

Australian Standard[®]

Composts, soil conditioners and mulches



This Australian Standard® was prepared by Committee CS-037, Garden Soils and Potting Mixes. It was approved on behalf of the Council of Standards Australia on 16 February 2012. This Standard was published on 29 February 2012.

The following are represented on Committee CS-037:

- Association of Accredited Certification Bodies
- Australian Institute of Horticulture
- Australian Society of Soil Science
- Compost Australia
- Consumers Federation of Australia
- Department of Agriculture and Food, WA
- Department of Primary Industries, Vic.
- Environmental Protection Agency, Qld
- Environmental Protection Agency, Vic.
- Independent Chairperson
- NSW Department of Primary Industries
- Nursery and Garden Industry Australia
- TAFE NSW
- University of NSW
- Waste Management Association of Australia

Additional Interests:

- Recycled Organics Unit
 - Sydney Environmental & Soil Laboratory
-

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard[®]

Composts, soil conditioners and mulches

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PREFACE

This Standard was prepared by the Standards Australia Committee CS-037, Garden Soils and Potting Mixes, to supersede AS 4454—2003.

This Standard incorporates Amendment No. 1 (June 2012). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

This Standard specifies general and specific requirements for composts, soil conditioners and mulches.

The major changes to this edition of the Standard include the following:

- (a) The Application has been extended to include ‘all levels of government’ and ‘as feedstocks to manufacturers’ (Clause 1.2).
- (b) A definition of raw mulch (Clause 1.5.9) and mature compost (Clause 1.5.4) have been added.
- (c) The requirements for compliance with national environment and health standards have been clarified, limits for chemical contaminants set, and a contaminant warning label and statement is now required if copper and zinc levels fall within certain ranges. (Clause 2.1, Table 3.1(C) and Clause 5.3(h)).
- (d) A clause addressing the classification of products by application and use has been added (Clause 3.1.2).
- (e) The method of measuring bulk density and volume of product as delivered has been clarified (new Appendix J).
- (f) The nitrogen drawdown index has been reinstated as a test for determining maturity/stability (Appendix O).
- (g) An optional revised health warning has been added (Clause 5.2 (e)).
- (h) Additional information on nutrients, trace elements and feedstocks is now required (Clause 5.5).
- (i) The self-heating test reverts to an optional test for determining maturity (Appendix N).
- (j) The determination of CaCO_3 equivalent is now only required if $\text{pH} > 8.0$ (Table 3.1(A)).
- (k) A requirement to test for pathogen indicators when high risk raw materials are used (Table 3.1(A)) has been added.
- (l) A new Appendix N, Method for determination of maturity index, has been included.
- (m) The reinstatement of carbon to nitrogen ratio (C:N).
- (n) The name of the ‘Method for determination of toxicity to plants’ test has been changed to ‘Method for plant growth test (Bioassay)’ and the method modified to accommodate physical properties of composts and mulches (Appendix F).
- (o) Additional requirements for claiming compliance are specified (Clause 4.2 and Appendix Q).
- (p) A new Appendix A, Methods of sampling, sample handling and preparation prior to analysis has been added.
- (q) Requirements to report test results for some parameters (pathogens, nutrients, contaminants, etc.) in mg/kg dry mass equivalent have been added.

- (r) Appendices on best practice guidelines for composting systems and vermiculture systems have been deleted as some of the information was obsolete and information on current best practice is readily available from other sources.

Relevant local, territory, state and federal government regulations not referenced in this Standard may detail additional requirements. In particular, prior to establishing a manufacturing facility, investigations may be required to ensure approval of the location.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard
Composts, soil conditioners and mulches

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for organic products and mixtures of organic products that are to be used to amend the physical and chemical properties of natural or artificial soils and growing media. It specifies physical, chemical, biological and labelling requirements for composts, mulches, soil conditioners and related products that have been derived largely from compostable organic materials and which meet the minimum requirements as set out in this Standard. It covers products marketed or distributed both in bags and in bulk in an unrestricted manner in all market sectors including domestic use, urban landscaping, agriculture and land rehabilitation.

This Standard applies to organic products and mixtures of organic products that have been treated by pasteurizing or composting procedures as defined by this Standard. Raw mulches that have not been subject to temperature-based pasteurization may be covered by this Standard if they are verified as being free of plant propagules and pathogens in accordance with Clause 3.2.1(b) of this Standard.

This Standard does not apply to home composting end products for self-use, nor does it apply to organic fertilizers such as blood and bone. Also excluded are liquid organic wastes, liquid seaweed products, non-organic mulches (e.g. gravel), non-organic soils and soil conditioners (e.g. gypsum and sand), non-compostable organic materials (e.g. plastics) and materials variously described as ‘compost starters’ and ‘activators’.

Shredded garden organics (sometimes referred to as ‘green waste’, ‘green organics’, ‘garden wastes’ or ‘yard wastes’) that have not been subjected to either a pasteurization or composting procedure are specifically excluded from this Standard, mainly because they have a high probability of containing plant propagules and pathogens. Vermicast that has not been subject to pasteurization or composting before or after being worked by worms may be covered by this Standard if it passes the provisions of Appendices L and M, along with all the other criteria in Tables 3.1(A), 3.1(B) and 3.1(C).

