Flexigas

UK INSTALLATION MANUAL

Install Flexigas™ with confidence.



bsi.
Stainless Steel Corrugated Semi-rigid Tubing
KITEMARK™
KM 598726
EN 15266

KM 598726 · EN 15266
GAS CSST · **2026 EDITION**

Notes

Important Notice

In the United Kingdom (including Northern Ireland and the Isle of Man) all work on gas installations (including but not limited to the servicing, installation and maintenance of the Flexigas system, or any attached gas appliance, fittings or conveyance system) must be carried out by a business or self-employed persons approved by the Health and Safety Executive. At the time of publication of this manual the current registration body is the Gas Safe Register.

Persons operating as gas engineers must hold a valid certificate of competence for this work activity. This certificate must have been issued under the Nationally Accredited Certification Scheme (ACS) or a National / Scottish Vocational Qualification (NVQ / SVQ) that is allied to the ACS.

All gas work and installations, including the installation of the Flexigas system, must always be carried out in accordance with The Gas Safety (Installation and Use) Regulations 1998 (including additions and addendums), British Standards, Local Building Regulations and this Installation Manual. While FlexiPipe-Flexigas Ltd will make every endeavour to update this installation manual to follow any changes to the Regulations and British Standards, it may not always be possible to do so. The qualified gas engineer using the Flexigas system must always ensure they are aware of any changes to the Local / National Regulations that apply to the work they are carrying out. In the event of a discrepancy between any Regulations / British Standards and this Installation Manual, the former shall take precedence.

Only components provided or specified by FlexiPipe-Flexigas Ltd as comprising part of the approved Flexigas Corrugated Stainless Steel Tubing (CSST) system for gas installations may be used in the installation. The direct joining of the Flexigas system with other flexible piping systems has not been tested and is strictly forbidden. Joining of the Flexigas system to other piping systems (including other flexible CSST piping systems) is only permitted by use of an approved BSP thread connector as outlined in this manual.

While CSST gas systems such as Flexigas provide significant safety advantages over rigid gas delivery systems (including reduced likelihood of leakage due to faulty installation and damage caused by geological events such as earthquakes), due to its reduced wall dimensions CSST may be more likely than rigid systems to be damaged by sharp objects, such as a nail or a screw, or by other unique occurrences such as a lightning strike. The proper grounding / earth bonding of the system will significantly reduce the risk from the latter; all installed Flexigas systems must be electrically bonded as per this manual (Section 20) and British Standards (in particular BS 6891). The Flexigas system should not be installed in any location where an excess degree of heat is likely to build up or be exposed to any naked flame.

Improper use or installation of the Flexigas CSST system may result in serious consequences, including but not limited to fire, explosions, asphyxiation and gas poisoning. The Flexigas system must always be installed in strict accordance with British Standards, all applicable local or national regulations, and always by a licensed professional. All installed Flexigas systems must be inspected by an authorised local building official, as well as properly pressure tested, prior to being placed in service. FlexiPipe-Flexigas Ltd will have no responsibility over any misrepresentation of the information contained in this manual or for any improper installation or repair work carried out that does not strictly comply with current British Standards.

Table of Contents

01	Scope	05
02	Competence and System Conformity	06
03	Standards and Regulations of Relevance to the Installer	07
04	How to Assemble Flexigas	08
05	How to Install Flexigas DS NEW	10
06	Best Practice	12
07	Safety Precautions Before Installation Work Commences	12
08	Special Care When Laying Out Flexigas Tubing	13
09	Bend Radii	13
10	Connection and Disconnection of Pipes and Fittings	14
11	Joisted Floors, Roof Spaces & Compartment Floors	15
12	Flexigas in Solid Floors	18
13	Flexigas in Walls	19
14	Sleeves	24
15	Flexigas in Ducts / Ventilation	24
16	Fire Protection / Stopping	25
17	Pipe Supports	25
18	Exterior Pipework	30
19	Interrelation with Other Services	31
20	Main Equipotential Bonding	32
21	Valves (Emergency Control Valves)	33
22	Prevention of Corrosion	34
23	Gas Tightness Testing and Purging	35
24	Connection of Flexigas to Other Systems	36
25	Damage and Repair	36
26	Warranty	37
27	Gas Pipework Inside a Protected Area	37
28	Pipe Sizing (including example)	40
29	Sizing Tables (Tables 1–6)	42

SECTION 01

01 Scope

The key installation standard for the use and installation of Flexigas is **BS 6891:2015** (for DN sizes 15–32); however, for larger sizes (DN40, 50) and for working pressures above those covered by BS 6891, **IGEM/UP/2** should be used. Any installer using Flexigas must be familiar with the updated version of these standards. This installation manual highlights key points of relevance from these standards; it is not intended to cover every aspect of BS 6891 or IGEM/UP/2 as it relates to the use and installation of gas pipework including Flexigas. This installation manual should never be used as a replacement for BS 6891, IGEM/UP/2 or The Gas Safety (Installation and Use) Regulations 1998.

The Flexigas stainless steel corrugated tubing (CSST) system is approved for installations of natural gas and LPG in domestic, commercial and industrial applications.

This approval is made by British Standards Institute in accordance with **EN 15266:2007** — Stainless steel pliable corrugated tubing kits in building for gas with an operating pressure up to 0.5 bar.

The BSI Kitemark number for the Flexigas system is **KM 598726**.

Flexigas is one of a small number of UK CSST manufacturers that previously held a BSI Kitemark to **BS 7838** before this standard was replaced by EN 15266. Flexigas continues to manufacture and test its products to both standards.

SECTION 02

02 Competence and System Conformity

Persons conducting gas installations like installing or repairing the Flexigas system must hold a valid certificate of competence for this work activity. This certificate must have been issued under the **Nationally Accredited Certification Scheme (ACS)** or a National / Scottish Vocational Qualification (NVQ / SVQ) that is allied to the ACS.

Only components provided or specified by Flexigas as comprising part of the approved Flexigas Corrugated Stainless Steel Tubing (CSST) system for gas installations may be used in the installation. **The direct joining of the Flexigas system with other flexible piping systems has not been tested and is strictly forbidden.** Joining of the Flexigas system to other piping systems (including other flexible CSST piping systems) is only permitted by use of approved BSP thread connectors as outlined in this manual.

IN SHORT

Only Flexigas™ components in a Flexigas™ system, joined by a qualified Gas Safe registered engineer, supported by valid ACS or NVQ / SVQ proof of competence. No mixing with other CSST, PEX or polyethylene gas systems.

> **Gas Safe Register** — check your engineer or find one near you at **www.gassaferegister.co.uk**. Every Flexigas install must be commissioned and pressure-tested per IGE/UP/1B before being placed in service.

SECTION 03

03 Standards & Regulations of Relevance to the Installer

The below is a non-exhaustive list. The competent installer using the Flexigas system should consult any relevant standard for the work they are carrying out.

- **BS 6891:2015** — Installation of low pressure gas pipework of up to 35 mm (R1 ¼) in domestic gas premises (2nd family gases). Supersedes BS 6891:2005.
- **BS 7838** — Specification for corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN 50.
- **BS/EN 15266:2007** — Stainless steel pliable corrugated tubing kits in building for gas with an operating pressure up to 0.5 bar.
- **BS 5482** — Code of practice for domestic butane and propane gas-burning installations Part 1 (DN 25 steel / DN 28 CSST).
- **BS 7671:2008** — Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition.
- **BS/EN 1775:2007** — Gas supply. Gas tubing for buildings (MOP ≤ 5 bar). Functional recommendations.
- **BS 951:2009** — Electrical earthing. Clamps for earthing and bonding. Specification.
- **IGEM/UP/1** (latest edition) — Strength testing, tightness testing and direct purging of industrial and commercial gas installations.
- **IGEM/UP/2** (latest edition) — Installation pipework on industrial and commercial premises.
- **IGEM/UP/5** (latest edition) — Gas in multi-occupancy buildings.
- **IGEM/UP/7** — Gas installations in timber framed and light steel framed buildings.
- **IGEM/UP/11** — Gas installations for educational establishments.

THE CONNECTION

04 How to Assemble Flexigas™

The corrugated tube self-flares against the brass seat to make a dry, metal-to-metal seal — no jointing compound, no PTFE. Seven steps, every fitting, every size.



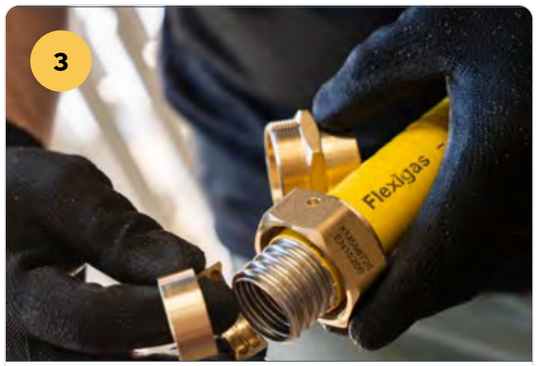
Cut

Cut with a wheel metal pipe cutter, centred in the valley between corrugations. Tighten the cutter only slightly each revolution. The cut must be **clean, square and circular with no sharp edges**.



Remove

With a utility knife, remove the yellow flame-retardant cover to expose **the last four corrugations**. No more, no less.



Slide

Slide the nut over the tubing, then place the two semi-circular collets so their ridges sit in the **last three valleys** of the exposed corrugations.



Tighten

Tighten the nut and fitting with two suitably-sized spanners. The seal forms when the last corrugation deforms around the seat inside the fitting. **Use sufficient torque.**



Wrap

After the gas tightness test passes, wrap the small gap between the fitting tail and the tube with yellow silicone tape. **Test first, so any leak stays visible.**



EARTH BONDING

Attach

Attach the FG Bond™ terminal to the fitting body using the pre-drilled holes, with the warning label between the terminal and the nut.



EARTH BONDING

Bond

Strip 1–2 cm of copper from the earthing cable and screw it down, with the cable running parallel to the tubing. *See Section 20 for full bonding requirements.*

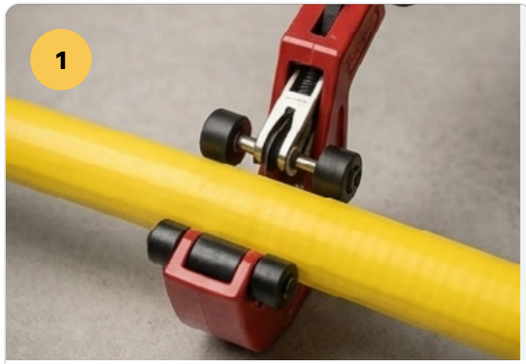
INTEGRATED BONDING

The Flexigas™ integrated bonding terminal is **included in our Kitemark from BSI** and certified to meet BS 951:2009. No external clamp on the stainless tube is required when FG Bond is used.

