

Specification for

Corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN 50

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Committees responsible for this British Standard

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- British Combustion Equipment Manufacturers' Association
- British Gas plc
- British Rubber Manufacturers' Association Ltd.
- British Turned-parts Manufacturers' Association
- LP Gas Association
- Society of British Gas Industries

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Foreword

This British Standard has been prepared by Technical Committee GSE/1. It gives requirements for bendable corrugated stainless steel pipe and associated fittings for the supply of 1st, 2nd and 3rd family gases. The requirements relate to materials, dimensions, mechanical properties and performance.

Information to be provided concerning installation is included in Annex A. It is anticipated that this will eventually form the basis of a separate installation standard analogous to BS 6891.

Product certification. Users of this British Standard are advised to consider the desirability of third-party certification of product conformity with this standard, based on testing and continuing product surveillance, which may be coupled with assessment of a supplier's quality system against the appropriate standard in the BS EN ISO 9000 series.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

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1 Scope

This British Standard specifies requirements for semi-rigid (bendable) corrugated stainless steel pipe and associated fittings in the nominal size range DN 10 to DN 50 and intended for use as installation pipework for the supply of 1st, 2nd and 3rd family gases in permanent buildings. It applies to corrugated pipe and fittings which are suitable for a maximum working pressure of 75 mbar when installed in accordance with BS 6891 or BS 5482-1 in domestic premises, or in accordance with the Institution of Gas Engineers publication IGE/UP/2 [1] in other premises. Requirements for the protection of the outer surface of the corrugated pipe by a coating or a cover are included.

Corrugated stainless steel semi-rigid pipe to this standard is not intended for applications in which during installation, or subsequent to installation, it can be subjected to repeated bending (see **A.5**).

Information to be provided in the installation instructions is specified in Annex A.

Annex B gives guidance on the nature of the requirements and test methods, to assist in the preparation of quality plans for the manufacture of corrugated pipe and fittings.

Annex C gives the suggested sizes of fittings.

NOTE 1 A typical method of installation, using corrugated pipe and fittings conforming to this standard, is to connect the meter outlet to a centrally placed manifold by the use of suitably sized corrugated pipe. Each appliance can then be connected directly to the manifold, again by the use of suitably sized corrugated pipe. Alternatively, for small installations, tees can be used. As the corrugated pipe can be readily bent to the required shape, bend and sweep fittings are generally not required.

NOTE 2 The threaded end-fittings covered by this standard are required to conform to BS 21 (see **6.4**) and are therefore suitable for use in conjunction with fittings to BS 143 & 1256 or BS EN 10242 which have jointing threads in accordance with BS 21.

NOTE 3 Attention is drawn to the possibility of restricted access on site and the need to consider the application of forces and torques required for assembly, particularly for larger diameters, when designing and planning the installation.

2 References

2.1 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 24. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this British Standard, the definitions given in BS 1179:1967 and BS 1179-6:1980 apply, together with the following.

3.1

bend radius

the radius measured to the axial centre-line of the corrugated pipe

3.2

coating

a layer of material bonded to the external surface of the corrugated pipe by the manufacturer and intended to improve the resistance of the pipe to external corrosion and mechanical damage

3.3

cover

a tubular outer sheath applied to the corrugated pipe by the manufacturer and intended to improve the resistance of the pipe to external corrosion and mechanical damage

3.4 Fittings

3.4.1

capillary adaptor

a fitting with one end intended for connection to corrugated pipe and the other end having a spigot for soldering into a capillary fitting

3.4.2

end-fitting

a fitting with one end intended for permanent attachment to corrugated pipe, and the other end threaded to BS 21

3.4.3

connector

a coaxial fitting with both of its ends intended for permanent attachment to corrugated pipe

3.4.4

manifold

a multiway fitting able to accept one threaded inlet connection and three or more threaded outlet connections

3.4.5

meter union

a fitting with an outlet intended for permanent attachment to corrugated pipe and an inlet suitable for direct connection to the meter outlet

3.4.6

strapped elbow

a fitting with one end intended for permanent attachment to corrugated pipe and the other end threaded to BS 21, and including a right-angle bend and lugs for wall mounting

3.4.7

push end-fitting

end-fitting intended to form a leak tight seal when assembled by the application of a linear force to the fitting

3.4.8

screw end-fitting

end-fitting intended to form a leak tight seal when assembled by the application of a tightening torque to the fitting

3.5

gasway

a duct conveying gas

3.6

manufacturer's instructions

instructions issued by the manufacturer for the assembly and installation of the corrugated pipe, fittings and component parts

3.7

nominal size (DN)

a numerical designation of size which is common to all components in a piping system other than components designated by outside diameter or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions

3.8

non-chlorinated material

a synthetic polymer or elastomer with a total chloride content not exceeding 50 ppm

3.9

retaining device

a circlip or other fastener providing a mechanical connection between an end-fitting and a corrugated pipe

3.10**semi-rigid**

capable of being bent by hand without tools during installation

NOTE The term “bendable” is sometimes used as a synonym for “semi-rigid”.

