

BS 6891:2015+A1:2019



BSI Standards Publication

**Specification for the installation and
maintenance of low pressure gas
installation pipework of up to 35 mm
(R1¼) on premises**

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 November 2015. It was prepared by Panel GSE/30/-/3, *Domestic installation pipes*, under the authority of Technical Committee GSE/30, *Gas Installations (1st, 2nd and 3rd family gases)*. A list of organizations represented on this committee can be obtained on request to its secretary.

NOTE 1 The standard now covers the main installation requirements for 3rd family gas installations that were previously covered by BS 5482-1.

NOTE 2 The general installation requirements for 3rd family gas installations specified in this standard also apply to gas installations supplied with LPG/air mixtures used in the Channel Islands or the Isle of Man, provided:

- *any gas equipment being installed has been appropriately converted and is suitable for the gas being supplied; and*
- *the requirements of the standard do not conflict with local regulations or authorized local custom and practice.*

Supersession

BS 6891:2015+A1:2019 supersedes BS 6891:2015, which is withdrawn.

BS 6891:2015 superseded BS 6891:2005+A2:2008, which has been withdrawn, and partially superseded BS 5482-1:2005, which has been partially withdrawn.

Information about this document

In this revision, the layout of the standard has been modified to follow the systematic approach adopted in other gas installation standards. The revision provides an update of the previous edition and has been updated to reflect changes in installation practice and legislation, and align with other appropriate standards. A number of other safety initiatives have also been included that have not previously been covered elsewhere in detail. The opportunity has also been taken to combine the pipework requirements for 2nd and 3rd family gas (natural gas and LPG) installations into a single standard for use by the gas industry.

Text introduced or altered by Amendment No. 1 is indicated in the text by the tags  . Minor editorial changes are not tagged.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Users of this British Standard are advised to consider the desirability of selecting products for which independent quality assurance certification against the appropriate product manufacture standard has been obtained.

Presentation conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in notes in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this British Standard cannot confer immunity from legal obligations.

Attention is drawn to the following statutory regulations:

- The Gas Safety (Installation and Use) Regulations 1998 [[1](#)];
- The Gas Safety (Installation and Use) (Northern Ireland) Regulations 2004 [[2](#)];
- The Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) (Isle of Man) Order 1996 [[3](#)];
- The Health and Safety (Gas) (Guernsey) Ordinance 2006 [[4](#)];
- The Building Regulations 2010 (England and Wales), as amended [[5](#)];
- The Building Regulations (Northern Ireland) 2012 [[6](#)];
- The Building (Scotland) Regulations 2004, as amended [[7](#)];
- The Gas Safety (Management) Regulations 1996 [[8](#)];
- The Gas Safety (Management) Regulations (Northern Ireland) 1997 [[9](#)].

1 Scope

This British Standard specifies the design, installation, commissioning and maintenance of gas installation pipework carrying 2nd and 3rd family gas of up to 35 mm (R 1¼) on premises, including residential park homes (2nd and 3rd family gas) and caravan holiday homes (2nd family gas) (see [Table 1](#) and examples in [Figure 1](#) to [Figure 3](#); see also [Figure 4](#)).

NOTE 1 The principles of the standard can also be applied to the design, installation, commissioning and maintenance of gas installation pipework carrying 1st family gas.

NOTE 2 [Annex A](#) gives a method for calculating pipe sizes. [Annex B](#) discusses the sulfidation of natural gas installations, while [Annex C](#) summarizes the conclusions of a report on gas in intermediate floors. Guidance on determining whether an area can be deemed a “protected area” is given in [Annex D](#). Requirements for LPG final stage regulator and safety devices are specified in [Annex E](#). [Annex F](#) discusses the need for gas pipework design and installation for commercial installations to satisfy regulatory requirements regarding explosive atmospheres.

This British Standard is not applicable to:

- a) service pipework and distribution systems;
- b) pipework contained within an appliance;
- c) bulk storage vessels;
- d) LPG pipework installed in leisure accommodation vehicles and for accommodation purposes in vehicles in accordance with BS EN 1949;
- e) boats, yachts and other vessels;
- f) gas pipework supplying or within appliances having their own gas supply, such as mobile heaters; or
- g) gas pipework supplying or within catering establishments covered by BS 6173.

Table 1 — Pipework covered by BS 6891

Gas type	Pipework	Maximum nominal diameter ^{A)}	Nominal operating pressure mbar ^{B)}
2nd family (NG)	Downstream of the primary meter installation, but not downstream of the inlet of any appliance isolation valve or the inlet of the self-sealing connector of any flexible connection	R1¼ steel, DN 35 ^{A)}	21
3rd family (LPG)	Downstream of: - the emergency control valve (ECV) located on the outside of the property where no meter is fitted; or - the outlet of the final regulator where this is located downstream of the ECV; or - the outlet of the final regulator where this is located downstream of any cylinders and there is no ECV; or - the primary meter installation, but not downstream of the inlet of any appliance isolation valve or the inlet of the self-sealing connector of any flexible connection.	R1¼ steel, DN 35 ^{A)}	37 (propane) 28 (butane)

A) Dependent upon material type.

B) 1 bar = 105 N/m² = 100 kPa.

NOTE Unless stated otherwise:

a) the diameter for pliable corrugated (stainless-steel) tubing refers to the inside diameter; and

b) the diameter for carbon, stainless-steel tubing, copper and polyethylene (PE) refers to the outside diameter.