This Standard does not specify tests for specific or indicator plant pathogens due to a lack of validated methods.

1.2 APPLICATION

This Standard is intended for use by all levels of government, those who manufacture or supply compost, mulches and soil conditioners, and those involved in providing compostable organic materials as feedstocks to manufacturers.

1.3 OBJECTIVE

The objective of this Standard is to provide manufacturers, suppliers, customers and government bodies with the minimum requirements for the physical, chemical and biological properties of composts, soil conditioners, mulches and vermicast, as well as labelling and marking, in order to facilitate the beneficial recycling and use of compostable organic materials with minimal adverse impact on environmental and public health, by avoiding biosecurity and phytotoxicity risks associated with inappropriate product

manufacture or selection; by requiring pasteurization and compliance with associated regulations and guidelines for health and safety (see Clause 2.1); and by the correct characterization of compost products to enable informed purchasing decisions and give users such as growers and consumers assurance of compliance with minimum requirements.

1.4 REFERENCED DOCUMENTS

The following are referred to in this Standard:

AS

3743 Potting mixes

ARMCANZ (Agriculture and Resource Management Council of Australia and New Zealand Water Technology Committee)

Occasional Paper WTC No 1/95 *Guidelines for sewage systems—biosolids management*

1.5 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.5.1 Biosolids (sewage sludge)

Solid, semi-solid or slurry material produced by the treatment of sewage.

1.5.2 Coarse mulch

Mulch that has at least 70% by mass of its particles with a maximum size of greater than 16 mm and complies with the appropriate criteria in Tables 3.1(A), 3.1(B) and 3.1(C).

1.5.3 Compost

An organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurization (see Clause 1.5.13) and reduce phytotoxic compounds, and achieved a specified level of maturity required for compost (see Appendix N).

1.5.4 Compost—Mature

Compost that exhibits lower levels of phytotoxicity and a higher degree of biological stability (see Appendix N).

NOTE: Appendix N sets out the operational and testing requirements to determine the maturity of composts.

1.5.5 Composting

The process whereby organic materials are microbiologically transformed under controlled aerobic conditions to achieve pasteurization and a specified level of maturity (see Appendix N).

1.5.6 Fine mulch

Mulch that has less than 20% by mass of its particles passing a 5 mm sieve and less than 20% by mass of its particles retained by the 16 mm sieve based on the shortest dimension, and complies with the appropriate criteria in Tables 3.1(A), 3.1(B) and 3.1(C).

1.5.7 Manure

Any organic product composed mainly of animal excreta, which has undergone either the composting or pasteurization process, as defined in Clauses 1.5.5 and 1.5.13.

NOTE: Manure is assessed as for composted, pasteurized soil conditioners or fine mulch as listed in Tables 3.1(A), 3.1(B) and 3.1(C).

1.5.8 Mulch

Any organic product (excluding polymers that do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces.

1.5.9 Mulch—Raw

Mulch from a single known plant material type that, by virtue of the nature and source of the material, embodies minimal risk of plant propagules, pathogens and other contaminants.

NOTE: Most commonly this includes plant materials such as ornamental barks, untreated wood and bagasse. Mixed plant materials such as mixed garden organics, leaf mulches, engineered or chemically treated post-consumer timber products and raw manures are specifically excluded.

1.5.10 Mulch—Pasteurized

Mulch that has undergone pasteurization as defined in Clause 1.5.13.

1.5.11 Mulch—Composted

Mulch that has that has undergone controlled aerobic and thermophilic biological transformation through the composting process (see Clause 1.5.5) and achieved a specified level of maturity (see Appendix N).

1.5.12 Mushroom substrate (compost)

The residue from beds of composted organic materials that have supported a crop of mushrooms. The term 'spent mushroom compost' can also be used. Neither term can be used to describe materials that have not supported mushrooms.

1.5.13 Pasteurization

A process whereby organic materials are treated to significantly reduce the numbers of plant and animal pathogens and plant propagules.

1.5.14 Pasteurized product

An organic product that has undergone pasteurization as defined in Clause 1.5.13 but is relatively immature and lacking in biological stability.

1.5.15 Plant propagule

Plant or part of a plant that could generate a new plant, e.g. a seed, part of a rhizome, corm, bulb or any other fragment from which a plant could grow.

1.5.16 Primary package

Any form of packaging material, i.e. any packet, envelope, box, bag or the like, which is in intimate contact with the product and which is not intended to serve solely as a transport package. Also known as 'immediate package'.

1.5.17 Shall

Indicates that a statement is mandatory.

1.5.18 Should

Indicates a recommendation.

