

*Utilization Procedures
IGE/UP/9 Edition 2
Communication 1705*

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

Application of Natural Gas and fuel oil systems to gas turbines and supplementary and auxiliary fired burners



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SECTION 1 : INTRODUCTION

- 1.1 These Procedures have been drafted by a Panel appointed by the Institution of Gas Engineers and Managers' (IGEM's) Gas Utilization Committee, subsequently approved by that Committee and published by the authority of the Council of the Institution.
- 1.2 These Procedures supersede IGE/UP/9, Communication 1652, which is obsolete.
- 1.3 These Procedures cover the application of Natural Gas (NG) and fuel oil systems for firing gas turbines and their interactions with gas and oil firing for supplementary and auxiliary fired burners.
- 1.4 The development and application of gas turbines as efficient and reliable power sources is now well proven throughout the world. The high temperature of the exhaust heat and its ability to support combustion of additional fuel with supplementary and auxiliary firing has led to considerable use of turbines in conjunction with waste heat recovery equipment such as boilers, dryers, etc. The rapid start-up process, enabling turbines to accept full load within minutes from a "cold start", and their very high power-to-weight ratio, has popularised their use as standby power and base load generators of electricity.
- 1.5 In contrast to other types of gas and fuel oil fired burners, the start-up, operation and shut-down procedures employed on a turbine are determined by many more factors than merely the need to establish, maintain and control a stable flame. In particular, the inter-dependence of turbine power and combustion air supply, the need to reach a self-sustaining speed rapidly to reduce the depletion of any starter motive power supplies, the avoidance of critical shaft or blade aerofoil resonance and the very rapid flame modulation needed to handle the sudden acceptance and shedding of loads, impose severe restrictions. These restrictions render many of the practices common on other large gas burners impracticable in this application. The high excess air quantities also provide considerable scope for safe deviation from practices used on other burners.
- 1.6 For gas firing, it is vital to consider the system as a whole, including the gas transporter's (GT's) network, meter installation, installation pipework, fuel gas compressor, turbine, supplementary/auxiliary fired burners and other gas users on site. Although, generally, NG is dry, the effect of pipeline conditioning, for example glycol fogging, on the dryness of the gas, needs to be taken into account. For oil firing, it is vital to consider the design of supply pipework, filtration, heating and pumping sets as a whole. No individual component can be specified or finalised in isolation from the rest of the system. Close liaison at an early stage with the fuel and electricity suppliers and between the various equipment suppliers is essential.
- 1.7 Supplementary firing can be by in-duct gas or dual fuel burners or by boiler-mounted dual fuel burners. These Procedures are not intended to cover the specific requirements for fuel oil firing for supplementary/auxiliary burner systems.

Note: The ignition and subsequent operation of oil-fired systems are covered by BS EN 746 Part 2, BS EN 264, BS EN 267 and BS EN 293, as appropriate.

The operating range of burners identified in these Procedures is likely to be wider than the range of operation required to meet emissions criteria. Consequently, tighter tolerances and smaller ranges may be required to meet regulations on emissions and, thus, will not affect gas safety. However, the additional complexities may require special consideration to be given in relation to safe operation.

Procedures for gas compressors and commissioning of gas plant are given in IGE/UP/6 and IGE/UP/4, respectively.

1.8 These Procedures are intended to provide basic guidelines, highlighting the essential features necessary to ensure the safe and reliable use of gas turbines using NG or fuel oil as the principal, or as an alternative or participant, fuel. The very wide range of burner types and configurations employed on different designs necessarily dictates that no single specification can be prepared to cover the details of how these Procedures may be satisfied in all cases. Therefore, the aim is to establish the principal features of relevance to the safety of all installations, to deal in some detail with the techniques most commonly found in practice and, in so doing, to draw the reader's attention to the type of problem areas which may be encountered. In very many cases, the engineer involved will need to examine closely the individual installations with which they are concerned in order to ensure that safety, to an equal or better standard than that outlined, is provided. The details of how this is done are too varied to be specified rigidly and are, in many cases, subject to continuous revision by manufacturers in this very rapidly expanding field of technology. In addition to these Procedures, it is necessary to refer to the manufacturer's instructions.

1.9 These Procedures make use of the terms "should", "shall" and "must" when prescribing particular procedures. Notwithstanding Sub-Section 1.12:

- (a) The term "must" identifies a requirement by law in Great Britain (GB) at the time of publication.
- (b) The term "shall" prescribes a procedure, which, it is intended, will be complied with in full and without deviation.
- (c) 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 ACoPs or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.10 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that improper 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 cognisance be taken of HS(G)48.