Figure 1 — 2nd family gas installation with an internal meter

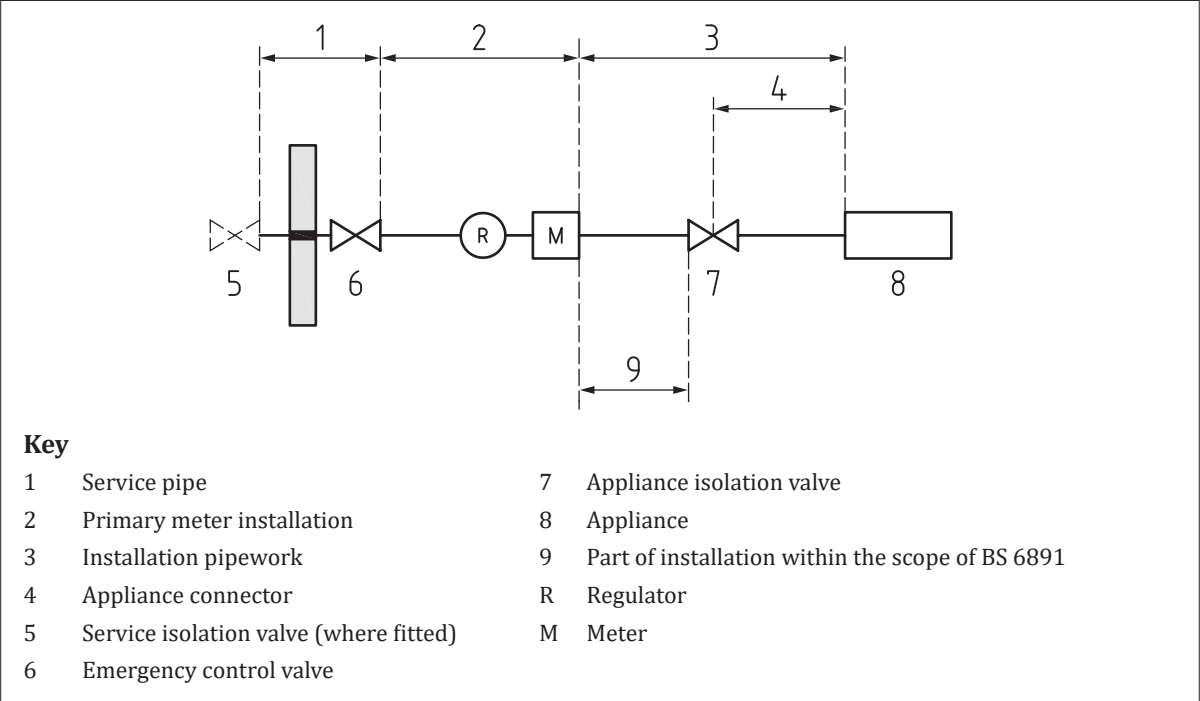


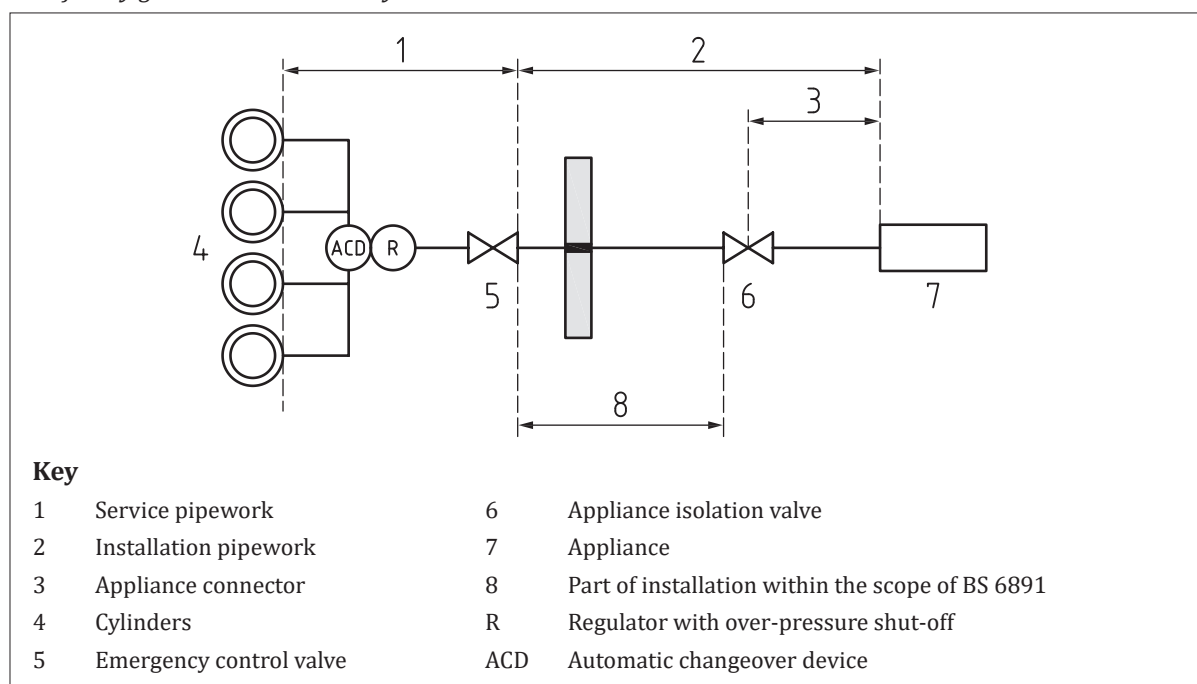
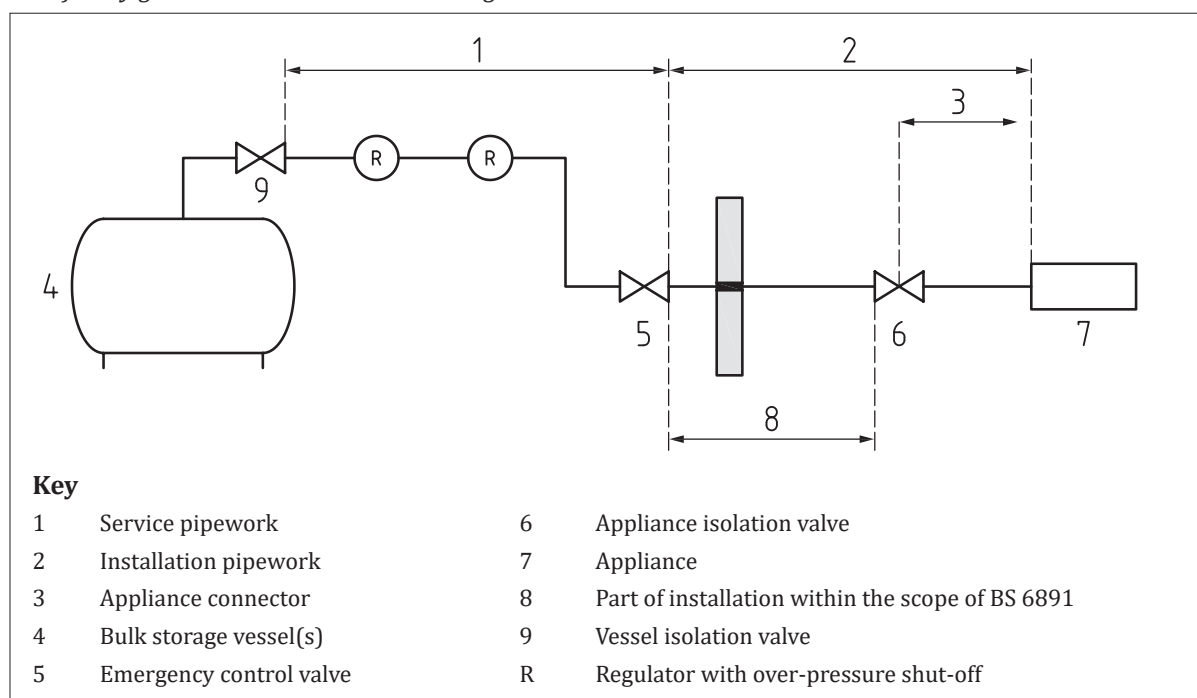
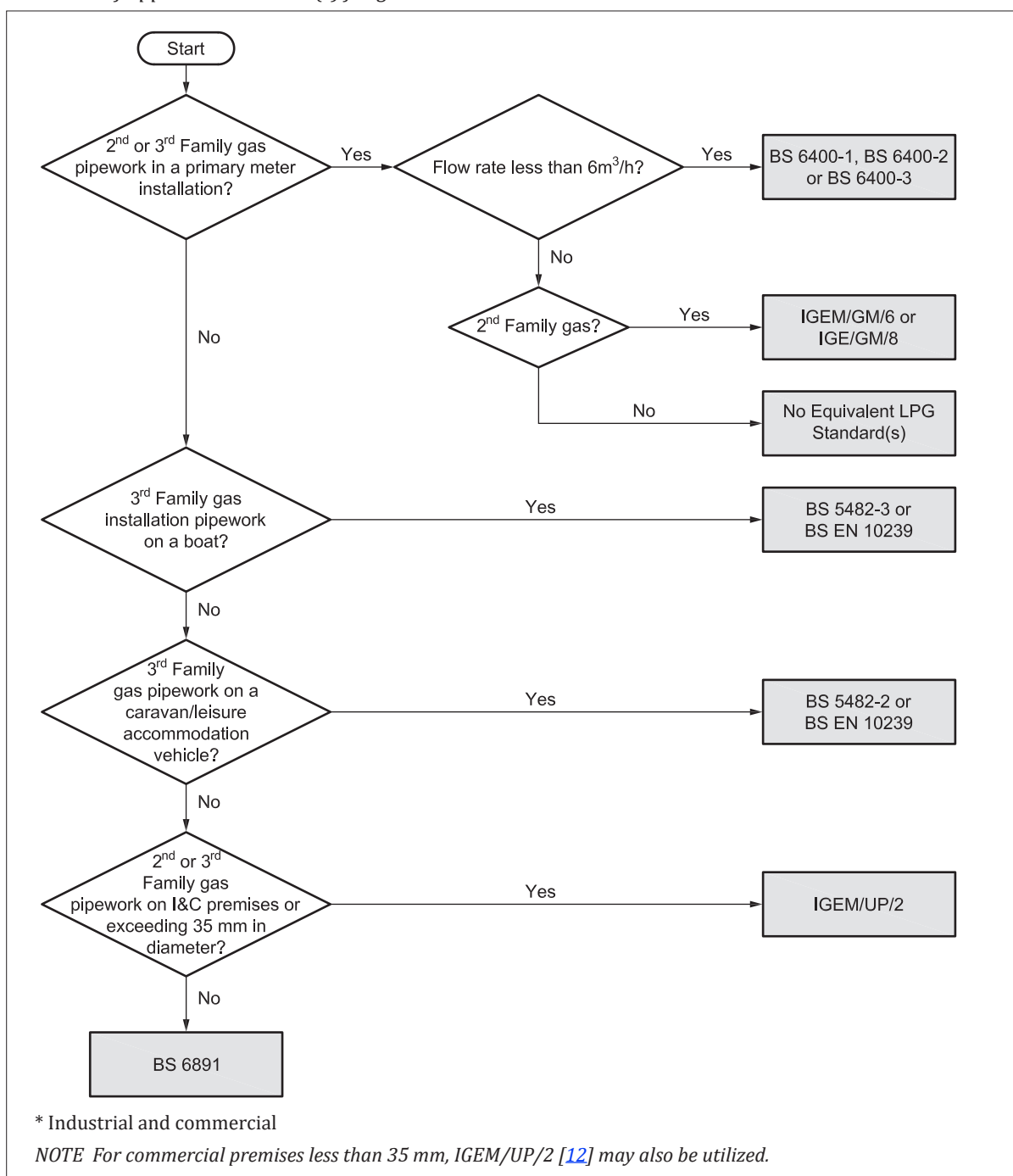
Figure 2 — 3rd family gas installation with cylinders**Figure 3** — 3rd family gas installation with bulk storage vessels

