BRITISH STANDARD

BS 6920-2.2.2:
2000+A1:2014

Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water —

Part 2: Methods of test —

Section 2.2: Odour and flavour of water —

Sub-section 2.2.2: Method of testing odours and flavours imparted to water by multi-layered hoses and pipes

ICS 13.060.20

BSI
British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee EH/3, *Water quality*, to Subcommittee EH/3/7, *Effects of materials on water quality*, upon which the following bodies were represented:

Association of Manufacturers of Domestic Electrical Appliances
Automatic Vending Association of Britain
British Bathroom Council
British Cement Association
British Coatings Federation Ltd.
British Malleable Tube Fittings Association
British Non-Ferrous Metals Federation
British Plastics Federation
British Plumbing Fittings Manufacturers' Association
British Precast Concrete Federation Ltd.
British Rubber Manufacturers' Association
British Valve and Actuator Manufacturers' Association
British Water
Department of the Environment for Northern Ireland
The Drinking Water Inspectorate
Galvanizers Association
Laboratory of the Government Chemist
Lead Development Association
Pipeline Industries Guild
UK Steel Association
UK Water Byelaws Scheme
Water Research Centre
Water UK
Zinc Development Association

This British Standard, having been prepared under the direction of the Health and Environment sector Committee, was published under the authority of the Standards Committee and came into effect on 15 May 2000

The following BSI references relate to the work on this British Standard:

Committee reference EH/3/7

Drafts for comment 99/560126 DC, 13/30287793 DC

ISBN 978 0 580 83878 1

Amendments/corrigenda issued since publication

Amd. No.	Date	Comments
14418 Corrigendum No. 1	4 August 2003	Change to reference in Clause **7**
A1	30 June 2014	See Foreword, Scope and Clause 8.

Contents

		Page
Committees responsible		Inside front cover
Foreword		ii
Introduction		1
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Principle	2
5	Reagents	2
6	Apparatus	2
7	Samples	2
8	Test procedure	2
9	Expression of results	4
10	Test report	4
Annex A (informative) Test sequence		5
Bibliography		6
Figure A.1 — Test sequence		5

Foreword

Publishing information

This subsection of BS 6920 is published by BSI Standards Limited, under licence from The British Standards Institution and came into effect on 15 May 2000. It was prepared by Subcommittee EH/3/7, *Effects of materials on water quality*. Amendment No. 1 was prepared by Technical Committee EH/6, *Effects of materials on water quality*.

Supersession

BS 6920-2.2.2:2000+A1:2014 supersedes BS 6920-2.2.2:2000, which is withdrawn.

Relationship with other publications

BS 6920 is published in several parts, namely *Part 1: Specification*, *Part 2: Methods of test*, *Part 3: High temperature tests* and *Part 4: Method for the GCMS identification of water leachable organic substances*.

Part 2 is further subdivided into a number of sections and subsections as follows.

Section 2.1: Samples for testing;

Section 2.2: Odour and flavour of water;

Subsection 2.2.1: General method of test;

Subsection 2.2.2: Method of testing odours and flavours imparted to water by multi-layered hoses and pipes;

Subsection 2.2.3: Method of testing odours and flavours imparted to water by hoses for conveying water for food and drink preparation;

Section 2.3: Appearance of water;

Section 2.4: Growth of aquatic microorganisms test;

Section 2.5: The extraction of substances that may be of concern to public health;

Section 2.6: The extraction of metals.

Information about this document

This edition introduces technical changes but it does not reflect a full review or revision of the standard.

Annex A is informative.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags [A1] ⟨A1]. Minor editorial changes are not tagged.

Hazard warnings

WARNING. This British Standard calls for the testing of extracts that might contain substances that could be injurious to the health of test panellists if adequate precautions are not taken. It is important that the guidance given in **8.1** is followed.

This British Standard refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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 a British Standard cannot confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 5 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Introduction

[A1] Hoses and pipes [A1] are usually manufactured by extrusion and therefore are subject to different processing conditions from moulded products. It is especially important therefore that [A1] these products [A1] are tested in their final form.

