

Draft Standard P 0413-200-5

Organic Soil Conditioners – Composts

*Amendements organiques – Composts*

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**Descriptors:** compost, organic matter, organic soil conditioner.

**ICS:** 65.080

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## NOTICE

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### INTERPRETATION

In this document, the use of the following expressions, verbal forms and of notes and informative annexes shall be interpreted by the reader as follows:

The verb **shall** is used to express a mandatory requirement in order to comply with this document.

The verb **should**, or the equivalent expressions **it is recommended that** and **ought to**, are used to indicate a useful, but not mandatory, suggestion, or to provide the most appropriate meaning in order to comply with this document.

**With the exception of the normative notes** indicated as such in the lower part of the figures and tables that contain requirements, **all other notes are informative** and provide useful information pertaining to the understanding or intent of a requirement, or to add some clarification or precision.

**Informative annexes** provide additional information intended to assist the understanding or use of elements of this document or to clarify its implementation, but contain no requirements to be complied with.

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## ORGANIC SOIL CONDITIONERS — COMPOSTS

### 1 PURPOSE

This standard specifies physical, chemical and biological characteristics of compost as well as the sampling methodology and the methods of analysis that shall be used to verify these characteristics.

### 2 SCOPE

This standard applies to compost from different sources used as organic soil conditioners, sold or distributed bagged or in bulk.

This document was developed to serve as a reference document for the conformity assessment of compost.

### 3 NORMATIVE REFERENCES

#### 3.1 GENERAL

In this standard, a dated normative reference means that this specific edition shall be used, while a non-dated normative reference means that the last edition of this reference shall be used.

For the purpose of this document, the following reference documents contain necessary requirements and are referred to in appropriate places in the text:

#### 3.2 NORMATIVE DOCUMENTS

##### **BNQ (Bureau de normalisation du Québec)**

CAN/BNQ 0413-210

*Organic Soil Conditioners — Composts — Determination of Foreign Matter Content — Sieving Method.*

(Amendements organiques — Composts — Détermination de la teneur en corps étrangers — Méthode granulométrique.)



CAN/BNQ 0413-220      *Organic Soil Conditioners — Composts — Determination of Oxygen Uptake — Respirometric Method.*  
 (Amendements organiques — Composts — Détermination du taux d'assimilation d'oxygène — Méthode respirométrique.)

**AOAC (AOAC International)**

AOAC 990.08      *Metals in Solid Wastes, Inductively Coupled Plasma Atomic Emission Spectrometric Method.*

AOAC 991.12      *Salmonella in Foods, Hydrophobic Grid Membrane Filter (ISO-GRID) Screening Method.*

**ASTM (American Society for Testing and Materials)**

ASTM D 2974      *Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.*

**EPA (United States Environmental Protection Agency)**

EPA 1683      *Specific Oxygen Uptake Rate in Biosolids.*

EPA 3050 B      *Acid Digestion of Sediments, Sludges and Soils.*

EPA 3051      *Microwave Assisted Acid Digestion of Sediments, Sludges, Soils and Oils.*

EPA 6010 B      *Inductively Coupled Plasma-Atomic Emission Spectroscopy.*

EPA 7061 A      *Arsenic (Atomic Absorption, Gaseous Hydride).*

EPA 7130      *Cadmium (Atomic Absorption, Direct Aspiration).*

EPA 7131 A      *Cadmium (Atomic Absorption, Furnace Techniques).*

EPA 7190      *Chromium (Atomic Absorption, Direct Aspiration).*

EPA 7191      *Chromium (Atomic Absorption, Furnace Techniques).*

EPA 7200      *Cobalt (Atomic Absorption, Direct Aspiration).*



EPA 7201	<i>Cobalt (Atomic Absorption, Furnace Techniques).</i>
EPA 7210	<i>Copper (Atomic Absorption, Direct Aspiration).</i>
EPA 7211	<i>Copper (Atomic Absorption, Furnace Techniques).</i>
EPA 7420	<i>Lead (Atomic Absorption, Direct Aspiration).</i>
EPA 7421	<i>Lead (Atomic Absorption, Furnace Techniques).</i>
EPA 7471 A	<i>Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique).</i>
EPA 7481	<i>Molybdenum (Atomic Absorption, Furnace Techniques).</i>
EPA 7520	<i>Nickel (Atomic Absorption, Direct Aspiration).</i>
EPA 7521	<i>Nickel (Atomic Absorption, Furnace Techniques).</i>
EPA 7741 A	<i>Selenium (Atomic Absorption, Gaseous Hydride).</i>
EPA 7950	<i>Zinc (Atomic Absorption, Direct Aspiration).</i>
EPA 7951	<i>Zinc (Atomic Absorption, Furnace Techniques).</i>

### 3.3 OTHER DOCUMENTS

HEALTH CANADA, Health Products and Food Branch, Bureau of Microbial Hazards. *Compendium of Analytical Methods — Laboratory Procedures for the Microbiological Analysis of Foods*, Ottawa, Vol. 3 (extracted from *The Compendium of Analytical Methods*).

MFLP-55 *Enumeration of Faecal Coliforms in Foods by the Hydrophobic Grid-Membrane Filter (HGFM) Method.*

MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC (MENV), Centre d'expertise en analyse environnementale du Québec.