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

- (a) Have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement by "responsible engineers".
- (b) Have done everything to ensure, so far as is reasonably practicable, that "responsible engineers" have the knowledge, skills, training, experience and personal qualities necessary for the proper exercise of professional judgement.

- (c) Have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review.
- (d) 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 judgement. When "responsible engineers" are asked to undertake tasks, which deviate from this, they should refer the matter to higher review.

1.12 Notwithstanding Sub-Section 1.11, these Procedures do 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 these Procedures being updated. Amendments to these Procedures will be issued when necessary and their publication will be announced in the Journal of the Institution and other publications as appropriate.

1.13 Requests for interpretation of these Procedures in relation to matters within their scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEM, Charnwood Wing, Ashby Road, Loughborough, Leicester, 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 nor does it relieve any party of any of their statutory obligation.

1.14 Some of the procedures applied within the United Kingdom (UK) gas industry differ when the maximum operating pressure (MOP) exceeds 7 bar, compared to lower pressures. These reflect experience and data gained by custom and practice within the UK over many years.

European Directives and standards use pressure breaks of 100 mbar, 5 bar and 16 bar. IGEM continues to amend its technical publications to reflect these pressure breaks. For the purposes of IGE/UP/9 Edition 2, the pressure break has been increased from 7 bar to 16 bar but there remain specific changes in certain procedures at 7 bar.

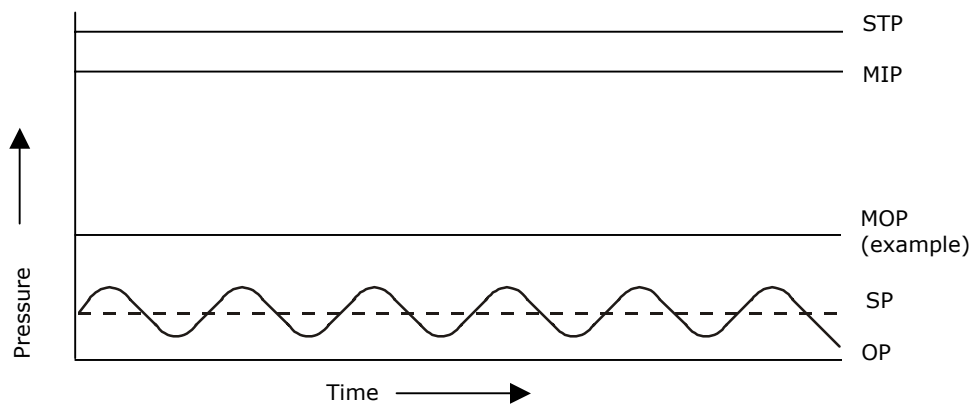
Note: "MOP" and other new terms such as operating pressure (OP) have been introduced to reflect gas pressure terminology used in European standards. Appendix 1 defines these terms and it is possible to equate them to terms used in Edition 1. These terms will arise in all relevant IGEM technical publications in future and, possibly, in other standards.

Referring to Figure 1, note how OP is shown to oscillate about the set point (SP).

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

1.15 These Utilization Procedures were published on 1st October 2004.

They may be used rather than the procedures given in IGE/UP/9 Edition 1 immediately but a lead-in period is allowed permitting the use of Edition 1 until 1st January 2005.



- STP = Strength test pressure
- MIP = Maximum incidental pressure
- OP = Operating pressure
- MOP = Maximum operating pressure
- SP = Set point of the regulator.

Note: This is extracted from IGE/TD/13 and simplified for the purposes of IGE/UP/9 Edition 2.

FIGURE 1 - RELATIVE PRESSURE LEVELS

SECTION 2 : SCOPE

2.1 These Procedures cover the essential safety aspects of the engineering, start-up, operation and shut-down of NG and fuel oil fired gas turbines and associated equipment (typical arrangements are shown in Figures 2, 3 and 4). They are not intended to provide a complete specification for such equipment.

2.2 These Procedures apply to normally distributed NG (a 2nd family gas as defined in BS 1179) and oil fuels as used for firing gas turbines (such fuels as meeting BS 2869 or ASTM D396-80).

They may be used for other gases, for example "landfill gas", "mines gas", "digester gas", liquefied petroleum gas (LPG), LPG/air, refinery gases, etc. and chemical feed-stocks and highly volatile fluids such as naphtha, etc. providing due account is taken of the differences between the fuels and of any related safety issues.

