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Ferroalloys—Sampling

Part 2: Sampling of molten alloys

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STANDARDS AUSTRALIA

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PREFACE

This Standard was prepared by the Standards Australia Committee on Ferroalloys under the direction of the Minerals Standards Board as one of a series of Standards on the sampling of ferroalloys. The other Standards in this series will be as follows:

Part 1: Sampling of particulate alloys.
Part 3: Preparation of samples.
Part 4: Determination of precision and bias.

The sampling of molten ferroalloys can present problems because of possible segregation of the ferroalloy. The procedures specified in this Standard are designed to minimize the possibility of such segregation.

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1 SCOPE. This Standard sets out the methods of sampling ferroalloys in molten form for both routine and special purposes to provide samples for preparation for chemical analysis and physical testing. As such, the Standard deals only with the collection of molten increments, subsamples and gross samples. Where subsamples and gross samples are to be constituted, this may be done only by direct combination of solidified increments. Any reduction and division of the solidified sample is considered to be sample preparation, which is the subject of another Standard.

Both mechanical and manual sampling systems are considered.

2 DEFINITIONS. For the purpose of this Standard, the definitions below apply.

2.1 Coefficient of variation—in mass-basis sampling, the percentage of the standard deviation relative to the mean value of the mass of increments.

2.2 Duplicate sampling—a particular case of replicate sampling (with only two replicate samples), for the purpose of estimating the average precision of sampling from a number of lots or sampling units.

2.3 Gross sample—a sample formed when all the primary increments or subsamples, either as taken or after having been prepared individually to a particular stage of sample preparation, are combined in the correct proportions for preparation of a laboratory sample.

2.4 Increment—the quantity of ferroalloy taken by—

(a) a single pass of the sampling device in the case of mechanical sampling; or

(b) either a single pass or the combined sum of multiple passes of the sampling implement in the case of manual sampling.

2.5 Lot—a quantity of alloy delivered at one time. A lot may be composed of one or more sampling units.

2.6 Manual sampling—the operation of sampling where the increments forming subsamples and gross samples are taken by human effort using a hand-held implement.

2.7 Mass-basis sampling—the method of taking increments at uniform mass intervals throughout the lot or sampling unit.

2.8 Mechanical sampling—the operation of sampling where the increments forming subsamples and gross samples are taken by a sampling machine.

2.9 Quality variation (σ_w)—a measure of the heterogeneity of a lot. It is the standard deviation of the quality characteristics of the increments taken from a lot. It is determined experimentally for each alloy.

2.10 Replicate sampling—the taking of increments from a lot or sampling unit at equal intervals of time, mass or space. The increments are placed in rotation into different containers to give several replicate samples of approximately equal mass.

2.11 Sampling unit—the discrete units (trains, sections of belt, daily production) which comprise the lot.

2.12 Stratified random sampling—the taking of increments at irregular intervals within constant intervals of time, mass or space.

2.13 Subsample—a quantity of ferroalloy, consisting of a number of increments taken from a part of the lot; also a composite of a number of increments each having been prepared individually as necessary.

2.14 Systematic sampling—the taking of increments at regular intervals within constant intervals of time, mass or space.

2.15 Time-basis sampling—the method of taking increments at uniform time intervals throughout the lot or sampling unit.

3 ESTABLISHING A SAMPLING SCHEME.

3.1 General. Sampling should be carried out by systematic sampling either on a mass basis (Clause 6), or on a time basis (Clause 7), but only when it can be shown that no systematic error could be introduced due to any periodic variation in quality or quantity of flow.

Where a systematic error could arise it is recommended that mass-basis sampling be carried out.

Flowrates or chemical composition of the molten alloy may vary uncontrollably during the tapping or teeming of the alloy. Where this is known to occur, mass-basis sampling should be carried out.

Manual sampling of molten ferroalloy shall be performed only where access is available to the complete alloy stream and should be carried only out at a location where there is no danger to the sampler.

Procedures for checking bias in sampling are the subject of a separate Standard.

3.2 General procedure for sampling. The general procedure for sampling shall be as follows:

(a) Decide for what purpose the samples are being taken, e.g. monitoring plant performance, use in commercial transactions.

(b) Identify the quality characteristics to be measured and specify the required overall precision and sampling precision.

NOTE: The precision is usually specified. Where other information is not available, the following may be taken as a guide:

Concentration of quality characteristic, percent	Precision as a percentage of the quality characteristic
> 60	0.3
$30 \leqslant 60$	0.5
$10 \leqslant 30$	1.0
$1 \leqslant 10$	1.5
< 1	5