3.11**visible**

that can be seen when examined in daylight or normal room lighting, by the unaided eye, corrected, if necessary, for abnormal vision

4 Materials**4.1 Corrugated pipe**

The corrugated pipe shall be manufactured from one of the following materials:

- a) stainless steel strip, conforming to grade 304S11, 316S11, 320S31 or 321S31 of BS 1449-2:1983;
- b) seamless stainless steel tube with composition and properties as for grade 304S11, 316S11, 320S31 or 321S31 of BS 1449-2:1983.

4.2 Coating or cover

The coating or cover shall be of a non-chlorinated material.

4.3 Fittings (see 3.4)

Fittings shall be made from material conforming to one of the following specifications:

- | | |
|-----------------------|--------------------------------|
| a) BS 970 303 S31 | stainless steel for machining; |
| b) BS 970 316 S11 | stainless steel for machining; |
| c) BS 970 316 S31 | stainless steel for machining; |
| d) BS 970 321 S31 | stainless steel for machining; |
| e) BS 1400 DCB 1 | brass for gravity die casting; |
| f) BS 1400 LG 2 | gunmetal for casting; |
| g) BS 1400 LG 3 | gunmetal for casting; |
| h) BS 2872 CZ 122 | brass for hot stamping; |
| i) BS 2874 CZ 121 Pb3 | brass for machining; |
| j) BS 2874 CZ 121 Pb4 | brass for machining; |
| k) BS 6681 B30-06 | malleable iron for casting; |
| l) BS 6681 W35-04 | malleable iron for casting. |

Fittings intended for soldering (see 6.3.9) shall be made from material conforming to e), f), g), h), i) or j) above.

4.4 Elastomeric seals

4.4.1 An elastomeric seal which is exposed to gas shall be a static seal made from material conforming to class A2/H3 of BS EN 549:1995, and shall be coloured black.

4.4.2 If a second elastomeric seal is required to enable end-fittings to meet the requirements of 9.6, it shall be made from silicone and be colourless or coloured white. The seal shall be fitted outside the seal described in 4.4.1.

4.4.3 If the hardness of the seals is outside the range 66 to 75 IRHD, the hardness should be stated in the manufacturer's instructions.

NOTE It is recommended that seals be in the hardness range 66 to 75 IRHD.

4.4.4 Seals shall be resistant to damage during assembly when assembled in accordance with the manufacturer's instructions. If a fitting tool is necessary for assembly, the tool shall be supplied with the seals or corrugated pipe and its use stipulated in the manufacturer's instructions.

4.5 Retaining device

The retaining device shall be made from one of the materials specified in 4.3, or from one of the following spring steels which can be assembled without permanent set:

- a) carbon spring steel, phosphated and oiled, conforming to condition and grade CS70 or CS80 of BS 1449-1.15;
- b) hard drawn stainless steel wire conforming to BS 2056.

NOTE The joint between a connector (both ends), end-fitting (one end), meter union (one end), strapped elbow (one end) or tee (all three ends) and the corrugated pipe will typically incorporate two elastomeric seals and a steel retaining device.

5 Finish

5.1 Corrugated pipe

5.1.1 Welds shall be free from globular deposits, discontinuities, porosity and undercutting, and shall have a regular surface. The bore of the corrugated pipe shall be clean and free from swarf and other foreign matter. The ends of the corrugated pipe, as supplied, shall be cleanly cut and free from burrs.

5.1.2 The corrugated pipe shall be coated or fitted with a tightly fitting cover in accordance with 4.2 and 6.2.

5.1.3 The corrugated pipe shall be free from dents and shall be supplied either straight or coiled, without kinks or other irregularities.

5.2 Fittings

5.2.1 Gravity die-castings shall be sound in all respects, free from laps, blow holes, pitting and other defects likely to affect the integrity of the pipework. All surfaces not machine-finished shall be clean and smooth. The castings shall be neatly dressed and no casting shall be rectified by burning, plugging, stopping or patching.