Note: Appendix 4 gives details of the constituents of typical Natural Gas.

2.3 These Procedures apply to fixed and to mobile gas turbines for continuous and standby duties, for example in factories, power stations and gas compression systems.

Turbines used for vehicular propulsion or used offshore are not covered. However, the general principles outlined in these Procedures may be used as guidance.

2.4 These Procedures apply to:

- both single and multi-shaft turbine types
Note: In this context, "shaft" relates to the turbine and not to the alternator. The term "spool" is a commonly used alternative.
- both single and multiple burner types
- turbines exhausting to heat recovery equipment, with or without supplementary and/or auxiliary fired burners, which may or may not have air supplies other than the engine exhaust. Those having independent air supplies are also considered as auxiliary fired.

2.5 These Procedures apply to gas turbines supplied directly from a "high" pressure gas supply and to those supplied via a gas compressor.

Note 1: Procedures for gas compressors are provided in IGE/UP/6.

Note 2: Procedures for spark ignition and dual fuel reciprocating engines are provided in IGE/UP/3.

2.6 Metric standard conditions apply, unless otherwise specified.

2.7 All pressures are gauge pressures, unless otherwise stated.

2.8 All fuel inputs are given net unless otherwise stated.

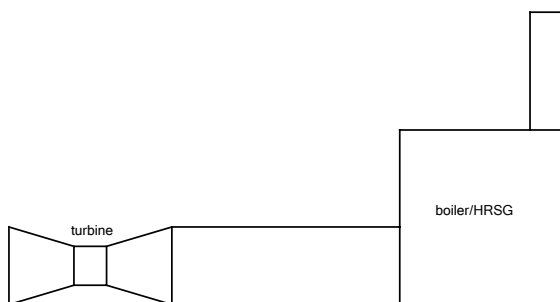
Note: The ratio of gross to net input is, approximately, 1.1:1, 1.09:1 and 1.08:1 for appliances on Natural Gas/Towns Gas, propane and butane respectively. For the purposes of these Procedures, where gross heat inputs represent requirements of existing Standards, they are converted to net using a conversion factor of 1.1 in all cases. For example, 600 kW gross input = $600 \div 1.1 = 545$ kW net input for Natural Gas.

2.9 The term "turbine(s)" refers to "gas turbine(s)" throughout, unless otherwise stated.

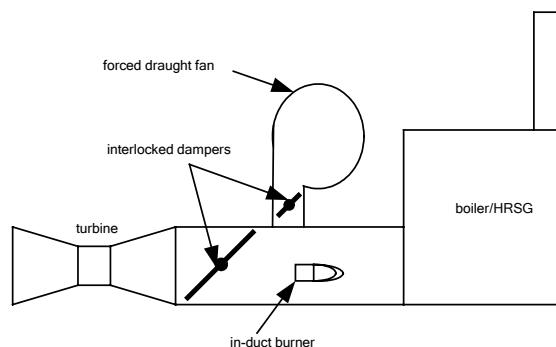
2.10 Italicised text is informative and does not represent formal Procedures.

2.11

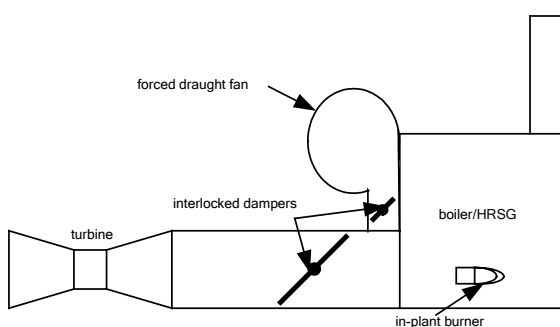
Appendices are informative and do not represent formal Procedures unless specifically referenced in the main sections via the prescriptive terms "should", "shall" or "must".