MA.700 - Sal - tm 1.0 *Dénombrement des salmonelles — Méthode par tubes multiples.*



QA LIFE SCIENCES INC. *ISO-GRID® Methods Manual*, 3d edition, Toronto, c1989, Chapter 10 "Salmonella" (AOAC Method # 991.12).

#### 4 DEFINITIONS

The terms in this document are of common use in business and industry, except for those that are defined as follows:

**compost** n: solid mature product resulting from composting. French: *compost*.

**composting** n: managed process of bio-oxidation of a solid heterogeneous organic substrate including a thermophilic phase. French: *compostage*.

**foreign matter** n: any matter over a 2-mm dimension that results from human intervention and having organic or inorganic components such as metal, glass, synthetic polymers (for example plastic and rubber) and that may be present in the compost but excluding mineral soils, woody material and rocks. French: *corps étranger*.

**increment** n: quantity of compost representative of one part of the lot. French: *prélèvement*.

**lot** n: the specific quantity of compost assumed to have the same characteristics. French: *lot*.

**mature** adj: term used to designate a compost that, when used as an organic soil conditioner, does not have phytotoxic effects on plants arising from, for example, nitrogen immobilization or anaerobioses. French: *mature*.

#### NOTES —

1 Mature compost can be stored, handled and used without giving rise to odour or self-heating problems, in any conditions.

2 The opposite of "mature" is **immature**.

**micronutrient** n: a plant nutrient (for example boron, copper, molybdenum, manganese, iron and zinc) required in lesser quantities than major (for example nitrogen, phosphorus and potassium) and secondary (for example calcium and magnesium) plant nutrients, having essential physiological functions in plant metabolism. French: *oligoélément*.

**organic soil conditioner** n: organic material of vegetable, or vegetable and animal, origin, applied principally to improve the physical properties and biological activity of soil. French: *amendement organique*. (Reference: ISO 8157, Clause 1.14 [see Annex F].)

**sample** n: quantity of compost from one or several increments representative of the entire lot. French: *échantillon*.



**sharp foreign matter** n: any foreign matter over a 3-mm dimension that may cause damage or injury to humans and animals during or resulting from its intended use. French: *corps étranger tranchant*.

NOTE — Sharp foreign matter may consist of, but are not limited to, the following:

- metallic objects or pieces of metallic objects, for example utensils, fixtures, electrical wiring, pins, needles, staples, nails, bottle caps;
- glass and porcelain or pieces of glass and porcelain, for example, containers, dishes, glass panes, electrical light bulbs and tubes, mirrors, shards.

**test portion** n: known quantity of compost of the test sample on which a test is actually conducted. French: *prise d'essai*.

**thermophilic phase** n: biological phase in the composting process characterized by the presence of micro-organisms which act optimally in a temperature range of 45 °C to 75 °C. French: *phase thermophile*.

**total organic matter** n: substance of vegetable or animal origin remaining after partial removal of water. French: *matière organique totale*.

**trace element** n: chemical element present in compost at a very low concentration. French: *élément trace*.

## 5 CLASSIFICATION

For the purpose of this standard, there are three different types of compost classified in decreasing order of quality: **AA**, **A** and **B**. This classification is based on their total organic matter, foreign matter and trace element content.

## 6 GENERAL REQUIREMENT

Compost shall be free of harmful matter that may cause harm or injury to humans, animals and plants during, or resulting from, its intended use.

NOTE — Although composts generally contain trace contents of persistent or bio-accumulating organic contaminants, in particular dioxins, furans, polychlorinated biphenyls (PCB) and polycyclic aromatic hydrocarbons (PAH), the manufacturer should pay special attention to raw materials that might contain such contaminants. To this effect, it is recommended that the composting of raw materials with high concentrations of these contaminants be avoided.



## 7 SPECIFIC REQUIREMENTS

### 7.1 PHYSICO-CHEMICAL CHARACTERISTICS

#### 7.1.1 Moisture Content

The moisture content shall not exceed 65 % of mass, on a wet weight basis, for all types of compost, when analyzed in accordance with the method indicated in Clause 9.1.1.

#### 7.1.2 Total Organic Matter Content

Total organic matter content, in percentage of mass on a dry weight basis, shall not be less than the following requirements when analyzed in accordance with the method indicated in Clause 9.1.2:

- Type *AA*: 50 %;
- Type *A*: 30 %;
- Type *B*: 30 %.

#### 7.1.3 Foreign Matter Content

##### 7.1.3.1 Sharp Foreign Matter Content

Composts of Types *AA* and *A* shall not contain any sharp foreign matter of dimension greater than 3 mm (see Chapter 4) when analyzed in accordance with the method indicated in Clause 9.2.

**Bag** composts of Type *B* shall not contain any sharp foreign matter of dimension greater than 3 mm (see Chapter 4) when analyzed in accordance with the method indicated in Clause 9.2.

**Bulk** composts of Type *B* shall have a sharp foreign matter content less or equal to 3 pieces of foreign matter per 500 ml, and maximum dimension of the foreign matter shall be at most 12,5 mm when analyzed in accordance with the method indicated in Clause 9.2.

