BRITISH STANDARD

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Methods for

Sampling manufactured domestic solid smokeless fuels in small consignments of mass 50 kg to 5000 kg either in bulk or in bags —

Part 2: Sampling of solid smokeless fuels other than coke

UDC 662:62:620:113

Cooperating organizations

The Solid Fuel Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Association of Consulting Engineers
British Carbonization Research Association*
British Cast Iron Research Association
British Coal Exporters' Federation*
British Ironfounders' Association
Chamber of Coal Traders
Chartered Institution of Building Services
Coke Oven Managers' Association*
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This British Standard, having been prepared under the direction of the Solid Fuel Standards Committee, was published under the authority of the Executive Board on 31 January 1979

The following BSI references relate to the work on this standard:
Committee reference SFC/45
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Amendments issued since publication

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Contents

Foreword

This method is based on proposals submitted by the National Coal Board.

The principles and procedures for incremental sampling of coal and coke and the precision obtained in practice are described in BS 1017-1 and BS 1017-2. These procedures are suitable for samples intended for determining the mean quality of production over a period or of bulk consignments of mass greater than 5 000 kg but not for those for small consignments of mass 500 kg to 5 000 kg such as domestic fuels in bulk or in bags.

A method for sampling domestic coke in small consignments is specified in BS 4845-1. This new Part of BS 4845 specifies a corresponding method for small consignments of other manufactured solid smokeless fuels.

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Summary of pages
This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 4845 specifies procedures for the sampling of small consignments of domestic solid smokeless fuels, other than coke, of mass 50 kg to 5 000 kg either in bulk or in bags of a nominal upper size not greater than 80 mm.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purposes of this Part of BS 4845 the following definitions apply.

3.1
domestic solid smokeless fuels

the solid residue of the distillation of coal or of a mixture of coal with additives and/or binders, at medium or low temperatures (below 800 °C), which when tested by the procedure specified in BS 3841 has a smoke emission not exceeding 5 g/h

3.2
consignment

the whole quantity of fuel from which a sample is to be taken

3.3
increment

the quantity of fuel taken by a single operation of the sampling instrument

4 Representative samples

For the sample to be representative of a consignment it is essential that the sample is formed from several increments. For bulk quantities this is achieved by taking increments from the whole quantity and for fuel in bags by taking increments from the mixed contents of the required number of complete bags.

5 Precision of sampling

Important factors in the precision of sampling are the number of increments taken and their mass. It is essential that the mass of an increment is related to the size of the fuel to be sampled and that for a given precision the mass of the sample is not less than a minimum related to the nominal upper size of 80 mm (see clause **1**).

Experiments have shown that, for smokeless fuels within the scope of this Part of BS 4845, multiple samples each of mass approximately 50 kg are necessary to give the required precision.

A standard precision of ± 1 % for moisture content with a probability of 95 % is desirable (see clause **4** of BS 1017-2:1960). However, experiments have shown that for consignments of smokeless fuel in bags this precision can only be achieved by sampling an impracticably large number of bags and that a precision of ± 2 % with the same probability is an acceptable compromise for smokeless fuels either in bulk or in bags which come within the scope (clause **1**) and are sampled in accordance with the procedures specified in clause **7**.

NOTE If additional samples, say for reserve, are necessary it is important to ensure that an adequate initial mass is available.

6 Mass of sample

The mass of the sample taken shall be about 50 kg, and not less than 45 kg, obtained in increments each of about 2 kg.

7 Procedure

7.1 General. To ease the problem of handling use a normal shovel capable of holding a mass of about 2 kg.

Where it is necessary to mix the consignment of fuel or any part of it during sampling carry out this operation on a clean, dry, hard surface.

Place each sample in a suitable clean dry container (or containers) capable of being effectively sealed to prevent loss of moisture and close immediately. Each container shall be properly labelled to enable the sample to be fully identified.

NOTE Metal or plastic containers provided with a close fitting lid or plastic bags with necks which can be tightly bound are suitable.

