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Method for Manual Sampling of Commercial Coal

商品煤样人工采取方法

(ISO 18283:2006, Hard Coal and Coke - Manual Sampling, MOD)

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Method for Manual Sampling of Commercial Coal

1 Scope

This Standard stipulates the terms and definitions of manual sampling method of commercial coal; general principles and precision of sampling; establishment of sampling schemes; sampling methods; manual sampling instruments; packaging and marking of coal sample; sampling report.

This Standard is applicable to lignite, bituminous coal and anthracite.

2 Normative References

Through the reference in this Standard, clauses of the following documents become clauses of this Standard. In terms of references with a specific date, all the subsequent modification sheets (excluding the corrected content) or the revised editions are not applicable to this Standard. However, all parties that reach an agreement in accordance with this Standard are encouraged to explore the possibility of adopting the latest version of these documents. In terms of references without a specific date, the latest version is applicable to this Standard.

GB/T 19494.3 *Mechanical Sampling of Coal - Part 3: Determination of Precision and Bias Test* (GB/T 19494.3-2004, ISO 13909-7:2001, ISO 13909-8:2001, NEQ)

3 Terms and Definitions

The following terms and definitions are applicable to this Standard.

3.1 Coal Sample

Coal sample refers to a representative portion of coal taken from coal to determine certain characteristics.

3.2 Sample of Commercial Coal

Sample of commercial coal refers to coal sample that represents average properties of commercial coal.

3.3 Test Sample of Coal

Test sample of coal refers to coal sample that is prepared to satisfy a certain specific test requirement.

3.4 Common Sample of Coal

Common sample of coal refers to coal sample that is taken for multiple tests.

3.5 Moisture Sample of Coal

Moisture sample of coal refers to coal sample that is specifically taken for the determination of total moisture.

3.6 General Sample of Coal

General sample of coal sample that is specifically taken for the preparation of general-analysis test sample of coal.

3.7 General-analysis Test Sample of Coal

General-analysis test sample of coal refers to coal sample that is crushed to a particle size of less than 0.2 mm and reaches an air-dried state, which is used for the determination of most physical and chemical properties.

3.8 Size Analysis Sample of Coal

Size analysis sample of coal refers to coal sample that is specifically taken for particle size analysis.

3.9 Increment

Increment refers to a sample taken by one-time operation of the sampling device, or, interception of a full cross section of a coal stream.

3.10 Sub-sample

Sub-sample refers to coal sample that is constituted of several primary increments that are uniformly distributed throughout the sampling unit.

3.11 Gross Sample

Gross sample refers to coal sample merged from all increments taken from a sampling unit.

3.12 Primary Increment

Primary increment refers to increment taken in the first stage of sampling, before any crushing and division.

3.13 Divided Sample

Divided sample refers to a retained portion after division for the purpose of reducing sample mass.

3.14 Sampling

Sampling refers to the process of taking a representative portion of coal from a large amount of coal.

3.15 Continuous Sampling

Continuous sampling refers to the process of taking a gross sample from each sampling unit; during the sample, increment points are distributed at a uniform interval.

3.16 Intermittent Sampling

Intermittent sampling refers to the process of taking samples from only several sampling units.

3.17 Lot

Lot refers to an independent coal quantity that requires the determination of global property.

3.18 Sampling Unit

Sampling unit refers to coal quantity of a gross sample taken from a lot of coal. A lot of coal may be one or multiple sampling units.

NOTE: equivalent to sub-lot (part of a lot for which a test result is required) in ISO 18283.

3.19 Nominal Top Size

Nominal top size refers to corresponding sieve size of sieve that is closest to (but not greater than) 5% of the accumulative mass fraction of articles on the sieve.

3.20 Precision

Precision refers to the degree of consistency between independent test result obtained under specified conditions.

NOTE 1: it is also expressed in an index of precision, for example, two standard deviations.