**Bulk** composts of Type *B* with a sharp foreign matter content shall carry the complete **warning** in French and in English as formulated and presented in Clause 10.2 of this standard.

##### 7.1.3.2 Foreign Matter Content

Foreign matter content of composts shall meet the following requirements when analyzed in accordance with the method indicated in Clause 9.2.



	Type AA	Type A	Type B
Foreign matter content, expressed in percentage of mass on a dry weight basis	$\leq 0,01$	$\leq 0,5$	$\leq 1,5$
Foreign matter content whose maximum dimension is greater than 12,5 mm and less than 25 mm, expressed in count per 500 ml	0	Not applicable	Not applicable
Foreign matter content whose maximum dimension is greater than 25 mm, expressed in count per 500 ml	0	$\leq 1$	$\leq 1$

NOTES —

- 1 In accordance with the definitions of **foreign matter** and **sharp foreign matter** (see Chapter 4), sharp foreign matter is clearly considered to be foreign matter in the calculation of foreign matter content.
- 2 Foreign matter content in Type *A* and Type *B* composts whose dimensions is greater than 12,5 mm and less than 25 mm is deemed not applicable because the requirement is based solely on foreign matter content, expressed in percentage of mass on a dry weight basis.

#### 7.1.4 Trace Element Content

Trace elements of concern include arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), mercury (Hg), molybdenum (Mo), nickel (Ni), lead (Pb), selenium (Se) and zinc (Zn).

The trace element content of compost shall not exceed the following maximum concentration levels when analyzed in accordance with the methods indicated in Clause 9.4:

NOTE — Excessive accumulation in soil over the long term may become toxic to plants, animals and humans. However, Cu, Co, Mo and Zn (and possibly Ni and Se) are also plant micronutrients, and their presence may be useful in composts. Co, Cr, Cu, Mo, Ni, Se and Zn are also micronutrients required by animals and humans. However, Cd, Hg, and Pb are of no known value to either plants or animals.



## MAXIMUM TRACE ELEMENT CONTENT IN COMPOST

Trace Elements	Maximum Content	
	Types AA and A Compost, mg/kg (dry weight basis)	Type B compost <sup>1</sup> , mg/kg (dry weight basis)
Arsenic (As)	13,0	75
Cadmium (Cd)	3,0	20
Chromium (Cr)	210	
Cobalt (Co)	34,0	150
Copper (Cu)	400	
Lead (Pb)	150	500
Mercury (Hg)	0,80	5
Molybdenum (Mo)	5,0	20
Nickel (Ni)	62	180
Selenium (Se)	2,0	14
Zinc (Zn)	700	1850

1. Maximum admissible concentrations of trace elements in Type **B** composts are specified in "Trade Memorandum T-4-93" administered by the Canadian Food Inspection Agency (see Annex F) and are based on the hypothesis of a total cumulative addition to the soil of 200 metric tons per square hectometre of a dry compost with a guaranteed total nitrogen content of 2,5 % (meaning 5 % of mass on a dry weight basis). Such compost applied with an annual nitrogen rate of 220 kg/hm<sup>2</sup> (4400 kg/hm<sup>2</sup> of dry compost) would, after 45 years, reach the following maximum acceptable concentrations in kilograms per square hectometre, for the addition of trace elements in the soil: As = 15; Cd = 4; Co = 30; Hg = 1; Mo = 4; Ni = 36; Pb = 100; Se = 2.8 et Zn = 370 (see Annex D).

## 7.2 MICROBIOLOGICAL CHARACTERISTICS

### 7.2.1 Oxygen Uptake Rate

Compost shall be mature at the time of sale and distribution. To be considered mature, the oxygen uptake rate of compost shall be less than, or equal to, 400 milligrams of oxygen per kilogram of volatile solids per hour when analyzed in accordance with methods indicated in Clause 9.3.

Compost with an oxygen uptake rate of less than, or equal to, 200 milligrams of oxygen per kilogram of volatile solids per hour may be sold or distributed bagged or in bulk. Compost with an oxygen uptake rate of higher than 200 milligrams of oxygen per kilogram of volatile solids per hour shall be sold or distributed in bulk.



### 7.2.2 Fecal Coliform Content

The fecal coliform content shall be less than 1 000 MPN\*/g of total solids (dry weight basis) when analyzed in accordance with the method indicated in Clause 9.5.1.

### 7.2.3 Salmonella Content

The salmonella content shall be less than 3 MPN\*/4g of total solids (dry weight basis) when analyzed in accordance with the method indicated in Clause 9.5.2.2, or salmonella shall be absent when analyzed in accordance with the method indicated in Clause 9.5.2.3.

## 8 SAMPLING

### 8.1 GENERAL

The following chapter describes the sampling methodology that shall be used to obtain a representative sample of compost. Compost shall be sampled as offered for sale or distribution.

### 8.2 APPARATUS

#### 8.2.1 General

All sampling apparatus shall be made of materials that cannot affect the characteristics of the compost being sampled.

#### 8.2.2 Shovel, Container and Sheet

A metal shovel, a container and a rubber or plastic sheet shall be used to collect increments.

To form a representative sample, increments shall be deposited on the sheet.

The shovel, the container and the sheet shall be new, or cleaned and disinfected, before each use.

