Designation: D 5192 – 08

Standard Practice for Collection of Coal Samples from Core[1]

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1. Scope

1.1 This practice describes procedures for collecting and handling a coal sample from a core recovered from a borehole.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 121 Terminology of Coal and Coke

D 388 Classification of Coals by Rank

D 1412 Test Method for Equilibrium Moisture of Coal at 96 to 97 Percent Relative Humidity and 30°C

D 2013 Practice for Preparing Coal Samples for Analysis

D 2796 Terminology Relating to Megascopic Description of Coal and Coal Seams and Microscopical Description and Analysis of Coal [3]

D 4371 Test Method for Determining the Washability Characteristics of Coal

D 4596 Practice for Collection of Channel Samples of Coal in a Mine

3. Terminology

3.1 *Definitions*—For additional definitions of terms, refer to Terminology D 121.

3.1.1 *borehole*, *n*—the circular hole through soil and rock strata made by boring.

3.1.2 *caves or washouts*, *n*—zones of increased hole diameter caused by rock fragments that fall from the walls of a borehole and can block the hole or contaminate the cuttings and which erode or abrade the sidewall of the borehole by the action of the drilling. These zones can affect the accuracy of certain geophysical logs (especially density). Corrections to other geophysical logs can be made if a caliper log is available. The most common causes of caves or washouts include soft or fractured lithologies, the presence of water-producing zones, and the downhole pressure of the drilling medium (fluid or air) that often causes differential erosion of various strata within the borehole.

3.1.3 *concretion*, *n*—in a geological sense, a mass of mineral matter found in rock of a composition different from its own and produced by deposition from aqueous solution in the rock.

3.1.4 *core*, *n*—in drilling, a cylindrical section of rock (coal) that is usually 5 to 10 cm in diameter, taken as part of the interval penetrated by a core bit and brought to the surface for geologic examination, representative sampling, and laboratory analyses.

3.1.5 *core barrels*, *n*—two nested tubes above the bit of a core drill, the outer rotating with the bit, the inner receiving and preserving a continuous section or core of the material penetrated. The following two types of inner barrels are commonly used.

3.1.5.1 *split-tube barrel, n*—a type of inner barrel consisting of two longitudinal halves of pipe bound together by reinforced tape at intervals along the barrel length that allows easy access to a relatively intact core (by cutting the tape). (This is the preferred barrel type for coal exploration, when available.)

3.1.5.2 *solid-tube barrel, n*—a type of inner barrel consisting of a single solid-walled length of pipe in which removal of the core is accomplished by mechanical or hydraulic pressure at one end of the pipe thus extruding the core onto a core tray. (The core is likely to be less intact than when a split-tube barrel is used.)

3.1.6 *core sample*, *n*—that part of a core of rock or coal obtained so as to accurately represent a thickness of a unit penetrating by drilling.

3.1.7 *geophysical log*, *n*—a graphic record of the measured or computed physical characteristics of the rock section encountered in a borehole, plotted as a continuous function of depth. Measurements are made by a sonde, which contains the detectors, as it is withdrawn from the borehole by a wire line. Several measurements are usually made simultaneously, and

[1] This practice is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.18 on Classification of Coals.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Withdrawn.

the resulting curves are displayed side by side on the common depth scale. A common suite of logs used in coal exploration include caliper, density (gamma-gamma), natural gamma, and resistivity.

3.1.7.1 *caliper log, n*—a continuous mechanical measurement of the diameter and thus the rugosity of the borehole. The tool identifies zones where swelling or cavings (washouts) have occurred during drilling. The tool's value is in allowing qualitative or quantitative corrections to be made to other geophysical logs which are affected by borehole size (especially density).

3.1.7.2 *density log (gamma-gamma log), n*—measures electron density within lithologic units which is related to their bulk density. The wireline tool records the intensity of gamma radiation (in counts per second) from a nuclear source within the tool after it has been attenuated and backscattered by lithologies within the borehole. Due to the distinctly low density of coals, the density log is essential in coal exploration for identifying coal seams and coal-seam partings. The bias/resolution of density logs can be affected by source-detector spacing (closer spacing increases resolution), borehole size and irregularities (see *caves* or *washouts*), and the presence of casing and logging speed.