Figure 4 — Selection of applicable standard(s) for gas installations

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 21, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)*

BS 143, and 1256, *Threaded pipe fittings in malleable cast iron and cast copper alloy*

BS 669-1, *Flexible hoses, end fittings and sockets for gas burning appliances — Part 1: Specification for strip-wound metallic flexible hoses, covers, end fittings and sockets for domestic appliances burning 1st and 2nd family gases*

BS 669-2, *Flexible hoses, end fittings and sockets for gas burning appliances — Part 2: Specification for corrugated metallic flexible hoses, covers, end fittings and sockets for catering appliances burning 1st, 2nd and 3rd family gases*

BS 864-2, *Capillary and compression tube fittings of copper and copper alloy — Part 2: Specification for capillary and compression fittings for copper tubes*¹

BS 1552, *Specification for open bottomed taper plug valves for 1st, 2nd and 3rd family gases up to 200 mbar*

BS 3016, *Specification for pressure regulators for liquefied petroleum gases*¹

BS 3212, *Specification for flexible rubber tubing, rubber hose and rubber hose assemblies for use in LPG vapour phase and LPG/air installations*

BS 4371, *Specification for fibrous gland packings*

BS 5114, *Specification for performance requirements for joints and compression fittings for use with polyethylene pipes*¹

BS 6172, *Installation and maintenance of domestic gas cooking appliances (2nd and 3rd family gases) — Specification*

BS 6362, *Specification for stainless steel tubes suitable for screwing in accordance with BS 21 'Pipe threads for tubes and fittings where pressure-tight joints are made on the threads'*

BS 6400-1, *Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m³/h — Part 1: Low pressure (2nd family gases)*

BS 6400-2, *Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m³/h — Part 2: Medium pressure (2nd family gases)*

BS 6400-3, *Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m³/h — Part 3: Low and medium pressure (3rd family gases)*²

BS 6501-1, *Metal hose assemblies — Part 1: Guidance on the construction and use of corrugated hose assemblies*

BS 6956, *Jointing materials and compounds*

BS 7624, *Installation and maintenance of domestic direct gas-fired tumble dryers of up to 6 kW heat input (2nd and 3rd family gases) — Specification*

BS 7671, *Requirements for electrical installations — IET wiring regulations*

BS 7838, *Specification for corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN 50*

BS 8537, *Copper and copper alloys — Plumbing fittings — Specification for press ends of plumbing fittings for use with metallic tubes*

BS EN 331, *Manually operated ball valves and closed bottom taper plug valves for gas installations in buildings*

BS EN 751-1, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds*

¹ Withdrawn.

² This standard also gives informative references to BS 6400-3:2007.

- BS EN 751-2, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds*
- BS EN 751-3, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes*
- BS EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*
- BS EN 1254-1, *Copper and copper alloys — Plumbing fittings — Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes*
- BS EN 1254-2, *Copper and copper alloys — Plumbing fittings — Part 2: Fittings with compression ends for use with copper tubes*
- BS EN 1254-4, *Copper and copper alloys — Plumbing fittings — Part 4: Fittings combining other end connections with capillary or compression ends*
- BS EN 1254-5, *Copper and copper alloys — Plumbing fittings — Part 5: Fittings with short ends for capillary brazing to copper tubes*
- BS EN 1555-1, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*
- BS EN 1555-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*
- BS EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*
- BS EN 1775:2007, *Gas supply — Gas pipework for buildings — Maximum operating pressure less than or equal to 5 bar — Functional recommendation*
- BS EN 10216-1, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*
- BS EN 10216-2, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties*
- BS EN 10216-5, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 5: Stainless steel tubes*
- BS EN 10217-1, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*
- BS EN 10217-2, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties*
- BS EN 10217-7, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 7: Stainless steel tubes*
- BS EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*
- BS EN 10241, *Steel threaded pipe fittings*
- BS EN 10242 (all parts), *Threaded pipe fittings in malleable cast iron*
- BS EN 10255, *Non-alloy steel tubes suitable for welding and threading — Technical delivery conditions*
- BS EN 10312, *Welded stainless steel tubes for the conveyance of aqueous liquids including water for human consumption — Technical delivery conditions*

BS EN 12864, *Low-pressure, non adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar, with a capacity of less than or equal to 4 kg/h, and their associated safety devices for butane, propane or their mixtures*³

BS EN 13349, *Copper and copper alloys — Pre-insulated copper tubes with solid covering*

BS EN 13785, *Regulators with a capacity of up to and including 100 kg/h, having a maximum nominal outlet pressure of up to and including 4 bar, other than those covered by EN 12864 and their associated safety devices for butane, propane or their mixtures*³

BS EN 13786, *Automatic change-over valves having a maximum outlet pressure of up to and including 4 bar with a capacity of up to and including 100 kg/h, and their associated safety devices for butane, propane or their mixtures*³

BS EN 15069, *Safety gas connection valves for metal hose assemblies used for the connection of domestic appliances using gaseous fuel*

BS EN 15266, *Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0.5 bar*

BS EN 16129, *Pressure regulators, automatic change-over devices, having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg/h, associated safety devices and adaptors for butane, propane, and their mixtures*

BS EN 16436-1, *Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixture in the vapour phase — Part 1: Hoses and tubings*

BS EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

BS EN ISO 10380, *Pipework — Corrugated metal hoses and hose assemblies*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 additional emergency control valve (AECV)

valve, not being the emergency control valve (ECV), for shutting off the supply of gas in an emergency, intended for use by a gas consumer

NOTE An AECV might not isolate all the gas consumer's gas installation.

3.2 appliance isolation valve

manual valve to shut off the gas supply to an individual appliance

3.3 basement

part of a building that is partly or wholly underground

NOTE For the purposes of this definition, a room which is built into a hillside is not considered partially underground if at least one (outside) wall of the room is at the same level or at a higher level than the area outside. Additionally, the area outside should not itself be considered to be at a lower level than the wider topography. The ultimate test should be that if an LPG leak occurred in such a room, it could disperse safely to outside (and away) rather than build up either in the room, in other areas of the building or in the immediate area outside the room.

³ Current, though superseded by BS EN 16129.

3.4 bulk storage vessel

permanently-installed vessel for the storage of LPG under pressure, which is filled in situ

3.5 caravan holiday home

transportable leisure accommodation vehicle that does not meet the requirements for construction and use of road vehicles, that retains means for mobility and is for temporary or seasonal occupation

[SOURCE: BS EN 1949:2011+A1:2013, 3.4]

3.6 compartment floor

floor that separates one dwelling from the rest of the building

3.7 concrete slab

cast in situ concrete which forms the structural load bearing part of a floor

3.8 cylinder

portable and refillable cylinder/vessel containing LPG under pressure

3.9 duct

enclosed space specifically designed and constructed for the passage of building services

3.10 electrofusion joint

joint formed between polyethylene components using fittings which have an integrated electric heating element

[SOURCE: BS EN 1775:2007, 3.4.5]

3.11 emergency control valve (ECV)

valve, not being an additional emergency control valve (AECV), for shutting off the supply of gas in an emergency, intended for use by a gas consumer and installed at the end of a service or service pipework

3.12 fire compartment

building or part of a building comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire to or from another part of the same building

NOTE A roof space above the top storey of a fire compartment is included in the compartment where the walls of that compartment extend up to the roof line.

3.13 floor screed

mix of, typically, sand and cement used as a non-structural floor finish/topping

3.14 installation pipework

pipework or fitting from the outlet of the primary meter installation or, for LPG installations where no meter is fitted, the outlet of the ECV to points at which appliances/equipment are to be connected

NOTE This definition varies from that given in the Gas Safety (Installation and Use) Regulations 1998 [1]. This term does not refer to:

- a service (pipe) or distribution main or other pipeline;
- a pipe or fitting forming part of a gas appliance;
- a pipe or fitting within a primary meter installation; or
- any valve attached to a storage container or cylinder.

