

Evaluation of sampling methods for iron ores —

Part 2: Experimental methods for checking the precision of sampling

[ISO title: Iron ores — Experimental methods for checking the precision of sampling]

UDC 622.341.1:620.113

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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

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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 *BSI News* February 1987

ISBN 0 580 16154 4

Amendments issued since publication

Amd. No.	Date of issue	Comments

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National foreword

This Part of BS 5662 has been prepared under the direction of the Iron and Steel Standards Committee. It supersedes BS 5662-2:1979, which is withdrawn. It is identical with ISO 3085:1986 “*Iron ores — Experimental methods for checking the precision of sampling*”, 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)
	BS 5662 <i>Evaluation of sampling methods for iron ores</i>
ISO 3084:1986	Part 1:1987 <i>Experimental methods for evaluation of quality variation</i> (Identical)
ISO 3086:1986	Part 3:1987 <i>Experimental methods for checking the bias of sampling</i> (Identical)
ISO 4701:1985	BS 5663 <i>Methods of testing iron ores</i> Part 2:1987 <i>Determination of size distribution by sieving</i> (Identical)

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, 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 to be applied for checking the precision of sampling of iron ores being carried out in accordance with the methods specified in ISO 3081 or ISO 3082.

NOTE These methods may also be applied for the purpose of checking the precision of preparation of samples being carried out in accordance with the methods specified in ISO 3082 or ISO 3083.

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 3084, *Iron ores — Experimental methods for evaluation of quality variation*.

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

ISO 4701, *Iron ores — Determination of size distribution by sieving*.

3 General conditions

3.1 Number of consignments for experiment

In order to reach a reliable conclusion, it is recommended that the experiment be carried out on more than 20 consignments of the same type of iron ore; however, if this is impracticable, at least 10 consignments should be covered. If the number of consignments for the experiment is not sufficient, each consignment may be divided into several parts to produce more than 20 parts on the entire consignments for the experiment, and the experiment should be carried out on each part, considering each part as a separate consignment in accordance with ISO 3081 or ISO 3082.

3.2 Number of increments and number of gross samples

The minimum number of increments required for the experiment shall be twice the number specified in ISO 3081 or ISO 3082. Namely, if the number of increments required for the routine sampling is n_1 and one gross sample is made up of the minimum number of increments, the minimum number of increments required for the experiment shall be $2n_1$ and two gross samples shall be made up.

NOTE If this is impracticable, the number of increments n_1 may be taken and divided into two parts, each comprising $n_1/2$.

3.3 Sample preparation and testing

The preparation and testing of the sample shall be carried out in accordance with the methods specified in the relevant International Standards.

NOTE In the case of chemical analysis, such as the determination of the total iron content, it is preferable to carry out a series of determinations on test samples of a consignment on different days.

3.4 Replication of experiment

Even when a series of experiments has been conducted prior to regular sampling operations, the experiments should be carried out occasionally in order to check a possible quality variation in the consignments, and at the same time, to control the methods of sampling, sample division and testing.

Because of the large amount of work involved in this method, it should be carried out as part of routine work of sampling and testing.

4 Method of experiment

4.1 Sampling procedure

The sampling procedure to be followed shall be selected from the three categories of sampling, i.e. periodic systematic sampling, stratified sampling and two-stage sampling, depending on the method of taking increments from the consignment in accordance with the relevant clauses of ISO 3081 or ISO 3082.

4.1.1 Periodic systematic sampling

4.1.1.1 The number of increments, n_1 , shall be selected from Table 4 of ISO 3081 or ISO 3082, depending on the mass of the consignment and the classification category of the iron ore, i.e. "large", "medium", or "small" quality variation.

4.1.1.2 The sampling interval, Δm , in tonnes, shall be calculated by dividing the tonnage, m_1 , of the consignment by $2n_1$, i.e. giving intervals equal to one-half of the sampling interval of the routine sampling. The sampling interval thus calculated shall be rounded down to the nearest 10 t.

4.1.1.3 The increments shall be taken at a regular sampling interval (see 4.1.1.2), with a random start from the consignment.

4.1.1.4 The increments shall be placed alternately in two containers, A and B. Thus, two gross samples, A and B, will be made up, each composed of n_1 increments.

¹⁾ At present at the stage of draft.

Example 1

Suppose that a consignment of 19 000 t of discharged iron ore is transferred by belt conveyors and that the classification category of the ore is “medium” quality variation: the minimum required number of increments, n_1 , is 60, as shown in Table 4 of ISO 3081 or ISO 3082.