1.5.19 Soil conditioner

Any composted or pasteurized organic product, including vermicast, manure and mushroom substrate, that is suitable for adding to soils. This also includes products termed 'soil amendment', 'soil additive', 'soil improver' and similar, but excludes polymers that do not biodegrade, such as plastics, rubber and coatings. Soil conditioners may be either 'composted soil conditioners' or 'pasteurized soil conditioners'. A soil conditioner has not more than 20% by mass of particles with a maximum size above 16 mm and complies with appropriate criteria in Tables 3.1(A), 3.1(B) and 3.1(C).

1.5.20 Vermicast

Solid organic product resulting from the transformation of compostable organic materials in a controlled vermiculture process, which complies with the appropriate criteria of Tables 3.1(A), 3.1(B) and 3.1(C).

1.6 NOTATION

The following unit is used in this Standard as the unit for electrical conductivity (EC):

dS/m deci-Siemens per metre (1 dS/m = 1 mS/cm).

SECTION 2 GENERAL REQUIREMENTS — CONTAINMENT OF (HUMAN, ANIMAL AND PLANT) DISEASE

2.1 COMPLIANCE WITH ENVIRONMENT PROTECTION AND HEALTH REGULATIONS AND GUIDELINES

All products shall fully comply with the chemical, physical, organic and pathogen contaminant provisions specified for products suitable for unrestricted use as expressed in the currently applicable federal and state or territory guidelines and regulations for land application of products derived from organic wastes, compostable organic materials or biosolids, or with the provisions of this Standard, whichever is the more restrictive.

Where there are no such currently applicable federal and state or territory provisions for composts, soil conditioners and mulches, products shall comply with the list of chemical contaminant upper limit values and the labelling provisions of Tables 3.1(A), 3.1(B) and 3.1(C).

NOTE: Non-conformance with this Standard does not indicate that the product may not otherwise be suitable for a range of specified applications that comply with other state or territory government regulations, guidelines, or specified end user requirements. Consequently it is not appropriate for regulators to specify compliance with this Standard as a mandatory requirement for facility operations, licensing or application to land of production outputs.

2.2 PLANT PROPAGULES (WEEDS)

Products shall be free of viable plant propagules when tested in accordance with Appendix M.

SECTION 3 SPECIFIC REQUIREMENTS

3.1 PRODUCT CLASSIFICATION

3.1.1 Major classification

3.1.1.1 *Classification by maturity*

Products shall be classified as one or more of the following:

- (a) Raw mulch.
- (b) Pasteurized product.
- (c) Composted product.
- (d) Mature compost.

3.1.1.2 *Classification by particle size*

Products shall be classified as one or more of the following:

- (a) Soil conditioner.
- (b) Coarse mulch.
- (c) Fine mulch.

3.1.2 Classification by application and use

This Standard does not attempt to classify products by suitability for any specific end use or application. The producer may adopt industry specific end use guidelines or develop internal guidelines to ensure their products are fit for purpose. In some cases these criteria may conflict with the normative requirements of Tables 3.1(A), 3.1(B) and 3.1(C) or the informative sections of this Standard. While falling outside the requirements of this Standard, such conflict does not necessarily imply that the product is not fit for the intended purpose.

Producers of such end use specific products should base such formulations on scientific and technical knowledge, supported if necessary by experimental trials and industry experience.

3.2 PROCESS CRITERIA

3.2.1 Pasteurization

Any product supplied or described as ‘pasteurized’ shall have had the whole of its mass subjected to either of the following:

- (a) Appropriate turning of outer material to the inside of the windrow so the whole mass is subjected to a minimum of three turns with the internal temperature reaching a minimum of 55°C for three consecutive days before each turn. Pasteurization occurs as a result of a time/temperature relationship. Where higher risk materials including manure, animal waste, food or grease trap wastes are used as feedstock, a longer time at 55°C or higher and more turns may be necessary in order to counter reinfection by the outside of the pile when turned. For these higher risk materials the core temperature of the compost mass shall be maintained at 55°C or higher for 15 days or longer, during this period the windrow shall be turned a minimum of five times (consistent with: Standards for the use or disposal of sewage sludge, Regulation 503, US EPA).

- (b) An alternative process that guarantees the same level of pathogen reduction as required by ARMCANZ WTC No 1/95, which shall be confirmed by pathogen testing, and the elimination of viable plant propagules, which shall be confirmed by testing to the procedure in Appendix M.

NOTES:

- 1 Shredded garden organic materials and vermicast that have spent three days in a suitable in-vessel composting system, in which all materials contained within achieve a minimum of 55°C, or that have spent two to three weeks in well-managed turned windrows, are likely to meet pasteurization criteria, or other approved technology. Materials that are used soon after shredding will not meet these pasteurization criteria, and so are excluded from this Standard.
- 2 Alternative processes (time/temperature requirements) that guarantee the same level of pathogen reduction as required by ARMCANZ WTC No 1/95 are specified in the following report:

Guidance on the treatment in approved composting or biogas plants of animal by-products and catering waste, (2008), Department for Environment, Food and Rural Affairs, UK.

