manual". It is reproduced here under PSI license © HSE Version 5.0 January 2008.

Note: Check HSE website for latest edition.

Sch 1 para No	Verification Issues	Assessment
1	General	
	Is the name and address of the duty holder as stated in the safety case?	
2 & 3	Description	
	Is the extent/location of the network/pipeline systems as per the safety case or as notified to HSE? Are maps and drawings available with the system clearly marked? Are interfaces with other gas conveyors clear? Are drawings to an appropriate scale and are the necessary features to assist with the safe management of gas supply clear?	
	Note: The safety case probably will not identify every location or system but gas conveyors are required to send to HSE, from time to time, a list of sites/locations to which the safety case applies.	
	Are all relevant consumer types/premises covered by the safety case – e.g. if a mix of industrial and domestic is this covered?	
	Are any interruptible consumers clearly identified on the system?	
	If different supply systems are operating at Low Pressure and Medium Pressure does the safety case reflect this?	
	Is the full inlet operating pressure range covered by the safety case? Do the systems cope with the full range of inlet pressure swings that were predicted? How is this monitored?	
	Are patterns of consumption the same as predicted in the safety case? How well is the supply system coping with the actual consumption/demand?	
	Are the materials and construction methods used the same as declared in the safety case – e.g. is polyethylene pipe used exclusively or are parts of the system(s) in steel?	
	What are the jointing methods used?	
	Are control rooms, their mode of operation and extent of control still reflected in the safety case?	

4	Technical specifications and operations and maintenance procedures	
	A number of technical specifications are likely to be referenced in safety cases.	
	It is important to remember that the primary purpose of referencing standards in the safety case concerns the safety and reliability of critical plant and the management of the safe flow of gas. It is not to repeat all the detailed system integrity requirements that might be covered by, say, materials and welding standards, etc.	
	A check should be made that technical specifications quoted are readily available to those who need to use them.	
	Are they current versions/editions?	
	Are they being used and being used appropriately – who checks? For example, are IGE/TD Recommendations used across the system or are other standards preferred in certain circumstances – because they may offer cheaper or easier solutions?	
	Are standards and recommendations enhanced or otherwise modified by company standards or requirements?	
	A set of standards or Recommendations may be selected by the inspector and used to assess part of a network during an office and site visit.	
	For example, Section 5 of IGE/TD/3 could be used to test the construction planning arrangements while at the gas conveyor's offices. Then, if a visit is made to a site where polyethylene mains are being installed then further compliance with IGE/TD/3 could be checked – e.g. the management of materials quality, jointing, ensuring the correct depth of cover and position of pipes in relation to other services, testing arrangements, etc.	
	If service installation works are being undertaken then these should be checked against IGE/TD/4 . The issues that may be covered include the management of materials quality, depth of cover and proper service entry.	
	For medium pressure services, with their higher risks, particular note could be taken of the means of isolating services, recording their position, controlling pressure to the consumer's appliances, safe venting of meter boxes, measures to ensure no gas can enter the building via the meter box, ensuring the general condition and security of meter boxes, etc. Compliance with IGE/TD/15 should be checked.	
	Pressure regulating installations could be visited to be checked against IGE/TD/13 for site location and protection, site isolation valves, housing type, number and type of downstream protection devices on gas streams, arrangements for regulating/controlling pressure, etc.	