THE DUCTED SYSTEM

05 How to Install Flexigas DS™

Flexigas DS™ adds an outer ribbed duct layer over the standard yellow CSST — meeting the definition of a duct under BS 6891 and IGEM/UP/2, 3 & 7. The same seven steps, with one extra cover layer to strip.



Cut

Cut through **both the DS duct layer and the inner Flexigas tube in one pass** with a wheel metal pipe cutter. Centre the cut in the valley between corrugations.



REMOVE — OUTER DUCT

Strip the duct

With a utility knife, safely remove a section of the outer flame-retardant duct layer to expose the standard Flexigas tube inside.



REMOVE — INNER COVER

Strip the yellow

With a utility knife, remove the flame-retardant yellow cover of the inner Flexigas tube so the **last four corrugations** are exposed.



Slide

Slide the nut over the tubing, then place the two semi-circular collets so their ridges sit in the **last three valleys**.



Tighten

Tighten with two suitably sized spanners. The seal forms when the last corrugation deforms against the seat inside the fitting. **Use sufficient torque.** DN40 / DN50: a 24″ Stillson wrench or larger.



Wrap

After the gas tightness test passes, wrap the small gap between the fitting tail and the tube with yellow silicone tape. **Test first, so any leak stays visible.**



EARTH BONDING

Bond

Strip 1–2 cm of copper from the earthing cable and screw it down onto the FG Bond terminal, with the cable running parallel to the tubing. *See Section 20 for full bonding requirements.*

REFRESHER ONLY

The full DS Instruction Sheet ships with every coil. Scan the QR or visit **www.flexigas.com/training** for the training videos before first install. All UK gas installations must have earth bonding to BS 7671 and BS 6891.

SECTION 06

06 Best Practice

The following is considered general best practice when installing Flexigas:

- Ensure all Flexigas components are physically stored, located or installed where they are not liable to mechanical damage.
- Ensure the bore of the Flexigas tubing is not restricted by kinks, burrs, foreign material or in any other way.
- Ensure you have adequate length of Flexigas tubing before starting work; where possible, make continuous runs.
- Take care when opening the packaging — the pipe is stored in a coil and will release upon opening.
- While unrolling, ensure no kinks or twisting in the tube occurs.
- Do not store the tube or fittings in extreme temperatures; if exposed to such temperatures, allow them to return to room temperature before assembly.

Anytime after the tubing or fittings have been removed from their packaging, and especially during installation on site, care should be taken so that dirt, water or other building materials do not enter the tubing. Any foreign material entering the system can severely restrict normal flow and even restrict flow altogether.

07 Safety Precautions

Where work is taking place on pipe already connected to a gas meter either:

- The meter should be disconnected with both open ends of the tubing sealed with dust caps fitted to the meter; or
- All open ends of the tubing terminated with a self-sealing appliance connector that conforms to BS 669: Part 1 or BS 669: Part 2.

After completion of work all open ends of the tubing shall be plugged, capped or terminated with a self-sealing appliance connector complying with BS 669. Installers must also consider the risk of persons restoring the gas supply at the primary meter should they leave the general location where the work is in progress.

SECTION 08

08 Special Care When Laying Out Flexigas Tubing

Flexigas is easily introduced and passed along small spaces where it might be hard to see the location of existing services. As such, special care should be taken not to damage any existing services, in particular electrical services such as cables, junction boxes etc. Installers should also reference bonding requirements in **Section 20**.

The installer should also take note and mark the location of Flexigas tubing behind wall spaces, under flooring, or any other location that might put it at risk of being damaged by a nail, screw or other sharp object.

09 Bend Radius

Flexigas can easily be passed around objects and bent by hand, including making tight bends if necessary. However, such tight bends should be avoided where possible as multiple tight bends can restrict gas flow and increase pressure drop. It is preferable to make larger smoother bends with a higher radius to reduce pressure loss, and to avoid repeated bending during installation.

SIZE	MIN. BEND RADIUS	SUGGESTED BEND RADIUS
DN 15	20 mm	75 mm
DN 22	25 mm	75 mm
DN 28	75 mm	125 mm
DN 32	75 mm	125 mm
DN 40	75 mm	125 mm
DN 50	90 mm	125 mm

SECTION 10

10 Connection and Disconnection of Pipes & Fittings

Where any installation pipe is no longer required, the pipe(s) shall be disconnected as close to the point of supply as practicable. All pipe ends shall be sealed with an appropriate fitting (e.g. a plug or cap).

During any work that necessitates connection or disconnection of any metal installation pipework, a temporary continuity bond shall be fixed where production of a spark or shock could cause a hazard, whether or not permanent equipotential bonding has been established (see **Section 20**).

Where practicable, any redundant pipework should be removed.

Recommended disconnection procedure:

1. Isolate the electrical connection of associated gas appliances from the electricity mains supply.
2. Clip or clamp a temporary continuity bond to each side of the union, fittings or complete section that is to be removed or connected, ensuring good metallic contact is made.
3. Leave the bond in position until after the work is completed and metallic continuity is re-established.

A recommended temporary continuity bond comprises at least **1.2 m** of single-core insulated flexible cable or equivalent of at least **250 V** rating, cross-sectional area not less than **10 mm²**, multi-strand flexible construction conforming to BS 6004, BS 6007 or BS 6231, with a robust clip or clamp firmly attached at each end. Where the meter is removed, BS 6400 should be consulted.

SECTION 11

11 Joisted Floors, Roof Spaces & Compartment Floors

Flexigas laid in joisted floors and roof spaces shall run either **in the direction of the joists or at 90° to the joist direction**. Diagonal runs are not to be installed.

Notches shall be in accordance with Figures 1A–1D (following pages). Joists less than 100 mm or greater than 250 mm shall not be notched.

Direct connection to the gas meter is allowed if the meter is securely attached; otherwise **rigid pipework should be used for the first 600 mm**. Running Flexigas all the way to the meter is made easier by the integrated CSST earthing terminal, which removes the need for a separate bonding clamp on the rigid section.

Where Flexigas is installed between solid timber joists in floors, intermediate floors or roof spaces, it should be correctly supported in accordance with **Section 17**:

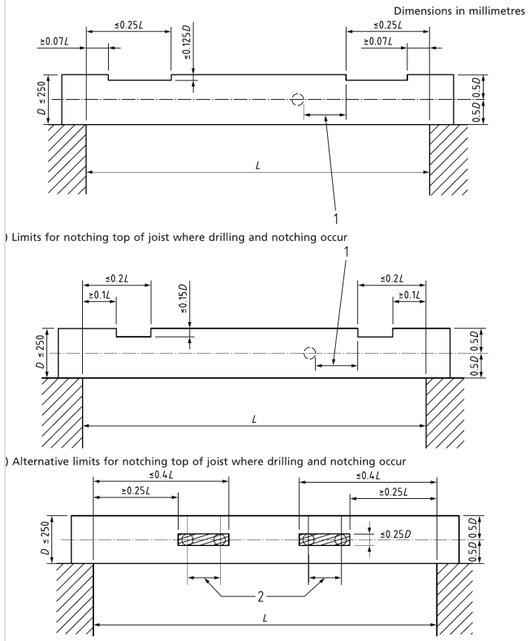
- Pipes laid **across** solid timber joists with flooring above should run in purpose-made notches or circular holes per Figure 1A.
- Where pipes are installed between timber engineered joists, the Flexigas shall be installed through the web of joists per Figure 1C and the joist manufacturer's guidance.
- Where pipes are installed between metal web joists, the pipes shall pass between the metal webs with supports fixed to the top or bottom of the timber flanges, not in contact with the metal structure.
- The flanges of timber engineered joists and metal web joists shall not be notched.
- Visual inspection of the void should be carried out before running pipework below suspended floors.
- In underfloor / joisted voids, ventilation shall be provided per **Section 15** (low-level vents for LPG and LPG-air mixtures, high-level vents for natural gas).
- Where pipework is installed within roof spaces, roof rafters, purlins, trussed rafters, bracing etc., notching, drilling or cutting away shall only be done with approval of a structural engineer.
- Pipework shall not be installed within any fire compartment floor that separates one dwelling from another part of the building, except as shown in Figures 1C & 1D.
- Roof spaces with vapour permeable underlay without specific ventilation shall be treated as unventilated voids: additional ventilation shall be applied (at least two ventilators per space, each ≥50 cm²).
- Pipework shall not be laid below or within roof space insulation material.
- Use a drill hole size **20 mm larger than the Flexigas DN size**.
- **Care shall be taken when re-fixing flooring** to avoid nail / screw damage; mark the flooring above the pipe run wherever possible.

BS 6891 / SECTION 11

F Joist installations

FIGURE 1A Limits for notching & drilling of solid timber joists

Figure 1A - Limits for notching and drilling of solid timber floor joists



) Limits for notching top of joist where drilling and notching occur

) Alternative limits for notching top of joist where drilling and notching occur

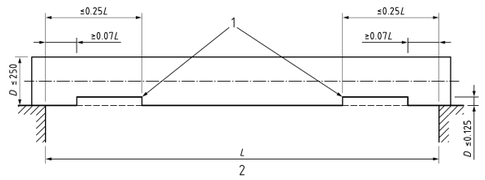
Limits for drilling of joists where drilling and notching occur

ey

Min. 100 mm between notch and hole 2 Holes not closer than 3 × diameter

OTE 1 The notching can occur at both ends, either on top or bottom, without a design check.

Figure 1A - Limits for notching and drilling of solid timber floor joists



Key

1 Positions within which notching can occur on the bottom without a design check. Minimum 100 mm between the notch and any holes [see Figure 13a)].

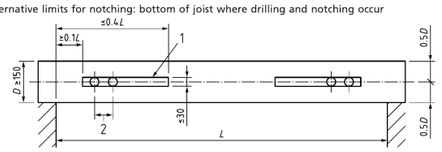
2 Clear span simply supported joist (not a trimmer, trimming joist or beam)

NOTE 2 The notching can occur at both ends, either on top or bottom, without a design check.

d) Limits for notching bottom of joist where drilling and notching occur

NOTE 3 The notching can occur at both ends on the bottom without a design check.

e) Alternative limits for notching: bottom of joist where drilling and notching occur



f) Alternative drilling zone where no notching occurs

Key

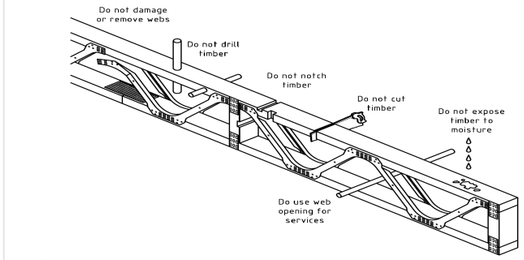
1 Drilling zone where no notching occurs

2 Holes not closer than 3 × diameter of largest hole and a maximum of 8 × 30 mm holes can be accommodated within each drilling zone. No notching is permitted.

