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WITHDRAWAL

October 2011

Method for testing sorbents

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Octobre 2011

Méthode d'essai des sorbants

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Method for Testing Sorbents



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CANADIAN GENERAL STANDARDS BOARD

Method for Testing Sorbents

1. SCOPE

- 1.1 This method covers laboratory-conducted performance tests for specific types of sorbent materials, regardless of their mode of action, for the sorption of crude oil, its contained natural components and mixtures thereof.
- 1.2 This document does **not** apply to Type III booms or pillows, or Type IV agglomeration units.
- 1.3 The testing and evaluation of a product against this method may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this method has the responsibility to consult the appropriate health and safety practices in conjunction with any existing applicable regulatory requirements prior to its use.

2. APPLICABLE PUBLICATIONS

- 2.1 The following publications are applicable to this method:
- 2.1.1 Department of the Environment
A Catalogue of Crude Oil and Oil Product Properties
Selection Criteria and Laboratory Evaluation of Oil Spill Sorbents, an Update, Update II, Update III, Update IV.
- 2.2 Reference to the above publications and other related standards is to the latest issues unless otherwise specified by the authority applying this method. The sources of these publications are shown in the Notes Section.

3. TERMINOLOGY

- 3.1 The following definitions apply to this method:

Absorption (Absorption)

A process where the material taken up is distributed throughout the body of the absorbing material.

Adsorption (Adsorption)

A process where the material taken up is distributed over the surface of the adsorbing material.

Biodegradation (Biodégradation)

Decomposition by biological action.

Buoyancy (Flottabilité)

The tendency to remain floating.

Flammability (before application) (Inflammabilité) (avant utilisation)

The ease with which a material will ignite either spontaneously, from exposure to a high-temperature environment, or to a spark or open flame.

Hydrophobic (Hydrophobe)

Not wettable by water.

Initial sorption capacity (Capacité de sorption initiale)

The amount of test liquid picked up by a sorbent during initial exposure to a particular test liquid given in this standard.

Maximum sorption capacity (Capacité de sorption maximale)

The maximum amount of test liquid picked up by a sorbent either on initial exposure to a particular test liquid or on subsequent reuse trials.

Oleophilic (Oléophile)

Wettable by oil.

Rate of release (Taux de libération)

The release of test liquid over a specified time interval.

Retention (Rétention)

The ability of a sorbent to hold test liquid.

Shedding/Linting (Perte de matériau)

The release of sorbent material on application.

Shelf life (Durée utile)

Period of useful life of a product from manufacture to application.

Sorbents (sorbants)

Organic, inorganic and synthetic materials that retain oil and other liquids by absorptive and/or adsorptive processes.

Sorption capacity (Capacité de sorption)

The amount of test liquid that a particular material mass and/or volume can pick up under specified conditions.

Sorption rate (Taux de sorption)

Amount of test fluid sorbed per unit time per unit of sorbent mass and/or volume under specified conditions.

Static resistance (Résistance statique)

The potential to resist static electric discharge.

Storage density (Masse spécifique [en stockage])

The quantity of sorbent material that may be stored in a specified volume prior to application.

Water pick-up (Eau sorbée)

The amount of water picked up by a sorbent.

Water/test liquid ratio (Rapport eau/liquide d'essai)

The amount of water in the test liquid with respect to the amount of test liquid recovered by the sorbent.

Toxicity (Toxicité)

The inherent property of a physical or chemical agent to cause damage to a biological system.

4. PRINCIPLE AND INTENDED USES

- 4.1 The sorbent materials are tested using established tests for factors relating to performance and handling. This method is to be used as a basis for comparison of sorbents in a consistent manner and to present their characteristics and properties of value during their life cycle.

5. CLASSIFICATION

5.1 The sorbents shall be classified in the following types and categories:

5.1.1 Types

Type I — Scrimmed or unscrimmed sheet, pad, blanket, roll, or sweep

Type II — Loose — unconsolidated, particulate material

Type III

Type IIIa — Sorbent material contained by an outer material or netting such as pillows and socks and/or are designed to be utilized as individual units.