	IGE/GL/1 may be used by the gas conveyor for medium or low-pressure network design. A check could be made of the design of a selected network or system with particular reference to the following:	
	- what source pressures were used in the design? How were these established? How are they monitored? -	
	- what agreements were made between other gas conveyors at the interfaces at system boundaries? -	
	- what is the breakdown of annual load (domestic, commercial, etc.)? -	
	- what is the maximum design load? -	
	- what diversity factor was applied? -	
	- what is the policy for allowing additional loads to be connected? -	
	- what are the arrangements for periodic network analysis?	
	Examination of procedures for operations and maintenance – examples:	
	A number of procedures may be referred to in the safety case and some should be selected for closer examination.	
	The main purpose of the examination is to check that written procedures are readily available to those who need them; that identification of the need for procedures and their preparation is properly managed; that the issue of revisions is properly controlled; that communications with other interested and affected parties are established and working; that audit arrangements are in place; that proper liaison exists with enforcing authorities and emergency services and that arrangements for the appointment, training and ongoing assessment of the competence of staff with safety critical functions are properly managed.	
	Examples of procedures for detailed examination might include:	
	- procedures for carrying out inspections, functional checks and full maintenance of plant and equipment at pressure regulating installations together with reporting and feedback arrangements;	
	- procedures for carrying out inspections, functional checks and full maintenance of plant and equipment at pressure regulating installations together with reporting and feedback arrangements;	
	- procedures for routine and non-routine operations which might affect the safe supply of gas – e.g. making connections, isolations, etc.; and	

	- procedures for dealing with reported gas escapes including carbon monoxide emissions.	
5	Safety management – risk assessment and health and safety arrangements	
	The risk assessment should reflect the network described in the safety case. The risk assessment itself and the processes used need only be verified further if it is found that the networks differ from those described or it becomes clear that certain risks have not been included.	
	Is there any evidence that risk assessments are being reviewed periodically?	
	Have preventative and protective measures identified in the assessment been implemented?	
	Are arrangements in place for making available procedures and protective measures to managers, supervisor, other employees, safety representatives and safety committees?	
	Note: All risks assessments must only relate to the source of risk from natural gas.	
6	Safety management – an adequate management system	
	Some questions which might be asked during an inspection of a gas conveyor:	
	In particular:	
	Are the key post holders as described by the safety case actually employed?	
	Are the key post holders aware of their responsibilities as described?	
	In general:	
	Bearing in mind the complexity of the operation and supporting organisation is there a “safety-intelligent” directing mind to secure safe gas supply within the organisation or does it rely principally on outside expertise and advice?	
	Does the organisation, as described in the safety case, have sufficient technical and managerial expertise to be able to be an intelligent user of technical services (from consultants or engineering services providers), to procure gas supply related services (from contractors) and to understand and evaluate feedback and advice?	
	In more detail:	
	Does the organisation/management:	
	- understand its duties under the law?	

	- set, interpret and deliver safety and engineering standards relevant to gas supply safety?	
	- understand and support the safety case?	
	- maintain and develop a "corporate memory"?	
	- ensure suitably and sufficiently qualified and experienced staff are available to make safety related judgments affecting gas supply and at all times?	
	- have sufficient breadth and depth of knowledge to understand the safety features of the plant and gas supply system?	
7	Safety management – competence and training	
	Are the procedures for staff selection, training and supervision as detailed in the safety case being followed?	
	Do key post holders have the qualifications, knowledge, experience and skills required?	
	Is there sufficient competent staff to cope with emergency situations as well as normal operations? Is there sufficient staff to cover for others on leave or during sickness?	
8	Safety management – contractors	
	If the gas conveyor uses contractors extensively for the above activities then this is an area that should be examined in detail. The key issue is ensuring contractors are competent to design, construct and install, operate and maintain plant and equipment that will be, and remain, fit for the purpose of securing a safe gas supply.	
	As a minimum the following issues should be verified at the gas conveyor's offices and during a site visit.	
	In the office:	
	- are pre-tender assessments available for all contractors currently being used?	
	- can the gas conveyor demonstrate that contractors have the appropriate qualifications, knowledge and skills for the work they are employed to do? Are they able to follow safe systems of work in relation to gas?	
	- is the level of supervision described in the safety case being applied in practice?	
	- is the level of monitoring and inspection by the gas conveyor of contractors' work as described in the safety case?	
	- are as laid/as built drawings, material and test certificates provided by contractors?	