5.2.2 Hot brass stampings shall be sound and solid without laminations, and shall be smooth and well finished.

5.2.3 Machined components shall be of a fine finish and free from scores and surface defects likely to affect the integrity of the pipework. The texture of surfaces intended for capillary soldering or in contact with any seal, during or after assembly, shall not exceed 0.8 mm R_a , in accordance with BS 1134-1 and BS 1134-2.

5.2.4 Gasways and washer seatings shall be free from burrs and sharp edges. The interior of components shall be free from swarf and other foreign matter.

5.2.5 Components shall be free from scores, dents, cuts and other damage likely to cause a malfunction of the component.

6 Design and dimensions

6.1 Corrugated pipe

6.1.1 The corrugated pipe shall be constructed from single-ply seamless or single longitudinally butt-welded tube, subsequently annularly corrugated. The corrugations shall be of uniform height and pitch, and continuous along the length of the pipe. Transverse jointing of strip or circumferential jointing of pipe shall not be permitted at any stage of manufacture. If jointing is carried out after corrugating (prior to coating or covering), such jointing shall be either machine butt-welded or machine edge-welded as shown in Figure 1 and all the appropriate tests described in clauses 8 and 9 shall be carried out on pipe incorporating such jointing.

6.1.2 The dimensions of the corrugated pipe shall be as given in Table 1.

Table 1 — Dimensions of corrugated pipe

Nominal size of pipe DN	Maximum external diameter of bare metal pipe mm	Minimum thickness of steel (finished product) mm
10	13,5	0,18
12	16	0,18
15	20	0,20
22	27	0,25
28	34	0,25
32	42	0,30
40	48	0,30
50	63	0,30

6.2 Coating or cover

6.2.1 The corrugated pipe shall have a coating or cover suitable for continuous use at a temperature of 95 °C.

6.2.2 The coating or cover shall have a minimum thickness of 0.5 mm.

6.2.3 The coating or cover shall be coloured yellow in accordance with BS 4800:1989, colour code 08C35 or 10E53.

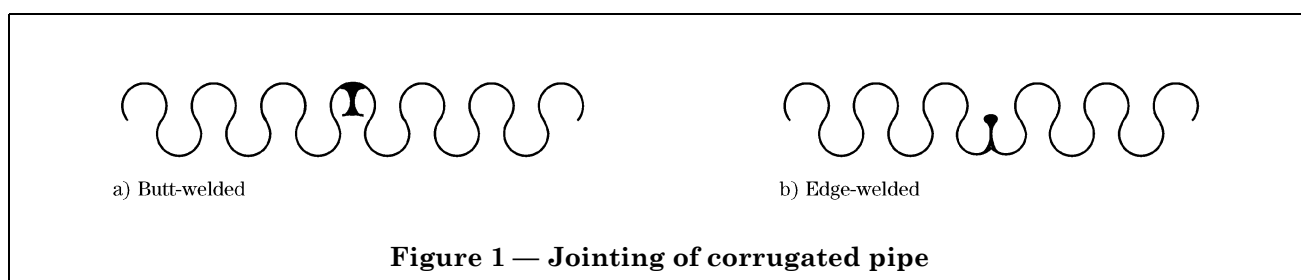
6.3 Fittings

6.3.1 General

NOTE A suggested range of fittings is given in Annex C.

6.3.1.1 The end designed to receive corrugated pipe shall be of the same design for all fittings.

NOTE Consideration should be given to forces and torques required for assembly, particularly for larger diameters, when designing and planning the installation, due to the possibility of restricted access on site.



6.3.1.2 The joint between the coated or covered pipe and the fitting shall be designed to resist the passage of liquids. If it is necessary to fit a boot or sleeve in order to achieve a liquid-resistant joint, this shall be stated in the manufacturer's instructions.

NOTE This requirement is to prevent liquids from reaching the stainless steel.

6.3.1.3 The wall thickness between any gasway and any exterior surface of a fitting shall be not less than 1 mm at any point. Fittings shall be free from internal fins or other irregularities which might restrict the free flow of gas, and shall be designed so that resistance to the flow of gas is minimized. Castings shall be free from visible porosity.

6.3.2 Connectors

Connectors shall have both ends designed to receive corrugated pipe directly.

6.3.3 Straight end-fittings

Straight end-fittings shall have one end designed to receive corrugated pipe directly. The other (threaded) end shall be in accordance with 6.4. The ends shall be coaxial.