Type IIIb — Booms — Sorbent material contained by outer fabric or netting and/or that has a dimensional configuration or other manufactured traits whose sorption capacity would be significantly altered if cut to meet Type I size requirements. Booms are manufactured with connections for coupling end to end. *This document does not address Type III sorbents.*

Type IV — Agglomeration unit — pom pom, yarn, or netting. *This document does not address Type IV sorbents.*

Type V — Alternate — Sorbents that do not meet the requirements of the above Types but possess at least one characteristic that warrants further consideration.

5.1.2 Categories

The L-W category refers to sorbents that are suitable for sorbing spills on land or water.

The L category refers to sorbents that are suitable for sorbing spills exclusively on land.

The W category refers to sorbents that are suitable for sorbing spills exclusively on water.

The ALTERNATE category will encompass sorbents that do not meet the requirements of the above categories but possess at least one redeeming characteristic which warrants further consideration.

6. APPARATUS AND MATERIALS

6.1 **Test Cells (open):** The dimensions of the test cells shall be large enough to enable the sorbent sample to float freely within the test cell.

Note: The following is a recommended vessel for Type I and Type II sorbents: Pyrex 190 mm (diameter) × 100 mm (depth) crystallizing dish with a watch glass or glass plate cover to accommodate a sample size not less than 130 mm (length) × 130 mm (width) for Type I and 100 cm³ for Type II. The recommended vessel for full size Type I sorbents is a 53 × 56 cm plastic sink (laundry sink or equivalent) to accommodate a full size sorbent sample.

6.2 **Test Cells (enclosed):** Test cells for use with shaker table shall be large enough to enable wave action to thoroughly mix water and test liquid with sorbent.

Note: A 4 L glass jar with a screw type lid is recommended.

6.3 **Basket for Type II test:** The basket shall be of a sufficient size and strength to accommodate the sample size and weight (150 cm³ or 4–10 g) when saturated. The basket must not be so tall as to interfere with the lid.

Note: The mesh should retain the sorbent, yet allow free oil to drain away from the sorbent.

6.4 **A temperature control system:** equivalent to maintain a test cell temperature of $20 \pm 3^{\circ}\text{C}$.

6.5 **Top Loading Balance:** 0.1 g resolution.

6.5.1 The following materials are recommended:

A balance with a range of up to 400 g is recommended for sorbents of Type I and Type II.

Weighing pans of 20 cm diameter to accommodate sample size are recommended (non-stick coated pan or lined pan should be used for ease in cleaning).

Photo-finishing clip or clothes-peg type clip is recommended.

- 6.6 **Wringer-type Press:** Hand-operated with a double roller design similar to wringer-type washing machines. Both rollers must be attached to the drive mechanism to reduce slippage. Pressure is applied at the rate of 4 kg/cm of nip (approximating a 20 kg mass being placed on top roller for 13 × 13 cm square sample).
- 6.7 **Plate Press:** Hydraulic press or similar device able to apply 340 kPa (50 lb/in²) of pressure on top plate measuring 15 × 15 cm.
- 6.8 **Graduated Conical Centrifuge Tubes:** (100 mL capacity).
- 6.9 **Shaker Table:** capable of producing a frequency of 150 cycles/min and an amplitude of 3 cm Eberbach Shaker Table or equivalent.

7. TEST LIQUIDS

- 7.1 The types of liquids to be tested should be representative of the wide variety of liquids that sorbents could be used to clean up. Viscosity for liquids may vary up to 10% and be measured at 20 ± 3°C. Density of liquids should not vary more than 5% between replicate runs. The following representative liquids may be substituted by an equivalent liquid:
- 7.1.1 Low viscosity — Diesel Fuel Oil
Viscosity: 1–100 cP @ 20 ± 3°C
Grade 2-D, Automotive diesel fuel oil
- 7.1.2 Low viscosity — Crude Oil
Viscosity: 100–300 cP @ 20 ± 3°C
U.S. Domestic (Texas)
Saudi Light
- 7.1.3 Medium viscosity — Weathered Crude Oil
Viscosity: 1000–3000 cP @ 20 ± 3°C
U.S. Domestic (Texas)
Saudi Light
Bachaquero
- 7.1.4 High viscosity — Fuel Oil #6
Viscosity: 25000–50000 cP at 20 ± 3°C
Bunker C Fuel Oil (Fuel Oil #6)
Bachaquero
- Care must be taken when dealing with volatile fractions to ensure excessive evaporation does not occur.