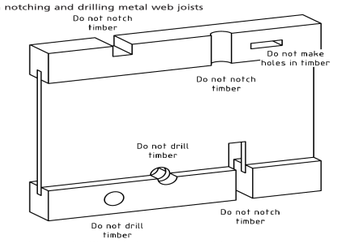
Six permitted top-, bottom- and centre-notch / drilling zones, with min spacing and dimensions in millimetres.

FIGURE 1B Metal-web & engineered joists

Figure 1B - Notching and drilling of metal web joists and timber engineered joists



a) Restrictions on notching and drilling metal web joists

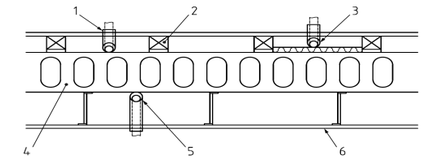


b) Restrictions on notching and drilling timber-engineered joists

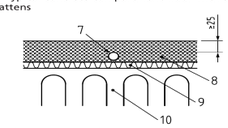
Do not notch the flange. Do not drill the web.

FIGURE 1C Concrete compartment floors

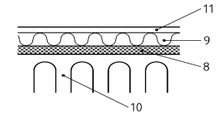
Figure 1C – Flexigas in concrete compartment floors



a) Typical concrete compartment floor with suspended ceiling and topping of timber decking on battens



b) Alternative screed topping



c) Alternative timber floating floor topping (N pipework to be installed in this type of floor topping)

Key

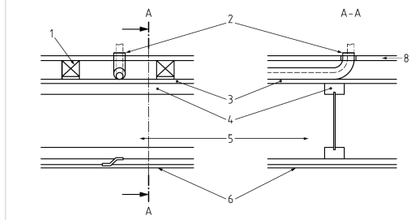
1 Pipework within vented ducting extended above floor level and sealed to floor deck with flexible sealant
2 Floor decking on battens on resilient bearers/pads
3 Ducted pipework can be above or below any resilient quilt laid between floor battens with fixings used to secure the ducting penetrating or damaging the quilt
4 Structural floor slab
5 Pipework within vented ducting located within suspended ceiling void and sealed to ceiling board
6 Suspended ceiling
7 Pipework with factory-finished protection laid in screed above resilient overlay A)
8 Screed
9 Resilient sound-proofing overlay
10 Structural floor slab
11 Floating floor

A) Exposed metallic pipework, for example at joints, shall be further protected on site (see **8.1.7** to **8.1.12**).

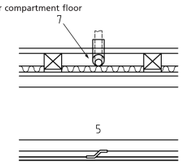
Vented ducting routed above floor level.

FIGURE 1D Flexigas in timber fire-compartment floors

Figure 1D – Flexigas in timber fire compartment floors



a) Typical suspended timber compartment floor



b) Typical suspended timber compartment floor incorporating resilient quilt

Key

1 Floor decking on battens on resilient bearers/pads
2 Pipework within vented ducting extended above floor level and sealed to floor deck with flexible sealant
3 Structural deck
4 Timber joist
5 No pipework in this void
6 Ceiling fixed to resilient bars
7 Ducted pipework can be above or below any resilient quilt laid between floor battens with no fixings used to secure the ducting penetrating or damaging the quilt
8 Floor deck

Ducted pipework laid in resilient quilt between battens, with no fixings used to secure the ducting through the quilt.

SECTION 12

12 Flexigas in Solid Floors

The Flexigas plastic cover complies with section 8.10.7 of BS 6891:2015 (specifically, with regard to cover thickness and chloride content of plastic cover) and therefore the cover **meets the requirements for direct burial** (factory-finished protection) and does not require additional sleeving when placed in floor screed. However, section 8.10.6 of BS 6891:2015 and Regulation 208 19(2)(b) of the Gas Safety Regulations also require all gas pipework to be protected against damage caused by movement as best as possible (e.g. from subsidence or other structural movement).

If the gas installer judges that the Flexigas tubing may be subject to unforeseen movement, it is considered best practice (and optional) to place the Flexigas tubing in a suitable sleeve as per **Section 14**.

All buried pipework should be inspected for damage before being placed in a solid floor. Any gaps or holes in the plastic cover should be wrapped with silicone tape with at least **50% cover** to provide a layer of double thickness.

The installed Flexigas system should be tested for gas tightness before being covered by floor screed. Where a pipe is buried in a concrete screed there shall be a minimum of **25 mm of cover** above the Flexigas tubing or sleeve.

Flexigas fittings shall not be directly buried in any solid floor. If a fitting is required within the floor screed or below, ground boxes with removable covers (“conduit junction boxes”) shall be used so the fitting can be accessed if needed.

Flexigas should never be buried in structural elements such as concrete slabs or structural toppings, nor in power-floated floors. Pipework in acoustic floors shall only be installed with the agreement of the building designer.

Where pipework is installed in solid floors it shall run parallel or at 90° to the walls. Examples are shown in Figures 2A–2C.

SECTION 13

13 Flexigas in Walls

Flexigas tubing should be placed in walls by following the procedures and diagrams below. For examples in timber and masonry walls, refer to:

- Brick and block plastered — Figure 3A
- Brick and block with dry lining on dabs — Figure 3B
- Brick and block dry lined on battens — Figure 3C
- Timber frame and light steel construction — Figure 3D

PIPE RUNS

Flexigas tubing shall, where possible, be vertical and shall be placed in ducts with convenient access points or placed in pipe chases. The installation pipe shall be secured and have as few joints as practicable.

DAMAGE

Flexigas tubing should be inspected for damage before being placed within a wall. Any damage to the plastic cover can be repaired using silicone tape, with at least 50% overlap cover from one pass to the next.

CAVITY WALLS

Flexigas tubing shall not be placed within the cavities of cavity walls. Every pipe passing through a cavity wall shall take the shortest practicable route and shall be sleeved (see **Section 14**).

DRY-LINED WALLS

Flexigas tubing installed behind dry lining shall be suitably encased by building material. Where it passes within 50 mm of the decorative face of plasterboard it shall be protected against penetration — for example with 1 mm steel plate.

TIMBER & LIGHT STEEL-FRAMED WALLS

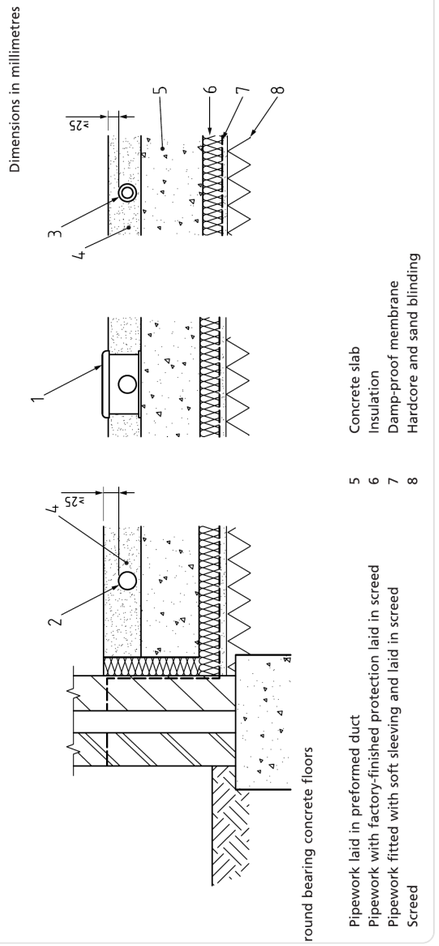
Flexigas installed within walls of timber-frame construction shall: be run within purpose-designed channels or ducts; be adequately secured; have as few joints as practicable; be protected from mechanical damage; not be in a position where it could be penetrated by a nail/screw 50 mm long (50 mm from plasterboard face or behind 1 mm steel plate).

BS 6891 / SECTION 12

F Buried pipe — concrete

FIGURE 2A Buried pipe — ground-bearing concrete

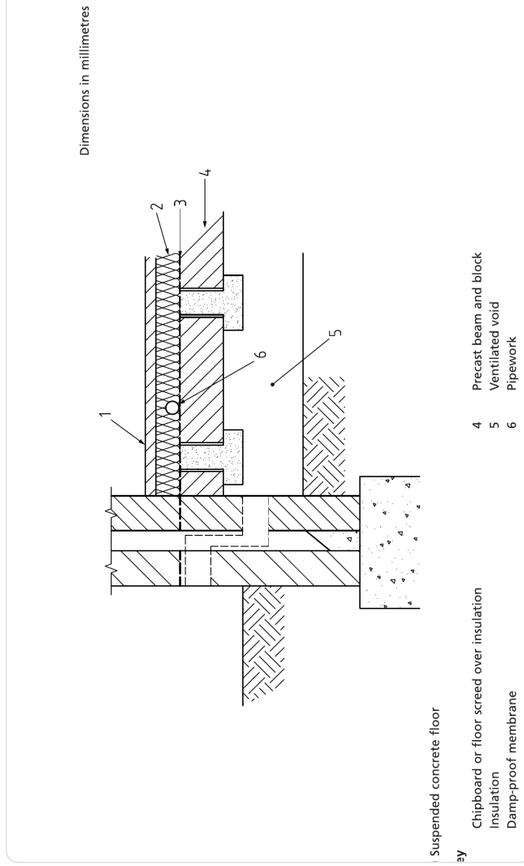
Figure 2A - Examples of Buried Pipe – Ground Bearing Concrete Floors



Three permitted configurations: in preformed duct, in screed with factory protection, or in screed with sleeving and sand blinding.