#### 8.2.3 Sampling Containers

Sampling containers shall be new, or clean and disinfected. They shall also be dry and airtight.

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\* **MPN: Most Probable Number.** A technique used in microbiology to count bacteria present in food products intended for human or animal consumption.



## **8.3 SAMPLING METHOD**

### **8.3.1 General**

A sample of compost consists of a number of increments determined on the basis of the volume of the lot to sample. Increments shall be representative of the lot; they shall not contain disproportionate amounts of compost taken from the surface of the pile neither from segregated or contaminated zones.

Sampling for increments shall be conducted as expeditiously as possible to avoid undue exposure of the compost to the air, resulting in loss or absorption of moisture.

If more than one sample is collected, the shovel, container and sheet shall be changed, or cleaned and disinfected, between each sampling in order to avoid cross contamination by fecal coliforms or salmonella.

### **8.3.2 Volume and Number of Increments**

If the total volume of the lot to sample is equal to, or less than, 5 000 m<sup>3</sup>, the number of increments shall total 10.

If the total volume of the lot to sample is greater than 5 000 m<sup>3</sup> but equal to, or less than, 10 000 m<sup>3</sup>, the number of increments shall total 20.

If the total volume of the lot to sample is greater than 10 000 m<sup>3</sup>, the number of increments to sample shall total 40.

The volume of each increment shall be at least 2 litres.

### **8.3.3 Lot Consisting of One Pile of Compost**

The number of increments to collect shall be determined on the basis of the volume of the pile of compost to sample (see Clause 8.3.2).

Increments shall be collected using the shovel and container (see Clause 8.2.2).

Increments shall be collected from the pile of compost at regular intervals. The distance of the interval between each increment shall be determined by dividing the perimeter of the pile by the number of increments to be collected.

Increments shall be collected alternately from the top, middle and bottom of the pile of compost at a depth of 50 cm, after a depth of 10 cm of compost has been removed from the surface of the pile.

NOTE — The perimeter of a pile of compost may be determined using a measuring device or by counting the number of steps required to walk around the pile.



### 8.3.4 Lot Consisting of Several Piles of Compost

The number of increments to collect shall be determined on the basis of the volume of the piles of compost to sample (see Clause 8.3.2).

Increments shall be collected using the shovel and container (see Clause 8.2.2).

Increments shall be collected from the piles of compost at regular intervals. The distance of the interval between each increment shall be determined by dividing the total perimeter of the piles by the number of increments to be collected. The total perimeter of the piles is obtained by adding together the perimeters of each pile.

Increments shall be collected alternately from the top, middle and bottom of the pile of compost at a depth of 50 cm, after a depth of 10 cm of compost has been removed from the surface of the pile.

**NOTE** — The perimeter of a pile of compost may be determined using a measuring device or by counting the number of steps required to walk around the pile.

## 8.4 PREPARATION AND CONSERVATION OF A REPRESENTATIVE SAMPLE

All increments collected shall be placed on the rubber or plastic sheet (see Clause 8.2.2) and mixed. To create a representative sample, the compost collected from all the increments shall be reduced using the quartering method (see Annex A) until a maximum volume of 5 litres to 10 litres is obtained.

The representative sample shall be placed in a sample container or sample containers (see Clause 8.2.3) and identified indicating the date (in all-numerical format by order of **year** [with four digits]-**month-day**) and hour (in all-numeric format **hh**[00-24]:**mm**[00-59]) the representative sample was prepared.

The representative sample shall be stored at a temperature from 0 °C to 5 °C during shipping and storage until the time of analysis.

To determine the fecal coliform content, the shelf life between the collection of increments and the analysis shall not exceed 48 hours.

## 8.5 PREPARATION OF SAMPLES FOR SUBSEQUENT LABORATORY ANALYSES

### 8.5.1 Reduction of the Representative Sample

If further reduction is required, the quartering method described in Annex A shall be used.

### 8.5.2 Preparation of an Oven-Dried Ground Test Portion for Analysis of Trace Elements

Select a minimum 300-g test portion from the representative sample prepared as specified in Clause 8.5.1. Spread the mass evenly on a large flat pan; crush large lumps with a spoon or spatula. Dry the



test portion in the oven at a temperature of  $105\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  for at least 16 hours. When the mass of the test portion reaches a constant value, determine the mass of this test portion to the nearest 0,1 g.

Grind the oven-dried test portion to a size of 1 mm or less.

NOTE — Substances smaller than 1 mm in dimension may be required to reduce the variation in the results or because of the specific nature of the apparatus used. Abrasion of the metal parts of the grinding device can be a source of contamination. Heat build-up during grinding can affect the test portion and test results.

## **9            METHODS OF ANALYSIS**

### **9.1            MOISTURE AND TOTAL ORGANIC MATTER CONTENT**

#### **9.1.1        Moisture Content**

The moisture content shall be determined in accordance with the Method A described in Standard ASTM D 2974.

The moisture content shall be the average of two 50-g test portion results and shall be expressed in percentage of mass on a wet weight basis.

#### **9.1.2        Total Organic Matter**

The total organic matter content shall be determined in accordance with the Method C described in Standard ASTM D 2974. The temperature of the muffle furnace shall be  $550\text{ }^{\circ}\text{C}$ .

