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**Methods for determining the physical and mechanical
properties of coal and rock - Part 1: General requirements for
sampling**

煤和岩石物理力学性质测定方法 第1部分:采样一般规定

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3 Terms and definitions

3.1 coal sample: a block of coal that after being taken keeps in the main the original structure and physical state of the coal body.

3.2 rock sample: a block of rock that after being taken keeps in the main the original structure and physical state of the rock mass.

4 Equipment, tools and packaging materials

4.1 The sampling equipment and tools are mainly an electric coal drill, a pneumatic pick, a geological drilling rig for taking coal and rock cores, and a cutting saw.

4.2 The packaging materials for the test samples are plastic sheeting of adequate thickness

and strength, cling film and wide adhesive tape; containers and paraffin wax; and sawdust, foamed plastic and wooden boxes.

5 Technical requirements

5.1.1 Before sampling, geological material such as the composite geological column of the sampling place shall be collected and the structure of the strata there shall be understood.

5.1.2 Where the properties of the coal or rock at one particular place are being studied, a representative sampling point shall be looked for near that place. Following GB/T 19222, the sampling points for ordinary coal and rock samples shall keep clear of igneous intrusions, altered zones, weathered zones, scoured zones, fault breccia zones and the ground they affect. Before sampling, the coal or rock face shall be cleaned so that the surface is fresh and even.

5.1.3 Where the properties of coal and rock over a wider area are being studied, samples shall be taken at several representative points according to how the lithology changes.

5.1.4 Where the lithology varies markedly through the thickness of a stratum, samples shall be taken separately at the upper, middle and lower horizons.

5.1.5 Each group of coal and rock samples shall come from the same horizon and the same direction, in the same lithology.

5.1.6 For strata whose lithology varies greatly, coal and rock samples taken at different places and different horizons shall not be numbered as one group.

5.1.7 Sampling by blasting is not advised. Where there is no other way, the charge in the shot hole shall be reduced and the holes shall be laid out sensibly.

5.1.8 For sampling for certain special tests, the corresponding requirements shall be set out according to the test rules.

5.2.1 Coal seams are sampled layer by layer according to the test requirement and the seam thickness: below 3.5 m, one group of coal samples is taken; between 3.5 m and 5 m, two groups are taken, one near the roof and one near the floor; between 5 m and 10 m, three groups may be taken, from the upper, middle and lower parts; above 10 m, more layers may be sampled according to the thickness, or a drilling rig may be used.

5.2.2 Where the purpose is to determine the ordinary physical and mechanical properties of roof and floor, samples shall be taken from the immediate roof, the main roof and the floor of the seam. Where the purpose is to determine the bursting liability of the strata, samples shall be taken within 30 m of the roof or the floor of the seam, one group being taken from each sub-layer of different lithology more than 2 m thick; where the sub-layers are not more than 2 m thick each and their continuous cumulative thickness is more than 3.5 m, the sample shall be taken from the hardest stratum. The floor of the seam is sampled to a depth

of not less than 3 m; where a false floor less than 1 m thick is present, that false floor is sampled and floor rock is also sampled to a depth of not less than 3 m below it. Where the seam holds dirt bands, samples of each dirt band are taken as its thickness, its lithology and its effect on the working of the seam warrant.

6 Sampling methods

6.1.1 In a single thin or medium thick seam, coal and rock blocks that have just fallen, that are free of cracks and whose horizon can be clearly told, may be picked at the working face or the heading face; blocks that are to be worked further into standard specimens should be not smaller than 20 cm by 20 cm by 20 cm.

6.1.2 In a newly driven cross-measure roadway or stone drift the samples may be won with an electric coal drill or a pneumatic pick; in an old roadway a short side heading shall be driven or a drilling rig used to take the coal and rock samples.

6.2 Where a geological drilling rig is used, at least two holes are drilled and two groups of cores are taken. The holes shall be drilled perpendicular to the bedding plane with a deviation of less than 5° , and the angle between the sample taken and the bedding plane shall be marked; where the deviation angle is large the core diameter shall be increased. The core diameter should be 50 mm, and where a 50 mm core cannot be taken directly the core diameter taken should be not less than 70 mm. Where the purpose is to determine the bursting liability of the strata, the sampling depth follows the composite geological column and samples are taken from the various strata within 30 m of the seam roof.

6.3 For the bending strength that has to be tested in a bursting liability assessment, the long axis of the specimen shall lie parallel to the bedding plane, and it is best to take rock blocks for the specimens. Where a drilling rig is used, the core shall be drilled parallel to the bedding plane, and in a roadway or at a coal face the core diameter shall be increased to 12 cm to 15 cm.

6.4 Where the coal is of low strength, where joints and cracks are well developed, or where the rock is soft, the number of standard specimens shall be increased: twice the number listed in Table 1 shall be taken, and for soft rock not less than three times that number.

6.4 (continued) Table 1 lists, for each test, the standard specimen size and the minimum number of standard specimens, with a remarks column. The tests covered are the true density, the bulk density together with water absorption and moisture content, the uniaxial compressive strength, the deformation parameters, the tensile strength, the shear test by the variable angle method, the shear strength, the triaxial test, the assessment of coal bursting liability, the hardness coefficient, the swelling ratio, the bending strength, the swelling stress, the slake durability and the point load strength, the last being listed separately for regular and for irregular specimens. In the extracted table several rows carry fewer cells than the table has columns and the remarks appear to run across more than

one row, so the sizes and the numbers cannot be paired with their tests reliably and are not reproduced here.

7 Recording and numbering

7.1 During sampling one person is put in charge of describing and numbering the coal and rock samples. The lithology at the sampling point is described, including the joints, the bedding, the cracks and the degree of fracturing, and the place, the date and the method of sampling are recorded as in Annex A. In the record, the numbers of the coal and rock samples shall correspond one to one with the samples themselves.

7.2 After sampling, the coal and rock samples are numbered with red paint or a similar material. The number is written as a fraction. The figure in the denominator is the number of the seam in the geological column. In the numerator, the first figure is the number of the sampling place; the letter that follows shows the horizon, R standing for the seam roof, F for the seam floor, C for the seam itself and M for a dirt band; and the third figure is the number of the sub-layer counted from the top downwards. The worked example given is a sample whose denominator figure 4 shows that it comes from seam 4 of the geological column, whose numerator figure 2 shows that it comes from the second sampling place, whose numerator letter R shows that it comes from the roof of the seam, and whose numerator figure 3 shows that it comes from the third sub-layer of that roof counted from the top downwards, two roof sub-layers having already been sampled above it. The fraction glyphs of the two sample numbers given in the clause did not survive extraction and are not reproduced here.

7.3 An arrow is painted in red on the coal or rock sample to show the direction of the bedding, the arrow pointing perpendicular to the bedding and upwards, as in Figure 1, which shows the specification of the coal and rock samples taken and the marking.

8 Sealing and boxing

8.1.1 Coal and rock samples that have been taken shall be wrapped in cling film at the sampling point underground straight away, numbered as 7.2 requires and marked with their characteristics; the description card is put inside the plastic wrapping and the outside is bound tight with cling film and wide adhesive tape, so that the sample is sealed. The cling film shall be strong enough, and where no film of a suitable size is available the sample may be wrapped in several layers.

8.1.2 The wrapped samples should be brought to the surface as soon as possible and sealed at once by dipping the whole of them in wax.

8.2 Once sealed, the samples shall be carried by hand or by a vehicle put at their disposal to the appointed place on the surface and packed into wooden boxes. The four sides and the top and bottom of a box are packed tight with sawdust, the box is strapped with steel