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which might then be lost to the weight measurement.

(iii) *Cassette*. The cassette shall enclose the capsule so as to prevent contamination and intentional or inadvertent alteration of dust deposited on the filter. The cassette must be easily removable without causing a loss or gain of capsule weight. The cassette shall be designed to prevent contaminants from entering or dust from leaving the capsule when it is not in use, and to prevent the reversal of airflow through the capsule or other means of removing dust collected on the filter.

(3) *Arrangement of components*. The connections between the cyclone vortex finder and the capsule and between the capsule and the ¼-inch (0.64 centimeters) (inside diameter) hose mentioned in paragraph (b)(5) of this section shall be mechanically firm and shall not leak at a rate of more than 0.1 liters per hour under a vacuum of 4 inches (10 centimeters) of water.

(4) *Clamping of components*. The clamping and positioning of the cyclone body, vortex finder, and cassette shall be rigid, remain in alignment, be firmly in contact and airtight. The cyclone-cassette assembly shall be attached firmly to a backing plate or other means of holding the sampling head in position. The cyclone shall be held in position so that the inlet opening of the cyclone is pointing perpendicular to, and away from, the backing plate.

(5) *Hose*. A 3-foot (91 centimeter) long, ¼-inch (0.64 centimeters) (inside diameter) clear plastic hose shall be provided to form an airtight connection between the inlet of the sampler pump and the outlet of the filter assembly. A device, capable of sliding along the hose and attaching to the miner's outer garment, shall be provided.

(c) *Battery charger*.

(1) *Power supply*. The battery charger shall be operated from a 110 (VAC) (nominal), 60 Hz power line.

(2) *Connection*. The battery charger shall be provided with a cord and polarized connector so that it may be connected to the charge socket on the pump or battery case.

(3) *Protection*. The battery charger shall be fused, shall have a grounded

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power plug, and shall not be susceptible to damage by being operated without a battery on charge.

(4) *Charge rates*. The battery charger shall be capable of fully recharging the battery in the pump unit within 16 hours.

§ 74.5 Tests of coal mine dust personal sampler units.

(a) The National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, shall conduct tests to determine whether a CMDPSU that is submitted for approval under these regulations meets the requirements set forth in § 74.4.

(b) The Mine Safety and Health Administration (MSHA), Department of Labor, will conduct tests and evaluations to determine whether the pump unit of a CMDPSU that is submitted for approval under these regulations complies with the applicable permissibility provisions of 30 CFR 18.68.

§ 74.6 Quality control.

The applicant shall describe the way in which each lot of components will be sampled and tested to maintain its quality prior to assembly of each sampler unit. In order to assure that the quality of the CMDPSU will be maintained in production through adequate quality control procedures, MSHA and NIOSH reserve the right to have their qualified personnel inspect each applicant's control-test equipment procedures and records and to interview the employees who conduct the control tests. Two copies of the results of any tests made by the applicant on the CMDPSU or the pump unit thereof shall accompany an application provided under § 74.13 of this part.

Subpart C—Requirements for Continuous Personal Dust Monitors

§ 74.7 Design and construction requirements.

(a) *General requirement*. Continuous Personal Dust Monitors (CPDMs) shall be designed and constructed for coal miners to wear and operate without impeding their ability to perform their work safely and effectively, and shall

be sufficiently durable to perform reliably in the normal working conditions of coal mines.

(b) *Ergonomic design testing.* Prior to submitting an application under § 74.13, the applicant shall develop a testing protocol and test the CPDM to assure that the device can be worn safely, without discomfort, and without impairing a coal miner in the performance of duties throughout a full work shift. The results of the test shall also demonstrate that the device will operate consistently throughout a full work shift under representative working conditions of underground coal miners, including representative types and durations of physical activity, tasks, and changes in body orientation.

(1) The testing protocol shall specify that the tests be conducted in one or more active mines under routine operating conditions during production shifts.

(2) The applicant shall submit the testing protocol, in writing, to NIOSH for approval prior to conducting such testing.

(3) The applicant shall include the testing protocol and written test results in the application submitted to NIOSH as specified in § 74.13.

(4) NIOSH will advise and assist the applicant, as necessary, to develop a testing protocol and arrange for the conduct of testing specified in this paragraph.