FIGURE 2B Suspended concrete floor

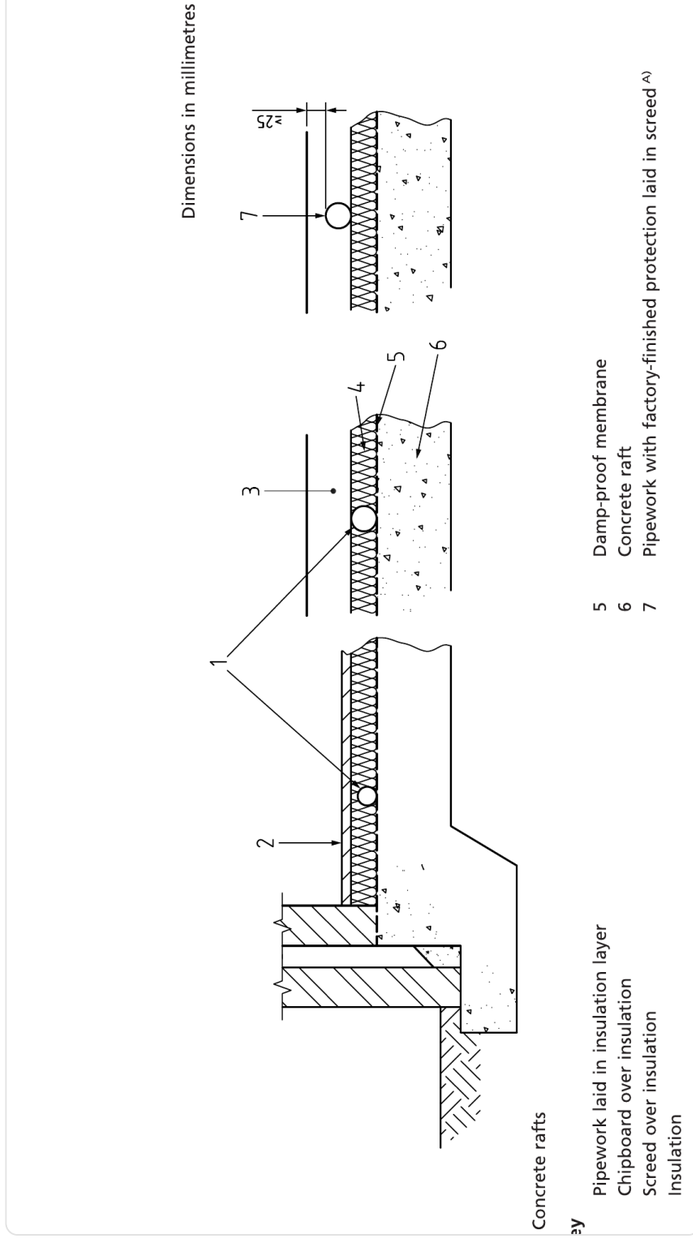
Figure 2B - Examples of Buried Pipe – Suspended Concrete Floor



Pipework laid in chipboard-on-screed insulation, or in pre-cast beam-and-block ventilated voids.

FIGURE 2C Buried pipe — concrete rafts

Figure 2C - Examples of Buried Pipe – Concrete Rafts



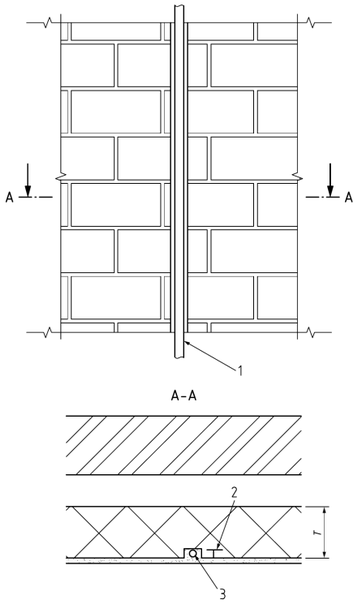
Pipework laid in insulation layer with chipboard cover, damp-proof membrane and concrete raft above.

BS 6891 / SECTION 13

F Walls — brick & block

FIGURE 3A Brick and block plastered

Figure 3A - Brick and Block Plastered

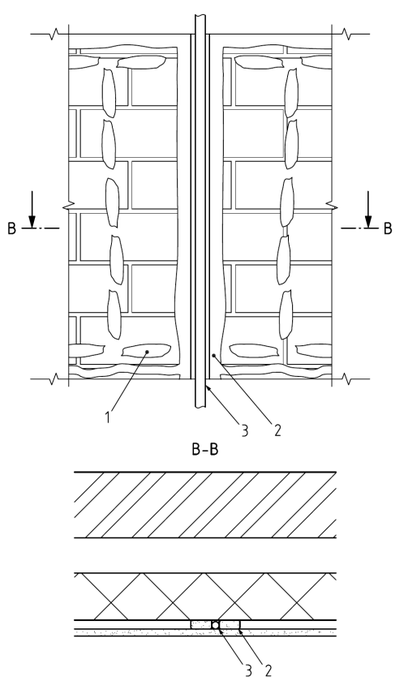


Key
1 Pipework set in chase
2 Depth of chase
3 Pipework set into chase in plastered wall
Maximum depth of chase: *T*/6 horizontal; *T*/3 vertical

Pipework set in chase. Max chase depth: T/6 horizontal, T/3 vertical.

FIGURE 3B Brick and block — dry lining on dabs

Figure 3B - Brick and Block with Dry Lining on Dabs.

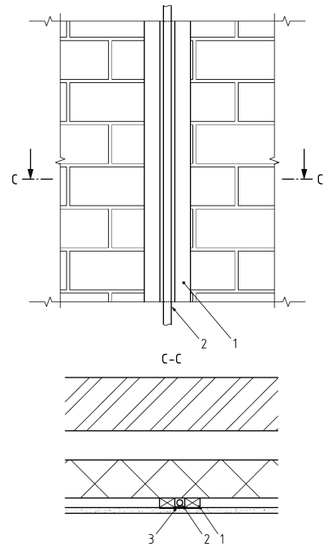


Key
1 Individual adhesive dabs
2 Continuous adhesive dabs to surround pipework
3 Pipework

Continuous adhesive dabs surround the pipework; individual dabs may be used to anchor the lining.

FIGURE 3C Brick and block dry lined on battens

Figure 3C - Brick and Block Dry Lined on Battens



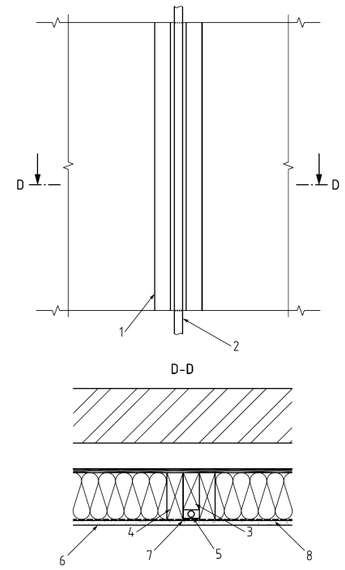
NOTE The joints between the wall and studs should be sealed with mastic in order to avoid gas tracking around the studs.

Key
1 Timber battens
2 Pipework
3 Steel plate of min. 1 mm thickness

Steel plate of minimum 1 mm thickness shields the pipework where it crosses battens.

FIGURE 3D-A Timber and light-steel framed walls

Figure 3D-A – Examples of Flexigas installed in timber and light steel framed construction walls



NOTE The joints between the studs should be sealed with mastic in order to avoid gas tracking around the studs.

a) Pipework passing through timber-frame wall

Key
1 Timber stud
2 Pipework
3 Timber stud blocking piece
4 Timber stud
5 Pipework
6 Plasterboard
7 Steel plate of min. 1 mm thickness
8 Vapour barrier

Pipework passing through a timber-frame wall, sealed at the studs with mastic.

SECTION 14

14 Sleeves

Sleeves shall be of a material capable of containing gas: copper, steel, polyethylene (PE) or polyvinyl chloride (PVC). Pipework passing through a wall or floor, whether or not it contains a cavity, shall pass through a sleeve.

Sleeves shall pass through the full width of the wall or the full thickness of the floor. They shall not impair the fire resistance of the building. The annular space between pipe and sleeve shall be sealed at one end to the pipe with a flexible fire-resistant compound. Where a sleeve passes through an exterior wall, the seal shall be on the inside.

The internal diameter of any sleeve should allow an annular space around the pipe sufficient for satisfactory insertion and adequate sealing. **Flexigas fittings shall not be located within the sleeve.** The outside of the sleeve shall be sealed at each end to the building structure with a suitable building material (e.g. cement mortar).

15 Flexigas in Ducts / Ventilation

Vertical and horizontal ducts containing Flexigas tubing must be ventilated so minor gas leakage does not cause the duct atmosphere to become unsafe. The duct may run freely through several storeys or take the form of an enclosure at each storey level. Where ducts are continuous, ventilation is normally achieved by openings sized per the table below.

CROSS-SECTIONAL AREA (M^2)	MIN. FREE AREA OF EACH OPENING (M^2)
≤ 0.01	0
0.01 – 0.05	Cross-sectional area of duct
0.05 – 7.5	0.05
> 7.5	1/150 of duct cross-sectional area

Note: ducts with cross-sectional area ≤ 0.01 m² and total volume < 0.1 m³ are considered adequately ventilated by adventitious means. Flexigas tubing may be installed in an unventilated duct where sleeved per Section 14. Flexigas shall not be placed in any metallic duct/chase that includes a metallic appliance vent or chimney.

SECTION 16

16 Fire Protection / Stopping

For buildings containing flats and/or maisonettes, Flexigas installations shall be **fire stopped** as they pass from one floor to another, unless in their own protected shaft ventilated top and bottom to outside air. When installation pipes from a continuous duct enter a flat or maisonette they shall be fire stopped at the point of entry.

Where pipework passes through an individual dwelling or commercial unit other than the one it supplies, it shall be located within a purposely constructed duct to prevent damage. The fire resistance of any duct containing gas pipework should equal or exceed the void it passes through. Examples of typical multi-storey installations are shown in Figures 4A & 4B.

Best Practice In Regards To Fire Stopping

When pipes pass through the protecting structure (compartment walls/floors), all openings should be kept as small and few as practicable, and suitably fire stopped to allow thermal movement while preserving fire resistance. To prevent displacement, fire-stopping materials should be supported by or reinforced with limited-combustibility materials. Any proprietary fire stopping, when tested per BS 476, should achieve the relevant fire resistance for load-bearing capacity, integrity and insulation.

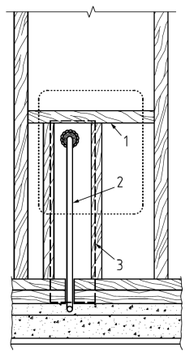
17 Pipe Supports

Flexigas CSST tubing should be supported by the following maximum distances between pipe supports:

NOMINAL SIZE	VERTICAL RUN	HORIZONTAL RUN
DN 15	1.2 m	1.2 m
DN 22	1.8 m	1.8 m
DN 28	1.8 m	1.8 m
DN 32	2.5 m	2.5 m
DN 40	2.5 m	2.5 m
DN 50	2.5 m	2.5 m

FIGURE 3D-B Timber-framed wall detail

Figure 3D-B – Examples of Flexigas installed in timber and light steel framed construction walls



NOTE The joints between the studs should be sealed with mastic in order to avoid gas tracking around the studs.

b) Pipework installed in a timber-framed wall

Key

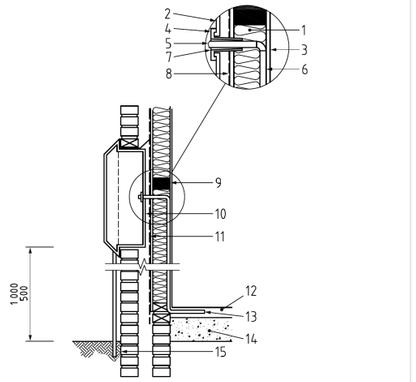
1 Timber stud
2 Pipework
3 Steel plate of min. 1 mm thickness

Pipework installed within a timber-frame wall, with steel plate shielding through stud penetrations.

