

Evaluation of sampling methods for iron ores —

Part 1: Experimental methods for evaluation of quality variation

[ISO title: Iron ores — Experimental methods for evaluation of quality variation]

UDC 622.341.1:620.113

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Iron and Steel Standards Committee (ISM/-) to Technical Committee ISM/58 upon which the following bodies were represented:

- British Steel Industry
- Institution of Mining and Metallurgy
- Mechanical Handling Engineers' Association

This British Standard, having been prepared under the direction of the Iron and Steel Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 October 1987

© BSI 11-1999

First published February 1979
First revision October 1987

The following BSI references relate to the work on this standard:
Committee reference ISM/58
Draft announced in *BSI News* February 1987

ISBN 0 580 16153 6

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
1 Scope and field of application	1
2 References	1
3 General conditions	1
4 Method of investigation for stratified sampling and systematic sampling	1
5 Method of investigation for two stage sampling	6
6 Classification of quality variation	8
Figure 1 — Schematic diagram for one investigation	3
Figure 2 — Example of schematic diagram for composition of pairs of subsamples (type 1)	4
Figure 3 — Schematic diagram for composition of substrates	7
Table 1 — Number of wagons to be selected per single train	6
Table 2 — Classification of quality variation on the values of standard deviation in the total iron content	8
Publications referred to	Inside back cover

National foreword

This Part of BS 5662 has been prepared under the direction of the Iron and Steel Standards Committee. It supersedes BS 5662-1:1979, which is withdrawn. It is identical with ISO 3084:1986 “*Iron ores — Experimental methods for evaluation of quality variation*”, published by the International Organization for Standardization (ISO).

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “Part of BS 5662”.

Cross-references

International Standard	Corresponding British Standard
	BS 5660 <i>Methods of sampling iron ores</i>
ISO 3081:1986	Part 1:1987 <i>Manual method of increment sampling</i> (Identical)
ISO 3082:1987	Part 2:1987 <i>Mechanical method of increment sampling and sample preparation</i> (Identical)
ISO 3083:1986	BS 5661:1987 <i>Method for preparation of samples of iron ores by manual means</i> (Identical)
ISO 3085:1986	BS 5662 <i>Evaluation of sampling methods for iron ores</i> Part 2:1987 <i>Experimental methods for checking the precision of sampling</i> (Identical)
ISO 3086:1986	Part 3:1987 <i>Experimental methods for checking the bias of sampling</i> (Identical)

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself 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 12, 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 and field of application

This International Standard specifies experimental methods for the evaluation of quality variation of iron ores for the purpose of defining the sampling procedure by the stratified method, the systematic method and the two stage method as specified in ISO 3081 or ISO 3082.

NOTE The experimental methods may be applied approximately to time basis sampling where the variation of the flow of the ores is not so large.

2 References

ISO 3081, *Iron ores — Increment sampling — Manual method*.

ISO 3082, *Iron ores — Increment sampling and sample preparation — Mechanical method*¹⁾.

ISO 3083, *Iron ores — Preparation of samples — Manual method*.

ISO 3085, *Iron ores — Experimental methods for checking the precision of sampling*.

ISO 3086, *Iron ores — Experimental methods for checking the bias of sampling*¹⁾.

3 General conditions

3.1 Quality variation

The magnitudes of quality variation or degrees of heterogeneity of iron ores shall be determined by standard deviation as described in 3.1.1 and 3.1.2.

3.1.1 Stratified sampling and systematic sampling

The standard deviation of a quality characteristic between increments taken from within strata, denoted by σ_w , shall be determined.

3.1.2 Two stage sampling as applied to sampling from wagons or containers²⁾

The standard deviation of a quality characteristic between increments taken from within wagons selected, denoted by σ_w , and the standard deviation between wagons selected from a consignment, denoted by σ_b , shall be determined.

3.2 Quality characteristics

The quality characteristic chosen for determining the quality variation is generally the total iron content; however, it should be recognized that the moisture content, size distribution and other quality characteristics may have to be taken into account. In this case, the criteria for classification of quality variation (see clause 6) shall be established beforehand.