3.2.2 Composting

Any product supplied or described as ‘composted’ shall—

- (a) comply with Clause 3.2.1; and
- (b) have achieved a specified level of maturity in accordance with the requirements of Appendix N.

3.3 PHYSICAL AND CHEMICAL REQUIREMENTS

Products shall comply with the physical and chemical requirements for the classification as set out in Tables 3.1(A), 3.1(B) and 3.1(C). Products shall comply with Table 3.1(B) if a claim is being made in relation to the relevant attribute in the Table.

TABLE 3.1(A)
PHYSICAL AND CHEMICAL REQUIREMENTS FOR COMPOSTS, MULCHES AND SOIL CONDITIONERS

Characteristic and unit of measurement	Requirements				Test method—Appendix	Conditional marking Clause
	Raw mulch	Pasteurized product	Composted product	Mature compost		
pH pH units	Minimum 5.0 If pH >8.0 determine total CaCO ₃ content (Appendix H)	Minimum 5.0 If pH >8.0 determine total CaCO ₃ content (Appendix H)	Minimum 5.0 If pH >8.0 determine total CaCO ₃ content (Appendix H)	Minimum 5.0 If pH >8.0 determine total CaCO ₃ content (Appendix H)	B	5.3(g) 5.4(c)
Total CaCO ₃ equivalent % dry matter	To be determined and stated if pH >8.0 (See Table 3.2)	To be determined and stated if pH >8.0 (See Table 3.2)	To be determined and stated if pH >8.0 (See Table 3.2)	To be determined and stated if pH >8.0 (See Table 3.2)	H	5.3(g)
Electrical conductivity dS/m (See Note 7)	Maximum 10 (See Table 3.3)	Maximum 10 (See Table 3.3)	Maximum 10 (See Table 3.3)	Maximum 10 (See Table 3.3)	B	5.3(a)
Sodium % dry mass	No requirement	<1 or at least 7.5 moles calcium plus magnesium for each mole of sodium in the dry matter	<1 or at least 7.5 moles calcium plus magnesium for each mole of sodium in the dry matter	<1 or at least 7.5 moles calcium plus magnesium for each mole of sodium in the dry matter	D	5.5(a)
Phosphorus, soluble mg/L in solution	No requirement	≤5 For products that claim to be for phosphorus-sensitive plants <1 if applied to sandy soils No requirement otherwise	≤5 For products that claim to be for phosphorus-sensitive plants <1 if applied to sandy soils No requirement otherwise	≤5 For products that claim to be for phosphorus-sensitive plants <1 if applied to sandy soils No requirement otherwise	B	5.3(b) 5.5(a)
Phosphorus, total % dry mass	No requirement	≤0.1 For products that claim to be for phosphorus-sensitive plants No requirement otherwise	≤0.1 For products that claim to be for phosphorus-sensitive plants No requirement otherwise	≤0.1 For products that claim to be for phosphorus-sensitive plants No requirement otherwise	D	5.3(b) 5.5(a)

(continued)

TABLE 3.1(A) (continued)

Characteristic and unit of measurement	Requirements				Test method—Appendix	Conditional marking Clause
	Raw mulch	Pasteurized product	Composted product	Mature compost		
Ammonium-N mg/L in solution	Not applicable	Not applicable	<200	<100	B	5.3(c)
Nitrogen, total (Note 1) % dry matter	≥0.8 If a contribution to plant nutrition is claimed	≥0.8 If a contribution to plant nutrition is claimed	≥0.8 If a contribution to plant nutrition is claimed	≥0.8 If a contribution to plant nutrition is claimed	C	5.3(d) 5.5(a)
Organic carbon % dry matter	≥20	≥20	≥20	≥20	C	5.5(a)
Carbon: Nitrogen Ratio (C:N)	Level appropriate for application	Level appropriate for application	Level appropriate for application	Level appropriate for application specific products	C	
Wettability Minutes	Not applicable	<7 For the <10 mm fraction only	<5 For the <10 mm fraction only	<5 For the <10 mm fraction only	E	—
Pathogen indicators	N/A	Where high risk materials including manure, animal waste, food and grease trap wastes, mixed waste and biosolids are used as feedstock: Salmonella spp: absent in 50 g (dry weight equivalent) Faecal coliforms <1000 MPN/g (dry weight equivalent)	Where high risk materials including manure, animal waste, food and grease trap wastes, mixed waste and biosolids are used as feedstock: Salmonella spp: absent in 50 g (dry weight equivalent) Faecal coliforms <1000 MPN/g (dry weight equivalent)	Where high risk materials including manure, animal waste, food and grease trap wastes, mixed waste and biosolids are used as feedstock: Salmonella spp: absent in 50 g (dry weight equivalent) Faecal coliforms <1000 MPN/g (dry weight equivalent)		

(continued)