FIGURE 3D-C Meter box — timber-frame

Figure 3D-C – Examples of Flexigas installed in timber and light steel framed construction walls

Dimensions in millimetre



NOTE Pipework to be located in a channel formed by timber studs of the same depth as the timber frame [the principles for which are shown in Figure 18a) and b)]. Timber studs should be sealed with mastic.

c) Pipework entering a timber-framed/light steel-framed building from a meter box

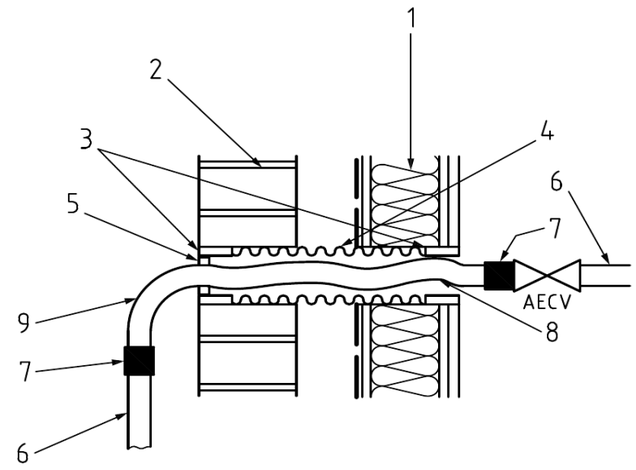
Key

1 Insulation
2 Meter box wall
3 Plasterboard
4 Rear spigot
5 Pipework (protected by a steel plate of min. 1 mm thickness as necessary)
6 Vapour control layer
7 Mastic sealing
8 Timber sheathing
9 Timber stud
10 Air space between back of box and breather membrane
11 Breather membrane carried down behind meter box
12 Floor screed
13 Pipework from meter notched through sole plate Preservative treatment to sole plate made good
14 Concrete
15 Service pipe or service pipework, as appropriate

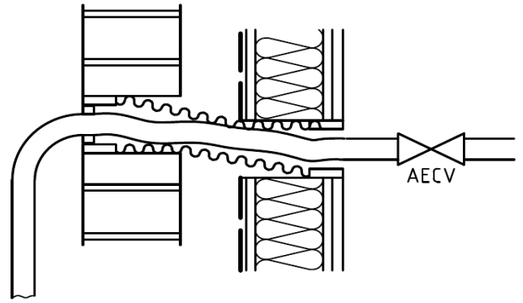
Meter box wall, breather membrane carried down behind, with pipework notched through the sole plate.

FIGURE 3E Typical method of accommodating movement through a masonry / timber-frame wall

Figure 3E– Typical method of accommodating movement though a masonry/timber frame wall



a) As installed: before movement of timber



b) After relative movement of timber

Key

1 Timber frame
2 Masonry external wall or wall of internal riser duct
3 Sealant between sleeve and wall
4 Flexible pipe sleeving
5 Flexible sealant on one end of sleeve only, preferably external side to prevent water ingress
6 Rigid pipe
7 Transition fitting from rigid pipework to pliable corrugated (stainless-steel) tubing
8 Pliable corrugated (stainless-steel) tubing
9 Bend not to exceed manufacturer's recommendation

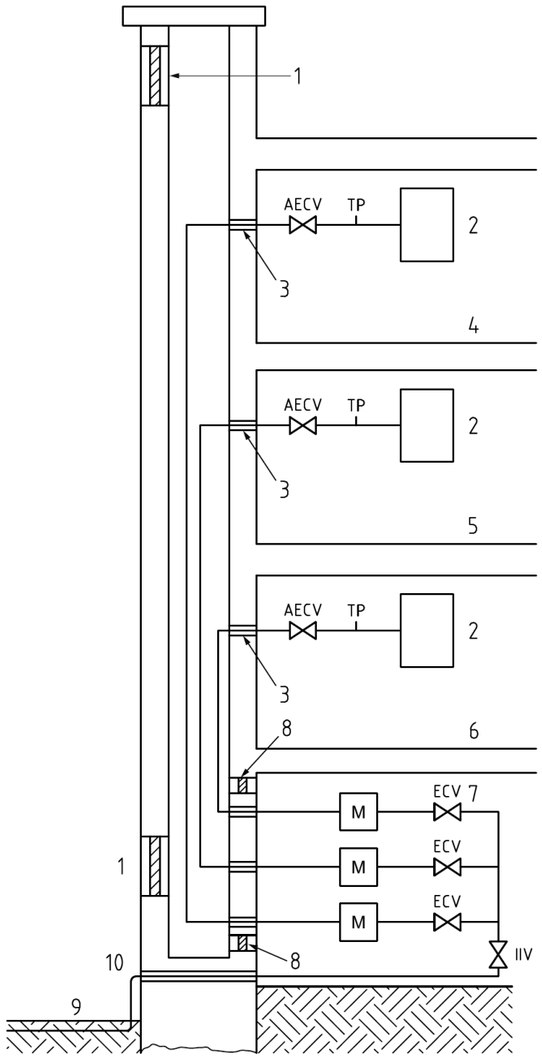
Transition from rigid pipework to pliable corrugated tubing, with the flexible sealant on the outer end of the sleeve and a sleeve dressing for water ingress.

BS 6891 / SECTION 16

F Multi-storey installations

FIGURE 4A **Multi-storey buildings — ventilated duct**

Figure 4A - Typical installation pipework in multi storey buildings containing flats or maisonettes – Ventilated duct.



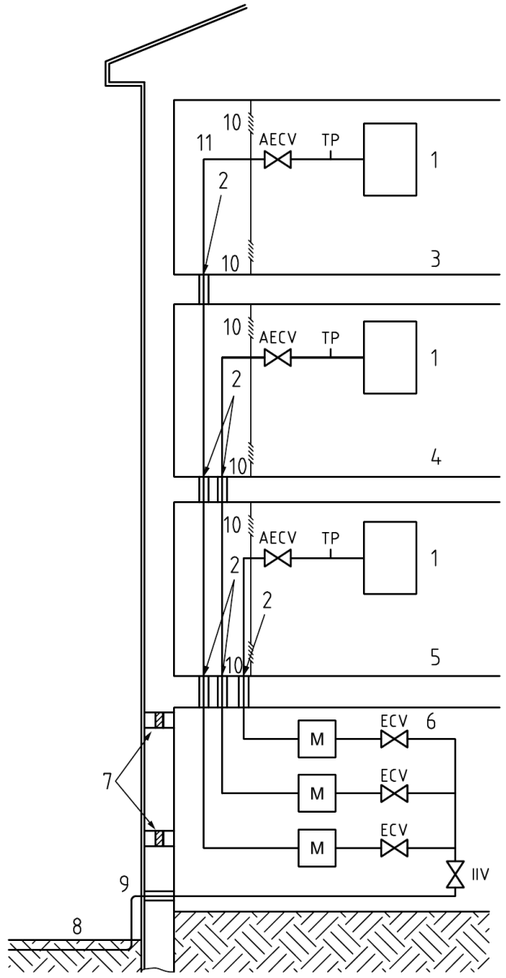
a) Ventilated duct

Key	1	Ventilation	6	Flat 1	ECV Emergency control valve
	2	Appliance	7	Meter room	AECV Additional emergency control valve
	3	Fire stop	8	Meter room ventilation	IIV Inlet isolation valve
	4	Flat 3	9	Ground level	M Gas meter
	5	Flat 2	10	Gas service	TP Test point

Ventilated duct rising through floors with one AECV + TP per flat. Vents communicate with an area ventilated per Building Regs.

FIGURE 4B **Multi-storey — fire-stopped pipework**

Figure 4B - Typical installation pipework in multi storey buildings containing flats or maisonettes - Fire stopped pipework and a ventilated enclosed area.



b) Fire stopped pipework and ventilated enclosed area

Key	1	Appliance	6	Meter room	11	Enclosure
	2	Fire stop	7	Meter room ventilation	ECV	Emergency control v
	3	Flat 3	8	Ground level	AECV	Additional emergen valve
	4	Flat 2	9	Gas service	IIV	Inlet isolation valve
	5	Flat 1	10	Vent	M	Gas meter
					TP	Test point

NOTE Vents are to communicate with an area that is ventilated in accordance with the Building Regulations [5], [6], [7].

Fire-stop at every compartment crossing. Vents communicate with an area ventilated per Building Regs.

SECTION 18

18 Exterior Pipework

The Flexigas cover has been tested to both **EN 15266** and **BS 7838** (withdrawn and replaced by EN 15266) to specifically meet the requirements for direct burial.

Where Flexigas is installed underground, the user should check the cover for any holes or gaps and cover with self-adhesive silicone tape with at least 50% per pass (to ensure a double layer) to prevent corrosion from the surrounding soil.

Flexigas installed in soil, gardens or under areas with no vehicular traffic shall have at least **375 mm** of cover. Flexigas installed below drives with light vehicular traffic shall be at least **475 mm**, and for drives with heavy traffic at least **600 mm**.

For more information on how to bury all gas pipework including Flexigas, see **BS 6891:2015 Section 8.13**.

Flexigas fittings shall not be installed below ground.

Flexigas is suitable for use where it is exposed. The cover is UV stable and as such no further protection or labelling is required. The installer should check to ensure there are no holes in the protective layer, and that the gap between the cover and the fittings is properly covered with self-adhesive tape.

For commercial or LPG installations please consult the relevant standards. Examples of typical exterior pipework are shown in Figure 5.

SECTION 19

19 Interrelation with Other Services

Installation pipework shall be located or electrically insulated so that it does not touch metallic fitments which can give rise to electrolytic corrosion. The Flexigas polyethylene cover and silicone tape should provide adequate protection where spacing is impracticable.

Where installation pipework is not separated by electrical insulating material, they shall be spaced as follows:

- At least **150 mm** away from electricity meters and associated excess-current controls, electrical switches or sockets, distribution boards or consumer units.
- At least **25 mm** away from electricity supply and distribution cables.

Care shall be taken not to damage any electrical conductor when installing pipework. Installation pipes shall not be buried in floors together with electrical underfloor heating, unless the underfloor heating has been physically and permanently disconnected.

SECTION 20

20 Main Equipotential Bonding

All domestic gas installations (including CSST systems such as Flexigas) shall have **main equipotential bonding** of the gas installation pipework conforming to BS 7671.

The integrated Flexigas CSST earthing terminal has been tested by British Standards to meet the requirements of **BS 951:2009** for use as a bonding clamp, and therefore meets the requirements of BS 6891 and BS 7671. The integrated terminal makes earth bonding easier but need not be used if another suitable BS 951:2009 bonding clamp is used instead.