Hereafter referred to as “pipework”.

3.15 intermediate floor

floor that separates one living space from another living space in the same dwelling

NOTE This is not a compartment floor that separates one dwelling from another part of the building.

3.16 leisure accommodation vehicle

unit of living accommodation for temporary or seasonal occupation

NOTE Such vehicles might meet the requirements of the Road Vehicles (Construction and Use) Regulations 1986, as amended [13], and include touring caravans, motor caravans and caravan holiday homes.

3.17 limited relief valve

device which is part of the regulator and which limits, in the event of a failure, the pressure rise above a predetermined value without shutting off the flow of gas

3.18 liquefied petroleum gas (LPG)

commercial butane or commercial propane

NOTE BS 4250 specifies requirements for commercial butane and commercial propane.

3.19 LPG supplier

person or organization who provides LPG to a gas consumer, either by means of the filling or refilling of a storage vessel, or in refillable cylinders

3.20 mechanical joint

joint in which gas tightness is achieved by compression with or without a seal and which can be disassembled and reassembled

[SOURCE: BS EN 1775:2007, 3.4.3]

3.21 meter installation

installation that comprises a primary meter, valves, filter, meter regulator and associated safety devices, pliable connector, interconnecting pipework, fittings and support

NOTE 1 A meter installation commences at the outlet of the ECV. Depending on the type of meter installation it terminates at:

- the outlet connection of the meter;
- the outlet of the meter outlet adaptor if fitted; or
- in the case of a semi-concealed meter with a pliable connector downstream of the meter, the outlet of the meter box outlet adaptor.

[SOURCE: BS 6400-3:2007, 3.23, modified]

NOTE 2 A typical installation with pipework is shown in [Figure 1](#).

3.22 multi-occupancy building

building that contains multiple domestic dwellings or a building that contains both multiple domestic dwelling(s) and commercial unit(s)

3.23 nominal operating pressure (NOP)

pressure under which the appliance(s) operates in nominal condition when supplied with the corresponding reference gas

3.24 operating pressure

pressure at which a gas system operates under normal conditions

3.25 over-pressure shut-off (OPSO)

shut-off device, triggered by an excess outlet pressure, which causes the complete shut-off of the flow of gas for all values of inlet pressure

NOTE This device is normally an integral part of the regulator. It may also be referred to as a “slam shut valve” or “over-pressure cut-off” (OPCO).

[SOURCE: BS 6400-3:2007, 3.25.1, modified]

3.26 permanent dwelling

structure of a permanent nature used primarily for domestic purposes

3.27 pliable corrugated (stainless-steel) tubing

tubing of stainless steel, capable of being bent easily by hand a limited number of times and covered with an outer sheath by the manufacturer at the time of production

NOTE The term is sometimes abbreviated to corrugated stainless-steel tubing (CSST) or pliable tubing (PLT). This product should not be confused with the pliable connectors referred to in BS 6400, which are not covered by an outer sheath and have factory-fitted end connections.

3.28 power-floated floor

floor finish formed by powered rotary metal blades passed over a partly cured concrete floor slab to form a monolithic structure, which avoids the need for a separate screed to provide the floor finish

3.29 precast flooring

factory-produced concrete flooring system that provides the structural load bearing part of the floor

EXAMPLE Concrete plank or concrete beam and block suspended flooring systems.

3.30 press end joint

joint in which tightness is achieved by using an appropriate tool for either compressing a fitting to form the joint or expanding a pipe to enable forming the joint

NOTE Such a joint cannot be disassembled and reused.

3.31 primary meter

meter nearest to and downstream of a service pipe or service pipework for ascertaining the volume of gas supplied through that pipe by a gas supplier

3.32 protected area

ventilated space containing gas pipework, and isolated from other parts of a building within fire-resisting construction, which includes:

- a) a common stairway, corridor or lobby that provides an escape route from a building to a place of safety and access for firefighting purposes (referred to within Building Regulations [5], [6], [7] as a “protected shaft”, “protected stairway”, “protected corridor/lobby” or “protected zone”); and
- b) a service shaft/duct, which can also contain electrical and water services

NOTE Fire-resisting is the ability of a component or construction of a building to satisfy for a stated period of time some or all of the appropriate criteria specified in the relevant part of BS 476. Additional guidance on determining whether an area can be deemed a “protected area” or otherwise is given in Annex D.

3.33 range-rated appliance

appliance that has the facility for an operative to adjust the heat input of the appliance within a narrow range of minimum and maximum heat inputs stated by the manufacturer to suit the actual heat requirements of the system

NOTE The range between minimum and maximum heat inputs is in the region of 3 kW.

3.34 regulator

device that controls the pressure at its outlet within predetermined parameters

3.35 residential park home

caravan used for permanent residence

NOTE Such caravans do not meet all of the requirements of the Road Vehicles (Construction and Use) Regulations 1986, as amended [13]. These are covered by BS 3632. "Permanent residence" is defined in the Caravan Sites and Control of Development Act 1960 [14] and the Caravans Sites Act 1968 [15].

3.36 service pipe

pipe for distributing gas to premises from a distribution main, being any pipe between the distribution main and the outlet of the first emergency control valve

3.37 service pipework

pipe for supplying gas to premises from a gas storage vessel, being any pipe between the gas storage vessel and the outlet of the ECV

3.38 sleeve

protective pipe forming an annulus embedded in the structure through which pipework can be inserted and withdrawn

3.39 threaded joint

joint in which gas tightness is achieved by metal-to-metal contact within threads with the assistance of a sealant

[SOURCE: BS EN 1775:2007, 3.4.2]

3.40 under-pressure shut-off (UPS0)

device integral to the regulator, which causes the complete shut-off of the gas flow when the outlet pressure is below a predetermined value

[SOURCE: BS 6400-3:2007, 3.25.2]

3.41 void

enclosed space not specifically designed for the passage of building services

3.42 variable-rated appliance

appliance that has the facility for an operative to set the heat input of the appliance within a wide range of heat inputs stated by the manufacturer to suit the actual heat requirements of the system

4 Competence

Persons carrying out work that will have an impact on work covered by the scope of this standard shall ensure that they have the competence relevant for the task such as not to compromise

the requirements/recommendations of this standard and in particular the safe installation, commissioning and operation of gas equipment.

COMMENTARY ON CLAUSE 4

Competence requires sufficient knowledge, practical skill and experience to carry out the job in hand safely, with due regard to good working practice. The installation should also be left in a safe condition for use. Knowledge should be kept up to date with changes in law, technology and safe working practice.

It is a statutory requirement in Great Britain, the Isle of Man, Northern Ireland and Guernsey (see [Table 2](#)) that all “gas work” be carried out by a business or self-employed person(s) that is a member of a “class of persons” registered with a registration body which has been approved by an approval body (see [Table 2](#)) to operate and maintain such a register.

At the time of publication, the only body with approval to operate and maintain a register of individuals/businesses who are “members of a class of persons” is the Gas Safe Register. Thus, it is essential that all businesses or self-employed gas engineers are registered with the Gas Safe Register.

The qualifications which persons need to have to be deemed competent to carry out gas work are given in [Table 3](#).

Table 2 — Approval bodies and statutory regulations by country/territory

Country/territory	Approval body	Statutory regulations
Great Britain	Health and Safety Executive (HSE)	Gas Safety (Installation and Use) Regulations 1998 [1]
Isle of Man	Health and Safety at Work Inspectorate (HSWI)	Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) (Isle of Man) Order 1996 [3]
Northern Ireland	Health and Safety Executive Northern Ireland (HSENI)	Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004 [2]
Guernsey	Health and Safety Executive for the States of Guernsey [HSE (Guernsey)]	Health and Safety (Gas) (Guernsey) Ordinance 2006 [4]

Table 3 — Competence requirements by country/territory

Qualifications	Great Britain and Isle of Man	Northern Ireland	Guernsey
Current certificate(s) of competence in the type of gas work to be conducted, issued by an awarding body accredited by the United Kingdom Accreditation Service (UKAS) (ACS certification)	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned in matters of gas safety	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned under the HSC ACoP arrangement ^{A)} as approved with the registration body	✓	✓	✗
Any other scheme recognized by the gas registration body for registration purposes	✓	✓	✓

^{A)} Guidance on the individual competence required for gas work is given in IGEM/IG/1: *Standards of training in gas work* [\[16\]](#).

5 Design and planning

5.1 Exchange of information and time schedule

- 5.1.1** At the initial stages of building/installation design and planning it shall be verified that the pipework will be adequate for the known requirements.