3.3 Iron ores to be classified

Quality variation shall be determined for each type of iron ore specified between the contracting parties.

3.4 Sampling, sample preparation and testing

Sampling, sample preparation and testing of the sample for this investigation shall be carried out in accordance with the relevant International Standards.

3.5 Execution of investigation

The sampling for this investigation may be conducted in conjunction with routine sampling for the determination of quality of the consignment. In other words, the same sample collected from the consignment may be used for both purposes.

4 Method of investigation for stratified sampling and systematic sampling

The procedures for the evaluation of standard deviation within strata, σ_w , applicable to both stratified sampling and systematic sampling, are described in 4.1 to 4.6.

¹⁾ At present at the stage of draft.

²⁾ Hereinafter referred to simply as “wagons”.

4.1 Type of investigation

4.1.1 Type 1

When large-size consignments are infrequently delivered, the quality variation may be derived from a single consignment.

Split the consignment into at least 10 parts of almost equal mass.

Then make up a pair of subsamples for each part by combining the increments involved in each part as shown in Figure 1 a) and example 1.

4.1.2 Type 2

When small-size consignments are frequently delivered, the quality variation may be derived from several consignments of almost equal mass.

Split all the consignments involved into at least 10 parts of almost equal mass.

Then make up a pair of subsamples for each part by combining the increments involved in each part as shown in Figure 1 b) and example 2.

4.1.3 Type 3

When consignments are frequently delivered and investigation by type 1 or type 2 is uneconomical, the quality variation may be derived from a larger number of consignments of almost equal mass.

Make up a pair of subsamples for each consignment as shown in Figure 1 c) and example 3.

4.1.4 Type 4

In the case of sampling from a wagon-borne consignment and when the increments are taken from all the wagons of the consignment, the sampling scheme may be regarded as a method of stratified sampling.

Make up a pair of subsamples for each consignment as shown in Figure 1 d).

4.2 Number of increments and composition of subsamples

4.2.1 Number of increments

The number of increments to be taken from one or several consignments for this investigation may be the same as that selected for routine sampling. However, when the routine sampling is based on the classification category of “small” quality variation (see Table 4 of ISO 3081 or ISO 3082) and the number of increments is considered to be insufficient to obtain a reliable standard deviation, then the number of increments shall be increased.

4.2.1.1 In the case of investigation type 1, the number of increments, n_1 , shall be determined from Table 4 of ISO 3081 or ISO 3082, and the increments taken shall be grouped into at least 10, each made up into a pair of subsamples [see Figure 1 a)].

4.2.1.2 In the case of investigation type 2, the number of increments, n_1 , to be taken from each consignment shall be in accordance with Table 4 of ISO 3081 or ISO 3082. The increments corresponding to each consignment shall then be subgrouped on a stratum basis. Each of the increments thus subgrouped should be made up into a pair of subsamples [see Figure 1 b)].

4.2.1.3 In the case of investigation type 3, the number of increments, n_1 , to be taken from each consignment shall be determined from Table 4 of ISO 3081 or ISO 3082 [see Figure 1 c)].

4.2.1.4 In the case of investigation type 4, the number of increments, n_1 , being collected from each train of the consignment shall be determined from Table 4 of ISO 3081, and the number of increments, n_3 , to be taken from each wagon shall be calculated from ISO 3081 [see Figure 1 d)]. If the number is odd, it shall be increased by one to make it even.

4.2.2 Composition of subsamples

The subsamples shall be made up in accordance with the following procedure:

- a) give a serial number to the increments in each part in order of sampling;
- b) make up a pair of subsamples from both consecutive odd-number increments (denoted by subsample A_i) and consecutive even-number increments (denoted by subsample B_i) in each part (see Figure 2);
- c) for each investigation, prepare n sets of paired subsamples.

Each subsample shall be made up of two or more increments.