The purpose of electrical bonding is to create a zone in which voltage differences (and therefore hazards from electric shocks) are minimised. This is achieved by connecting separate conductive components together with a main equipotential bonding conductor or metal pipework.

Main equipotential bonding shall be connected:

- As near as practicable to the point of entry into premises.
- Before any branch in the installation pipework.
- In a position where it is accessible, visually observed, and fitted with a warning label stating “Safety electrical connection. Do not remove.”
- By a mechanically and electrically sound connection which is not subject to corrosion.

If a different BS 951 bonding clamp is used, the main protective bonding conductor must **not** be attached to the Flexigas tubing (stainless steel) directly. The bonding clamp may only be attached to the hex part of the fittings, or to copper or rigid steel parts of the installation.

Main equipotential bonding cable: minimum cross-sectional area **10 mm²**, green/yellow insulation, reference 6491X conforming to BS 6004. For internal meters, the bonding connection should be within **600 mm** of the meter outlet. See Figure 6.

SECTION 21

21 Valves (Emergency Control Valves)

An **Emergency Control Valve (ECV)** should always be fitted. An ECV is not part of the installation pipework. It is usually installed at the end of the service main, at the inlet of the primary meter.

An **additional emergency control valve (AECV)** shall be fitted:

- To the installation pipe where it enters the building if the meter is sited 6 m or more away from the building.
- Inside individual flats served by a large single or multiple-meter installation in a remote or communal area (see also Section 16 — Fire Stopping).

Every AECV shall:

- Be labelled or marked to show its open and closed position.
- Be fitted in an accessible position.
- Be easy to operate.
- Be fitted with a suitable handle securely attached, or other permanent means of operation.
- Where the lever moves in the vertical plane, move to the “off” position in a downward direction.

A pressure test point shall be installed no more than **300 mm** downstream of the AECV. Where the installation pipe is taken from inside a building to supply an appliance externally, a valve shall be installed in an accessible position where the pipe leaves the building. It is preferable that the valve be fitted externally.

SECTION 22

22 Prevention of Corrosion

Flexigas shall not be installed in a position where it is likely to be exposed to a corrosive environment. The Flexigas yellow cover will provide adequate protection against corrosion in the majority of installation environments. The installer however must take special care to ensure that all exposed parts of the stainless steel are adequately protected either by the cover or by wrapping with silicone tape.

Any exposed stainless steel around the fitting should be wrapped with self-bonding silicone tape, as should any gaps or holes in the plastic cover, so that no stainless steel is exposed.

Assembled pipework should be tested for gas tightness (per Section 23) before any additional protection against corrosion is applied on site.

Special care should be taken to check the integrity of the cover when burying pipework with any gaps or holes wrapped with at least 50% overlap. This should be done **after** performing the gas tightness test.

When applying the tape, ensure the pipe is clean and dry. A minimum of **50% overlap** should be used when wrapping the pipe to provide a layer of at least double thickness. Where possible, wrapping should be coloured yellow ochre in accordance with BS 1710.

PIPEWORK IN FIREPLACE OPENINGS

CSST such as Flexigas are not suitable for use in the openings of all-fuel fireplaces as soot and debris can be particularly corrosive. Flexigas being used in such a scenario must be terminated outside the firebox with the final installation made with a suitably-protected pipe.

SECTION 23

23 Gas Tightness Testing & Purging

Upon completion of the installation and prior to gas being made available, the installation shall be tested for gas tightness and purged in accordance with **IGE/UP/1B** — Tightness testing and purging of domestic sized natural gas installations (or other applicable standard).

Self-bonding silicone tape should only be applied to any gaps/holes on the cover, and to the area around the fittings, after the gas tightness testing has been conducted.

Some leak detection fluids may be corrosive to the components of Flexigas (stainless steel and brass) and should not be used. In particular, chemicals with a high chloride content (such as soaps) should be strictly avoided.

Whenever a gas supply system is being commissioned or re-commissioned it must be purged per **IGEM/UP/1A or 1B**. This includes conducting a tightness test as above.

To calculate the total internal volume of a pipework installation that includes Flexigas, the following table can be used:

SIZE	M^3 VOLUME OF 1 M LENGTH
DN 15	0.00020
DN 22	0.00043
DN 28	0.00068
DN 32	0.00098
DN 40	0.00162
DN 50	0.00236

Where it is not possible to purge through an appliance, an appropriately sized purge point needs to be provided (see IGEM/UP/1).

SECTION 24

24 Connection of Flexigas to Other Systems

The Flexigas system can only be connected to other piping systems by means of **approved BSP thread fittings**.

Flexigas tubing is only compatible with Flexigas fittings. No Flexigas components should ever be connected directly with any other CSST system, despite how similar they may appear.

Where soldered components are to be joined to Flexigas (by means of a thread fitting), the solder work should be done well before any Flexigas component is brought within the vicinity of where the connection is to be made. Before attaching the Flexigas fitting, ensure that the corresponding thread is cleaned, dry and free from any solder flux residue.

25 Damage and Repair

Despite its weight, Flexigas is quite resilient. However, the installer should still take special care not to damage the components, either in storage or installation.

Where damage has occurred to the cover, it can be repaired by use of self-bonding silicone tape, with at least 50% overlap. Any damage to the cover should be repaired **after gas tightness testing**.

Where damage to the tubing has occurred, the damaged section should be removed. A section of tubing should be replaced where: the tubing has been punctured (e.g. by a nail, drill or screw); has been bent beyond its minimum bend radius; has been significantly crushed to the point of restricting flow; or has been exposed to a corrosive chemical or material.

Where the damage occurs in a pipework section where fittings are not permitted (e.g. in tubing placed in the ground or a wall), it will be necessary to replace the whole tubing run, or take the run back to a location where fittings are permitted. If the damaged section is in a portion where fittings are permitted, it can be repaired by removing the damaged component and joining the two sections together with a Flexigas Union fitting. Where a larger section of tubing has been damaged, it can be replaced by use of two Union fittings and an additional piece of Flexigas tubing.

SECTION 26

26 Warranty

Flexigas warrants that all components of the FlexiGas™ system are free from defects and that if any such defect should be discovered, a replacement component will be provided up to **25 years** from the date of purchase. This warranty is limited to making a replacement component available and does not include any labour cost involved or connected therewith (including but not limited to diagnosing the defective component and/or removing and reinstallation of said defective component).

This warranty does not apply to any defective component that is considered unfit for purpose or defective due to improper installation, storage, transportation or general misuse (either through negligence or otherwise), nor does it extend to any loss or damage caused by events outside the direct control of Flexigas (including but not limited to improper storage or transportation, floods, fires and other acts of God). This warranty is in lieu of any other warranties expressed, implied or statutory.

27 Gas Pipework Inside a Protected Area

Flexigas that is installed in **one continuous length** (with no fittings) meets the requirements of BS 6891 to be installed in a protected area, such as a protected corridor or lobby without additional ventilation (such as a dedicated fireproof duct), provided that the protected area is deemed “normally occupied”.

A normally occupied area is a part of the building or dwelling where it is reasonably expected for people to be in the vicinity, such as a common stairwell.

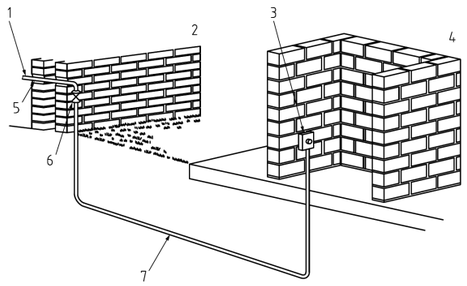
Where Flexigas is installed in a suspended ceiling above a protected area, and where this suspended ceiling does not form part of the required fire/acoustic performance of the compartment floor, the suspended ceiling void can be vented into the ‘normally occupied’ protected area via meeting the ventilation requirements of Section 15. Where such ventilation is not possible, Flexigas should be installed in a dedicated fireproof duct with at least the same fire-resisting construction as the protected area it is passing through.

BS 6891 / SECTIONS 18 & 20

F Exterior & bonding

FIGURE 5 Typical exterior pipework with 375 mm cover

Figure 5 - Typical exterior pipework with 375mm cover



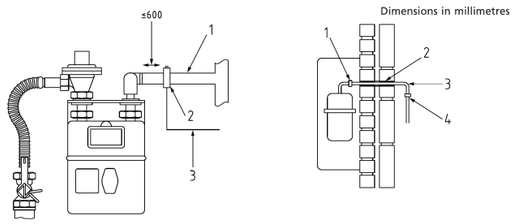
Key

1	Gas supply to external location	5	Pipe sleeve
2	House wall	6	External pipework isolation valve
3	Leisure point	7	Pipework
4	Barbecue		

Pipe routed from house wall to garden barbecue / leisure point. Min cover: 375 mm soil, 475 mm light traffic, 600 mm heavy traffic.

FIGURE 6 Position of main equipotential bonding connection

e 6 - Position of main equipotential bonding connection



a) Internal meter installation

Key

1 Pipework
2 Bonding connection
3 Green-yellow cable to consumer earth terminal

b) Meter installation in external box/ compartment

Key

1 Bonding connection (non-preferred position)
2 Pipework sleeve (sealed)
3 Pipework
4 Bonding connection (preferred position)

NOTE For medium-pressure fed meter installations the main protective bonding conductor should only exit the box as detailed in BS 6400-2 and BS 6400-3.

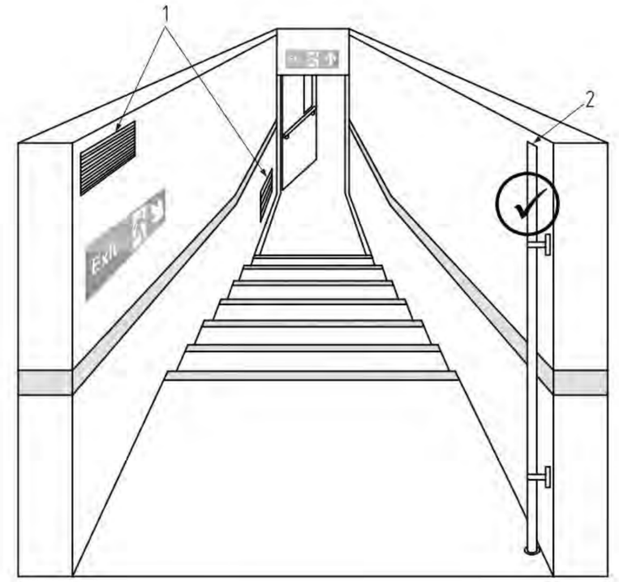
Internal meter: bond on consumer side, within 600 mm of the meter outlet. External box: preferred bonding position shown.

