

PAS 100:2018

Specification for composted materials



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Foreword

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- Oversight panel for the Compost Certification Scheme
- Environment Agency (EA)
- National Farmers Union (NFU)
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- Renewable Energy Assurance Limited (REAL)
- United Kingdom Accreditation Service (UKAS)
- Zero Waste Scotland

Publication status

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PAS 100 is not to be regarded as a British Standard and will be withdrawn upon publication of its content in, or as, a British Standard.

This PAS is not intended to restrict new developments in design and materials. Accordingly, all feedback about it and proposals for future work will be considered. It will be reviewed as and when the technical need arises or after two years, whichever is sooner. BSI reserves the right to withdraw or amend this PAS on receipt of authoritative advice that it is appropriate to do so.

Due acknowledgment is given to the Food and Agriculture Organization of the United Nations (FAO) with regards to **3.23 to 3.27, 3.29, 3.35, 3.39, 3.40, 3.41, 3.50, 3.72, 3.80, 3.81** and text within **4.4**.

Source: Food and Agriculture Organization of the United Nations, 2009. The Codex Alimentarius Commission, *Food Hygiene (Basic Texts)* Fourth Edition, www.fao.org/docrep/012/a1552e/a1552e00.htm. Reproduced with permission, with or without modification.

Presentation conventions

The provisions of this PAS are presented in upright, roman type. Its requirements are expressed in sentences in which the principal auxiliary verb is 'shall'.

Commentary, explanation (guidance) and general informative material is presented in smaller italic type, and does not constitute normative elements (requirements). Much of this appears as notes in this PAS, each beginning with 'NOTE', and other such material appears in the annexes marked 'informative'.

Conformity and certification

Marking PAS 100:2018 on or in association with compost represents a composter's declaration of conformity, i.e. a claim by or on behalf of the composter that the requirements of this PAS have been met. The accuracy of the claim is therefore solely the responsibility of the person or organization making the claim. Such a declaration is different from third party certification of conformity with this PAS. Composters should note the Compost Quality Protocol's (QP) requirement for third party certification when demonstrating that compost derived from controlled biowaste is no longer subject to waste regulatory controls (see Introduction's **0.2**, fourth paragraph).

Contractual and legal considerations

This PAS does not purport to include all the necessary provisions of a contract. Composters and any other parties who use this PAS are responsible for its correct application.

Compliance with a PAS does not in itself confer immunity from legal obligations. Neither does certification of conformity by a third-party.

NOTE 1 In England and Wales, processes that compost controlled source segregated biowastes are required under legislation to have an authorization to operate or register an exemption from authorization. An example of an authorization is an environmental permit (permits include waste management licences and exemptions issued prior to 6 April 2008 when the environmental permitting regulations [7] came into effect).

NOTE 2 In Scotland and Northern Ireland, processes that compost biowastes must have a Waste Management Licence (WML) or register an exemption from licensing (see [8] & [9] for Scotland and [10] for Northern Ireland). For facilities treating Category 3 Animal By-Products, a Pollution, Prevention and Control Permit (PPC) may be required (see [9] for Scotland and [11] for Northern Ireland).

NOTE 3 The use of composts made from controlled, source segregated biowastes is subject to environmental permitting in England and Wales [7], or waste management licensing regulations in Scotland [8] & [9] or Northern Ireland [10] & [11]. However, see 0.2 of the Introduction of this PAS for circumstances in which composts derived from controlled biowastes may be transported, stored and used without waste regulatory controls.

0 Introduction

0.1 Use of composts

Composts derived from source segregated biodegradable materials and wastes are used in agricultural, horticultural, land restoration, soft landscaping, sports recreation, and other markets in the UK. According to their grade (in terms of particle size range) and other properties, composts are supplied for use as soil improvers and mulches, as substrates for growing media, and as a significant ingredient in manufactured topsoils and turf dressings. Awareness of suitable uses for composts, the associated benefits and compost availability has improved considerably in recent years. Provisions for investment in composting are now routinely made with compost quality and potential markets in mind.

0.2 Waste recovery

Efforts are being made to significantly reduce the millions of tonnes of biodegradable waste that are landfilled every year in the UK. The composting of biodegradable wastes prior to their landfill helps reduce later generation and emissions of methane. This benefit is maximized when composted material is permanently diverted from landfill and is of sufficient quality for supply to diverse markets.

The production, transport, storage and use of composts derived from controlled biowastes is subject to waste management controls and pollution prevention regulations, according to the country in which those activities take place.

Uncertainty over the point at which waste has been fully recovered and ceases to be waste within the meaning of Article 3(1) of the EU Waste Framework Directive (2008/98/EC) [12] has inhibited the development and marketing of materials produced from waste which could be used beneficially without damaging human health and the environment. Interpretation of EU legislation is ultimately a matter for the European Court of Justice and there is now a substantial body of case law on the interpretation of the definition of waste in Article 3(1) of the Waste Framework Directive. Drawing on the principles established in this case law, it is possible to identify the point at which certain wastes cease to be waste and thus when the Waste Framework Directive's

waste management controls no longer apply. It is now possible to specify a set of criteria for the product of a waste treatment process such that, if they are met, the product will no longer be regarded by the relevant regulatory authorities as waste.