Results shall be expressed in percentage of mass on a dry weight basis.

### **9.2            FOREIGN MATTER CONTENT**

Foreign matter content shall be determined in accordance with the procedure described in Standard CAN/BNQ 0413-210.

Foreign matter content shall be expressed, accordingly, in percentage of mass on a dry weight basis or as a count per 500 ml (not dried sample).

### **9.3            OXYGEN UPTAKE RATE**

The oxygen uptake rate shall be determined in accordance with either the procedure described in Standard CAN/BNQ 0413-220 or EPA Method 1683, or any other method of evaluating oxygen uptake rate for which a scientific correlation with the Standard CAN/BNQ 0413-200 and EPA Method 1683 can be demonstrated.

Results shall be expressed in milligrams of oxygen per kilogram of volatile solids per hour.



## **9.4 TRACE ELEMENT CONTENT**

### **9.4.1 General**

Trace element content shall be determined using the inductively coupled plasma mass spectrometry methods indicated in Clause 9.4.2 or by the atomic absorption spectrometry methods indicated in Clause 9.4.3, except for mercury (Hg) content, which shall be determined by the cold vapour technique described in Clause 9.4.3.

Test portions prepared in accordance with the procedure described in Clause 8.5.2 shall be used.

The results shall be expressed in milligrams per kilogram (dry weight basis).

### **9.4.2 Inductively Coupled Plasma Mass Spectrometry**

As, Cd, Co, Cr, Cu, Mo, Ni, Pb, Se and Zn content by inductively coupled plasma mass spectrometry shall be determined in accordance with the procedures described in the EPA Method 6010 B or AOAC Method 990.08.

For EPA Method 6010 B, test portions shall be digested in accordance with the extraction procedure described in EPA Method 3050 B or EPA Method 3051 prior to analysis.

### **9.4.3 Atomic Absorption Spectrophotometry**

As, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Se and Zn content by atomic absorption spectrophotometry shall be determined in accordance with the procedures described in the following methods.

- Arsenic (As): EPA 7061 A;
- Cadmium (Cd): EPA 7130 or EPA 7131 A;
- Chromium (Cr): EPA 7190 or EPA 7191;
- Cobalt (Co): EPA 7200 or EPA 7201;
- Copper (Cu): EPA 7210 or EPA 7211;
- Lead (Pb): EPA 7420 or EPA 7421;
- Mercury (Hg): EPA 7471 A;
- Molybdenum (Mo): EPA 7481;
- Nickel (Ni): EPA 7520 or EPA 7521;
- Selenium (Se): EPA 7741 A;
- Zinc (Zn): EPA 7950 or EPA 7951.



## 9.5 MICRO-ORGANISM CONTENT

### 9.5.1 Fecal Coliforms

Fecal coliform content shall be determined in accordance with the procedure described in the MFLP-55 Method.

A 25-g test portion shall be used and diluted with 0,1 % peptone water to obtain a dilution ratio of 1 part per 10. A *Sorval*<sup>®\*</sup> type mechanical mixer shall be used to mix the compost sample with peptoned water to avoid perforation of *Stomacher*<sup>®\*</sup> type mixer bags.

Results shall be expressed as Most Probable Number (MPN) per gram of total solids (see Annex B).

### 9.5.2 Salmonella

**9.5.2.1 General** — The salmonella content shall be determined in accordance with one of the following methods: MA. 700 – Sal – tm 1.0, *ISO-GRID*<sup>®\*</sup> *Salmonella* or AOAC 991.12.

**9.5.2.2 MA. 700 – Sal – tm 1.0 Method** — The results shall be expressed as the Most Probable Number (MPN) per 4 grams of total solids (see Annex B).

**9.5.2.3 *ISO-GRID*<sup>®\*</sup> *Salmonella* Method and AOAC Method 991.12** — A 25-g test shall be used.

The results shall be expressed as the presence or absence of salmonella.

## 10 MARKING LABELLING, NOTICE AND WARNING

### 10.1 MARKING AND LABELLING

Labels on bags of compost and the accompanying documents shall carry the following information:

- a) this standard number and title, certificate of conformity number and registered mark of the certification body, if the product is certified;
- b) compost classification according to one of three types (*AA*, *A* or *B*) indicated in Chapter 5.

**ATTENTION** — When the product is distributed in Québec, the marking and labelling shall comply with the *Charter of the French language* and *Regulation Respecting the Language of Commerce and Business*.

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\* The trade names *Sorval*<sup>®</sup>, *Stomacher*<sup>®</sup> and *ISO-GRID*<sup>®</sup> are examples of products on the market. This information is provided for the convenience of users of this document and in no way constitutes an endorsement by the BNQ or a recommendation to use said product exclusively. Equivalent products may be used if it can be shown that they achieve the same results. It is the responsibility of users of this document to choose an adequate equivalent product.



## 10.2 NOTICE AND WARNING

In addition to the above information, compost sold or distributed in bulk shall carry the following notice concerning directions for use:

**CAUTION** — THE APPLICATION RATE SHALL BE IN ACCORDANCE WITH PROVINCIAL OR TERRITORIAL REGULATIONS FOR FERTILIZER ELEMENT OR TRACE ELEMENT APPLICATIONS TO SOIL, OR IN THE ABSENCE OF SUCH REGULATIONS, UTILIZATION SHALL BE IN ACCORDANCE WITH THE *FERTILIZERS ACT* AND *FERTILIZERS REGULATIONS*.