(5) NIOSH may further inspect the device or conduct such tests as it deems necessary to assure the safety, comfort, practicality, and operability of the device when it is worn by coal miners in the performance of their duties.

(6) NIOSH may waive the requirement for the applicant to conduct testing under paragraph (b) of this section if NIOSH determines that such testing is unnecessary to assure the safety, comfort, practicality, and operability of the device when it is worn by coal miners in the performance of their duties.

(c) *Maximum weight.* A CPDM shall not add more than 2 kg to the total weight carried by the miner. CPDMs that are combined with other functions, such as communication or illumination, may exceed 2 kg provided

that the total added weight carried by the miner does not exceed 2 kg.

(d) *Dust concentration range.* The CPDM shall measure respirable coal mine dust concentrations accurately, as specified under § 74.8, for an end-of-shift average measurement, for concentrations within a range from 0.2 to 4.0 mg/m³ for respirable coal mine dust. For end-of-shift average concentrations exceeding 4.0 mg/m³, the CPDM shall provide a reliable indication that the concentration exceeded 4.0 mg/m³.

(e) *Environmental conditions.* The CPDM shall operate reliably and accurately as specified under § 74.8, under the following environmental conditions:

(1) At any ambient temperature and varying temperatures from minus 30 to plus 40 degrees centigrade;

(2) At any atmospheric pressure from 700 to 1000 millibars;

(3) At any ambient humidity from 10 to 100 percent relative humidity; and

(4) While exposed to water mists generated for dust suppression and while monitoring atmospheres including such water mists.

(f) *Electromagnetic interference.* The CPDM shall meet the following standards for control of and protection from electromagnetic interference.

(1) For emissions control, operators must follow: IEEE Std C95.1-2005, (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz) and 47 CFR 15.1 through 15.407 (FCC Radio Frequency Devices). Persons must proceed in accordance with IEEE Std C95.1-2005 (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz).

(i) The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Persons may obtain a copy from: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036. <http://www.ansi.org>.

(ii) Persons may inspect a copy at MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia

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22209–3939, (202) 693–9440, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(2) For immunity/susceptibility protection, operators must follow: IEC 61000–4–6, International Standard (Electromagnetic compatibility—Part 4–6: Testing and measurement techniques—Immunity to conducted disturbances, induced by radio-frequency fields), Edition 3.0, 2008–10. Persons must proceed in accordance with IEC 61000–4–6, International Standard (Electromagnetic compatibility—Part 4–6: Testing and measurement techniques—Immunity to conducted disturbances, induced by radio-frequency fields), Edition 3.0, 2008–10. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

(i) Persons may obtain a copy from the International Electrotechnical

Commission at the address provided below:

International Electrotechnical Commission, IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH–1211 GENEVA 20, Switzerland. <http://www.standardsinfo.net>.

(ii) Persons may inspect a copy at MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia 22209–3939, (202) 693–9440, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(g) *Durability testing.* The CPDM shall be designed and constructed to remain safe and measure respirable coal mine dust concentrations accurately, as specified under § 74.8 of this section after undergoing the following durability tests, which NIOSH will apply to test devices prior to their use in further testing under § 74.8 of this-subpart:

Vibration	Mil-Std-810F, 514.5	U.S. Highway Vibration, Restrained Figure 514.5C–1.	1 Hours/Axis, 3 Axis; Total Duration = 3 Hrs, equivalent to 1,000 miles.
Drop	3-foot drop onto bare concrete surface.	In standard in-use configuration.	1 drop per axis (3 total).

(1) Persons must proceed in accordance with Mil-Std-810F, 514.5, Department of Defense Test Method for Environmental Engineering Considerations and Laboratory Tests, 1 January 2000. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Persons may obtain a copy from the U.S. Department of Defense at the address provided below.

ASC/ENOI, Bldg. 560, 2530 Loop Road West, Wright-Patterson AFB OH 45433–7101. <http://www.dtc.army.mil/navigator/>.

(2) Persons may inspect a copy at MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia 22209–3939, (202) 693–9440, or at the National Archives and Records Adminis-

tration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(h) *Reporting of monitoring results.*

(1) The CPDM shall report continuous monitoring results legibly or audibly during use. A digital display, if used, shall be illuminated and shall provide a minimum character height of 6 millimeters. Other forms of display (e.g., analogue) must provide comparable visibility. Auditory reporting, if used, shall be clear, have adjustable volume, and provide means for the user to obtain data reports repetitively. The

CPDM shall also report end-of-shift results using computer software compatible with current, commonly used personal computer technology.