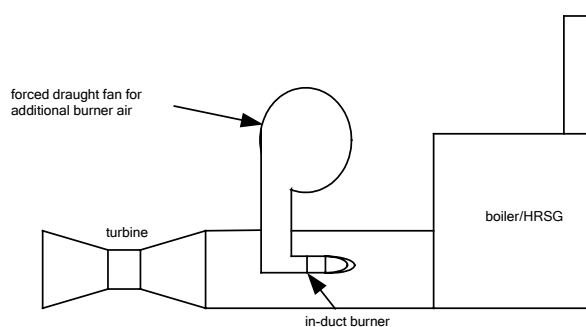
(a) Simple, unfired



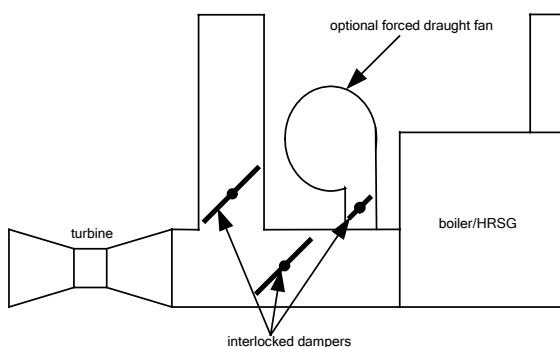
(b) In-duct, auxiliary fired



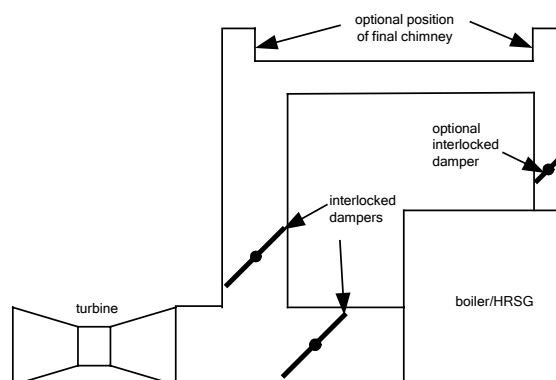
(c) Auxiliary fired in plant



(d) Supplementary fired with optional fan



(e) With turbine by-pass and separate plant flue and optional forced draught fan



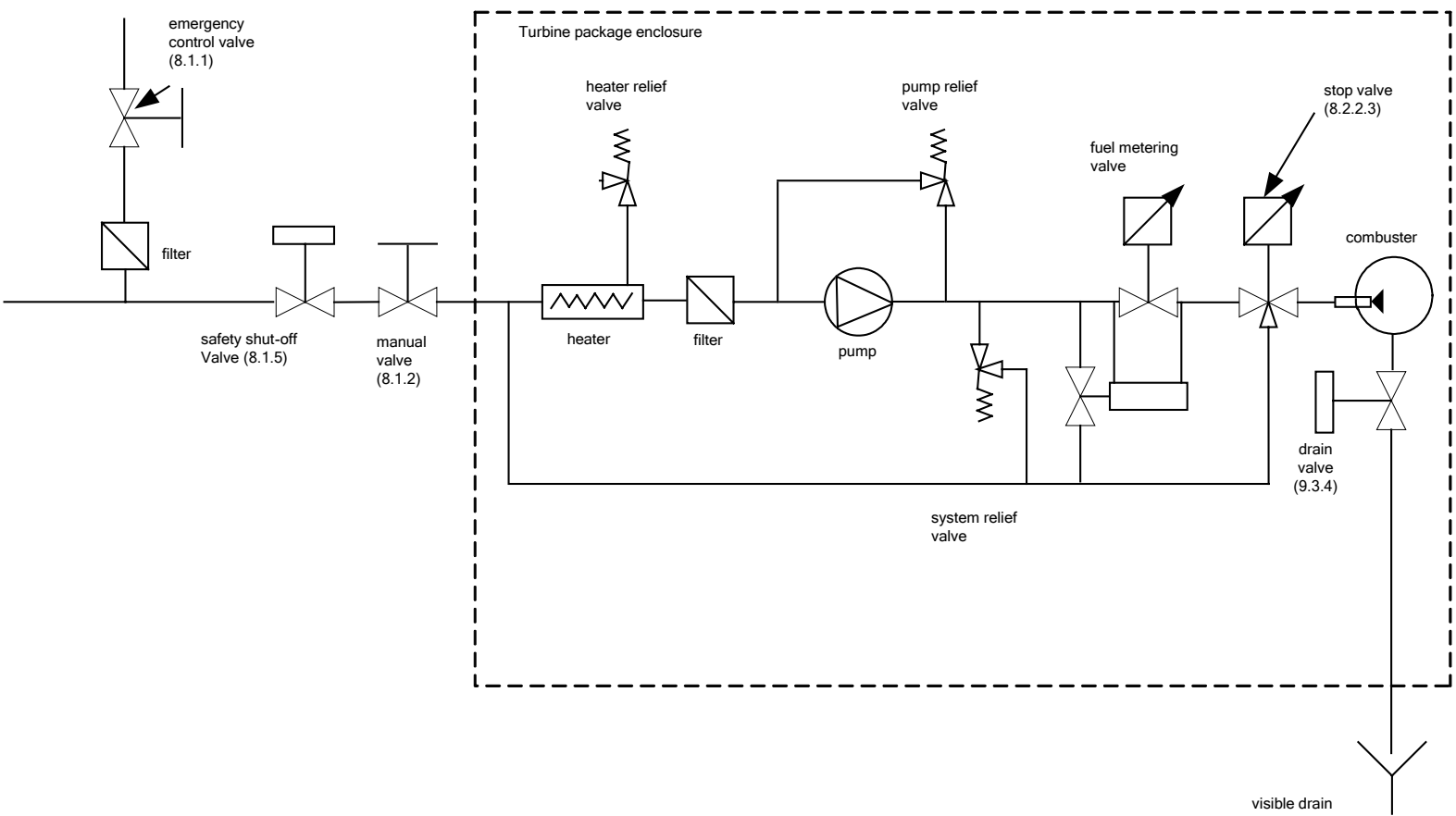
(f) As (e) but with common exhaust from by-pass stack and plant flue