NOTE 2: the precision of coal sampling is the limit value of the difference (under 95% probability) between the determination result of a single sampling and the average value of the determination results of countless samplings of the same coal (same source, same property).

3.21 Systematic Sampling

Systematic sampling refers to the process of taking increments in accordance with the same time, space or mass interval, but the first increment is randomly taken within the first interval, while the remaining increments are taken at a selected interval.

3.22 Random Sampling

3.30 Random Error

Random error refers to an error which is statistically independent of the previous errors.

NOTE: this signifies that in a series of random errors, any two errors are uncorrelated, and it is impossible to predict any individual errors. Errors are divided into system errors (bias) and random errors. In an observation series, as the number of observations increases, the average value of random errors tends to be zero.

3.31 Bias

Bias refers to system error. As a result of this, the average of a series of results is always higher than or lower than the value obtained through reference method.

3.32 Relevant Bias

Relevant bias refers to permissive bias of actual importance or consent from all parties of a contract.

4 General Principles and Precision of Sampling

4.1 General Principles of Sampling

The objective of coal sampling and sample preparation is to obtain a test coal sample whose test results are representative of the entire lot of coal being sampled.

The basic process of sampling and sample preparation is: firstly, from many points that are distributed throughout the entire lot of coal, collect a significant amount of coal, namely, primary increment; then, directly incorporate the various primary increments into a gross sample, or, incorporate them after division; finally, through a series of sample preparation procedure, prepare the gross sample into test coal samples of the requested number and type.

The basic requirement of sampling is that all particles of the lot of coal being sampled may enter the sampling equipment; each particle has an equal probability of being taken into the sample.

In order to make sure that the precision of the test results of the obtained sample satisfies the requirements, take the following factors into consideration during the sample:

a) Variability of coal (generally, measured through the variance of primary increment);

b) The number of gross samples taken from this lot of coal;

c) The number of increments of each gross sample;

When sampling is directly conducted from stationary coal, full-depth sample or different depths (up, middle, down, or up and down) of sample shall be taken. When it can be guaranteed that the quality of coal in the carrier is uniform, and stratified loading of coal with different qualities does not exist, sampling from the top of the carrier is also allowed.

No matter which mode is adopted for sampling, it shall all pass bias test to prove that it has no substantial bias.

Under the circumstance of sampling from the top of train, truck and barge, immediately take samples after the loading. When sampling is conducted after transportation, dig a pit to 0.4 m ~ 0.5 m, then, take samples. Before the sampling, thoroughly eliminate coal briquettes and gangues that fall to the bottom of the pit. Increments shall be uniformly distributed on the sampling surface. Pay attention to large accumulations (for example, accumulations in the corner or near the wall of the carrier) caused by isolation during the handling process (for example, loading and unloading).

The opening of probe/drill or shovel used for manual sampling shall at least be 3 times of the nominal top size of coal, and not less than 30 mm (see 9.1). The capacity of the sampling apparatus shall be sufficiently large. The mass of the increments being taken shall reach the requirements in 5.2.4.2. During the sampling, increments shall not fill up the sampling apparatus, or, be overflowed from the sampling apparatus. In addition, increments shall be taken at a time; do not throw the excessive part, or, make up the deficient part.

While taking increments, the probe/drill or shovel shall be vertically (or, in a certain inclination) inserted from the sampling surface. While taking increments, large-size materials (for example, coal or gangue) shall not be intentionally pushed aside.

The number of sampling units, the number of increments, the minimum mass of increments, and the minimum mass of gross sample are shown in 5.2.3 (or 5.3.2.4) and 5.2.4.

6.2.2 Distribution of increments

6.2.2.1 Increment distribution method

6.2.2.1.1 Systematic sampling method

Divide the surface of the sampled compartment/barge into several small blocks with an equal area; number them. Then, successively take one increment from the middle part of each small block of each compartment/barge. The first increment shall be randomly taken from the small blocks of the first compartment/barge; the remaining increments shall be successively taken from the subsequent compartment/barge.