(2) The CPDM shall report results as cumulative mass concentration in units of mass per volume of air (mg/m^3) with two significant figures of accuracy rounded as customary.

(i) *Power requirements.* The power source of the CPDM shall have sufficient capacity to enable continuous sampling for 12 hours in a coal mine dust atmosphere of up to $4.0 \text{ mg}/\text{m}^3$. If the CPDM uses a rechargeable battery, the battery charger shall be operated from a 110 (VAC) (nominal), 60 Hz power line.

(j) *Flow stability and calibration of pump.* If a pump is used, the flow shall not vary more than ± 5 percent of the calibrated flow for 95 percent of samples taken for any continuous duration for up to 12 hours. The flow calibration maintenance interval to assure such performance shall be specified in the calibration instructions for the device.

(k) *Battery check.* If the CPDM uses a rechargeable battery, the CPDM shall have a feature to indicate to the user that the device is sufficiently charged to operate and provide accurate measurements for an entire shift of 12 hours under normal conditions of use.

(l) *Integration with other personal mining equipment.*

(1) If the CPDM is integrated or shares functions with any other devices used in mines, such as cap lights or power sources, then the applicant shall obtain approvals for such other devices, prior to receiving final certification of the CPDM under this section.

(2) A CPDM that is integrated with another device shall be tested, according to all the requirements under this part, with the other device coupled to the CPDM and operating.

(m) *Tampering safeguards or indicators.* The CPDM shall include a safeguard or indicator which either prevents intentional or inadvertent altering of the measuring or reporting functions or indicates that the measuring or reporting functions have been altered.

(n) *Maintenance features.* The CPDM shall be designed to assure that the device can be cleaned and maintained to

perform accurately and reliably for the duration of its service life.

§ 74.8 Measurement, accuracy, and reliability requirements.

(a) *Breathing zone measurement requirement.* The CPDM shall be capable of measuring respirable dust within the personal breathing zone of the miner whose exposure is being monitored.

(b) *Accuracy.* The ability of a CPDM to determine the true concentration of respirable coal mine dust at the end of a shift shall be established through testing that demonstrates the following:

(1) For full-shift measurements of 8 hours or more, a 95 percent confidence that the recorded measurements are within ± 25 percent of the true respirable dust concentration, as determined by CMDPSU reference measurements, over a concentration range from 0.2 to $4.0 \text{ mg}/\text{m}^3$; and

(2) For intra-shift measurements of less than 8 hours, a 95 percent confidence that the recorded measurements are within ± 25 percent of the true respirable dust concentration, as determined by CMDPSU reference measurements, over the concentration range equivalent to 0.2 to $4.0 \text{ mg}/\text{m}^3$ for an 8-hour period.¹

(c) *Reliability of measurements.* The CPDM shall meet the accuracy requirements under paragraph (b) of this section, regardless of the variation in density, composition, size distribution of respirable coal mine dust particles, and the presence of water spray mist in coal mines.

¹The equivalent dust concentration range to the 8-hour range of $0.2 - 4 \text{ mg}/\text{m}^3$ is calculated by multiplying this 8-hour range by the dividend of eight hours divided by the duration of the intrashift measurement specified in units of hours. For example, for a measurement taken at exactly one hour into the shift, the 8-hour equivalent dust concentration range would be a one-hour average concentration range of: $8 \text{ hours}/1 \text{ hour} \times (0.2 - 4 \text{ mg}/\text{m}^3) = 1.6 - 32 \text{ mg}/\text{m}^3$; for a two-hour measurement, the applicable concentration range would be calculated as: $8 \text{ hours}/2 \text{ hours} \times (0.2 - 4 \text{ mg}/\text{m}^3) = 0.8 - 16 \text{ mg}/\text{m}^3$; for a 4-hours measurement, the equivalent range would be: $0.4 - 8 \text{ mg}/\text{m}^3$; * * * etc. A CPDM must perform accurately, as specified, for intrashift measurements within such equivalent concentration ranges.