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Method for

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

Part 1: Sampling of coke

UDC 662.749.2:620.113

Co-operating organizations

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

Association of Consulting Engineers	Gas Council*
British Cast Iron Research Association*	Greater London Council
British Coke Research Association*	Heating and Ventilating Contractors' Association
British Ironfounders' Association	Imperial Chemical Industries Limited*
British Mechanical Engineering Confederation	Institute of British Foundrymen*
British Steel Industry*	Institute of Fuel*
Chamber of Coal Traders	Institution of Gas Engineers*
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Coal Utilisation Council	Institution of Mechanical Engineers*
Coke Oven Managers' Association*	Low Temperature Coal Distillers' Association of Great Britain Ltd.*
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Department of the Environment	Water-tube Boilermakers' Association*
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Electricity Council, the Central Electricity Generating Board and Area Boards in England and Wales*	

The scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Coal Exporters' Federation	London Coal Exporters' Association
British Paper and Board Manufacturers' Cement Makers' Federation	National Federation of Coke Distributors' Associations
County Councils Association	Society of Chemical Industry
Independent Coke Producers' Association	Solid Smokeless Fuels Federation
Institute of Weights and Measures Administration	South Wales Institute of Engineers
Institution of Electrical Engineers	Independent Manufacturers and users

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Foreword

In BS 1017, "*The sampling of coal and coke*", Part 2, "*Sampling of coke*", the problems involved in the sampling of coke are discussed in detail in relation to the size of the material and the precision required, and sampling procedures are specified. These procedures are, however, mainly applicable to the sampling of coke where the aim is to determine the mean quality of production over a period, or of a large consignment in bulk. At times the need arises for the sampling of relatively small quantities of coke, which may be in bulk or contained in bags, when the principle of sampling by increments from a moving stream of coke cannot be applied.

This standard provides for sampling under these conditions, which apply particularly to domestic coke, and it should be regarded as supplementary to BS 1017-2.

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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.

Introduction

The principles of incremental sampling and the precision which is obtained in practice are discussed in detail in BS 1017-2. In preparing that standard the procedures evolved were designed to provide the required precision in sampling for the determination of moisture. The same principle has been adopted in considering the procedures of this standard.

Bearing in mind the fact that the precision obtainable from a sample is dependent upon the number of increments taken, and that the mass of an increment must be determined by reference to the size of the coke to be sampled, it follows that for a given precision the mass of sample must not be less than a minimum related to the nominal upper size of the coke, which in cases covered by this standard will not exceed 63 mm. It has been found by experiment that for such cokes a sample weighing about 50 kg is required to provide the precision specified.

In order to obtain a representative sample from a quantity of coke in bulk, it will be necessary in every case to carry out incremental sampling of the whole quantity.

Since it is not practicable to apply this principle when the coke is contained in a number of bags, the recommended procedure under these circumstances involves the selection of the requisite number of complete bags, the contents of which are mixed and the required mass extracted by increments.

1 Scope

This British Standard specifies procedures for the sampling of consignments of domestic coke of up to 63 mm nominal upper size in the range 50–5 000 kg, either in bulk or in bags.

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

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1 coke

the solid residue of the distillation of coal at high temperature (above 800 °C)

2.2 consignment

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

2.3 increment

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

3 Precision of sampling

3.1 While it is recognized that the standard precision of $\pm 1\%$ of moisture with a probability of 95 %¹⁾ is desirable, experiment has shown that in the case of consignments of coke in bags the proportion of bags which needs to be taken as the sample to provide this precision for the determination of moisture is unduly large, and a precision of $\pm 2\%$ of moisture, with the same probability, is regarded as an acceptable compromise. The precision provided by the procedure specified for consignments of 250 kg up to 5 000 kg is in no case inferior to this.