SECTION 27 Gas pipework inside a protected area

27 - GAS PIPEWORK INSIDE A PROTECTED AREA

Flexigas that is installed in one continuous length (with no fittings) meets the requirements of BS 6891 to be installed in a protected area, such as a protected corridor or lobby without additional ventilation (such as a dedicated fire proof duct), provided that the protected area is deemed "normally occupied".

A normally occupied area is a part of the building or dwelling where it reasonably expected for people to be in the vicinity, such as a common stairwell.



Key

1. Vent direct to outside air.
2. Flexigas tubing of one continuous length

Where Flexigas is installed in a suspended ceiling above a protected area, and where this suspended ceiling does not form part of the required fire/acoustic performance of the compartment floor, the suspended ceiling void can be vented into the 'normally occupied' protected area via meeting the ventilation requirements of section 15.

Where such ventilation is not possible, Flexigas should be installed in a dedicated fire proof duct with at least the same fire-resitting construction as the protected area it is passing through.

51

Pipework in one continuous length (no fittings) routed above a protected ceiling void that is itself vented into the 'normally occupied' protected area.

SECTION 28

28 Pipe Sizing
(including example)

At the design and planning stage, verify that the installation pipes will be adequate for both immediate and probable future requirements, particularly where pipe will be buried or hard to access. For domestic natural gas, allow a **maximum pressure loss of 1 mbar** between the meter outlet and each appliance connection. Meter pressure is **21 mbar** (BS 6891). Low-pressure 3rd-family gas: **28 mbar (butane)** / **37 mbar (propane)** with pressure drop ≤ 2.5 mbar (BS 5482).

Discharge rates in the following tables are **approximate** and assume a straight horizontal run. Arcs not counted as 90° bends, restrictions and future appliances all affect the result — size for **all** appliances at their maximum gas rate, with margin for higher-rate replacements (e.g. larger boilers).

Fittings disrupt those discharge rates. Add the following equivalent tubing lengths when estimating tube size:

SIZE	90° BEND	TEE (THROUGH)	TEE (DIVERTED)	COUPLING	ELBOW
DN 15	0.3 m	0.3 m	0.9 m	0.3 m	0.9 m
DN 22	0.3 m	0.3 m	0.9 m	0.3 m	0.9 m
DN 28	0.3 m	0.3 m	0.9 m	0.3 m	0.9 m
DN 32	0.3 m	0.3 m	1.0 m	0.3 m	1.0 m
DN 40	0.3 m	0.3 m	1.0 m	0.3 m	1.0 m
DN 50	0.3 m	0.3 m	1.5 m	0.3 m	1.0 m

Table 1 assumes a pressure loss of **1 mbar**. Pressure loss is proportional to length, so a pipe four times longer than needed gives **0.25 mbar** per equivalent section.

Figure 7 (opposite) shows a Flexigas domestic installation with pipe lengths and gas rates. The pressure loss between **A** and **H** must not exceed **1 mbar**. With four sections (A–B, B–D, D–F, F–H), apportion **0.25 mbar** to each.

SECTION 28 — WORKED EXAMPLE

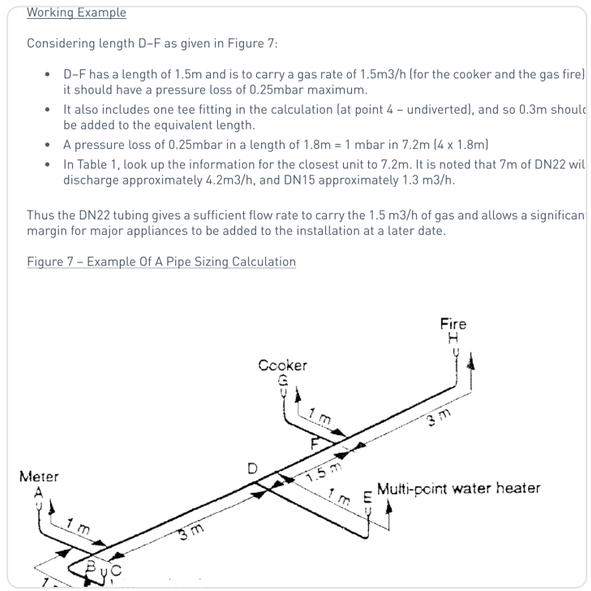
28 Worked Example

Considering length **D–F** as given in Figure 7:

- D–F has a length of **1.5 m** and is to carry a gas rate of **1.5 m³/h** (for the cooker and the gas fire); it should have a pressure loss of **0.25 mbar** maximum.
- It also includes one tee fitting in the calculation (at point 4 — undiverted), so 0.3 m should be added to the equivalent length.
- A pressure loss of 0.25 mbar in a length of 1.8 m = 1 mbar in 7.2 m (4 × 1.8 m).
- In Table 1, look up the information for the closest unit to 7.2 m. It is noted that **7 m of DN22** will discharge approximately 4.2 m³/h, and DN15 approximately 1.3 m³/h.

Thus the DN22 tubing gives a sufficient flow rate to carry the 1.5 m³/h of gas and allows a significant margin for major appliances to be added to the installation at a later date.

FIGURE 7 **Example of a pipe sizing calculation**



Domestic Flexigas installation showing pipe lengths A–H. Multiple appliances on a single trunk; lengths and gas rates per the worked example above.

Typical appliance gas rates (m³/h):
Warm air unit 1.0 · Multi-point water heater 2.5 · Cooker 1.0 · Gas fire 0.5 · Central heating boiler 1.5 · Combination boiler 2.5

SECTION 29 — TABLE 01

29 Sizing Tables

Table 1 — Natural Gas. Approximate discharge (m³/h) through a straight horizontal run of Flexigas. Specific gravity = 0.6, pressure drop between ends = 1 mbar.

TUBING LENGTH (METRES)	DN SIZE					
	15	22	28	32	40	50
1	4.2	10.3	19.5	35.0	59.0	120.0
2	2.8	7.4	13.4	24.5	41.0	84.3
3	2.2	6.4	11.0	20.3	34.0	68.8
4	1.9	5.4	9.2	17.6	29.5	59.3
5	1.6	4.7	8.5	15.8	26.7	53.0
6	1.5	4.4	7.7	14.3	23.8	48.6
7	1.3	4.2	7.1	13.2	22.0	44.4
8	1.2	3.9	6.7	12.3	20.5	41.3
9	1.1	3.7	6.3	11.7	18.9	39.2
10	1.0	3.5	6.0	11.2	17.9	37.0
12	0.9	3.2	5.5	10.3	16.4	33.6
15	0.8	2.9	4.9	9.2	14.6	30.1
20	0.7	2.5	4.3	7.9	12.6	25.8
25	0.5	2.3	3.8	7.1	11.3	23.0
30	0.5	2.1	3.5	6.5	10.3	20.8
40	0.5	1.8	3.0	5.5	8.9	18.0
50	0.4	1.6	2.7	5.0	8.0	16.0
60	0.4	1.5	2.5	4.6	7.3	14.6
70	0.3	1.4	2.3	4.3	6.7	13.4
80	0.3	1.3	2.1	4.0	6.3	12.7
90	0.3	1.2	2.0	3.8	5.9	12.0
100	0.3	1.1	1.9	3.6	5.6	11.0

SECTION 29 — TABLE 02

29 Sizing Tables

Table 2 — Propane. Approximate discharge (m³/h) through a straight horizontal run of Flexigas. Specific gravity = 1.52, pressure drop between ends = 2.0 mbar.

TUBING LENGTH (METRES)	DN SIZE					
	15	22	28	32	40	50
1	3.4	9.2	16.8	30.9	51.2	110.7
2	2.4	6.8	11.7	22.0	35.7	78.2
3	1.9	5.6	9.5	17.8	29.3	63.3
4	1.7	4.6	8.3	14.9	25.3	55.3
5	1.5	4.3	7.5	13.9	22.5	49.5
6	1.3	3.9	6.7	12.7	20.6	44.9
7	1.2	3.7	6.3	11.3	18.9	41.6
8	1.1	3.4	5.9	10.9	17.7	38.7
9	1.0	3.3	5.5	10.4	16.7	36.3
10	0.9	3.1	5.3	9.8	15.6	34.7
12	0.8	2.8	4.8	9.0	14.5	31.2
15	0.7	2.5	4.3	8.1	12.9	27.9
20	0.6	2.2	3.8	7.1	11.1	24.0
25	0.4	2.0	3.3	6.3	9.9	21.4
30	0.4	1.8	3.1	5.8	9.0	19.4
40	0.4	1.6	2.7	5.0	7.8	16.8
50	0.4	1.2	2.2	4.1	7.0	14.9
60	0.3	1.2	2.0	3.9	6.4	13.6
70	0.3	1.1	1.9	3.6	5.8	12.5
80	0.3	1.0	1.7	3.3	5.5	11.9
90	0.3	1.0	1.7	3.1	5.1	11.2
100	0.3	0.9	1.6	3.1	4.9	10.3

SECTION 29 — TABLE 03

29 Sizing Tables

Table 3 — Butane. Approximate discharge (m³/h) through a straight horizontal run of Flexigas. Specific gravity = 2.07, pressure drop between ends = 2.0 mbar.

TUBING LENGTH (METRES)	DN SIZE					
	15	22	28	32	40	50
1	2.9	8.2	14.0	26.0	43.8	94.8
2	2.1	5.8	10.0	18.5	30.6	67.0
3	1.7	4.8	8.1	15.2	25.1	54.2
4	1.4	4.1	7.0	13.1	21.6	47.4
5	1.2	3.7	4.3	11.6	19.3	42.4
6	1.1	3.4	5.8	10.8	17.6	38.5
7	1.1	3.2	5.4	10.2	16.2	35.6
8	0.9	3.0	5.0	9.5	15.1	33.2
9	0.8	2.8	4.7	8.9	14.3	31.1
10	0.8	2.6	4.5	8.6	13.4	29.8
12	0.7	2.4	4.1	7.7	12.4	26.7
15	0.6	2.2	3.7	7.0	11.0	23.9
20	0.5	1.9	3.2	6.0	9.5	20.5
25	0.4	1.7	2.9	5.4	8.5	18.3
30	0.4	1.6	2.6	4.9	7.7	16.6
40	0.4	1.4	2.3	4.3	6.7	14.4
50	0.3	1.2	1.9	3.5	6.0	12.8
60	0.3	1.0	1.7	3.3	5.5	11.7
70	0.2	1.0	1.6	3.0	5.0	10.7
80	0.2	0.9	1.5	2.9	4.7	10.2
90	0.2	0.8	1.4	2.7	4.4	9.6
100	0.2	0.8	1.4	2.6	4.2	9.0

SECTION 29 — TABLE 04

29 Pressure Drop — Natural Gas

Table 4 — Natural Gas. Approximate pressure drop (mbar per metre) through a straight horizontal 1 m run of Flexigas. Specific gravity = 0.6.