NOTE Gas pipework design and installation for commercial installations undertaken in accordance with this British Standard need to account for any requirements imposed by DSEAR [17], [18]. Additional information can be found in [Annex F](#).

- 5.1.2** All necessary information regarding the routing of pipework and positions of valves and termination points to serve the appliances shall be made available by means of drawings, specifications and consultations, as appropriate.

NOTE Any drawings should include:

- a) the positions of voids, shafts, ducts and channels when pipework is to be concealed;
- b) special requirements of a precautionary nature, e.g. limitations on proximity to other services or effects of differential movement due to the building construction; and
- c) sizes, materials and positions of all pipework and fittings.

- 5.1.3** Any pipework installed shall be tested for gas tightness in accordance with [10.2](#) before being buried, covered, painted or wrapped.

5.2 Sizing

- 5.2.1** When designing an installation, the size of all pipework shall be such that the gas is at a suitable pressure at the inlet of any gas appliance to ensure that it meets the required appliance heat input.

Where any sections of the pipework supply gas to multiple appliances, the heat input of all appliances fed by that section of pipework shall be taken into account.

NOTE [Annex A](#) gives a method for calculating pipe sizes in a system.

- 5.2.2** The design maximum pressure loss for all pipework shall not exceed that specified in [5.3.2](#) or [5.4.2](#) in the following circumstances:

- a) new installations;
- b) pipework modification or extension to existing installations;
- c) before any new appliance is fitted to a new or existing installation; and
- d) increasing any appliance heat input.

NOTE The design pressure loss of existing installations that are not subject to the modifications listed in b), c) or d) should conform to the standard that was applicable at the time of installation, for example previous editions of BS 6891 for natural gas and BS 5482-1 for LPG.

- 5.2.3** For range-rated appliances, the installer shall use the maximum heat input to ensure the pipework is sized to meet the requirements of [5.2.1](#) and [5.2.2](#).

NOTE For combination boilers where the maximum heat input is different for the hot water and heating modes, the higher of the two heat inputs should be used.

- 5.2.4** For variable-rated appliances, the installer shall establish the heat input necessary to meet the requirements of the system and shall use this value to ensure the pipework is sized to meet the requirements of [5.2.1](#) and [5.2.2](#).

NOTE For combination boilers where the maximum heat input is different for the hot water and heating modes, the higher of the two heat inputs should be used.

5.3 Natural gas installations

5.3.1 Meter installation

The meter and other meter installation components shall be of sufficient capacity for the installation design load.

NOTE Further information on meter installations is given in BS 6400-1 and BS 6400-2, IGE/GM/6 [10] or IGE/GM/8 [11], as appropriate.

5.3.2 Pipework

The design pressure loss between the outlet of the primary meter installation and the point to be connected on any appliance inlet shall not exceed 1 mbar at the design installation flow rate (see 5.2.3 and 5.2.4).

NOTE See Figure 5 for illustrative examples.

5.4 LPG installations

5.4.1 Storage vessels, service pipework, regulators and meter installation

The storage vessel(s), service pipework, regulators, meter (where applicable) and other supply equipment installed shall be of sufficient capacity for the installation.

NOTE Further information on meter installations is given in BS 6400-3. Further information on storage vessel(s), service pipework and regulators (where no meter is fitted) is given in UKLPG Codes of Practice 1 and 22 [19], [20].

Requirements for LPG final stage regulator and safety devices are specified in Annex E.

Figure 5 — Sizing pipework — Design maximum pressure loss for typical installations

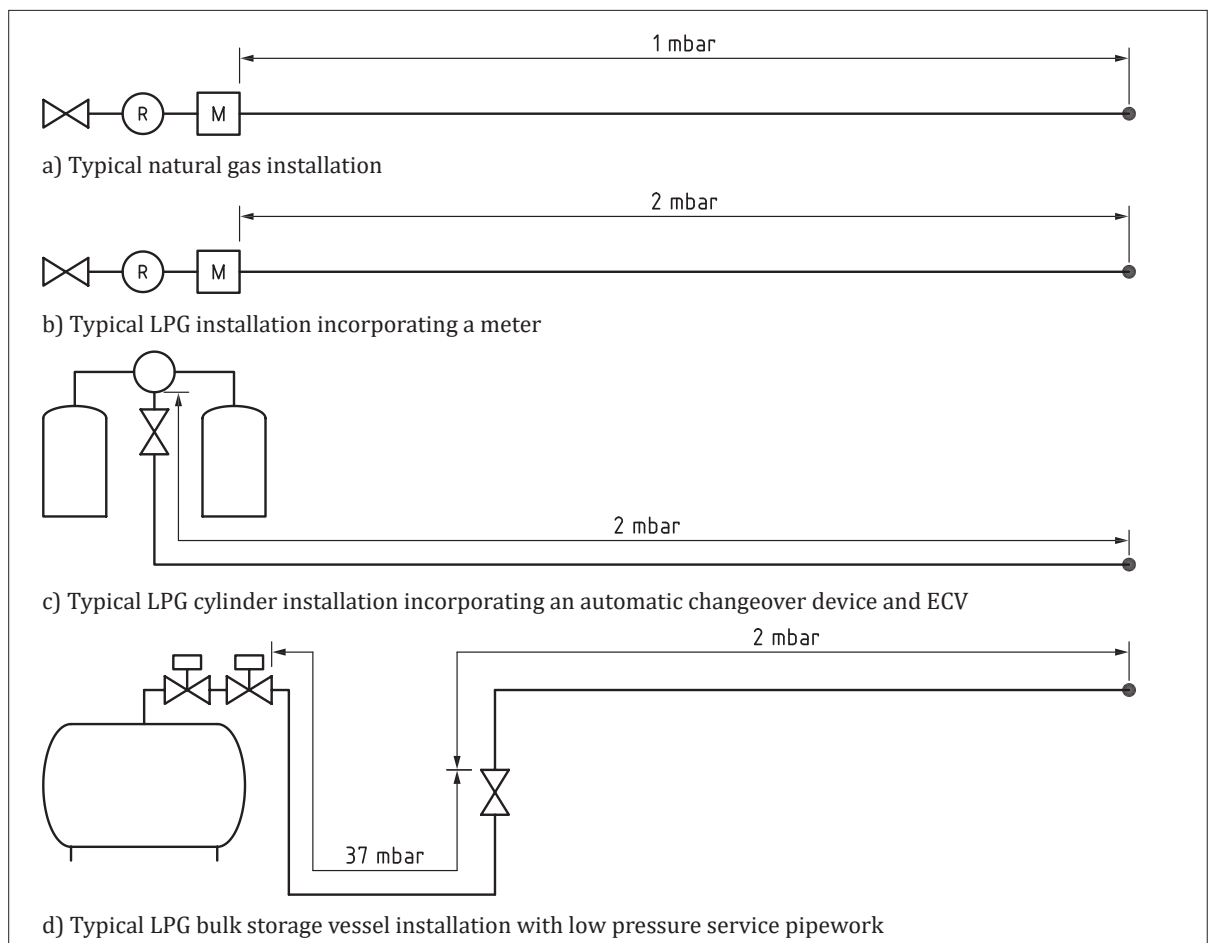
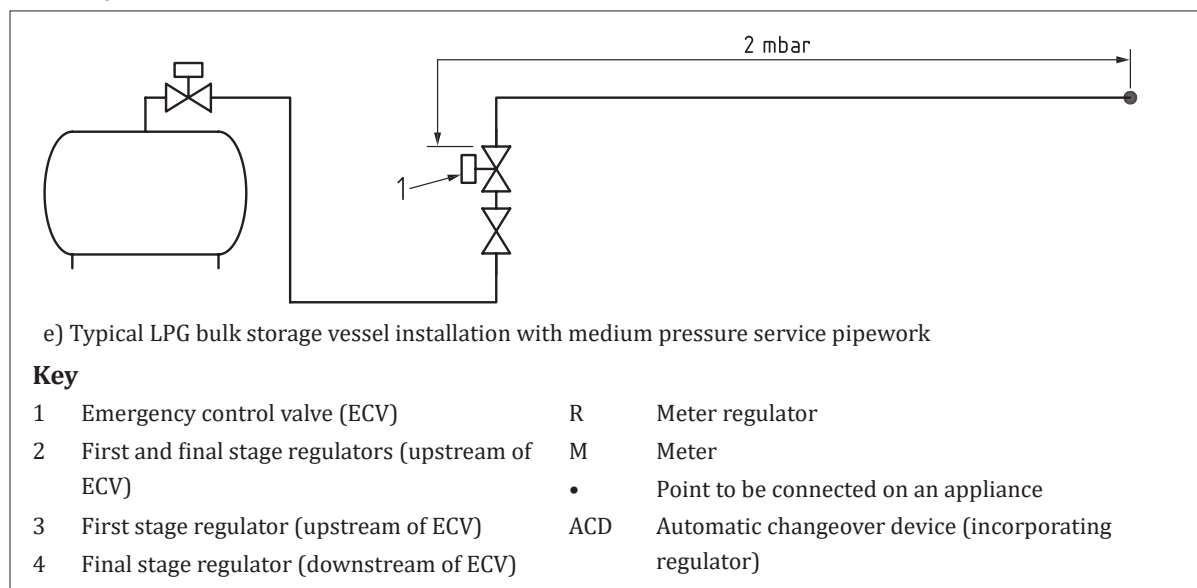