When the consignment is of more than 50 kg and is in bulk, or if it is in bags and weighs more than 250 kg, this precision is attained by incremental sampling of the whole consignment. For certain purposes it may be necessary to take reserve samples and it will be seen that this cannot be done if the initial quantity to be sampled is too small.

4 Mass of sample

4.1 The mass of sample taken shall be about 50 kg, obtained in increments each of about 2 kg. In no case shall the mass of the sample be less than 45 kg.

5 Procedure

5.1 General. To ease the problem of handling, a normal shovel capable of holding about 2 kg shall be used.

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

Each sample shall be placed in one or more clean, dry, weighed containers, each with a lid that can be made air-tight on closure and which shall be closed immediately sampling is completed.

5.2 Sampling of consignments of 50 kg in bulk or in bags. The sample shall consist of the whole of the consignment.

¹⁾ This is explained in Clause 4 of BS 1017-2:1960.

5.3 Sampling of consignments of more than 50 kg in bulk. The sample shall be taken by increments of about 2 kg, covering the whole of the consignment, and in the course of sampling the whole of the coke shall be moved by the shovel. The number of increments taken shall be not less than 22 for any one sample. The increments shall be collected at regular and evenly spaced intervals covering the whole consignment.

The procedure may be illustrated by the following examples:

Example 1

It is required to sample a consignment of 500 kg of coke. This mass is equivalent to 250 increments each of 2 kg. To ensure that the sample contains not less than 22 increments equally spaced, it will be necessary to collect 1 increment in $250/22$, i.e. not less than 1 increment in every 11 increments moved.

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

Example 2

It is required to sample the consignment as in Example 1 above, but in triplicate to provide reserve samples.

To ensure that each sample contains not less than 22 increments, equally spaced, it will be necessary to collect 1 increment in $\frac{250}{3 \times 22}$, i.e. not less than 1 increment in every 3 increments moved.

This would be carried out as follows:

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

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

5.4 Sampling of consignments of more than 50 kg and not more than 250 kg in bags. The whole of the consignment (see Note) shall be tipped into a conical heap on a clean, dry, hard surface and shall be mixed by reforming it into a second conical heap. The sample shall then be taken by the procedure and number of increments specified in sub-clause 5.3.

5.5 Sampling of consignments greater than 250 kg and not exceeding 5 000 kg in bags. A total mass of not less than 250 kg of coke shall be collected from the consignment by taking complete bags evenly spaced through the consignment. Immediately these bags have been taken (see Note) the coke shall be tipped into a conical heap on a clean, dry, hard surface and mixed by re-forming it into a second conical heap.

The sample shall then be taken by the procedure and number of increments specified in sub-clause 5.3.

NOTE If the coke is visibly wet, it shall be placed in one or more containers at this stage and partially dried, as described in Appendix A, before incremental sampling is carried out.

Appendix A Partial drying of the sample

The whole of the sample is weighed in its container(s) on a weighing machine, the scale of which correctly registers differences of 100 g or less. The sample is then either spread out in a thin layer on a steel plate in a warm, well-ventilated room and left until there is no visible moisture on either the coke or the steel plate, or partially dried in a large oven. The minimum time of exposure is 12 hours. In the meantime each container is dried and weighed. After drying, the sample is replaced in the original container(s) and weighed. The percentage loss of moisture is recorded and details written on the label of the sample container(s).

- If m = mass of the container(s) plus the sample,
 m_1 = mass of the dry container(s),
 m_2 = mass of the dry container(s) plus the partially dried coke,
 X = percentage of loss of moisture due to the partial drying.

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

After the residual moisture has been determined on the partially dried sample, the total moisture will be given by:

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

- where X = percentage loss on partial drying (taken from the label)
 M = percentage of residual moisture, determined by the procedure described in BS 1016-2.

Publications referred to

This standard makes reference to the following British Standards:

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

BS 1016-2, *Total moisture of coke.*

BS 1017, *The sampling of coal and coke.*

BS 1017-2, *Sampling of coke.*

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