FIGURE 2 - TYPICAL CHP INSTALLATIONS



Note: Cross references denote related clause in these Procedures

FIGURE 3 - SIMPLIFIED GAS FUEL SCHEMATIC FOR A TYPICAL TURBINE INSTALLATION WITH A GAS FIRED BOILER



Note: Cross references denote related clause in these Procedures.

FIGURE 4 - SIMPLIFIED LIQUID FUEL SYSTEM SCHEMATIC

SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

These Procedures are set out against a background of legislation in force in GB and the UK, as appropriate, at the time of publication. Similar considerations are likely to apply in other countries and reference to the appropriate national legislation will be necessary. The following legal and allied considerations outlined are particularly relevant to turbines.

Appendix 2 lists relevant legislation, standards, guidance notes, etc. Where British Standards, etc. are quoted, equivalent national or international standards etc. equally may be appropriate.

3.1 EUROPEAN LEGISLATION

Due account must be taken of relevant European Directives and enforcing Regulations etc. as they become statute including:

- Pressure Equipment Directive implemented in the UK by The Pressure Equipment Regulations (PER) and The Pressure Systems (Safety) Regulations (PSSR)
- Machinery Directive implemented in the UK by The Supply of Machinery (Safety) Regulations
- Construction Products Directive implemented in the UK by The Construction Products Regulations
- Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – The ATEX Equipment Directive- implemented in the UK by The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations
- Safety and Health Protection of Workers Potentially at Risk from Explosive Atmospheres - The ATEX Workplace Directive – implemented in the UK by The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).

3.2 UK LEGISLATION

3.2.1 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 other persons such as members of the public who may be affected by the work activity.

3.2.2 Management of Health and Safety at Work Regulations (MHSWR)

In addition to specific duties under GS(I&U)R (see clause 3.2.8), 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.

3.2.3 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.

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

More information on the Regulations can be found in HS(L)22. Free leaflets include INDG 291 and INDG 229.

3.2.4 Pressure Equipment Regulations (PER)

These Regulations are intended to cover the placing on the market and the putting into use of pressure equipment. The Regulations deal with the manufacture, design and supply of pressure equipment. They impose duties on the responsible person.

Note 1: A "responsible person" is defined as "the manufacturer or his authorised representative established within the Community; or where neither the manufacturer nor his authorised representative is established within the Community, the person who places the pressure equipment or assembly on the market or puts it into service as the case may be."

Note 2: "Pressure equipment" is defined as "vessels, piping, safety accessories and pressure accessories; where applicable, pressure equipment includes elements attached to pressurised parts, such as flanges, nozzles, couplings, supports lifting lugs and similar."

Note 3: The duties on the "responsible person" are to ensure that pressure equipment:

- satisfies the relevant essential requirements*
- has undergone the relevant conformity assessment procedure, if applicable*
- has had the CE mark affixed by the manufacturer, if applicable*
- has had the declaration of conformity drawn up by the manufacturer that the equipment is, in fact, safe.*

Note 4: Not all pressure equipment is covered by PER. There are 21 categories of exceptions, detailed in Schedule 1 of PER.

Note 5: The relevant conformity assessment procedure is determined by the classification of the pressure equipment according to criteria laid down in the Regulations. The classification system results in equipment being placed in one of five categories depending on the inherent level of hazard within the system.