[A1] Many of these products [A1] are designed for use at mains pressure; hoses are typically fabricated from the water-contact material, some form of reinforcement, e.g. polyamide or steel, and an outer covering which may be made of different material from the water-contact surface. In a similar way many pipes and tubes are composed of several layers; often the water-contact surface will differ from that used for the outside of the pipe.

In these products, the outer materials are not necessarily designed for use in contact with water intended for human consumption, and are not subject to the tests described in BS 6920. Experience has shown, however, that odour and flavour-imparting substances can diffuse from these outer non-water contact materials of the product through the water-contact material and thus affect the odour and flavour of the water. Thus samples of these products have to be tested for their effect on the odour and flavour of water as complete hoses. The method described in BS 6920-2.2.1 is not suitable for such products.

[A1] Hoses constructed from one material only (with or without any reinforcements) can be assessed for their ability to affect the odour and flavour of water using the method set out in BS 6920-2.2.1. A modified test procedure is given in BS 6920-2.2.3 for use with hoses intended for conveying water for food and drink preparation purposes.

NOTE The method described in Clause **8** can also be used to prepare leachates from multi-layered hoses and pipes (including in-situ relined pipes) for the "Appearance of Water" test given in BS 6920-2.3, the "Extraction of substances that may be of concern to public health" given in BS 6920-2.5 and the "Extraction of Metals test" given in BS 6920-2.6. [A1]

1 Scope

This subsection of BS 6920 describes a method designed to assess the ability of [A1] multi-layered [A1] hoses (including reinforcements) and [A1] pipes [A1] to impart a discernible odour or flavour to water intended for human consumption.

NOTE 1 A modified test for use with hoses intended for use in conveying water for food and drink preparation is described in BS 6920-2.2.3.

NOTE 2 [A1] Under the relevant National Regulations [1] to [7], the National Regulator may specify additional provisions in some cases and will assess the significance of the results obtained. [A1]

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of BS 6920. For dated references, subsequent amendments to or revisions of any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 6920-1:2014, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Part 1: Specification.*

BS 6920-2.1:2014, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Part 2: Methods of test — Section 2.1: Samples for testing.*

BS 6920-2.2.1:2000+A3:2014, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Part 2: Methods of test — Section 2.2: Odour and flavour of water — Subsection 2.2.1: General method of test.*

BS 6920-2.2.3:2000+A2:2014, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Part 2: Methods of test — Section 2.2: Odour and flavour of water — Subsection 2.2.3: Method of testing odours and flavours imparted to water by hoses for conveying water for food and drink preparation.*

[A1] BS EN ISO 4788, *Laboratory glassware — Graduated measuring cylinders* [A1]

3 Terms and definitions

For the purposes of this subsection of BS 6920, the definitions given in BS 6920-2.2.1 apply.

4 Principle

[A1] A length of hose or pipe [A1] is filled with test water for 24 h. This water is then diluted and assessed for the presence of any discernible odour or flavour compared with the test water blank, by the test panellists. If an odour or flavour is detected, then the same sample is refilled with test water for a further six sequential periods, including one 72 h period and concluding with a 24 h period, using fresh test water for each period.

The water from the final soaking period is diluted and assessed for the presence of any discernible odour or flavour compared to the test water blank. The test procedure is repeated on a separate sample using chlorinated test water.

NOTE 1 A flow diagram showing the sequence of this test procedure is given in Annex A.

NOTE 2 The procedures for assessing the water samples for odour and flavour are described in full in BS 6920-2.2.1.

NOTE 3 The procedures do not involve any testing of the outer layers of [A1] multi-layered hoses or pipes [A1] on their own, but only as part of the complete product.

5 Reagents

The reagents shall be as given in BS 6920-2.2.1.

6 Apparatus

The apparatus shall be as given in BS 6920-2.2.1.

7 Samples

Samples of [A1] hoses and pipes [A1] shall conform to BS 6920-2.1:2014, **6.4**.

8 Test procedure

8.1 General

WARNING Conduct this test with due regard to the possible presence of substances in the extracts [A1] derived from the test material [A1] that may be hazardous to the health of the test panellists.

Only products [A1] Text deleted [A1] deemed suitable for contact with water intended for human consumption in accordance with BS 6920-1:2014, Clause **7** (toxicological test) shall be assessed in this test, unless details of the chemical composition and process of manufacture of the sample(s) are known, and any possible hazard can be assessed.