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
0.1	0.001	–	–	–	–	–
0.2	0.004	0.001	–	–	–	–
0.25	0.005	0.001	0.001	–	–	–
0.40	0.010	0.003	0.001	0.001	–	–
0.50	0.015	0.003	0.001	0.001	0.001	–
0.60	0.021	0.004	0.001	0.001	0.001	0.001
0.80	0.042	0.006	0.002	0.001	0.001	0.001
1.00	0.063	0.009	0.003	0.001	0.001	0.001
1.20	0.094	0.013	0.004	0.002	0.001	0.001
1.40	0.115	0.016	0.006	0.002	0.001	0.001
1.50	0.140	0.019	0.007	0.002	0.001	0.001
1.60	0.164	0.024	0.008	0.003	0.002	0.001
1.80	0.200	0.030	0.010	0.004	0.002	0.001
2.00	0.255	0.036	0.012	0.004	0.002	0.001
2.20	0.310	0.043	0.013	0.005	0.002	0.001
2.40	0.362	0.049	0.016	0.006	0.003	0.001
2.50	0.432	0.053	0.018	0.006	0.003	0.001
2.60	0.495	0.059	0.020	0.007	0.003	0.001
2.80	0.560	0.067	0.024	0.008	0.004	0.001
3.00	0.600	0.077	0.026	0.008	0.004	0.001
3.20	0.675	0.087	0.028	0.009	0.004	0.001
3.40	0.749	0.010	0.034	0.010	0.004	0.001
3.50	0.803	0.111	0.036	0.011	0.005	0.001
3.60	0.856	0.126	0.039	0.013	0.005	0.001
3.80	0.944	0.137	0.044	0.014	0.005	0.001
4.00	0.990	0.146	0.048	0.015	0.006	0.002
4.50	–	0.185	0.060	0.017	0.007	0.002
5.00	–	0.225	0.074	0.022	0.009	0.002

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
5.50	–	0.275	0.081	0.024	0.011	0.003
6.00	–	0.328	0.107	0.031	0.013	0.003
6.50	–	0.386	0.126	0.037	0.015	0.003
7.00	–	0.451	0.147	0.043	0.016	0.004
7.50	–	0.518	0.169	0.049	0.018	0.005
8.00	–	0.591	0.192	0.056	0.021	0.005
8.50	–	0.669	0.217	0.063	0.024	0.006
9.00	–	0.753	0.244	0.071	0.027	0.007
9.50	–	0.841	0.273	0.080	0.030	0.008
10.00	–	0.934	0.303	0.088	0.033	0.008
15.00	–	–	0.762	0.219	0.079	0.019
20.00	–	–	1.226	0.360	0.129	0.031
25.00	–	–	–	0.567	0.200	0.049
30.00	–	–	–	0.823	0.286	0.070
35.00	–	–	–	1.050	0.389	0.095
40.00	–	–	–	–	0.506	0.124
45.00	–	–	–	–	0.638	0.157
50.00	–	–	–	–	0.787	0.194
55.00	–	–	–	–	0.950	0.235
60.00	–	–	–	–	1.128	0.279
65.00	–	–	–	–	–	0.328
70.00	–	–	–	–	–	0.380
75.00	–	–	–	–	–	0.437
80.00	–	–	–	–	–	0.498
85.00	–	–	–	–	–	0.562
90.00	–	–	–	–	–	0.630
95.00	–	–	–	–	–	0.702
100.00	–	–	–	–	–	0.778

SECTION 29 — TABLE 05

29 Pressure Drop — Propane

Table 5 — Propane. Approximate pressure drop (mbar per metre) through a straight horizontal 1 m run of Flexigas. Specific gravity = 1.52.

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
0.1	0.002	–	–	–	–	–
0.2	0.010	0.002	–	–	–	–
0.25	0.012	0.003	0.002	–	–	–
0.40	0.026	0.008	0.003	0.002	–	–
0.50	0.038	0.008	0.003	0.003	0.002	–
0.60	0.053	0.010	0.003	0.003	0.003	0.001
0.80	0.106	0.015	0.005	0.003	0.003	0.002
1.00	0.158	0.023	0.008	0.003	0.003	0.003
1.20	0.238	0.033	0.010	0.005	0.003	0.003
1.40	0.290	0.040	0.015	0.005	0.003	0.003
1.50	0.353	0.050	0.018	0.005	0.003	0.003
1.60	0.415	0.063	0.020	0.008	0.005	0.003
1.80	0.506	0.078	0.025	0.010	0.005	0.003
2.00	0.643	0.093	0.030	0.010	0.005	0.003
2.20	0.782	0.110	0.033	0.013	0.005	0.003
2.40	0.914	0.125	0.043	0.015	0.008	0.003
2.50	1.092	0.138	0.048	0.015	0.008	0.003
2.60	1.250	0.153	0.053	0.018	0.008	0.003
2.80	1.414	0.173	0.063	0.020	0.010	0.003
3.00	1.517	0.198	0.068	0.020	0.010	0.003
3.20	1.704	0.225	0.073	0.023	0.010	0.003
3.40	1.891	0.250	0.088	0.025	0.010	0.003
3.50	2.050	0.285	0.093	0.028	0.013	0.003
3.60	2.208	0.325	0.100	0.033	0.013	0.003
3.80	–	0.353	0.113	0.035	0.013	0.003
4.00	–	0.375	0.123	0.038	0.015	0.005
4.50	–	0.478	0.155	0.045	0.018	0.005
5.00	–	0.580	0.190	0.058	0.023	0.005

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
5.50	–	0.708	0.210	0.063	0.028	0.008
6.00	–	0.845	0.275	0.080	0.033	0.008
6.50	–	0.995	0.325	0.095	0.038	0.008
7.00	–	1.163	0.380	0.110	0.043	0.010
7.50	–	1.335	0.435	0.128	0.048	0.013
8.00	–	1.492	0.495	0.145	0.055	0.013
8.50	–	1.656	0.560	0.163	0.063	0.015
9.00	–	1.824	0.630	0.183	0.070	0.018
9.50	–	1.994	0.703	0.205	0.078	0.020
10.00	–	2.215	0.780	0.228	0.085	0.020
15.00	–	–	1.826	0.565	0.000	0.000
20.00	–	–	2.967	0.928	0.333	0.080
25.00	–	–	–	1.463	0.515	0.125
30.00	–	–	–	1.950	0.738	0.180
35.00	–	–	–	2.668	1.003	0.245
40.00	–	–	–	–	1.253	0.320
45.00	–	–	–	–	1.579	0.405
50.00	–	–	–	–	1.898	0.500
55.00	–	–	–	–	2.252	0.605
60.00	–	–	–	–	2.675	0.720
65.00	–	–	–	–	–	0.845
70.00	–	–	–	–	–	0.980
75.00	–	–	–	–	–	1.125
80.00	–	–	–	–	–	1.283
85.00	–	–	–	–	–	1.448
90.00	–	–	–	–	–	1.623
95.00	–	–	–	–	–	1.774
100.00	–	–	–	–	–	1.925

SECTION 29 — TABLE 06

29 Pressure Drop — Butane

Table 6 — Butane. Approximate pressure drop (mbar per metre) through a straight horizontal 1 m run of Flexigas. Specific gravity = 2.07.

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
0.1	0.003	–	–	–	–	–
0.2	0.013	0.002	–	–	–	–
0.25	0.017	0.003	0.003	–	–	–
0.40	0.036	0.010	0.003	0.002	–	–
0.50	0.053	0.010	0.003	0.003	0.002	–
0.60	0.073	0.014	0.003	0.003	0.003	0.002
0.80	0.145	0.020	0.007	0.003	0.003	0.002
1.00	0.218	0.031	0.010	0.003	0.003	0.003
1.20	0.327	0.044	0.014	0.007	0.003	0.003
1.40	0.399	0.054	0.020	0.007	0.003	0.003
1.50	0.485	0.068	0.024	0.007	0.003	0.003
1.60	0.571	0.085	0.027	0.010	0.007	0.003
1.80	0.696	0.105	0.034	0.014	0.007	0.003
2.00	0.884	0.126	0.041	0.014	0.007	0.003
2.20	1.076	0.150	0.044	0.017	0.007	0.003
2.40	1.257	0.170	0.058	0.020	0.010	0.003
2.50	1.502	0.187	0.065	0.020	0.010	0.003
2.60	1.719	0.207	0.071	0.024	0.010	0.003
2.80	1.944	0.235	0.085	0.027	0.014	0.003
3.00	2.086	0.269	0.092	0.027	0.014	0.003
3.20	2.343	0.306	0.099	0.031	0.014	0.003
3.40	2.600	0.340	0.119	0.034	0.014	0.003
3.50	2.818	0.388	0.126	0.037	0.017	0.003
3.60	–	0.442	0.136	0.044	0.017	0.003
3.80	–	0.479	0.153	0.048	0.017	0.003
4.00	–	0.510	0.167	0.051	0.020	0.007
4.50	–	0.649	0.211	0.061	0.024	0.007
5.00	–	0.789	0.258	0.078	0.031	0.007

GAS RATE (M³/H)	PRESSURE DROP (MBAR / M) — DN SIZE					
	15	22	28	32	40	50
5.50	–	0.962	0.286	0.085	0.037	0.010
6.00	–	1.149	0.374	0.109	0.044	0.010
6.50	–	1.353	0.442	0.129	0.051	0.010
7.00	–	1.581	0.517	0.150	0.058	0.014
7.50	–	1.816	0.592	0.173	0.065	0.017
8.00	–	2.071	0.673	0.197	0.075	0.017
8.50	–	2.346	0.762	0.221	0.085	0.020
9.00	–	2.638	0.857	0.248	0.095	0.024
9.50	–	2.948	0.955	0.279	0.105	0.027
10.00	–	3.274	1.061	0.309	0.116	0.027
15.00	–	–	2.700	0.768	0.000	0.000
20.00	–	–	–	1.261	0.452	0.109
25.00	–	–	–	1.989	0.700	0.170
30.00	–	–	–	2.883	1.003	0.245
35.00	–	–	–	–	1.363	0.333
40.00	–	–	–	–	1.775	0.435
45.00	–	–	–	–	2.237	0.551
50.00	–	–	–	–	2.757	0.680
55.00	–	–	–	–	–	0.823
60.00	–	–	–	–	–	0.979
65.00	–	–	–	–	–	1.149
70.00	–	–	–	–	–	1.333
75.00	–	–	–	–	–	1.530
80.00	–	–	–	–	–	1.734
85.00	–	–	–	–	–	1.945
90.00	–	–	–	–	–	2.168
95.00	–	–	–	–	–	2.404
100.00	–	–	–	–	–	2.647

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