The category then determines the range of conformity assessment modules relevant to that equipment. The modules are designed to allow the manufacturer to choose between a quality assurance route or type testing.

3.2.5 Pressure Systems Safety Regulations (PSSR)

3.2.5.1 These Regulations 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).

3.2.5.2 Relevant fluids for the purpose of this document would be NG at a pressure greater than 0.5 barg (above atmospheric pressure) or LPG (which is a liquid with a vapour pressure greater than 0.5 barg at ambient temperature). A pressure system would include bulk storage tanks, pipelines and protective devices but not an LPG cylinder (transportable pressure receptacle). 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 the Regulations. 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.

Note the special requirements placed on protective devices in such systems (see para 110b of HS(L)22. The regulations also apply to pipelines and its protective devices in which the pressure exceeds 2 barg (see Sch 1 part 1 item 5 of HS(L)22.

3.2.5.3 More information is available in HS(L)122 and some information is presented in the HSE free leaflets INDG 261 and INDG 178.

3.2.5.4 Safe operating limits of plant, belonging both to the user and the GT, must be established. These limits must determine the "weakest link" and protect against failure.

Note: Formal communications, between the user and the GT, need to be established and a division of responsibility understood clearly by both parties. The MAM may need to be consulted with regard to the meter installation.

3.2.5.5 Information must be exchanged concerning safe operating limits and schemes of examination for protective devices, to ensure that both parties are aware of each other's limitations and, consequently, the safe operating limits.

3.2.5.6 There are many exceptions and partial exceptions to the regulations, which are detailed in Schedule 1 Parts 1 and 2.

Note: A schematic diagram showing division of responsibility is recommended.

3.2.6 **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.

They 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.

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

Note: A "Memorandum of Guidance on the Electricity at Work Regulations, 1989" is published by HMSO and gives useful information on the Regulations.

3.2.7 **Noise at Work Regulations**

Under these Regulations, the employer is required to identify any potential injurious noise sources and carry out an assessment when an employee is exposed to a level of noise in excess of the first action level of a daily personal exposure of 85 dB(A). Action is then required to reduce noise at source so far as is reasonably practicable. Only then can consideration be given to hearing protection. A duty is also placed on manufacturers and suppliers to provide information on the noise likely to be generated by their product.

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

3.2.8.1 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. They may not apply to installations in factories but it is recommended that their intent is adopted in all cases.

3.2.8.2 GS(I&U)R address both NG and LPG.

3.2.8.3 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.

- 3.2.8.4 GS(I&U)R define the gas supplier for both NG and LPG and HS(L)56 provides guidance on those definitions, in particular for the more complicated case of LPG supplied from tanks and from cylinders.
- 3.2.8.5 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", i.e. Council for Registered Group Installers (CORGI) registered.
- 3.2.8.6 The installer 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 installer 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 installer must inform both the landlord/hirer, as well as the user, so that such faults can be rectified before further use.
- 3.2.8.7 The Regulations with respect to fuel gas systems, also require:
- the fitting and maintenance of a supply protection device
 - the need to avoid affecting adversely the upstream network.
- 3.2.8.8 The user must provide adequate protection for the upstream network as required by the GT. This includes protection against excess reverse pressures, low inlet pressures, large rates of change of flow and undue pressure/flow perturbations. The GT is permitted to demand suitable protection.

Note1: If a gas compressor, or any apparatus for using compressed air or extraneous gas is being proposed there is a legal duty to notify the GT of this intention not less than 14 days prior to its use. The GT may give direction as to the type and arrangement of any anti-fluctuation valves it may require. Failure to meet the requirements of the in this respect can lead to disconnection of supply. Compliance with the relevant requirements of these Regulations should be sufficient in most cases.

Note 2: It is essential that the fuel supplier is advised of the anticipated transient flow variations in order that they can be checked for compatibility with the gas metering/supply system.

Note 3: At the time of publication, these Regulations are under major review by the HSE.

Note 4: HS(L)56 and CoP 20 are also relevant.

Note 5: To meet the requirements of the HSWA, persons need to be experienced to perform their work safely.

- 3.2.8.9 GS(I&U)R place responsibilities on LPG suppliers to deal with escapes of LPG. For NG, the Gas Safety (Management) Regulations (GS(M)R) apply.

Note: Advice on dealing with gas escapes is contained in IGE/SR/20.