Then the sampling interval, Δm , in tonnes, for taking increments is given by the equation

$$\Delta m = \frac{m_1}{2n_1} = \frac{19\,000}{60 \times 2} \approx 158 \rightarrow 150$$

Thus, increments are taken at 150 t intervals. The point for taking the first increment from the first sampling interval of 150 t should be determined by a random selection method. If the point for taking the first increment is determined as 20 t from the beginning of shifting the consignment, subsequent increments should be taken at the point $20 + i\Delta m$, where $i = 1, 2, \dots, 2n_1$ (170 t, 320 t and so on). Since the whole consignment amounts to 19 000 t, 126 increments will be collected.

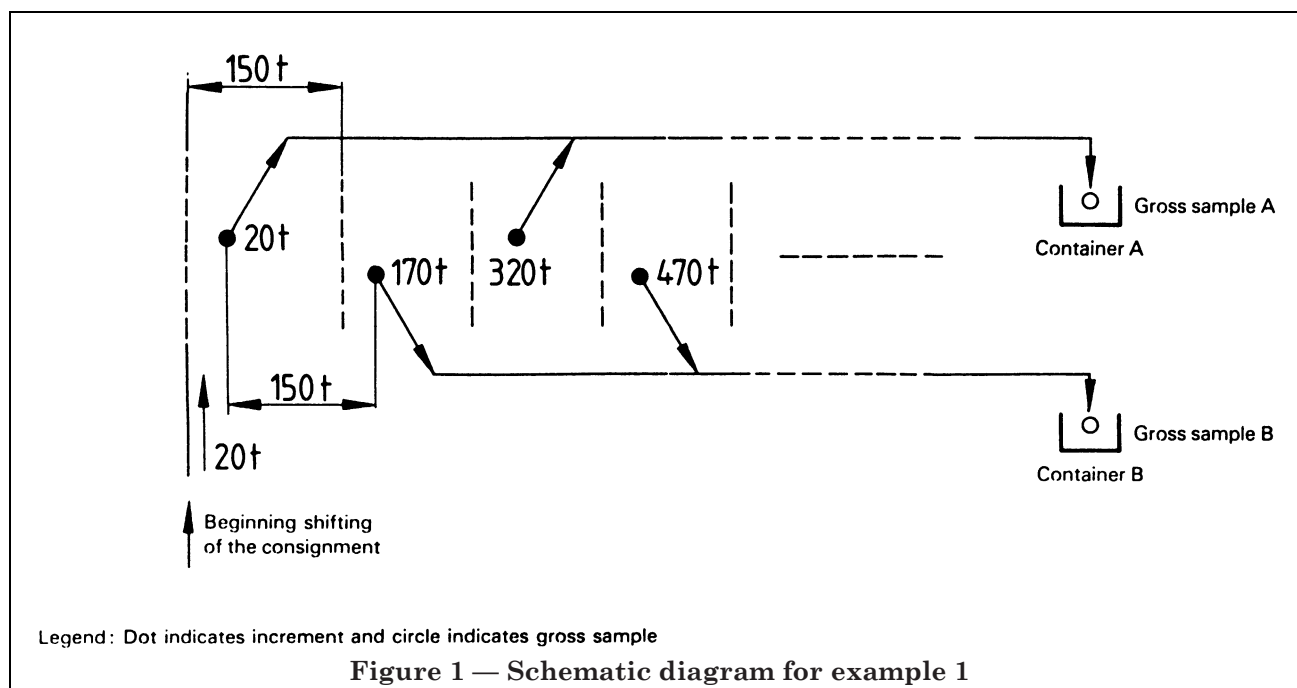
The increments are placed alternately in containers A and B, and two gross samples, A and B, are made up, each composed of 63 increments (see Figure 1).

4.1.2 Stratified sampling

4.1.2.1 In the case where the number of wagons or containers²⁾, i.e. the number of strata, n_4 , forming one consignment, is smaller than the number of increments, n_1 , given in Table 4 of ISO 3081, the number of increments, n_3 , to be taken from each wagon (stratum) shall be obtained by the equation given in 8.2.2 of ISO 3081.

4.1.2.2 $2n_3$ increments shall be taken from each wagon.

4.1.2.3 The $2n_3$ increments taken from each wagon shall be separated at random into two subsamples, each of n_3 increments.



²⁾ Hereinafter referred to simply as “wagons”.