8. CONDITIONING

- 8.1 Sorbents shall be inspected upon receipt by the testing agency and damaged specimens shall be removed and replaced as needed.
- 8.2 Condition all sorbent test specimens at 20 ± 3°C and 60 ± 10% relative humidity for not less than 24 h prior to testing. Condition specimens in a fully exposed state with no coverings or wrapping that would hinder the ambient equilibration process.

9. PROCEDURE

- 9.1 **Still Water Take-up** — This procedure is designed to test for water take-up under stagnant conditions. This test is performed at 20 ± 3°C.
- 9.1.1 **Type I Sorbent** — The sorbent to be tested should be cut with a sharp edge to ensure no tearing, edge compaction, or other physical disruption to minimum dimensions of 130 × 130 mm square. The sorbent is then weighed and the value is recorded. The test cell is filled with a layer of water (80 mm), and the sorbent sample is lowered into the test cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to protect the cell. After

12 ± 1 h check the condition of the sorbent. Any loss of buoyancy from original characters shall be noted. If 10% or more of the sample sinks below the waterline based upon visual inspection, go directly to L Test in par. 9.5; otherwise remove the sorbent in a vertical orientation with a clip and let drain hanging over the cell for 30 ± 3 s. Place a tared weighing pan under the sorbent to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Retain the sorbent sample for use in the long-term sorption test. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.

9.1.2 **Type II Sorbent** — The test cell is filled with a layer of water (80 mm). The sample size of the sorbent to be tested shall be between 4 to 10 g or reach a maximum of 150 cm³. The sorbent sample is placed in a basket which is lowered into the test cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to protect the cell. After 12 ± 1 h check the condition of the sorbent. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5; otherwise remove the sorbent with the basket and let drain over the cell for 30 ± 3 s. Place the basket over a tared weighing pan to catch any additional drips and immediately transfer the sorbent to the pan. Record the weight. Retain the sorbent sample for use in the long-term sorption test. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.

9.1.3 **Full Size Sorbent** — The test cell is filled with a layer of water (minimum depth 80 mm). A full size weighed sorbent sample is lowered into the test cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to protect the cell. After 12 ± 1 h check the condition of the sorbent. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5; otherwise manually remove the sorbent in a vertical orientation and let drain hanging over the cell for 30 ± 3 s. Place a tared weighing pan under the sorbent to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Retain the sorbent sample for use in the long-term sorption test. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.

9.2 **Long-Term Sorption Test** — This procedure is designed to test for test liquid take-up and determine hydrophobic properties of a sorbent sample. This test is performed at 20 ± 3°C.

9.2.1 **Type I Sorbent** — Lower the wetted sample from the water take-up test with a clip on a 5 mm layer of test liquid on excess water bath (at least 80 mm) at 20 ± 3°C. After a minimum of 12 h check the condition of the sorbent. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5; otherwise remove the sorbent in a vertical orientation with a clip and immediately hang from the balance. Place a tared weighing pan under the hanging sorbent to catch any drips. Record the weight of the saturated sorbent at 30 s, 45 s, 1 min, 2 min, 5 min, 15 min and 30 min. At the 30 min mark, transfer the sorbent to the pan. Transfer the sample and any residual liquid that remains in the pan to the wringer or plate press or similar device and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Collect liquid in a graduated conical centrifuge tube for water content determination. If the meniscus is distinctly visible in the conical tube then water content may be read directly. Reweigh the pressed sorbent and record the value. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). Observations should include but not be limited to: buoyancy, disintegration, and appearance of the sorbent and the water. The sorbent must remain structurally sound at saturation while being held along a side (avoid hanging by corner) of the sample and must not sink. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.

9.2.2 **Type II Sorbent** — Lower the basket containing the wetted sample from the Water Take-up Test on a 5 mm layer of test liquid on water (at least 80 mm) at 20 ± 3°C. After a minimum of 12 h check the condition of the sorbent. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5, otherwise remove the sorbent with the basket and immediately hang the basket from the balance. Place a tared weighing pan under the hanging basket to catch any drips. Record the weight of the basket with the saturated sorbent at 30 s, 45 s, 1 min, 2 min, 5 min, 15 min and 30 min. At the 30 min mark transfer the sorbent to the pan. Transfer the sample and any residual liquid that remains in the pan to the wringer or plate press or similar device and squeeze

the sorbent. This action may be cycled up to five times to extract remaining test liquid. Collect liquid in a graduated conical centrifuge tube for water content determination. If the meniscus is distinctly visible in the conical tube then water content may be read directly. Weigh the pressed sorbent and record the value. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). Observations should include but not be limited to: buoyancy, disintegration, and appearance of the sorbent and the water. The sorbent must not sink below the waterline. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.