3.2.9 **Confined Spaces Regulations**

In general, an acoustic enclosure used for a turbine is an enclosed space for the purposes of these Regulations.

These Regulations apply to a whole range of confined spaces. The supplier or designer 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 avoid entry into confined spaces unless avoidance is not reasonably practicable and there is a system of work which renders the work safe. They are also required to have specific emergency arrangements in place.

Employers need to:

- establish safe systems of work for entry to, or carrying out work in, or leaving, a confined space that renders the activities safe and without risks to health
- establish suitable and sufficient arrangements for rescue of people in the confined space in the event of an emergency
- ensure compliance, so far as is reasonably practicable, with the provisions of the Regulations in respect of any work carried out by employees, or other people within the employer's control.

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

These Regulations impose duties on designers, clients (and their agents), developers, planning supervisors and principal contractors. Not all the regulations apply to all construction projects. Further information is given in HS(G)224. For a notifiable project (as defined in CDM) the planning supervisor must notify HSE before construction work commences. Construction includes the alterations, repair, redecoration, maintenance, de-commissioning or demolition of a structure. It also covers installation, commissioning maintenance or removal of gas services.

3.2.11 **Supply of Machinery (Safety) Regulations**

These Regulations set out "essential requirements" written in general terms, which must be met by manufacturers/suppliers before a product may be supplied within the European Community. European standards provide the detail on the essential requirements. Machinery, as defined, once having been verified against the relevant standards, can then be affixed with the CE mark. The manufacturer or importer will have to be able to assemble a technical file detailing information on the health and safety considerations which went into the design of the product.

3.2.12 **Regulations to implement ATEX Directives**

The ATEX Directives provide an integrated regime for the design, selection, testing and use of equipment in hazardous areas, and for the prevention of explosions thereby. There are two sets of regulations, to implement these directives.

3.2.12.1 **The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations**

The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations place duties on the suppliers of equipment who must ensure that it complies with the essential health and safety requirements, generally by compliance with the relevant harmonised European standards, prior to CE marking.

3.2.12.2 **The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)**

These Regulations are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. The regulations require that risks from dangerous substances are assessed, eliminated or reduced. They 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. and regulations also require the identification of pipelines and containers containing hazardous substances.

The following publications contain details of the regulations and their application:

- HS(L)138
- HS(L)137
- HS(L)136
- HS(L)135
- HS(L)134
- INDG 370.

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

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

3.2.13.2 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 Natural Gas and the filler, importer or supplier for LPG.
- Dangerous gas fittings (as defined in RIDDOR) should be reported by a "member of class of persons".

3.2.13.3 Major injuries, death and dangerous occurrences must be notified immediately, for example by telephone, to the enforcing authority by the "responsible person" as defined by RIDDOR. Report can be made to the Incident Contact Centre by:

- telephone on 0845 300 9923
- fax on 0845 300 9924
- email to riddor@natbrit.com
- internet at www.riddor.gov.uk or
- via a link from HSE website at www.hse.gov.uk.

It is also possible to report to the local HSE office by telephone and then follow up with a written report on the correct F2508 form within the required timescale (10 days, or 14 days for dangerous gas fittings). Other reports should be made as soon as practicable and within 10 days of the incident.

3.2.13.4 HS(L)73 contains detailed guidance on RIDDOR, including a full list of injuries etc. that need reporting. The HSE leaflets (HS(E)61 (rev 1) and MISC 310 give some information on RIDDOR and how to report.

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

3.2.14.1 These Regulations, which reinforce existing statutory obligations under HSWA, impose a duty on employers to protect employees against risks to health, whether immediate or delayed, arising from exposure to substances hazardous to health, either used or encountered, as a result of a work activity. They also impose certain duties on employees.

3.2.14.2 Under COSHH, work must not be carried out which is liable to expose employees to hazardous substances unless the employer has made a suitable and sufficient assessment of the risk created by the work and the steps that need to be taken to comply with the Regulations. After assessing the risk, it is necessary to inform employees of the risks and to carry out the appropriate training and instruction to ensure the risks are minimised. In certain cases, control measures

such as ventilation or personal protective equipment may be necessary and, where provided, they must be used.

3.2.15 **Control of Asbestos at Work Regulations**

3.2.15.1 These Regulations set out standards for the identification, monitoring and assessment of work that may expose workers to asbestos and the measures needed to control the risk.