Figure 5 (continued)

5.4.2 Pipework

The design pressure loss between the outlet of the primary meter installation, or where no meter is installed, the outlet of the ECV or the outlet of the final stage regulator when fitted after the ECV and the point to be connected on any appliance inlet shall not exceed 2 mbar at the design installation flow rate (see 5.2.3 and 5.2.4).

NOTE See Figure 5 for illustrative examples. For LPG/air installations the typical operating pressure loss allowed for in the design calculations is 2 mbar.

5.5 Purge points

Where it is not possible to purge through an appliance with an open burner, purge points shall be provided to enable the installation to be adequately purged (see IGEM/UP/1 series of standards [21], [22], [23]).

6 Materials and components

COMMENTARY ON CLAUSE 6

When selecting materials for use as pipework, consideration should be given to strength, appearance and the need for protection against corrosion. The Gas Safety (Installation and Use) Regulations 1998 [1] prohibit the installation of lead or lead alloy pipes supplying gas. However, historically, lead pipes were used to install gas meters, and lead alloy pipes (known as lead composition pipes) were installed as pipework and can still be found in old housing stock. Provided this material is in good condition, sound, well-supported and of adequate size, connection can be made to steel or copper pipework using appropriate fittings (see Clause 7).

6.1 General

Materials used for pipework and fittings shall conform to 6.2, 6.3, 6.4, 6.5 and/or 6.6, as appropriate.

6.2 Steel

6.2.1 Steel tubes shall conform to:

- BS EN 10216-1 and BS EN 10217-1 and/or BS EN 10216-2;
- BS EN 10217-2; or

- BS EN 10255.

6.2.2 Rigid stainless-steel tubes shall conform to:

- BS 6362;
- BS EN 10216-5;
- BS EN 10217-7; or
- BS EN 10312.

6.2.3 Pliable corrugated (stainless-steel) tubing shall conform to:

- BS 7838; or
- BS EN 15266.

6.2.4 Steel fittings shall conform to BS EN 10241.

6.3 Malleable iron and cast copper alloy

Malleable iron and cast copper alloy fittings shall conform to:

- BS 143 and 1256; and/or
- BS EN 10242 (all parts).

6.4 Copper

6.4.1 Copper tube shall conform to:

- BS EN 1057; or
- BS EN 13349.

6.4.2 Capillary and mechanical fittings shall conform to:

- BS EN 1254-1;
- BS EN 1254-2;
- BS EN 1254-4; or
- BS EN 1254-5.

6.4.3 Copper and copper alloy press end connections shall conform to BS 8537, Type 2.

NOTE Sometimes referred to as "press-fit fittings".

COMMENTARY ON 6.4

Brazed joints should be made in accordance with BS EN 14324, using BS EN 1044 filler metals.

Soft solder should conform to BS EN 29453.

Sulfidation of the gas supplies can be a problem in some areas of the United Kingdom. See [Annex B](#) for further information.

6.5 Polyethylene

6.5.1 Polyethylene tubes shall conform to:

- BS EN 1555-1; or
 - BS EN 1555-2,
- as appropriate.

6.5.2 Polyethylene fittings shall conform to:

- BS 5114; or

- BS EN 1555-3,
as appropriate.

6.6 Jointing materials and compounds

Jointing materials and compounds shall conform, as appropriate, to the applicable parts of:

- BS 4371;
- BS 6956; or
- BS EN 751,

as appropriate.

NOTE Fibrous materials such as hemp conforming to BS 4371 should be used with the appropriate jointing compound (see [7.6](#)).

6.7 Valves

6.7.1 Valves shall conform, as appropriate, to:

- BS 1552; or
- BS EN 331; or
- PRS1/E [\[24\]](#); or
- GIS/V7-3 [\[25\]](#).

6.7.2 Lubricants used in valves shall be of a type suitable for use with the gas.

6.7.3 For LPG installations, plug valves shall be spring-loaded.

6.8 Self-sealing sockets

Only self-sealing sockets conforming to BS 669-1, BS 669-2 or BS EN 15069, as appropriate, shall be used for gas installations. These shall be installed in accordance with BS 6172 or BS 7624.

6.9 Flexible hoses, tubing, assemblies and their connections

6.9.1 LPG hoses, tubing and assemblies shall conform to:

- BS 3212; or
- BS 6501-1; or
- BS EN 16436-1; or
- BS EN ISO 10380.

6.9.2 LPG hoses and tubing connections (including nozzles and adaptors) shall conform to:

- BS 3212; or
- BS EN 16129.

6.9.3 Natural gas hoses, tubing and assemblies shall conform to:

- BS 6501-1; or
- BS EN ISO 10380.

7 Jointing

7.1 General

7.1.1 All joints shall be made in such a manner as to avoid undue stress on the fitting.

7.1.2 All pipework ends shall be square-cut and deburred, as appropriate, and finished joints shall be visually examined for defects.

7.1.3 All joints shall be mechanically strong and gas-tight.

7.2 Capillary fittings

7.2.1 Finished joints shall be visually examined to confirm that the solder has run completely around the joint.

7.2.2 Any flux selected for use shall only remain active during the heating process. All flux residues shall be wiped from the pipework and fittings when the joint has cooled.

7.2.3 It is important that pliable corrugated (stainless-steel) tubing is not contaminated in any way with flux or solder, either internally or externally. Any soldering on adjacent copper pipework shall be completed, and the soldered component thoroughly cleaned of flux, before any connection to pliable corrugated (stainless-steel) tubing is made.

NOTE Copper pipework can be jointed without conventional fittings by the use of purpose-made tools that form the pipework ends in accordance with BS EN 1254-1 or BS EN 1254-5.

7.3 Mechanical joints

7.3.1 Any mechanical joint shall be located in a readily accessible position that allows the fitting to be tightened to make a gas-tight joint.

7.3.2 Union joints shall be of the ground-faced or compression type.

7.4 Press end connections

7.4.1 All press end connections shall be assembled in accordance with the manufacturer's instructions.

7.4.2 The installer shall instruct the gas consumer/responsible person to ensure that the fittings are not painted with oil or solvent-based paints unless otherwise specified in the manufacturer's instructions.

NOTE The yellow colour of the bodies of press end connections should remain visible after installation.

7.5 Pliable corrugated (stainless-steel) tubing and fittings

Pliable corrugated (stainless-steel) tubing and fittings shall be assembled in accordance with the manufacturers' instructions.

7.6 Screwed joints

7.6.1 Threads shall conform to:

- BS 21;
- BS 864-2;
- BS EN 1254-4;
- BS EN 10226-1;
- BS EN ISO 228-1; or
- ISO 7-1.

7.6.2 All threads shall be cleaned prior to the application of any jointing material.

7.6.3 Fibrous materials such as hemp shall not be used on any threaded joint, except in conjunction with jointing compounds for existing long screw back-nut seals.

- 7.6.4** Jointing compounds and tapes shall conform to BS EN 751-1 (compounds), BS EN 751-2 (anaerobic sealants) or BS EN 751-3 (tapes), as appropriate, and shall be applied in accordance with the manufacturer's instructions.

COMMENTARY ON 7.6

When jointing compounds are used they should only be applied to the external threads, and any excess paste should be removed on completion of the joint. Jointing compound should not be used in conjunction with polytetrafluoroethylene (PTFE) materials.

It is important that any cutting oil residue is removed from the inside and outside of the pipework.

7.7 Lead composition pipework

When lead composition pipework is encountered and any connection joint has to be made, then only a soldered cup joint onto copper pipework or a suitable brass union fitting shall be made. Compression fittings designed for jointing water weight lead pipework shall not be used.