TABLE 3.1(A) *(continued)*

Characteristic and unit of measurement	Requirements				Test method—Appendix	Conditional marking Clause
	Raw mulch	Pasteurized product	Composted product	Mature compost		
Particle size grading using a 5 mm and 16 mm sieve (% mass retained by sieve)	Coarse mulch: Equal to or more than 70% by mass in the shortest dimension to be retained by the 16 mm sieve Fine mulch: Less than 20% by mass passing 5mm sieve and less than 20% by mass in the shortest dimension to be retained by the 16 mm sieve	Soil conditioner: Not more than 20% by mass in the shortest dimension to be retained by the 16 mm sieve Coarse mulch: Equal to or more than 70% by mass in the shortest dimension to be retained by the 16 mm sieve Fine mulch: Less than 20% by mass passing 5mm sieve and less than 20% by mass in the shortest dimension to be retained by the 16 mm sieve For vermicast requirement see vermicast sieve test below	Soil conditioner: Not more than 20% by mass in the shortest dimension to be retained by the 16 mm sieve Coarse mulch: Equal to or more than 70% by mass in the shortest dimension to be retained by the 16 mm sieve Fine mulch: Less than 20% by mass passing 5mm sieve and less than 20% by mass in the shortest dimension to be retained by the 16 mm sieve	Soil conditioner: Not more than 20% by mass in the shortest dimension to be retained by the 16 mm sieve Coarse mulch: Equal to or more than 70% by mass in the shortest dimension to be retained by the 16 mm sieve Fine mulch: Less than 20% by mass passing 5mm sieve and less than 20% by mass in the shortest dimension to be retained by the 16 mm sieve	G	—
Chemical contaminants (includes heavy metals), and organic contaminants (see Note 2)	See Table 3.1(C) and to comply with current national or state guidelines (see Clause 2.1 and Clause 2.2)	See Table 3.1(C) and to comply with current national or state guidelines (see Clause 2.1)	See Table 3.1(C) and to comply with current national or state guidelines (see Clause 2.1)	See Table 3.1(C) and to comply with current national or state guidelines (see Clause 2.1)	D	5.3(h)

(continued)

TABLE 3.1(A) (continued)

Characteristic and unit of measurement	Requirements				Test method—Appendix	Conditional marking Clause
	Raw mulch	Pasteurized product	Composted product	Mature compost		
Moisture content %	No requirement	Minimum 25 Maximum = % organic matter (OM) + 6 if OM >40% Maximum = % organic matter + 10 if OM <40%	Minimum 25 Maximum = % organic matter (OM) + 6 if OM >40% Maximum = % organic matter + 10 if OM <40%	Minimum 25 Maximum = % organic matter (OM) + 6 if OM >40% Maximum = % organic matter + 10 if OM <40%	I	—
Physical contaminants (% dry matter w/w)						
Glass, metal and rigid plastics	≤0.5	≤0.5	≤0.5	≤0.5	I	—
Plastics—light, flexible or film	≤0.05	≤0.05	≤0.05	≤0.05		
Stones and lumps of clay	≤5	≤5	≤5	≤5		
Vermicast sieve test (% volume)	—	≥90% passing the 1.18 mm sieve	—	—	L	—
Viable plant propagules	Nil after 21 days	Nil after 21 days	—	—	M	—
Maturity Index	N/A	1	2	3	N	

TABLE 3.1(B)
OPTIONAL PHYSICAL AND CHEMICAL TESTING FOR COMPOSTS, MULCHES AND SOIL CONDITIONERS
WHICH MAY BE USED TO DEFINE APPLICATION SPECIFIC PRODUCTS

Characteristic and unit of measurement	Requirements				Test method—Appendix	Conditional marking Clause
	Raw mulch	Pasteurized product	Composted product	Mature compost		
Phosphorus, soluble	≤5 For products that claim to be for phosphorus-sensitive plants	≤5 For products that claim to be for phosphorus-sensitive plants	≤5 For products that claim to be for phosphorus-sensitive plants	≤5 For products that claim to be for phosphorus-sensitive plants	B or P	5.3(b)
mg/L in solution	No requirement otherwise	No requirement otherwise	No requirement otherwise	No requirement otherwise		
Phosphorus, total	≤0.1 For products that claim to be for phosphorus-sensitive plants	≤0.1 For products that claim to be for phosphorus-sensitive plants	≤0.1 For products that claim to be for phosphorus-sensitive plants	≤0.1 For products that claim to be for phosphorus-sensitive plants	D or P	5.3(b)
% dry mass	No requirement otherwise	No requirement otherwise	No requirement otherwise	No requirement otherwise		
Nitrate-N mg/kg dry mass	No requirement	No requirement	≥10 If a contribution to plant nutrition is claimed	≥10 If a contribution to plant nutrition is claimed	B or P	5.3(c)
Ammonium-N plus nitrate-N mg/L in solution	Level appropriate for application specific products	Level appropriate for application specific products	Level appropriate for application specific products	Level appropriate for application specific products	B or P	5.3(c)
Nitrogen drawdown Index (<i>NDI</i>)	No requirement	No requirement	Degree of biological stability in accordance with Appendix N	Degree of biological stability in accordance with Appendix N	O	
Self heating °C (See Note 3)	No requirement	No requirement	Degree of biological stability in accordance with Appendix N	Degree of biological stability in accordance with Appendix N		—
Plant growth test (Bioassay) mm	No requirement	No requirement	Plant growth test result in accordance with Appendix N	Plant growth test result in accordance with Appendix N	F	5.3(f)