- 9.2.3 **Full Size Sorbent** — Lower the wetted sample from the water take-up test on a 5 mm layer of test liquid on water (at least 80 mm) at $20 \pm 3^\circ\text{C}$. After a minimum of 12 h check the condition of the sorbent. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5, otherwise manually remove the sorbent in a vertical orientation and immediately hang with clips from the balance. Place a tared weighing pan under the hanging sorbent to catch any drips. Record the weight of the saturated sorbent at 30 s, 45 s, 1 min, 2 min, 5 min, 15 min and 30 min. At the 30 min mark, transfer the sorbent to the pan. Transfer the sample and any residual liquid that remains in the pan to the wringer or plate press or similar device and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Collect liquid in a graduated cylinder and decant into a graduated conical centrifuge tube for water content determination. If the meniscus is distinctly visible in the conical tube then water content may be read directly. Reweigh the pressed sorbent and record the value. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). Observations should include but not be limited to: buoyancy, disintegration, and appearance of the sorbent and the water. The sorbent must remain structurally sound at saturation while being held along a side (avoid hanging by corner) of the sample and must not sink. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples shall be rejected and the test repeated with three new specimens.
- 9.3 **Dynamic Degradation Test** — This procedure is designed to test for water take-up and to determine oleophilic properties of a sorbent sample under dynamic conditions. This test is performed at $20 \pm 3^\circ\text{C}$ temperature.
- 9.3.1 Sample pieces of the sorbent (Type I: 4 pieces of 6×6 cm, Type II: 4–10 g or 150 cm³) are placed in a 4 L jar which is half-filled with water and sealed. The container is then placed on its side and mounted on a shaker table, or similar device, set at a frequency of 150 cycles per minute and an amplitude of 3 cm for a duration of 15 min. If 10% or more of the sample sinks below the waterline, based upon visual inspection, go directly to L Test in par. 9.5, otherwise remove the sorbent by straining the contents of the jar through a mesh basket to catch the sorbent. Weigh the sample after a 30 s drain period.
- 9.3.2 The jar is half-filled with fresh water and 10 mL of test liquid is added. The sorbent sample is returned to the jar which is then sealed. The container is placed on its side and mounted on a shaker table, or similar device, set at a frequency of 150 cycles per minute and an amplitude of 3 cm for a duration of 15 min. The jar is allowed to settle for a period of 2 min, at which time observations are recorded. Observations include but are not limited to: quantity of sorbent submerged, physical appearance of sorbent, and persistence of residual test liquid.
- 9.4 **W test** — This procedure will determine the amount of liquid that a sorbent will pick up in 15 min. Fresh samples are used for this test which is performed at $20 \pm 3^\circ\text{C}$.
- 9.4.1 **Type I Sorbent** — The sorbent to be tested shall be cut with a sharp edge to minimum dimensions of 130×130 mm square. The sorbent is then weighed and the value is recorded. The test cell is filled with an initial layer of water (at least 80 mm) and a quantity of test liquid to produce the required thickness for the test. The required thickness for test liquids with viscosities less than 10 cP is 2.5 mm. The required thickness for all remaining test liquids is 5 mm. The sorbent is lowered into the cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to restrict evaporation and to protect the cell. After $15 \text{ min} \pm 20 \text{ s}$ remove the sorbent with a clip and let drain hanging over the cell for $30 \pm 3 \text{ s}$. Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Transfer sample and any residual liquid that remains in the pan to the wringer or plate press or similar device and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Reweigh the pressed sorbent and record the sample weight. Collect liquid in a graduated conical centrifuge tube for water content determination. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). Each sorbent sample will be tested through five complete sorption

cycles or until its sorbency is reduced to 50% of its initial value or until disintegration. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.