	On site:	
	- are all the contractors employed by companies approved by the gas conveyor?	
	- do operatives have the required or specified competencies?	
	- are contractors actually working to the standards, specifications, plans and procedures required by the gas conveyor?	
	Emergency service provision	
	One area normally contracted out by gas conveyors is emergency service provision. All gas conveyors currently employ National Grid or another upstream Distribution Network Owner to carry out this on their behalf. For details refer to paragraph 13 below.	
9 & 10	Safety management – communicating information	
	In general, are the arrangements as described in the safety case?	
	In particular, how well do systems work for feeding back information on gas safety issues to the gas conveyor's management?	
	A key issue is the maintenance of records referring to each network or system and how these are kept up to date and distributed.	
	Has the gas conveyor passed on as laid plans and drawings of their systems to the emergency service provider?	
	Does the gas conveyor have arrangements to capture emergency calls, recording the information and passing it on to the National Grid Gas Freephone Emergency Number? It may be possible to check this via the switchboard and customer help lines.	
	Does the gas conveyor have arrangements for identifying the supplier of a property – e.g. for reportable carbon monoxide poisoning?	
11	Safety management – audit	
	The gas conveyor has to be able to demonstrate that they have established adequate arrangements for audit of those parts of the management system that deal with the safe management of the flow of gas and provision of an emergency response service.	
	Consider using HSG65 as a reference for inspecting audit arrangements.	
	If any audits have been conducted how independent were they?	

	Who has actually carried out audits – were they from within the organisation but outside the management chain responsible for the areas being audited or were they outside consultants, etc?	
	Review any audit reports with particular emphasis on the audit findings, recommendations and action plan. What progress has been made against any action plans?	
12	Co-operation	
	The main issue here is for the gas conveyor to show that arrangements are in place to ensure that any directions given by the Network Emergency Coordinator can be followed.	
	Does the gas conveyor have any written procedure for action in the event of a supply emergency?	
	Are the people identified in the procedures available and aware of their responsibilities?	
	Does the gas conveyor have up to date contact information for the local National Grid Gas or other upstream Distribution Network Owner's Distribution Network for all of its networks or systems?	
	Are the people nominated for communicating with other organisations aware of their responsibilities and available at all times?	
	If the gas conveyor has interruptible loads or large firm loads, does it have contact details for these consumers and how often are they validated?	
	Does the gas conveyor have the means to record and track a gas supply emergency?	
	Can domestic priority consumers be readily identified?	
	Does the gas conveyor have sufficient leaflets, and arrangements for distributing to households, asking them to reduce, cease or resume consumption?	
13	Gas escapes and investigations – emergency service provision	
	Can the gas conveyor show evidence of a current emergency service provision contract?	
	Does the contract cover the areas described in the safety case?	
	If the safety case states that the performance of the emergency service provider is monitored can the gas conveyor show any evidence of this?	
	Does the emergency service provider have all the necessary drawings and plans?	

	Has National Grid Gas been provided with the information it needs to relay calls immediately to the emergency service provider for each network or system?	
	What arrangements are there for recording notification of emergencies from Transco, action taken in response and time taken to make safe?	
	Are the arrangements that are in place to ensure that emergencies are dealt with promptly and effectively as per the safety case?	
	Are all foreseeable types of gas escapes covered by the arrangements?	
	What arrangements are in place to deal with emergency calls received directly by the gas conveyor – are these in accordance with the safety case?	
	Are there procedures for dealing with gas escapes, such as those for:	
	- controlling, directing and monitoring an incident;	
	- minimising the need to interrupt gas supplies;	
	- communications with affected consumers;	
	- etc?	
	Are there procedures for identifying the source of escapes of carbon monoxide or are these all covered by the emergency service provider?	
14	Gas escapes and investigations – arrangements for investigations	
	Do incident reporting procedures identify the need to notify HSE prior to commencing investigations of certain incidents? Is there evidence that HSE is being notified?	
	What are the means of ensuring that people who carry out investigations are competent to do so? What records exist to demonstrate the competence of investigators?	
	Do the procedures cover the requirement that investigation reports are sent to HSE? Are they being sent to HSE?	
	Are there arrangements for notifying suppliers of emissions of carbon monoxide? Is there any evidence that this is being carried out?	
15	Content and other characteristics of gas	
	Are the arrangements set out in the safety case being carried out?	