Bulk composts of Type **B** with sharp foreign matter content greater than zero shall carry the complete following **warning**, in French and English:

**ATTENTION** — CE COMPOST PEUT CONTENIR DES CORPS ÉTRANGERS TRANCHANTS. NE PAS UTILISER DANS LES PÂTURAGES ET DANS LES PARCS RÉCRÉATIFS NI À DES FINS RÉSIDENIELLES. / **CAUTION** — THIS COMPOST MAY CONTAIN SHARP FOREIGN MATTER. DO NOT USE IN PASTURES, IN PARKS OR FOR RESIDENTIAL PURPOSES.

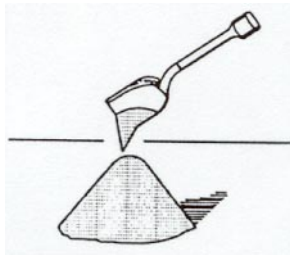
-0-0-0-0-0-0-0-0-0-0-0-0-

**ANNEX A**  
(normative)

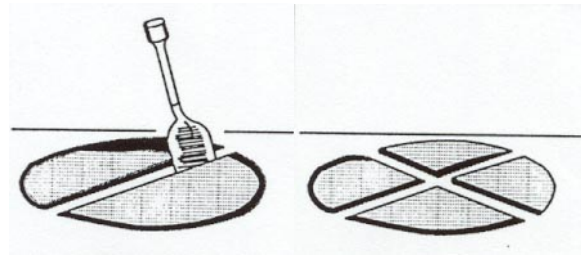
**REDUCTION OF SAMPLES BY THE QUARTERING METHOD**

Quartering is a simple method of sample reduction and requires no special apparatus.

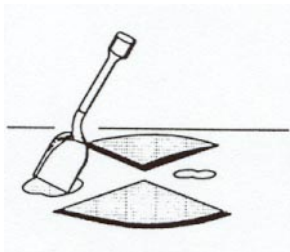
- A.1** Form the compost sample to be reduced into a conical pile.
- A.2** Flatten the top of the cone and divide the compost into four piles along two diameters at right angles to each other.
- A.3** Remove and discard two diagonally opposite quarters, leaving a clean surface in these free spaces.
- A.4** Mix the remaining quarters and repeat steps to **A.1** to **A.3** until the required amount of test sample is obtained.



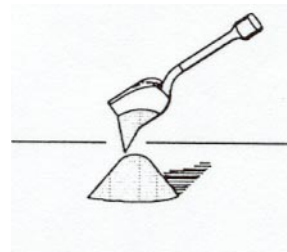
**A.1**



**A.2**



**A.3**



**A.4**



**ANNEX B**  
(informative)

**CONVERSION OF A RESULT OBTAINED FROM AN  
AS-RECEIVED TEST PORTION MASS**

(Clauses 9.5 and 9.5.2.2)

Use the following formula to convert a result obtained from an as-received test portion to a result expressed on a dry weight basis:

$$rbs = rbh \times \frac{1}{\left(1 - \frac{te}{100}\right)}$$

where *rbs*: result expressed on a dry weight basis;

*rbh*: result obtained with the as-received test portion;

*te* : moisture content of the test portion, expressed in percentage of mass on a wet weight basis.

**EXAMPLE** — If, for the determination of the presence of fecal coliforms, the following results are obtained:

- fecal coliforms found in the test portion: 400 MPN/g (as-received mass);
- moisture content of the test portion: 60 % (wet weight basis).

In order to express the results of the test as Most Probable Number (MPN) per gram of total solids (dry weight basis), use the following equation:

$$rbs = 400 \times \frac{1}{(1 - 0,60)} = 1000 \text{ NPP/g of total solids.}$$



ANNEX C  
(informative)

**MAXIMUM PERMISSIBLE CONCENTRATIONS OF TRACE ELEMENTS  
IN TYPES AA AND A COMPOST — *NO NET DEGRADATION* AND  
*BEST ACHIEVABLE* APPROACHES**

The **no net degradation** and the **best achievable** approaches are two different approaches that were considered for the determination of the maximum permissible concentrations of trace elements in Type AA and Type A composts.

The **no net degradation** approach referred to in *An International Survey of Composting Criteria* (see Annex F) requires that the use of compost not change the normal background levels of toxic composts in the receiving soils. In the *Review and recommendations for Canadian interim environmental quality criteria for contaminated sites* (see Annex F), Environment Canada defines **background level** as "the concentration of a chemical substance occurring in a media removed from the influence of industrial activity at a specific site and in an area considered to be relatively unaffected by industrial activity".

The **no net degradation** approach generally recognizes that the maximum permissible concentrations of trace elements in compost should be established by taking the arithmetic mean of measured background levels and adding three standard deviations from the mean. For **normal distributions**, 99 % of all trace element concentration results for samples from a region considered to be uninfluenced by industrial activities shall be below these maximum permissible concentrations.