[A1] Ensure that the extractions periods are consecutive and without a break; if a break in the sequence does occur, repeat the sequence using fresh samples. [A1]

Instruct the test panellists not to swallow any test extract under any circumstances.

8.2 First extract

8.2.1 *General*

On the same day as testing is to start, rinse the inner surface of two 1 m lengths of the hose (see Clause **7**) or pipe using a minimum of 2 l of chlorine-free test water (see BS 6920-2.2.1:2000+A3:2014, **6.2**) for each.

8.2.2 *Hoses*

Clamp one of the 1 m lengths of hose in a "U" bend configuration. Completely fill the hose using chlorine-free test water. Cover each end of the hose with a fresh piece of aluminium foil. In addition, fill four empty 1 l test containers conforming to BS 6920-2.2.1:2000+A3:2014, **7.1** with chlorine-free test water. These constitute the blank test and also provide the water to be used for the initial dilution (see **8.2**). Seal the containers with fresh pieces of aluminium foil.

8.2.3 [A1] *Pipes* [A1]

In some cases pipes can be bent into a "U" configuration similar to hoses, in this case treat them in accordance with **8.2.2**. Where this is not possible close off one end of each pipe using an inert stopper made from glass, PTFE or stainless steel.

8.2.4 *All samples*

Store the hose or pipe under test and the containers of water at either (23 ± 2) °C for (24 ± 1) h for cold water testing, or at the selected temperature in the case of high temperature tests conducted in accordance with BS 6920-3.

8.3 Preparation of the initial dilution

〉A1〈 8.3.1 *Dilution of extracts* 〉A1〈

At the end of the storage period, transfer the contents of the hose or pipe to an appropriately sized clean glass graduated measuring cylinder conforming to 〉A1〈 BS EN ISO 4788 〉A1〈 and determine and record the volume of the water.

Calculate the final volume to which the water from the hose or pipe has to be diluted using the following equation:

$$V = \frac{e\pi d}{15\,000}$$

where

V is the final volume of initial dilution (in l);

e is the length of the hose or pipe (in mm);

d is the internal diameter of the hose or pipe (in mm).

Dilute the extract to this calculated volume, using the water from the blank test containers (see **8.2.2**).

Consider this initial dilution as the first extract (see BS 6920-2.2.1:2000+A3:2014, **10.1.1**).

Since the calculated volume may be several litres, it may be more convenient to dilute only a measured portion of the water on a proportional basis. In this instance, first ensure that all the water in the hose or pipe has been mixed in a test container conforming to BS 6920-2.2.1:2000+A3:2014, **7.1**.

〉A1〈 8.3.2 *Odour and flavour assessment* 〉A1〈

Instruct the test panellists to assess the first extract, in accordance with BS 6920-2.2.1:2000+A3:2014, **10.2**. 〉A1〈 If necessary carry out further extractions as given in BS 6920-2.2.1:2014, **10.1.2** and **10.1.3**, prepare the dilutions for the final extract, and assess the odour and flavour in accordance with BS 6920 2.2.1:2014, **10.2**.

NOTE See BS 6920-1:2014, Annex B for a diagrammatical representation of how the results from the testing carried out in this standard can be assessed. 〉A1〈

8.4 Extraction in chlorinated water

Repeat the extraction procedure described in **8.2** using the other length of hose or pipe (see Clause **7**) and chlorinated test water prepared in accordance with BS 6920-2.2.1:2000+A3:2014, **6.3**. 〉A1〈 At the end of this 〉A1〈 extraction period transfer the contents of the hose 〉A1〈 or pipe to a 〉A1〈 glass graduated measuring cylinder conforming to 〉A1〈 BS EN ISO 4788 to 〉A1〈 determine and record the volume of the water.