	Is there evidence that the gas conveyor is complying with GS(M)R regulation 8 – i.e. that only gas permitted under this regulation is conveyed through pipes in the gas conveyor’s system?	
	If testing or monitoring is to be carried out are there reports or records of these activities?	
16	Continuity of supply	
	What arrangements and procedures are in place to ensure that the gas conveyor is able to maintain a secure supply? How are they used?	
17	Gas pressure at outlet of network	
	What arrangements are in place to monitor gas pressure in networks or systems – particularly at connections and extremities?	
	Are records available? How are these used in the management of the flow of gas? What pressure limits are set and does the system work within those limits?	
18	Supply emergencies	
	Are procedures available to deal with events identified in risk assessments (see paragraph 5 above)?	
	Do the procedures deal with arrangements between the gas conveyor and others who may be involved – e.g. other gas conveyors, suppliers and shippers?	
	Are procedures available where they have been identified in the safety case as being required under a National supply emergency?	
19	Conveying gas which does not comply with GS(M)R regulation 8	
	Do the arrangements follow those described in the safety case? [Not likely to be applicable for most gas conveyors.]	
20	Procedures for discontinuing supply (under a supply emergency)	
	If the gas conveyor relies on the emergency service provider to carry out disconnection then this should be covered in the emergency service provider contract.	
	If however, the gas conveyor carries out its own disconnection (or uses contractors) then the procedures should be reviewed against the safety case.	
	Key issues include:	
	- how does the gas conveyor determine the order in which disconnections take place?	
	- how are vulnerable consumers dealt with?	

	- how are disconnections across an affected area co-ordinated?	
	- how does the gas conveyor ensure that safe disconnection is achieved and maintained?	
	- how does the gas conveyor maintain records of who has been disconnected?	
21	Procedures for restoring gas supplies	
	If the gas conveyor relies on the emergency service provider to carry out restoration of supplies then this should be covered in the emergency service provider contract.	
	If, however, the gas conveyor carries out restoration of supplies itself (or uses contractors) then the procedures should be reviewed against the safety case.	
	Key issues include:	
	- communication arrangements with National Grid and other gas conveyors. -	
	- establishing competence of those carrying out purge and relight operations. -	
	- how will the gas conveyor maintain records of those who have been reconnected?	
	- procedures to be adopted when unable to gain access to properties? -	
	- details of arrangements and actions to be taken if the supply emergency was due to water ingress into the system and has passed beyond the meter in consumer's premises.	

APPENDIX 5 : PRINCIPLES, CONDUCT AND COMPETENCE OF AUDITORS AND AUDITING

The principles contained within BS EN ISO 19011:2002 – may be applied.

Audit principles relating to Auditors are:

- ethical conduct which is characterised by trust, integrity, confidentiality and discretion
- fair presentation which is the obligation to report truthfully and accurately
- due Professional Care which is the application of diligence and judgement.

Audit principles relating to the audit itself are:

- independence
- evidence based, which ensures that conclusions are based only on the audit evidence which in turn is verifiable.

The personal attributes to enable Auditors to act in accordance with the above principles, require the Auditor to be:

- ethical – fair, truthful, sincere, honest and discrete
- open-minded – willing to consider alternative ideas or points of view
- diplomatic – tactful in dealing with people
- observant – actively aware of physical surroundings and activities
- perceptive – instinctively aware of and able to understand situations
- versatile – adjusts readily to different situations
- tenacious – persistent, focused on achieving objectives
- decisive – reaches timely conclusions based upon logical reasoning and analysis
- self-reliant – acts and functions independently whilst interacting effectively with others.

These personal attributes could be said to apply equally to a Professional Gas Engineer governed by IGEM's Code of Professional Conduct.