NOTES TO TABLES 3.1(A) and (B):

- 1 The provisions for a high total nitrogen content with some nitrate and soluble nitrogen are designed to ensure that products labelled with claims that they will 'feed' plants will, in fact, be capable of supplying soluble nitrogen rather than acting as a sink for it. Users and specifiers of composts should be aware that these requirements do not guarantee that a product will not cause nitrogen deficiency when dug into a soil or placed on its surface. As a general rule, a source of plant-available nitrogen (e.g. urea) should be applied along with composts of low nitrogen content, so that plants are not harmed through nitrogen deficiency.
- 2 For determination of organic contaminant levels, products should be collected in glass jars, sealed with a metal cap or with aluminium foil under the cap as organic contaminants can migrate through plastic lids, and be refrigerated to avoid inadvertent secondary contamination.
- 3 This test method has not gained widespread use in the industry. The test is retained in this standard as an optional test for maturity/stability. Producers may find the test useful as an on-site indicator of maturity/stability.
- 4 Test methods for total contaminant concentration will be those soluble in strong oxidizing acids such as aqua regia and include methods such as BS EN 13650, *Soil Improvers and Growing Media. Extraction of aqua regia soluble elements*. BS EN 16772 *Soil quality. Determination of mercury in aqua regia soil extracts with cold-vapour atomic spectrometry or cold-vapour atomic fluorescence spectrometry* and USEPA Method 200.7 *Determination of metals and trace elements in water and wastes by inductively coupled plasma atomic emission spectrometry. Revision 4.4*.
- 5 Where urea is applied to products less than about one month previously, there is a potential for plant toxicity. If bioassay results are poor for inexplicable reasons and urea has been added it may be useful to measure urea content (see Appendix P4.3, Reference 6).
- 6 For product derived from mixed solid waste streams the visible contaminants are measured on the whole sample aliquot in accordance with Appendix I.
- 7 Table 3.3 sets out the maximum application rates of product with different salinities for plants of differing sensitivities to salinity.

TABLE 3.1(C)
UNRESTRICTED USE UPPER LIMITS FOR
CHEMICAL CONTAMINANTS

Contaminant	Unrestricted use upper limits (See Note 1) mg/kg
Arsenic	20
Cadmium	1
Boron (See Note 3)	100
Chromium	100
Copper (See Note 2)	150
Lead	150
Mercury	1
Nickel	60
Selenium	5
Zinc (See Note 2)	300
DDT/DDD/DDE (See Note 4)	0.5
Aldrin (See Note 4)	0.02
Dieldrin (See Note 4)	0.02
Chlordane (See Note 4)	0.02
Heptachlor (See Note 4)	0.02
HCB (See Note 4)	0.02
Lindane (See Note 4)	0.02
BHC (See Note 4)	0.02
PCBs (See Note 5)	ND

NOTES TO TABLE 3.1(C)

- 1 Values are expressed on a dry weight basis (DWB).
- 2 A product that contains levels of total copper (Cu) greater than 100 mg/kg but less than 150 mg/kg and/or total Zinc (Zn) greater than 200 mg/kg but less than 300 mg/kg (dry weight), whilst not exceeding the limit values for all other contaminants listed in Table 3.1(C), shall provide a warning label in accordance with the labeling requirements of Clause 5.3.
- 3 Testing for Boron is generally only necessary for products that are based on seaweed, seagrass or unseparated municipal solid wastes that have a component of cardboard packaging.
- 4 Test methods for these contaminants are given in Appendix D.
- 5 The detection limit for PCBs shall be 0.2 mg/kg.

3.4 REQUIREMENTS FOR SPECIFIC MATERIALS

3.4.1 Vermicast

Product labelled as ‘vermicast’ shall meet the pathogen and viable plant propagule requirements of this Standard (see Clauses 2.1, 2.2, and Tables 3.1(A), 3.1(B) and 3.1(C)). It shall meet the contamination requirements for pasteurized product in Tables 3.1(A), 3.1(B) and 3.1(C) when tested in accordance with Appendix M.

3.4.2 Manure

Product labelled as ‘manure’ shall meet the requirements of Section 3 for either pasteurized product, composted product or mature compost.

3.4.3 Mushroom substrate

Product labelled as ‘mushroom substrate’ or ‘spent mushroom compost’ shall meet the requirements of Appendix K.

3.4.4 Application of lime product

Tables 3.2(A) and 3.2(B) provide information on the approximate rate of application of lime product to produce a rise in pH of one unit.