Prepare the initial dilution of the extract in accordance with **8.3.1**. Neutralize any free residual chlorine in the initial dilution in accordance with BS 6920-2.2.1:2000+A3:2014, **10.4.2**. Instruct the test panellists to assess the first dilution prepared using chlorine-free water in accordance with BS 6920-2.2.1:2000+A3:2014, **10.4.2** and **10.4.3**. 〉A1〈 If necessary carry out further extractions in accordance with BS 6920-2.2.1:2000+A3:2014, **10.1.2** and **10.1.3**, but using chlorinated test water and assess the odour and flavour of the dilutions in accordance with **8.3.2**. 〉A1〈

8.5 High temperature tests

〉A1〈 8.5.1 *First extracts*

Set up two hoses or pipes filled with test water in accordance with **8.2** (first extract). Store the clamped hoses or pipes and containers of water at the appropriate test temperature for (24 ±1) h.

8.5.2 *Chlorine-free test water extract*

At the end of the (24 ±1) h period transfer the contents of one hose or pipe to a clean glass graduated measuring cylinder conforming to BS EN ISO 4788 to determine and record the volume of water. Prepare the initial dilution in accordance with **8.3.1**. Use this initial dilution as the first chlorine-free extract (see BS 6920-2.2.1:2000+A3:2014, 10.1.1).

8.5.3 *Chlorinated test water extract*

Measure and record the volume of water poured from the second hose or pipe and add a sufficient quantity of sodium hypochlorite solution (see BS 6920 2.2.1:2000+A3:2014, **6.5**) to give a final free residual chlorine concentration of (1 ±0.1) mg/l. Leave this chlorinated extract to stand, in the absence of light at (23 ±2) °C for 1 h to 2 h. At the end of this period neutralize any free residual chlorine in the initial dilution in accordance with BS 6920-2.2.1: 2000+A3:2014, **10.3.2**. Prepare the initial dilution from this chlorinated extract in accordance with **8.3**. Use this initial dilution as the first chlorinated extract (see BS 6920-2.2.1: 2000+A3:2014, **10.1.1**).

8.5.4 *Odour and flavour assessment*

Instruct the test panelists to assess each of the first extracts prepared in accordance with **8.5.2** and **8.5.3** respectively, in accordance with BS 6920-2.2.1:2000+A3:2014, **10.2**. If necessary carry out further extractions as given in BS 6920-2.2.1:2000+A3:2014, **10.1.2** and **10.1.3**. Prepare the dilutions of the final extract in accordance with **8.3.1** and assess for odour and flavour as given in BS 6920-2.2.1:2000+A3:2014, **10.2** and **10.3** for chlorine-free and chlorinated test water respectively. A1

9 Expression of results

Express the results in accordance with BS 6920-2.2.1.

10 Test report

In addition to the requirements for the test report given in BS 6920-2.2.1:2000+A3:2014, Clause **12**, the report shall include the following particulars:

— a reference to this British Standard, i.e. BS 6920-2.2.2;

— a description of A1 the multi-layered hose or pipe A1 including details of reinforcements and outer coatings;

— that extracts were prepared by filling lengths of hose with test water and subsequently diluting this with test water;

— the length of the test sample;