7.8 Electrofusion joints

Relevant information shall be obtained from the manufacturer of the PE pipe/fittings.

NOTE Solvent welding is not acceptable (see [8.15](#)).

8 Installation

8.1 General

- 8.1.1** Where pipework is liable to mechanical damage, it shall be physically protected. While installation work is in progress, precautions shall be taken to prevent the ingress of dirt, water, etc., into pipework.
- 8.1.2** The bore of any pipework shall not be restricted by kinks, burrs, foreign matter or in any other way.
- 8.1.3** Pipework shall be installed so as not to impair the structural stability, fire resistance, damp-proof course, or thermal and sound insulation of the building.
- 8.1.4** Pipework shall be situated such that, in the event of a gas escape, gas is not capable of entering cavities.
- 8.1.5** Pipework shall not be installed in any location where, if there is a requirement to gain access to the pipe in the future, this could affect the structural stability of the building.
- 8.1.6** For LPG installations, pipework entries to, and exits from, buildings shall always be above ground.
- 8.1.7** Pipework shall not be installed in a position where it is likely to be exposed to a corrosive environment.
- 8.1.8** Pipework and fittings that are considered to be at risk of corrosion and degradation shall either be manufactured from materials that are inherently resistant to corrosion or shall otherwise be suitably protected against corrosion.

NOTE Examples of pipework that is likely to be susceptible to corrosion and degradation are:

- *pipework buried in solid floors (see [8.10](#));*
 - *pipework buried in walls (see [8.11](#)); and*
 - *buried external pipework (see [8.13](#)).*
- 8.1.9** All sections of pipework considered to be at risk of corrosion and degradation shall be protected, including any joints and fittings.

- 8.1.10** Any factory-finished protection shall be examined for cuts or other defects and made good prior to use. Any damage shall be repaired in accordance with the manufacturer's instructions to give at least the same level of protection that was afforded before the damage. Any onsite protection shall be applied to clean and dry pipework and fittings.
- 8.1.11** Pipework in fireplace openings shall be factory-finished protected pipe and/or wrapped on site.
- 8.1.12** Assembled pipework shall be tested for gas tightness in accordance with [10.2](#) before any additional protection against corrosion and degradation is applied on site.

COMMENTARY ON 8.1.7 TO 8.1.12

Factory-finished protected pipe should be used wherever practicable. Factory-finished protection can take the form of pre-insulation coatings, coverings, sheathings, wrapping, dipping, galvanizing or painting.

Where possible, pre-insulation coatings, coverings, sheathings and wrapping should be coloured yellow ochre in accordance with BS 1710:1984, 08 C 35.

Where it is not practicable to use or obtain factory-finished protected pipe, protection should be applied on site and in accordance with manufacturer's instructions where applicable. Where wrapping tape is to be used, the pipework should be clean, dry and applied in accordance with the tape manufacturer's instructions. A minimum 55% overlap should be used to provide a layer of at least double thickness.

Care should be taken to avoid damaging protective coatings during storage, when bending and when installing.

Protection of joints requires special attention; exposed threads are particularly vulnerable to corrosion. Site protection should be suitably selected for the application (for example, to stop the ingress of water) and can be achieved by the application of PVC wrapping tapes, self-bonding silicone tapes, grease-impregnated tape or bituminous paints applied in accordance with manufacturer's instructions where applicable.

Where pliable corrugated (stainless-steel) tube fittings are used in an area considered to be at risk of corrosion and degradation, each fitting should be assembled in accordance with the manufacturer's instructions to ensure a liquid-proof seal is achieved between the factory-applied cover and the wall of the fitting.

Some pre-insulation coatings, coverings, sheathings and wrapping tapes suffer from colour fade and surface cracking due to the effects of ozone or when exposed to direct sunlight or other ultra-violet (UV) sources. Therefore, care should be taken to ensure a suitable material is selected.

Potentially corrosive environments also include coastal areas. Soot and debris in fireplace openings can be highly corrosive.

Copper pipework with soft-soldered capillary joints should not be located where it is liable to be subjected to temperatures in excess of 100 °C.

8.2 Connection to the meter installation

Where the meter is not securely restrained (e.g. by a meter bracket fastened to the floor/wall), the connection to the meter installation shall be in securely-fixed rigid pipework for at least the first 600 mm.

8.3 Safety precautions

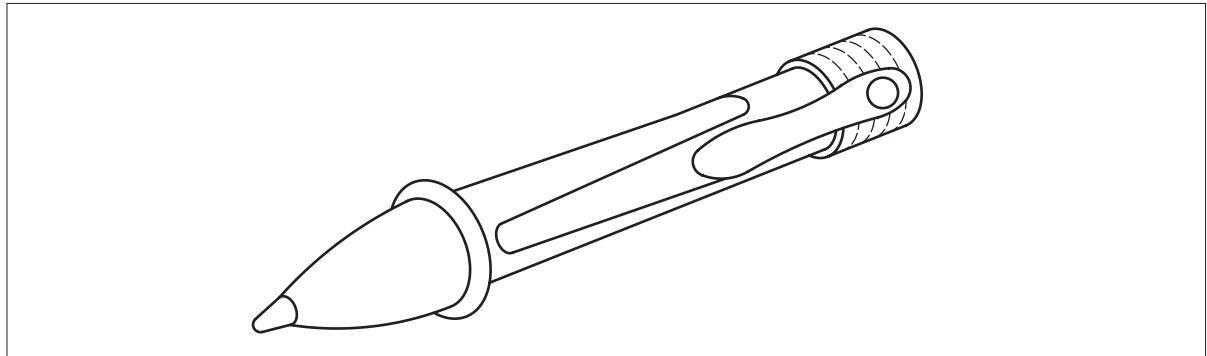
- 8.3.1** Prior to any work being undertaken on the pipework a risk assessment shall be carried out. This shall include:
- a) risks involved in working on installations that contain fuel gas; and

b) stray electrical currents.

8.3.2 Suitable precautions shall be taken to determine the possibility of stray electrical voltages being present.

NOTE The use of a non-contact voltage detector (single pole) capable of indicating voltages of 50 V or greater (see [Figure 6](#) for an example) on all exposed metalwork in the work area assists in the detection of stray voltage that might be harmful. It should be noted that such voltage detectors are not designed to respond to current flow and should be used in accordance with the manufacturers' instructions. Where any doubt about the electrical installation exists, the advice of a competent electrician should be sought.

Figure 6 — Non-contact voltage detector (single pole) — Example



8.3.3 Where an installation is temporarily isolated to allow work to be undertaken on it, the risks involved in working on an installation that contains fuel gas shall be assessed.

8.3.4 During any work that necessitates removal of a meter, breaking into the gas supply, or connection or disconnection of any metal pipework, a temporary continuity bond shall be fixed securely to the pipework either side of any intended connection or disconnection point or between the pipework and any fitting to be installed or removed. Such a temporary continuity bond shall always be used irrespective of any permanent protective bonding that is installed (see [Figure 7](#)).

COMMENTARY ON 8.3.4

A recommended temporary continuity bond comprises at least 1.2 m of single-core insulated flexible cable or equivalent of at least 250 V ac rating. The cable should have a cross-sectional area of not less than 10 mm² and be of multi-strand flexible construction, generally in accordance with BS 6004, BS 6007 or BS 6231, and with a robust clip or clamp firmly attached at each end.

The recommended disconnection procedure is as follows.