At the time of the first edition of this standard, measurements of existing background levels of trace elements were available only for the soils of Alberta, Ontario and Québec. Requirements based on the **no net degradation** approach were thus established using the highest values of background levels of soils obtained from these three provinces.

The **best achievable** approach referred to in *Trace Element Concentrations in Alberta Agricultural Soils* (see Annex F) favours the use of the best available technology to produce an end product. This approach is based on the fact that the best available technology (in this case source separation) to produce the desired end product should be used to establish the requirements for maximum permissible concentrations of trace elements in compost.

At the time of the first edition of this standard, data based on the **best achievable** approach was available in British Columbia's *Production and Use of Compost Regulation* (see Annex F). The data specified in this regulation were derived from municipal solid residues source separation management programs.



The following table presents the data that was available in 1996. Maximum permissible concentrations of trace elements for Type AA and Type A composts were established using the highest value derived from the **no net degradation** and **best achievable** approaches

Trace Element	Mean of Background Levels + 3 Standard Deviations			No Net Degradation Approach	Best Achievable Approach	Maximum Trace Element Concentration in Types AA and A Composts
	Alberta <sup>1</sup>	Ontario <sup>2</sup>	Québec <sup>3</sup>			
As		10		10	13 <sup>4</sup>	13
Cd	1,6	3	2,5	3	2,6 <sup>4</sup>	3
Co	14	25	34	34	26 <sup>4</sup>	34
Cr	30	50	121	121	210 <sup>4</sup>	210
Cu	29	60	48	60	400 <sup>5</sup>	100
Hg	0,1	0,15	0,09	0,15	0,8 <sup>4</sup>	0,8
Mo		2		2	5 <sup>4</sup>	5
Ni	36	60	62	62	50 <sup>4</sup>	62
Pb	20	150	68	150	150 <sup>4</sup>	150
Se		2		2	2 <sup>4</sup>	2
Zn	124	500	144	500	700 <sup>6</sup>	500

NOTE — All results are expressed in milligrams per kilogram (dry weight basis).

1. Reference: *Trace Element Concentrations in Alberta Agricultural Soils* (see Annex F).
2. Reference: *Upper Limit of Normal Contaminant Guidelines for Phytotoxicology Samples* (see Annex F).
3. Reference: "Caractérisation de la teneur en métaux lourds totaux et disponibles des sols du Québec", *Agrosol* (see Annex F).
4. Reference: *Production and Use of Compost Regulation* (see Annex F).
5. References: *Impacts of modifying the copper limit of the Canadian compost standard* and *Organic Matter Recycling Regulation* (see Annex F).
6. Reference: *Caractérisation de certains composts commerciaux disponibles au Québec* (see Annex F).



**ANNEX D**  
(informative)

**MAXIMUM PERMISSIBLE CONCENTRATIONS OF TRACE ELEMENTS  
IN TYPE B COMPOST**

Maximum permissible concentrations of trace elements for Type **B** compost ensure that the cumulative trace element additions to soil will not exceed the requirements shown below, assuming, on a wet basis, an annual application rate of 11 000 kg/hm<sup>2</sup> (1 hm<sup>2</sup> = 10 000 m<sup>2</sup> = 1 ha) of compost at 60 % moisture content (equivalent to an oven-dried mass of 4400 kg/hm<sup>2</sup> containing up to 5 % total nitrogen) for a period of 45 years.

No maximum trace content for Cu and Cr was retained for Type **B**, which corresponds to the absence of values indicated in "Trade Memorandum T-4-93" (see Annex F) and CCME *Guidelines for Compost Quality* (see Annex F).

Trace Element	Maximum Cumulative Trace Element Addition to Soils* Based on <i>Table I</i> in "Trade Memorandum T-4-93", kg/hm <sup>2</sup> (kg/ha)	Maximum Trace Element Concentration in Type <b>B</b> Compost Based on <i>Table II</i> in "Trade Memorandum T-4-93", mg/kg (dry weight basis)
Arsenic (As)	15	75*
Cadmium (Cd)	4	20
Cobalt (Co)	30	150
Lead (Pb)	100	500
Mercury (Hg)	1	5
Molybdenum (Mo)	4	20
Nickel (Ni)	36	180
Selenium (Se)	2,8	14
Zinc (Zn)	370	1850

\* The maximum arsenic concentration in a compost in milligrams per kilogram is calculated as follows:

$$\frac{15 \text{ kg/hm}^2}{4400 \text{ kg/hm}^2 \times 45 \text{ a} \times 1 \text{ g/1000 mg} \times 1 \text{ kg/1000 g}}$$

**ANNEX E**  
(informative)

**ANALYSIS METHODS FOR THE DETERMINATION OF TOTAL NITROGEN  
CONTENT, WATER INSOLUBLE NITROGEN CONTENT, AVAILABLE PHOSPHORUS  
CONTENT AND SOLUBLE POTASSIUM CONTENT**

This annex presents the list of the analysis methods recommended by the Canadian Food Inspection Agency (CFIA) for the determination of total nitrogen content, water insoluble nitrogen content, available phosphorus content and soluble potassium content.

**Total Nitrogen Content**

AOAC Analysis Method 955.04 (see Annex F) is recommended for the determination of the total nitrogen content. Result shall be expressed as a percentage of mass on a wet weight basis.