6.2.2.1.2 Random sampling method

blocks with an equal area (small blocks at the bottom of the coal stack shall be at a distance of 0.5 m from the ground). Then, adopt the method of systematic sampling or random sampling to determine the location of sampling zone and the location of sampling points (small blocks) in each zone. From each small block, take one full-depth, or, deep or top coal sample from each small block. Under the circumstance when it is not new working surface, firstly, eliminate 0.2 m of surface layer during the sampling;

b) When sampling is conducted on coal unloaded from bucket loader, unload coal sample onto a clean surface. Then, in accordance with Method a), take increments.

7 Intermittent Sampling Method

When sampling is often conducted on large lot of coal coming from the same coal source and with stable quality (for example, incoming coal from port), the method of intermittent sampling may be adopted. When intermittent sampling method is adopted, obtain prior consent from relevant parties.

Intermittent sampling scheme shall be designed in accordance with 5.3.2.4.1 b).

8 Various Coal Sample Taking

Generally speaking, coal sample for coal analysis includes: general analysis sample (sample used for the determination of general physical and chemical characteristics of coal); total moisture sample (sample exclusive for the determination of total moisture); common sample (sample used for multiple purposes, such as: the determination of full moisture, and the determination of general physical and chemical characteristics); physical sample (sample used for the analysis of special physical properties, for example, physical strength index or particle size).

Samples used for the determination of total moisture may be independently taken, or, be taken from common samples. Under the circumstance of extracting total moisture samples from common samples, the number of primary increments being taken shall be the greater number between the number of increments needed for ash content and moisture determination. If after extracting moisture samples, the remaining samples are insufficient for the required mass of the remaining tests, then, increase the number of increments, till the mass of gross sample satisfies the requirement.

If necessary (for example, coal is extremely wet), moisture samples may be independently taken. When moisture samples are independently taken, the following points shall be considered:

a) Coal gradually loses moisture, due to drainage during the storage;

Probe and drill shall receive bias test in accordance with the stipulations in GB/T 19494.3. After they pass the bias test, they may be put into use.

9.2.1 Sampling bucket

Sampling bucket (see Figure a)) is made of materials that do not easily stick to coal (for example, stainless steel). It is applicable to sampling in the falling coal stream.

9.2.2 Sampling shovel

Sampling shovel (see Figure 2 b)) is made of steel plates and is equipped with a sufficiently long hand shank. If the sampling of coal with other particle sizes is conducted, the size of the shovel may be accordingly adjusted. The head of the bottom plate of the shovel may be pointed.

9.2.3 Probe

Generally speaking, probe is tubular. It may be vertically, or, in small inclinations, inserted into coal. When inserting the probe into coal, it might be quite difficult. When pulling the probe out of coal, coal might fall from the bottom.

The several types of probe demonstrated in the figures may be adopted for the sampling of coal whose nominal top size is 25 mm.

Figure a c): constituted of two semi-circular tubes; the two semi-circular tubes may be slid together and form a closed circular tube. The length of this type of probe may reach 3.5 m at the maximum. Long probes may be used for the sampling of coal whose nominal top size is 20 mm.

Figure 2 d): the probe is constituted of a triangular slot tube with chute on both sides and a flat plate that can slide along the chute. When this probe is put into use, remove the sliding plate, insert the slot tube into coal. Then, insert the sliding plate back to its previous position; pull out the probe.

9.2.4 Manual twist drill

Figure 2 e): the distance between the opening of the drill and the screw shall be 3 times of the nominal top size of the sampled coal.

9.2.5 Manual cutting bucket

Figure 2 f): used for the sampling of falling coal stream manually, or, with mechanical assistance.

9.2.6 Stopping-belt sampling frame

Figure 2 g): the sampling frame is constituted of two parallel sideboards; the distance between the boards is at least 3 times of the nominal top size of the sampled coal

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