- a) *Isolate the electrical connection of associated gas appliances from the electricity supply.*
- b) *Clip or clamp a temporary continuity bond to each side of the union, fittings or complete section to be removed or connected, ensuring that good, secure, metallic contact is made (see [Figure 7](#)).*
- c) *Leave the bond in position until after the work is completed and metallic continuity re-established. Where pipework is to be removed, ensure that both sections of pipework left are bonded before removing the temporary electrical continuity bonding conductors.*

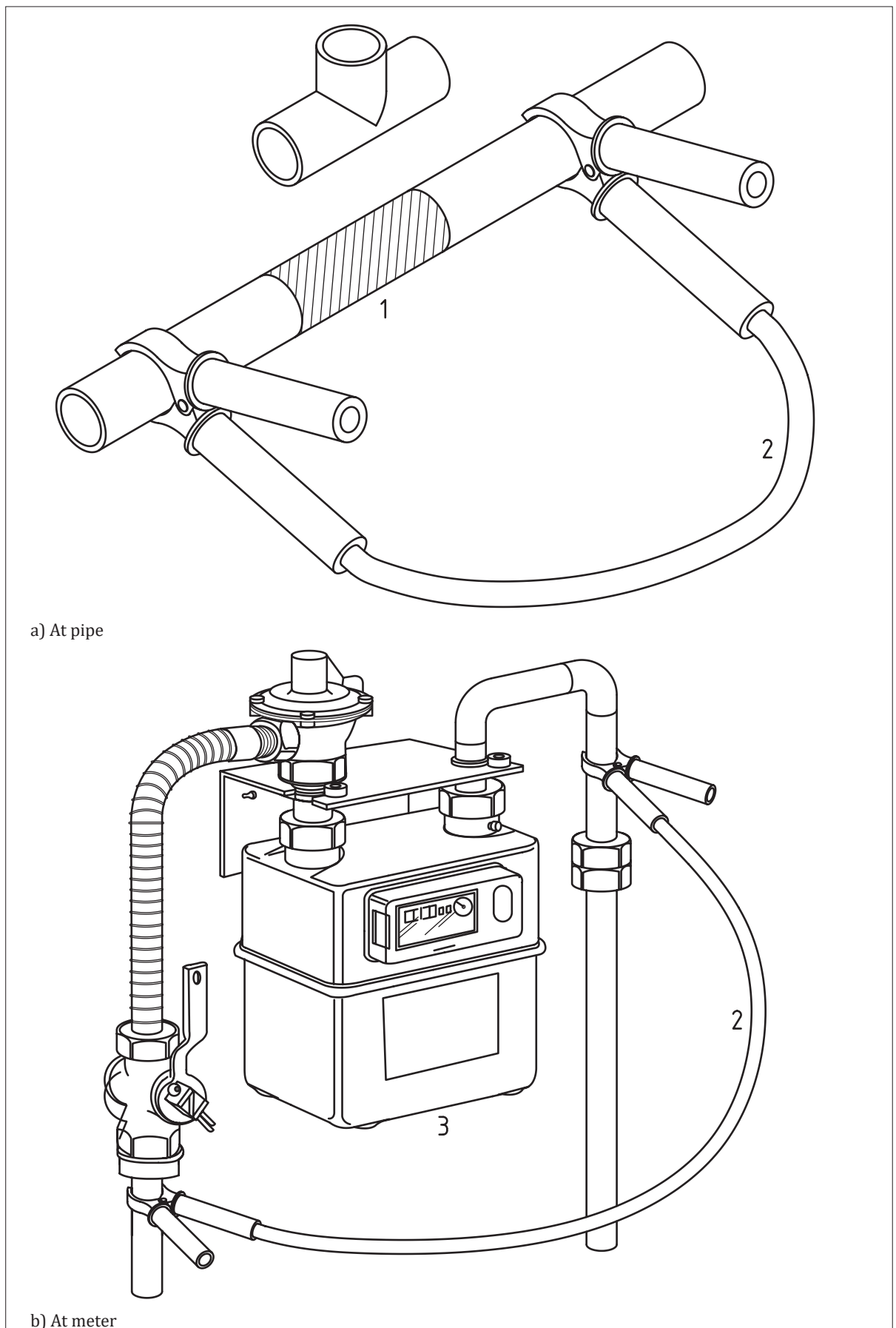
Figure 7 — *Use of temporary continuity bond*

Figure 7 (continued)**Key**

- | | |
|---|---------------------------------|
| 1 | Pipework to be cut out |
| 2 | Temporary continuity bond |
| 3 | Meter to be temporarily removed |

8.3.5 Before any work is commenced on an installation, or section of an installation, where there is a risk of any gas within the pipework being ignited and constituting a danger (for example, when using a blowlamp) the following precautions shall be taken.

- a) Conduct a tightness test in accordance with IGEM/UP/1 [21], IGEM/UP/1A [22] or IGEM/UP/1B [23], as appropriate, on the installation or section of the installation, in particular to verify that there is no let-by from the valve used to isolate the gas supply. Where a leak or let-by is found, rectify this before proceeding.
- b) Disconnect the gas supply to the installation or section of the installation.
- c) Remove any meter, where fitted in the section to be worked upon, from the installation or section of the installation.
- d) Immediately seal all exposed gas ways, for example open ends on the pipework and/or meter, with an appropriate fitting.
- e) Increase natural ventilation in the work area where possible.

Oxy-gas flame cutting equipment shall not be applied to any pipework or fitting containing gas. When working with a naked flame or other source of heat in the vicinity of combustible material, precautions shall be taken to avoid a fire hazard.

COMMENTARY ON 8.3.5

These are safety precautions that might reduce the risk of any gas being inadvertently ignited and constituting a danger. Where it is considered that, even when having taken these measures there could still be a risk of gas igniting, the gas operative may choose to purge the installation of any gas. Additional guidance on purging installations of any gas (decommissioning) can be found in IGEM/UP/1 [21], IGEM/UP/1A [22] and IGEM/UP/1B [23].

It is difficult to specify an exact set of parameters that indicate when an installation will or will not need to be decommissioned prior to working on it due to the diversity of installations that might be encountered.

8.3.6 All open ends of the pipework shall be sealed with an appropriate fitting before any work is left unattended.

8.3.7 Where work is in progress on the pipework that exposes the gas ways, for example open ends on the pipework, sources of ignition shall be kept away from the exposed gas ways.

8.3.8 When work has been completed, the open ends of pipework shall be sealed with an appropriate fitting that will facilitate purging the installation, for example suitably plugged or capped.

8.3.9 When any installation is to be decommissioned (for example, prior to the installation removal or property demolition), a risk assessment shall be carried out to determine whether there is a requirement to purge any fuel gas from the installation (see IGEM/UP/1 [21], IGEM/UP/1A [22] and IGEM/UP/1B [23]).

NOTE *It is difficult to specify an exact set of parameters that state when an installation should or should not be purged of fuel gas (decommissioned) due to the diversity of installations that can be encountered.*

Where the meter is removed BS 6400 should be consulted.

8.3.10 Where any pipework is no longer required, the pipework shall be disconnected as close to the point of connection to the live gas supply as practicable. In all circumstances, any exposed gas ways shall be sealed with an appropriate fitting and any part of the installation that might contain gas shall be labelled as such.

8.3.11 Precautions shall be taken to avoid damage to any electrical conductor when installing pipework.

8.4 Interrelation with other services

8.4.1 General

8.4.1.1 Pipework shall be located or electrically insulated such that it does not touch metallic fittings that could promote electrolytic corrosion.

8.4.1.2 Pipework shall:

- a) not be installed in a ventilation or air-conditioning duct (see [8.1.11](#) and [8.1.12](#) for pipework in the fireplace opening); and
- b) be physically spaced from other services, such as water, electricity, telecommunications and drainage.

8.4.1.3 Pipework shall not be buried in floors together with electrical underfloor heating, unless the underfloor heating has been physically and permanently disconnected.

8.4.2 Separation of pipework from electrical services

8.4.2.1 Where installation pipework is not separated from electrical equipment or cables by an insulating enclosure, dividing barrier, trunking or conduit, it shall be spaced as follows:

- a) at least 150 mm away from electricity supply equipment, such as metering equipment, main service cut-outs or supplier (main) isolation switches, and distribution boards or consumer units; $\overline{A_1}$ and $\overline{A_1}$
- b) at least 25 mm away from electrical switches, sockets and electricity supply and distribution cables.

8.4.2.2 The installation pipework shall not be positioned in a manner that prevents the operation of any electrical accessory, i.e. a switch or socket outlet.

NOTE Where these spacing requirements are impracticable the pipework should either be sheathed with an electrical insulating material rated at 230 V ac or more, or a panel of electrical insulating material should be interposed.

8.4.3 Main protective bonding conductor

8.4.3.1 A gas installation within a property with an electrical supply shall have a main protective bonding conductor connecting the pipework to the electrical installation's main earth terminal, as specified in BS 7671.

COMMENTARY ON 8.4.3.1

The purpose of protective bonding is to create a zone in which voltage differences through differing earth potentials are eliminated, and therefore hazards from electric shocks are minimized. This is achieved by connecting separate conductive components, such as the various metallic building services and structural steelwork, together with a main protective bonding conductor at the main earth terminal.

It is possible for stray currents to be transmitted through the gas pipework. Therefore, to avoid electric shock or a spark which could ignite the gas, it is important to maintain electrical continuity in the pipework at all times.