**Water Insoluble Nitrogen Content**

AOAC Analysis Method 945.01 (see Annex F) is recommended for the determination of the water insoluble nitrogen content. Result shall be expressed as a percentage of mass on a wet weight basis.

**Available Phosphorus Content**

AOAC Extraction Method 993.31 (see Annex F) is recommended for the preparation of the sample and the same method, or the indicated method, of Clause 9.4.2 of this standard is recommended for the determination of the available phosphorus content. Result shall be expressed in the form of phosphorus pentoxide ( $P_2O_5$ ) as a percentage of mass on a wet weight basis.

**Soluble Potassium Content**

AOAC Extraction Method 983.02 (see Annex F) is recommended for the preparation of the sample and the same method, or the indicated method, of Clause 9.4.2 of this standard is recommended for the determination of the soluble potassium content. Result shall be expressed in the form of potassium oxide ( $K_2O$ ) as a percentage of mass on a wet weight basis.

ANNEX F  
(informative)

**INFORMATIVE REFERENCES**

**F.1 NORMATIVE DOCUMENTS**

**AOAC (AOAC International)**

AOAC 945.01	<i>Nitrogen (Water-Insoluble) in Fertilizer.</i>
AOAC 955.04	<i>Nitrogen (Total) in Fertilizers — Kjeldahl Method.</i>
AOAC 983.02	<i>Potassium in Fertilizers — Flame Photometric Method.</i>
AOAC 993.31	<i>Phosphorus (Available) in Fertilizers — Direct Extraction Method.</i>

**ISO (International Organization for Standardization)**

ISO 8157: 1984	<i>Fertilizers and soil conditioners — Vocabulary. (Matières fertilisantes — Vocabulaire.)</i>
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**F.2 OTHER DOCUMENTS**

ALBERTA ENVIRONMENTAL PROTECTION, Soil Protection Branch. *Trace Element Concentrations in Alberta Agricultural Soils*, Lethbridge, 1994, 3 p.

BRITISH COLUMBIA. *Organic Matter Recycling Regulation*.

BRITISH COLUMBIA. *Production and Use of Compost Regulation*.

CANADIAN COUNCIL OF THE MINISTERS OF THE ENVIRONMENT (CCME). *Guidelines for Compost Quality*, March 1996, 14 p. (CCME 106 F).

CANADIAN FOOD INSPECTION AGENCY (CFIA). *Standard for Metals in Fertilizers and Supplements*, September 1997 (Trade Memorandum T-4-93).

CENTRE DE RECHERCHE INDUSTRIELLE DU QUÉBEC (CRIQ). *Caractérisation de certains composts commerciaux disponibles au Québec*, Sainte-Foy (Québec), mai 1994, 19 p. (technical report No. RDQ-94-026).

ENVIRONMENT CANADA, Water Quality Branch. *Review and recommendations for Canadian interim environmental quality criteria for contaminated sites*, Ottawa, 1991 (Study No. 197, Scientific Series).

GIROUX, M., M. ROMPRÉ, D. CARRIER, P. AUDESSE and M. LEMIEUX. "Caractérisation de la teneur en métaux lourds totaux et disponibles des sols du Québec", *Agrosol*, Sainte-Foy (Québec), volume 5, number 2, December 1992, pp. 46 to 55.

MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC, Direction du milieu rural. *Impacts of modifying the copper limit of the Canadian compost standard*, Québec, November 2003, 9 p. (prepared by Marc Hébert and Élisabeth Groeneveld).

ONTARIO MINISTRY OF THE ENVIRONMENT, Air Resources Branch. *Upper Limit of Normal Contaminant Guidelines for Phytotoxicology Samples*, Phytotoxicology Section, March 1989, 7 p. (ARB-138-88).

WASTE CONVERSION INCORPORATED. *An International Survey of Composting Criteria*, Ottawa, August 1992, p. 6 (Contract No. KE144-1-6173, internal report prepared for Environment Canada).

ANNEXE G  
(informative)

**BIBLIOGRAPHY**

**LAWS, REGULATIONS AND GUIDELINES ON COMPOSTS**

Here is a non-exhaustive list of Canadian laws, regulations or guidelines that may apply to the production and use of compost:

- ALBERTA. *Code of Practice for Compost Facilities.*
- BRITISH COLUMBIA. *Health Act.*
- BRITISH COLUMBIA. *Waste Management Act.*
- CANADA. *Fertilizers Act.*
- CANADA. *Fertilizers Regulations.*
- QUÉBEC. *Agricultural Operations Regulation.*
- QUÉBEC. *Environment Quality Act.*
- QUÉBEC. *Groundwater Catchment Regulation.*
- QUÉBEC. *Regulation respecting the application of the Environment Quality Act.*
- DEPARTMENT OF ENVIRONMENTAL AND LOCAL GOVERNMENT. *Guidelines — Sitting and Operating a Composting Facility*, Fredericton, New Brunswick.
- MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC. *Guide MRF (Fertilizing Residuals).*
- NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT. *Composting Facility Guidelines.*

**ONTARIO. INTERIM GUIDELINES FOR THE PRODUCTION AND USE OF AEROBIC COMPOST IN ONTARIO.**