TABLE 3.2(A)

APPROXIMATE RATE OF APPLICATION (KILOGRAMS OF DRY PRODUCT PER SQUARE METRE OF SOIL) OF LIME PRODUCT TO PRODUCE A RISE IN pH OF ONE UNIT TO THE TOP 10 CM OF SOILS OF VARIOUS TEXTURES

Soil texture	Lime content of product, % dry matter						
	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Sand	2	1	0.5	0.35	0.25	0.2	0.16
Sandy loam	3.2	1.6	0.8	0.6	0.4	0.3	0.25
Loam	4.4	2.2	1.1	0.8	0.6	0.4	0.35
Silty loam	6	3	1.5	1.1	0.75	0.6	0.5
Clay loam	7.2	3.6	1.8	1.3	0.9	0.7	0.6
Organic soil	14.6	7.3	3.7	2.6	1.8	1.5	1.2

TABLE 3.2(B)

APPROXIMATE RATE OF APPLICATION (GRAMS OF DRY PRODUCT PER LITRE OF GROWING MIX) OF LIME PRODUCT TO PRODUCE A RISE IN pH OF ONE UNIT

Lime content of product (% dry matter)						
2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
23	13	6.5	4	3	2.6	2

NOTES TO TABLES 3.2(A) and 3.2(B))

- 1 It is permissible to convert the rates of application to rates in mass or volume of moist product as supplied.
- 2 The lime content of all product with a pH > 8.0 should be stated as being within a 5 percentage point range up to 10% then within 10 percentage point ranges (as in this Table) together with a one line guideline on its potential effect on soil pH.
- 3 EXAMPLE:

For a particular product with 9% lime and 0.3 kg dry matter per litre:

The following rates of application (in litres of product per square metre of soil) of this product will raise the pH of the following soil types by approximately one unit:

Sand	Sandy loam	Loam	Silty loam	Clay loam	Organic soil
3	5	7	10	12	26

For potting mixes: Inclusion of 5% by volume of this product in a potting mix will raise the pH of the mixture by approximately one unit.

For the purposes of this Table, weight and volume may be considered to be of approximately equal value.

3.4.5 Maximum application rate of product with different salinities

Table 3.3 sets out maximum application rates of product with different salinities for plants of different sensitivities to salinity.

TABLE 3.3
MAXIMUM APPLICATION RATE OF PRODUCT
WITH DIFFERENT SALINITIES FOR PLANTS OF
DIFFERENT SENSITIVITIES TO SALINITY

EC range (See Appendix B)	Sensitive plants	Tolerant plants
dS/m	L/m ²	L/m ²
0–1	Unlimited	Unlimited
1–2	<15	<60
2–4	<8	<32
4–8	<4	<16
8–12	<2.5	<10
>12	<2	<8

NOTES:

- 1 These rates are for mulches or for incorporation into soil to a depth of 5 cm. When incorporated into the soil to a depth of at least 10 cm these amounts can be doubled.
- 2 The maximum rate of application of product is to be stated on the primary package or information sheet (as per Clause 5.3(a)), based on the electrical conductivity (EC) result, as in the following example:

The concentration of soluble plant nutrients in this product is such that the maximum rate of application on one occasion should be no more than 4 L per square metre for sensitive plants and no more than 16 L per square metre for tolerant plants. Repeat applications may be made after several weeks.

SECTION 4 VERIFICATION OF REQUIREMENTS AND TESTING

4.1 PRODUCT TESTING

4.1.1 Storage before testing

Product shall be tested as soon as possible after receipt by a laboratory and certainly within four days of receipt. If it must be stored after receipt, a subsample shall be taken for as-received moisture determination. If the sample is drier than a moisture content of 40% to 50%, w/w water shall be added to bring it into this range and the sample stored at 18°C to 25°C in a large container, which shall be loosely sealed (e.g. with plastic film) to minimize water loss but to allow oxygen entry.

4.1.2 Physical and chemical testing

Products shall be tested prior to distribution.

NOTE: If instructions are given on the primary package or information sheet to mix the product with other materials, it is advisable to produce the product with levels that are more strict than either the minimum or maximum requirement, depending on the particular characteristic listed in Tables 3.1(A), 3.1(B) and 3.1(C).

4.1.3 Test methods

Test methods for the analysis of properties of composts, soil conditioners and mulches, specified in Tables 3.1(A), (B) and (C), and elsewhere in this Standard, shall be in accordance with Appendices B to O.

NOTE: Methods for sampling and preparation of samples prior to analysis are given in Appendix A. Appendix Q gives guidance on the determination of compliance with this Standard. Appendix P provides guidance on test methods for assessing the nutrient value of compost.

4.2 CLAIMING COMPLIANCE

Documentation shall be retained to demonstrate the product complies with the requirements of Clause 2.1.

Documentation shall be retained to demonstrate the product has undergone one of the two alternative processes in Clause 3.2.1.

Documentation shall be retained to demonstrate the product has undergone the process in Clause 3.2.2.

NOTES:

- 1 Manufacturers making a statement of compliance with this Australian Standard on a product, its packaging, or promotional material related to that product, are advised to ensure that such compliance is capable of being verified.
- 2 Acceptable evidence of compliance with this Standard should include (but is not limited to) the following:
 - (a) Three test reports on samples representative of products produced under normal production conditions.
 - (b) Certification licence numbers and certificates.
 - (c) Independent evidence of conformance with the processing, testing and record keeping activities associated with the production of the products claimed to be compliant with this Standard.