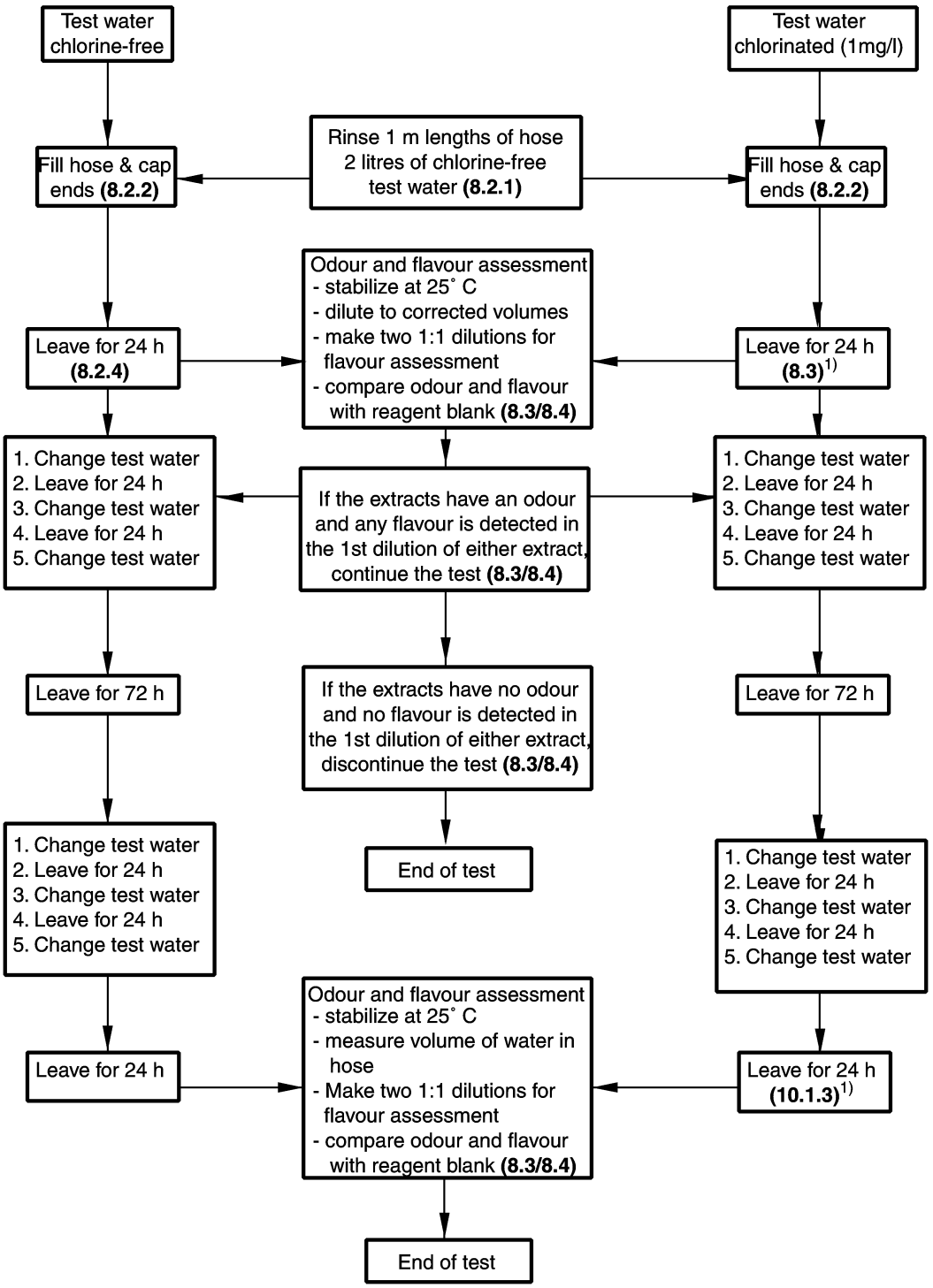
— the internal diameter of the test sample;

— the surface area of the material in contact with the test water;

— the volume of test water contained within the test sample during extraction;

— the total volume of the initial dilution (see **8.3**).

Annex A (informative)
Test sequence



NOTE For high temperature tests use the sequence as above at the selected temperature (**8.5**).

[1)] Test extract dechlorinated before testing (**8.4**).

Figure A.1 — Test sequence

Bibliography

Other publications

[1] GREAT BRITAIN. The Water Supply (Water Quality) (England) Regulations 2000. Statutory Instrument 2000, No. 3184. London: The Stationery Office.

[2] GREAT BRITAIN. The Water Supply (Water Fittings) Regulations 1999. Statutory Instrument 1999, No.1148 (England and Wales). London: The Stationery Office.

[3] GREAT BRITAIN. The Water Supply (Water Quality) Regulations 2010. Welsh Statutory Instrument 2010, No. 994 (W.99). London: The Stationery Office.

[4] GREAT BRITAIN. The Water Supply (Water Quality) (Scotland) Regulations 2001. Scottish Statutory Instrument 2001, No. 207. London: The Stationery Office.

[5] GREAT BRITAIN. The Scottish Water Byelaws, 2004. London: The Stationery Office.

[6] NORTHERN IRELAND. The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2009. Statutory Rules of Northern Ireland 2009, No. 246. London: The Stationery Office.

[7] NORTHERN IRELAND. The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009. Statutory Rules of Northern Ireland 2009, No. 255. London: The Stationery Office.

blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™