3.2.15.2 Employers cannot carry out any work that exposes, or is likely to expose, employees to asbestos unless an assessment of that exposure has been made. Employers have to set out steps to be taken to prevent, or reduce to the lowest level reasonably practicable, that exposure. Employers have to carry out medical surveillance of employees if they work over a certain time limit.

3.2.15.3 The Regulations impose a duty on those with responsibilities for the repair and maintenance of non-domestic premises to find out if there are, or may be, asbestos containing materials within them; to record the location and condition of such materials and assess and manage any risk from them, including passing of any information about their location and condition to anyone likely to disturb them. There is an 18 month lead in period for this duty.

3.2.15.4 Further information is available in HS(G)227. Other ACoPs associated with these Regulations are HS(L)27 and HS(L)28.

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

3.2.16.1 GS(M)R place specific duties on GTs, or their emergency service providers (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.

3.2.16.2 The ESP has specific duties to:

- to provide a continuously staffed and free telephone service to enable persons to report gas escapes and
- to 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 GTs to notify the ESP should they, rather than the ESP, receive a report of an escape from the consumer.

Note: The regulations refer to BG plc having these specific duties but BG plc no longer exists. National Grid Transco plc is the entity that currently provides these services.

3.2.16.3 GS(M)R require GTs to investigate fire and explosion incidents upstream of the emergency control valve (ECV) and to send a report of the investigation to HSE. GTs 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 installation pipework.

3.2.16.4 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: Advice on dealing with gas escapes is contained in IGE/SR/20.

3.2.17 **The Construction Products Regulations (CPD)**

The CPD applies to construction products, which are placed on the market and produced for incorporating in a permanent manner in construction works (which includes both building and civil engineering works). The essential requirements are: mechanical; safety and stability; safety in case of fire; hygiene, health and environment; safety in use; protection against noise; energy economy and heat retention.

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SECTION 4 : ARRANGEMENT OF PLANT

Typical plant arrangements are shown in Figures 2, 3 and 4.

- 4.1 There shall be adequate space surrounding all plant and control equipment to allow proper access for maintenance and repair.

Note: Generally, plant rooms provide better access for maintenance than acoustic enclosures but widen the scope of potentially hazardous areas.

- 4.2 In an indoor location, it shall be ensured that sufficient air is available for combustion and for ventilation, both while the plant is running and during shut-down.

- 4.3 A turbine may be fitted with an acoustic hood, weather protection canopy or similar structures. These shall be designed to ensure suitable ventilation for cooling and the dilution of any minor gas leak.

- 4.4 Any stationary turbine shall be fixed securely to its mountings. If used, vibration isolation mounts shall not permit movement in excess of normal vibration.

Note: It is recommended that vibration sensors are fitted to a turbine to shut it down in the event of excess levels of vibration which might lead to failure of any part of the system and gas pipework.

- 4.5 During the design of plant layout, consideration shall be given to the effects of a catastrophic turbine failure on nearby plant gas pipework and controls. Any necessary measures identified, to mitigate or contain the effects of catastrophic failure, shall be provided.

- 4.6 Hazardous area classification shall be considered during the design stage of the installation (see IGE/SR/25 and BS EN 60079-10).

- 4.7 If more than one turbine exhausts into a common chamber, special consideration shall be given to the design and to operational requirements.

- 4.8 Plant design layout shall take account of means of egress in an emergency.

- 4.9 Any plant room shall be constructed to comply with The Building Regulations for England and Wales, The Building Standards (Scotland) Regulations or The Building Regulations (Northern Ireland), as appropriate, and with particular respect to satisfying the minimum provisions of the relevant part of BS 476, in that, in the event of fire:

- the load bearing elements of construction shall have a 30 minute [60 minutes in Scotland] load bearing capacity
- the construction shall have at least a 30 minute [60 minutes in Scotland] integrity
- any constructional insulation shall have at least a 30 minute [60 minutes in Scotland] performance.

Note: For further information, see Approved Document B of The Building Regulations for England and Wales, and The Building Standards (Scotland) Regulations, and Technical Booklet Part E for The Building Regulations (Northern Ireland, as appropriate).

- 4.10 Consideration shall be given to the consequences of a major gas or oil leak from any appliance or associated pipework.

Note 1: A major gas leak could lead to a catastrophic failure of the plant room and to major physical damage to any building containing the plant room and to nearby buildings. Certain locations and plant constructions, for example basement plant rooms, fully enclosed reinforced concrete plant rooms, mid position plant rooms in high rise buildings, etc., require additional safety precautions for the affected supplies.