SECTION 5 PACKAGING, MARKING AND DOCUMENTATION

5.1 PACKAGING

5.1.1 Volume—Packaged materials

All products shall be packaged in multiples of a litre, and the volume shall be measured in accordance with the method in Appendix J.

When measured in accordance with this method, the actual volume of packaged product shall not be less than the volume stated on the primary package.

NOTE: Attention is drawn to relevant state or territory and federal regulations governing size and weight requirements that are not within the scope of this Standard.

5.1.2 Volume—Bulk materials

Details on the determination of volume of bulk product are subject to agreement between the supplier and the purchaser, e.g. loose or settled volume, or weight at a specified moisture content.

The method for determining volume and bulk density of bulk materials using a small sample (minimum 10 L) is described in Appendix J. Using the bulk density determined as in Appendix J, the mass of a load of product, and the volume of product despatched can be determined.

NOTE: Parties need to be aware that settling will occur during transport.

5.1.3 Protection

Both packaged and bulk product should be protected so that, under normal conditions of handling, storage and transport, the contents do not become contaminated by extraneous matter (e.g. plant propagules, pathogens and pests) and the contents of packages are not released unintentionally. Packaging shall contain perforations to allow for pressure equalization, and ease and safety of handling.

5.2 REQUIRED MARKING OR DOCUMENTATION

Any product supplied in accordance with this Standard shall be accompanied by information supplied either on the primary packaging or, where unavailable, a separate information sheet that is permanently and legibly marked with the information listed below.

NOTE: In this Standard, the term 'information sheet' can mean an invoice or other document that provides the information in a location where the consumer is most likely to read it.

On packages, the letters shall be no less than 9 point in size and in a prominent position.

This information shall accompany the product in order to verify compliance with this Standard and include the following:

- (a) Name or registered trademark and full street address of the manufacturer, packer or distributor.
- (b) Volume of contents, in litres (to the nearest litre), printed in letters a minimum of 18 point in size. The only statement of volume shall be the volume determined according to the method for the determination of volume in Appendix J.

NOTE: Packages should not be marked with codes such as 'No. 1 pack', or similar, as a substitute for stating the actual number of litres of contents in the package. Mass of contents should not be marked as a substitute for stating the actual volume in litres, although a mass may be provided in addition to volume.

- (c) The classification to which the product belongs, complying with Clauses 3.1.1.1 and 3.1.1.2 and defined in Clause 1.5, as well as its grade based on the maximum particle size in Tables 3.1(A), 3.1(B) and 3.1(C).
- (d) A statement as to whether the product is suitable for phosphorus-sensitive plants (see also Clause 5.3(b)) such as one of the following:
 - (i) ‘This product is suitable for use with phosphorus-sensitive plants’.
 - (ii) ‘The phosphorus content of this product is such that it is not suitable for application to phosphorus-sensitive plants’.

NOTES:

- 1 See Tables 3.1(A), 3.1(B) and 3.1(C), for the requirements for phosphorus-sensitive plants.
 - 2 Products that are not specified as being suitable for phosphorus-sensitive plants do not need to carry information about total or extractable phosphorus content, unless this is required by state government regulations, however, producers of compost or soil conditioners are encouraged to quote a range into which the total phosphorus content falls (e.g. 0.5 to 1%).
- (e) A health warning label and hazardous information label for customers on the handling of products on the package for bagged product or the information sheet/invoice in the case of bulk product, which shall be permanently and legibly marked as follows:
 - (i) *Appearance* The warning specified in Item (e)(ii) shall be printed in a contrasting colour to other non-warning printing, have a border in bold and shall appear in accordance with Items (A), (B) or (C) as appropriate:
 - (A) On 15 L or larger packages, in 16 point Arial bold or other Sans Serif font.
 - (B) On packages of less than 15 L, in 12 point Arial bold or other Sans Serif font.
 - (C) On the information sheet/invoice, in 10 point Arial bold or other Sans Serif font.
 - (ii) *Health warning label* The following warning* shall be printed in a prominent position on the front of the package for bagged product or for bulk product on the information sheet/invoice.

HEALTH WARNING THIS PRODUCT CONTAINS MICROORGANISMS AVOID BREATHING DUST OR MISTS— WEAR PARTICULATE MASK IF DUSTY WEAR GLOVES AND KEEP PRODUCT MOIST WHEN HANDLING WASH HANDS IMMEDIATELY AFTER USE READ DETAILED WARNING LABEL ON THIS BAG

* At the time of publication of the 2003 version of this Standard, the health warning specified in Clause 5.2(e)(ii) was the latest agreed to jointly by the Nursery and Garden Industry Association of Australia and enHealth. It is the responsibility of the manufacturer to ascertain whether this is still the latest required warning. For further information refer to the relevant Material Safety Data Sheet.