- 9.4.2 **Type II Sorbent** — The sample size of the sorbent to be tested shall be between 4 to 10 g or reach a maximum of 150 cm³. The sorbent is weighed and the value is recorded. The test cell is filled with an initial layer of water (at least 80 mm) and a quantity of test liquid to produce the required thickness for the test. The required thickness for test liquids with viscosities less than 10 cP is 2.5 mm. The required thickness for all remaining test liquids is 5 mm. The sorbent is placed in a basket which is then lowered into the cell. Place a lid on the cell to restrict evaporation and to protect the cell. After 15 min ± 20 s remove the sorbent with the basket and let drain over the cell for 30 ± 3 s. Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Transfer the sample and any residual liquid that remains in the pan to the press and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Collect liquid in a graduated conical centrifuge tube for water content determination. Reweigh the pressed sorbent and record the sample weight. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.
- 9.4.3 **Full Size Sorbents** — The full size sorbent sample is weighed and the value is recorded. The test cell is filled with an initial layer of water (at least 80 mm) and a quantity of test liquid to produce the required thickness for the test. The required thickness for test liquids with viscosities less than 10 cP is 2.5 mm. The required thickness for all remaining test liquids is 5 mm. The sorbent is lowered into the cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to restrict evaporation and to protect the cell. After 15 min ± 20 s remove the sorbent with a clip and let drain hanging over the cell for 30 ± 3 s. Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Transfer sample and any residual liquid that remains in the pan to the press and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Reweigh the pressed sorbent and record the sample weight. Collect liquid in a graduated cylinder and decant to a graduated conical centrifuge tube for water content determination. If the meniscus is not distinctly visible, the emulsion may be broken by adding a small quantity of solvent such as toluene to the centrifuge tube (approximately 10–20 mL). Each sorbent sample will be tested to determine test liquid recovery. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.
- 9.5 **L Test** — This procedure will test the amount of test liquid that a sorbent can pick up in 15 min. The liquid layer should be of a minimum thickness of 7.5 mm if the thickness of the sorbent is under 7.5 mm. If the sorbent is thicker than 7.5 mm, then a liquid layer at least as thick as the sorbent sample should be used. Fresh samples are used for this test which is performed at 20 ± 3°C.
- 9.5.1 **Type I Sorbent** — The sorbent to be tested shall be cut with a sharp edge to minimum dimensions of 130 × 130 mm square. The sorbent is then weighed and the value is recorded. The test cell is filled with an initial layer of test liquid. The sorbent is lowered into the cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to restrict evaporation and to protect the cell. After 15 min ± 20 s remove the sorbent in a vertical orientation with a clip and let drain hanging over the cell for 30 ± 3 s. Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Transfer sample and any residual liquid that remains in the pan to the press and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Reweigh the pressed sorbent to determine and record the sample weight. Each sorbent sample should be tested to determine test liquid recovery. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.
- 9.5.2 **Type II Sorbent** — The sample size of the sorbent to be tested shall be between 4 to 10 g or reach a maximum of 150 cm³. The sorbent is weighed and the value is recorded. The test cell is filled with an initial layer of test liquid. The sorbent is placed in a basket which is then lowered into the cell. Place a lid on the cell to restrict evaporation and to protect the cell. After 15 min ± 20 s remove the sorbent with the basket and let drain over the cell for 30 ± 3 s.

Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Weigh the empty basket for future calculations. Transfer sample and any residual liquid that remains in the pan to the press and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Reweigh the pressed sorbent to determine and record the sample weight. Each sorbent sample should be tested to determine test liquid recovery. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.

9.5.3 **Full Size Sorbents** — The full size sorbent is weighed and the value is recorded. The test cell is filled with an initial layer of test liquid. The sorbent is lowered into the cell. The sorbent shall be allowed to float freely within the test cell. Place a lid on the cell to restrict evaporation and to protect the cell. After $15 \text{ min} \pm 20 \text{ s}$ manually remove the sorbent in a vertical orientation and let drain hanging over the cell for $30 \pm 3 \text{ s}$. Place a tared weighing pan under the sorbent sample to catch any additional drips and immediately transfer the sorbent to the pan. Determine and record the sample weight. Transfer sample and any residual liquid that remains in the pan to the press and squeeze the sorbent. This action may be cycled up to five times to extract remaining test liquid. Reweigh the pressed sorbent to determine and record the sample weight. Each sorbent sample should be tested to determine test liquid recovery. All tests are triplicated with the median of the three runs being used for calculations. If the value of any run (g/g) deviates by more than 15% from the median of the three runs, then the samples will be rejected and the test repeated with three new specimens.