3.1.7.3 *natural gamma-ray log, n*—a record of the natural radioactivity of the lithologies encountered in the borehole environment. During recording of geophysical logs, the amount of natural radiation is recorded and presented in either counts per second (CPS) or American Petroleum Institute (API) units. Unlike many other log types, a representative natural gamma log can be obtained where borehole or fluid conditions, or both, are not optimal or where casing is present. The natural gamma log is most often used in the coal environment for identifying classic lithologies and differentiating coal seams and coal-seam partings.

3.1.7.4 *resistivity log, n*—a measure of the voltage differential of strata along the walls of a borehole when electrical current is passed through the strata. The resistivity log requires a fluid-filled hole to constantly provide a conductive medium between electrodes on the tool. The spacing between the electrodes determines the precision of the bed boundary relationships in much the same manner as with the density log. The resistivity log is useful primarily in conjunction with other log types. The logs are affected by casing, logging speed, electrode spacing, formation porosity, and resistivity changes in the borehole fluid.

3.1.8 *floor*, *n*—the rock material immediately underlying a coal bed.

3.1.9 *roof*, *n*—the rock material immediately overlying a coal bed.

3.1.10 *sonde*, *n*—an elongate cylindrical tool assembly used in a borehole to acquire a geophysical log.

4. Summary of Practice

4.1 At selected sites in a deposit of coal, a borehole is drilled and the core containing the coal and surrounding strata of rock is recovered.

4.2 The coal core is cleaned of drilling fluid, if necessary, properly described, and packaged so that loss of moisture is minimized. From this core, coal and roof and floor material of interest are collected for analysis and testing.

5. Significance and Use

5.1 A properly collected sample that includes the total coal bed interval provides a sample that is a representative cross section of the coal bed at the point of sampling. Core samples are taken for subsequent testing needed for evaluation of coal quality and characterization for commercial evaluations, for planning of mining operations to maintain coal quality, for the determination of coal rank in accordance with Classification D 388, and for geologic coal resource studies.

NOTE 1—Because of the potential for lateral variability, a sample may not represent the quality of the coal bed at another sample point. The reliability of the data generated from core samples is dependent on the number and spacing of the sample points and the variability of the coal characteristics in a given area.

5.2 Moisture determined directly from a core sample shall be considered *questionable* in any core sample because of possible contamination from drilling fluids and groundwater. If a more representative estimate of the inherent moisture content of the core sample (with the exception of certain low-rank coals) is desired, the sample should be analyzed according to Test Method D 1412.

6. Apparatus

6.1 *Steel Measuring Tape,* not less than 10 m (30 ft) long.

6.2 *Rock Hammer, Chisel, or Pick,* with file for sharpening.

6.3 *Water Source,* to provide fresh, clean water for rinsing drilling mud from cut surface of the core.

6.4 *Waterproof Marking Pencils* that are visible on coal, such as a yellow lumber crayon.

6.5 *Polyethylene Bags, Tubing, or Sheets,* 0.1 mm (4 mil) or thicker.

6.6 *Core Tray,* constructed of wood, plastic, or metal, onto which to extrude the core from the core barrel.

6.7 *Boxes for Core Storage,* constructed of wood, plastic, or coated cardboard or if the core is to remain stratigraphically oriented, use containers such as polyvinyl chloride (PVC) pipe.

6.8 *Tags and Waterproof Marking Pens,* for sample identification and for marking depths, orientation, and so forth, on the plastic sheeting.

6.9 *Notebook and Pencil,* or other means for record keeping.

6.10 *Waterproof Container,* to hold sample tag.

6.11 *Geophysical Logging Unit (optional),* consisting of recording equipment and sondes for high-resolution density and caliper logs and possibly gamma and resistivity logs.

7. Planning for Sampling

7.1 Obtain information such as geologic, topographic, and land ownership for locating suitable sites for drilling. Choose sites that will best satisfy the purpose of sampling.

7.2 A core approximately 47 mm (1.87 in.) in diameter yields a sufficient sample for most purposes. Minimum sample mass requirements for analytical tests, such as washability testing, may dictate a sample mass that can only be obtained from larger diameter cores or multiple separate cores.

NOTE 2—The diameter and length of the core (or number of separate