7.2 Sampling of consignments of mass 50 kg to 100 kg in bulk or in bags. The sample shall consist of the whole of the consignment, unless it is sufficient to take two samples of not less than 45 kg each.

7.3 Sampling of consignments of mass greater than 100 kg in bulk. Form the sample by taking increments each of mass about 2 kg covering the whole of the consignment; in the course of sampling ensure that the whole consignment is moved by the shovel. Take not less than 22 increments for any one sample. Collect the increments at regular and evenly spaced intervals covering the whole consignment. Because of the variability of moisture within the bulk load take three samples if more than 150 kg is available or two samples if more than 100 kg but less than 150 kg is available.

This is illustrated as follows:

It is required to sample a consignment of 500 kg of fuel. This mass is equivalent to 250 increments each of about 2 kg. To ensure that each of the three samples contains not less than 22 increments, equally spaced, it is necessary to collect one increment in 250/(3 × 22), i.e. not less than one increment in every three increments moved.

This is carried out as follows:

Sample	Increments
1	1, 10, 19, 28, ... 244
2	4, 13, 22, 31, ... 247
3	7, 16, 25, 34, ... 250

The remaining increments are moved during sampling but are not collected.

7.4 Sampling of consignments in bags of total mass greater than 50 kg but not greater than 250 kg. If the fuel is visibly wet place it in one or more containers and dry it partially as described in Appendix A.

Tip the whole consignment in a conical heap on a clean dry hard surface and mix by re-forming it in a second heap.

Using the procedure specified in **7.3**, take three samples if more than 150 kg is available, or two samples if more than than 100 kg but less than 100 kg is available.

7.5 Sampling of consignments in bags of total mass greater than 250 kg but not greater than 5 000 kg. Collect a total mass of not less than 250 kg of fuel from the consignment by taking complete bags evenly spaced through the consignment. If the fuel is visibly wet, place it in one or more containers and dry it partially as described in Appendix A

Empty the bags in a conical heap on a clean dry hard surface and mix by reforming it in a second heap.

Using the procedure specified in **7.3**, take four samples.

Appendix A Partial drying of the sample

Weigh the whole of the sample in its container(s) on a weighing machine, the scale of which correctly registers differences of 100 g or less. Then either spread the sample out in a thin layer on a steel plate in a warm, well-ventilated room and leave until there is no visible moisture on either the fuel or the steel plate, or partially dry it in a large oven. The minimum time of exposure shall be 12 h. In the meantime dry and weigh each container. After drying, replace the sample in the original container(s) and weigh. Record the percentage loss of moisture and write the details on the label of the sample container(s).

Calculate the percentage loss in mass of moisture due to the partial drying (X) using the following formula:

$$X = \frac{m - m_2}{m - m_1} \times 100$$

where

m is the mass of the container(s) and the sample

m_1 is the mass of the dry container(s)

m_2 is the mass of the dry container(s) and the partially dried fuel

After the residual moisture has been determined on the partially dried sample, the total moisture, as a percentage of the original sample, is calculated as:

$$X + M\left(1 - \frac{X}{100}\right)$$

where

X is the percentage loss on partial drying [taken from the label of the sample container(s)]

M is the percentage of residual moisture, determined by the procedure described in BS 1016-1.

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Publications referred to

BS 1016, *Methods for the analysis and testing of coal and coke.*

BS 1016-1, *Total moisture of coal.*

BS 1017, *Methods for sampling of coal and coke.*

BS 1017-1, *Sampling of coal*[1)].

BS 1017-2, *Sampling of coke.*

BS 3841, *Method for the measurement of smoke from manufactured solid fuels for domestic open fires.*

BS 4845, *Methods for sampling manufactured domestic solid smokeless fuels in small consignments of mass 50 kg to 5 000 kg either in bulk or in bags.*

BS 4845-1, *Sampling of coke*[1)].

[1)] Referred to in the foreword only.

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