10. **CALCULATIONS** — Using data from section 9 calculate the following:

10.1 **Still Water Take-up Test** — Use values obtained in par. 9.1 and state value of water uptake as grams of water per gram of sorbent, volume of water per gram of sorbent, and volume of water per sorbent storage volume.

10.2 **Long-Term Sorption Test** — Use values obtained in par. 9.2 and state value of test fluid sorbed as grams of test liquid per gram of sorbent, volume of test liquid per gram of sorbent, and volume of test liquid per sorbent storage volume. State value of water uptake in same units as test liquid. Calculate and display water percentage of total uptake. Calculate and draw profile of retention (curve) from values obtained at 30 s, 45 s, 1 min, 2 min, 5 min, 15 min, 30 min.

10.3 **Dynamic Test** — No calculations required; observations are recorded.

10.4 **W Test** — Use values obtained in par. 9.4 and state value of test fluid sorbed as grams of test liquid per gram of sorbent, volume of test liquid per gram of sorbent, and volume of test liquid per sorbent storage volume. Use values obtained in par. 9.3 and state value of water sorbed in same units as test liquid. Calculate and display water percentage of total uptake. Determine test liquid recovery for each test liquid.

10.5 **L Test** — Use values obtained in par. 9.5 and state value of test fluid sorbed as grams of test liquid per gram of sorbent. Volume of test liquid per gram of sorbent should also be calculated and recorded. Determine test liquid recovery potential for each test liquid.

10.6 **Reaction Time** — A quantitative comparison will be made between long-term sorption in par. 9.2 and the test liquid uptake in par. 9.4. Any sorbent that has not reached 90% saturation by the 15 min mark will be designated as a slow sorbent. (Assuming sorbents reach saturation within 12 h).

10.7 **Storage Density** — The storage density (kg sorbent/m^3) is calculated from data on the manufacturer's packaging.

11. ADDITIONAL TESTS

11.1 An additional specialized test method may be employed by the authority having jurisdiction, if these test methods are shown to severely hamper a sorbent's performance.

12. REPORT

12.1 The report shall provide relevant test data as requested by the specifying authority.

13. NOTES

13.1 Related Publications

American Society for Testing and Materials (ASTM)

F716-82 — Sorbent Performance of Absorbents

F726-81 — Sorbent Performance of Adsorbents

F1127-88 — Standard Guide for Containment by Emergency Response Personnel of Hazardous Material Spills.

13.2 Sources of Referenced Publications

13.2.1 The publications referred to in par. 2.1.1 may be obtained from the Department of the Environment, Publications, Ottawa, Ontario K1A 0C8.

13.2.2 The publications referred to in par. 13.1 may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, U.S.A., or photocopies are available from the Canadian General Standards Board, Sales Centre, Ottawa, Canada K1A 1G6. Telephone (613) 941-8703 or 1-800-665-CGSB (Canada only). Fax (613) 941-8705.

Withdrawn/Retired



Withdrawn/Retirée

11. ESSAIS SUPPLÉMENTAIRES

Une méthode d'essai supplémentaire spécialisée peut être utilisée par l'autorité compétente, si l'on constate que les méthodes d'essai exposées ici gênent la performance d'un sorbant.

12. RAPPORT

Le rapport doit contenir toutes les données utiles exigées par l'autorité qui a demandé les essais.

13. REMARQUES

13.1 Publications connexes

American Society for Testing and Materials (ASTM)

F716-82 — Sorbent Performance of Absorbents

F726-81 — Sorbent Performance of Adsorbents

F1127-88 — Standard Guide for Containment by Emergency Response Personnel of Hazardous Material Spills.

13.2 Sources de diffusion des publications de référence

13.2.1 Les publications mentionnées au par. 2.1.1 peuvent être obtenues, en anglais seulement, du ministère de l'Environnement, Service des publications, Ottawa, Ontario K1A 0C8.

13.2.2 Les publications mentionnées au par. 13.1 peuvent être obtenues de l'American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, U.S.A., ou des photocopies sont disponibles auprès de l'Office des normes générales du Canada, Centre des ventes, Ottawa, Canada K1A 1G6. Téléphone (613) 941-8703 ou 1-800-665-CGSB (Canada seulement). Télécopieur (613) 941-8705.