In countries that have adopted the Compost Quality Protocol (QP) [a] once biowaste-derived compost has been produced in compliance with the Compost QP (which includes conformance with PAS 100) and provided it is destined for use in a market designated in the Compost QP, it is not normally subject to waste regulatory controls. In a UK country that has not adopted the Compost QP, biowaste-derived compost may no longer be subject to waste regulatory controls when PAS 100's requirements and any additional conditions set by the regulatory authority have been met. In countries that have adopted the Compost QP, third party certification of conformity to PAS 100 and the Compost QP is necessary for biowaste-derived compost to no longer be subject to waste regulatory controls. In Scotland, where the Compost QP has not been adopted, the regulatory authority requires certification of conformity to PAS 100, amongst the additional conditions the authority has set for biowaste-derived compost to no longer be subject to waste regulatory controls. Those considering transporting, storing and using biowaste-derived composts outside of waste regulatory controls in a UK country should check the position of that country's regulatory authority responsible for protection of the environment.

Whilst compliance with this PAS (and the Compost QP in countries that have adopted it) helps composters demonstrate due diligence in the recovery of biodegradable waste materials, it does not exempt the compost from regulations, measures and good practices that apply to both waste and non-waste materials, such as the Animal By-Products Regulations, groundwater protection controls, and the Action Programme of Measures for Nitrate Vulnerable Zones (see references in the Bibliography).

Those who use composts on agricultural land in England or Wales should ensure that the relevant parts of the Codes of Good Agricultural Practice for the Protection of Water, Soil & Air, are followed (see [e] for England and [f] for Wales). Similarly, those who use composts on agricultural land in Scotland should ensure that the relevant parts of the Prevention of Environmental Pollution from Agricultural Activity Code of Good Practice [g] are followed. End users of composts on agricultural land in Northern Ireland should ensure that the relevant parts of the Code of Good Agricultural Practice for the Prevention of Pollution of Water, Air and Soil [h] are followed.

This PAS is a non-statutory document so does not set regulatory limit values for the use of composts as “wastes”.

0.3 Control of hazards

Compost can have properties that are hazardous when it is handled and used, consequently PAS 100 specifies its minimum quality, such that any risks associated with its handling and general use are limited to acceptable levels, when compost is handled and used as per good practice. In support of this, PAS 100 requires the composter to have a Safety and Quality Control System including Hazard Analysis and Critical Control Point (HACCP) planning, operate a Quality Management System (QMS), and supply clear information to the customer.

0.4 Changes from previous edition

PAS 100:2018 incorporates references to new legislation, guidelines and scientific reports. There have been some definitions updated and a definition of ‘customer’, ‘end user’ and ‘laboratory’ added.

It continues to require the composter’s commitment to supply composts that are fit-for-purpose. This is incorporated in a new clause (see 4.2) regarding the requirement for compost to be fit-for-purpose and the compost producer agreeing (in writing) with the customer any additional or more stringent parameters than in tables 3 and 4.

The HACCP section has been re-written to extend the requirements. This includes having a team approach to developing a Safety and Quality control system with a requirement to consider hazards affecting quality as well as safety relevant to the intended use.

PAS100:2018 introduces a requirement to have an index of Quality Management System documents. It also introduces the requirement for operators to demonstrate ongoing competence (see 4.5.3).

With regard to input materials, the clause about waste wood (see 5.1.5) has been re-worded to allow only untreated waste wood as an input material. It requires deliveries of input materials to be inspected and checked against the acceptance criteria defined by the producer.

When using automated monitoring equipment on insulated aerated static piles, PAS100:2018 recommends that the monitoring point should be moved on every monitoring occasion.

PAS100:2018 requires that when compost is stored for a period of six months or longer, that the compost is re-assessed for compliance with the requirements of 4.2 and the re-assessment is recorded.

The minimum frequency for routine compost sampling and testing can either be measured in cubic metres (as in PAS100:2011) or in tonnes.

After validation, no sampled batch of compost shall be dispatched for use until after the test results have been checked for conformance to PAS 100 (see 14.4).

There has been additional recommendations for soil sampling added to Annex B. A new informative annex (Annex D) has been added, which includes an extract from the renewable fertilizer matrix regarding recommendations for using compost in different applications.

0.5 Supplementary requirements

Those manufacturing or specifying products with technically demanding requirements can require compost with specific characteristics. Their requirements can cover a wider range of parameters or demonstrate higher quality than the minimum specified in this PAS. Examples include composts used as an ingredient in turf dressings and growing media, which are normally enhanced by compost maturation before it is dispatched for use (see Annex C for guidance).

Organic food and farming standards include restrictions on biowaste types from which composts may be made, if they are intended to be used within such organic systems. In the UK, the Department for Environment, Food and Rural Affairs maintains information about standards and certification schemes for organic land management and crop production systems including the use of composts.

NOTE Further information is available at <https://www.gov.uk/guidance/organic-farming-how-to-get-certification-and-apply-for-funding>

The composter is responsible for checking and meeting any supplementary criteria that compost customers require.

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1 Scope

This Publicly Available Specification (PAS) specifies requirements for the process of composting, the selection of input materials, the minimum quality of composted materials and the storage, labelling and traceability of compost products. It specifies requirements for a Quality Management System (QMS) for the production of composts to ensure they are consistently fit for their intended uses. It also requires a Safety and Quality Control System, including Hazard Analysis and Critical Control Point (HACCP) assessment, which the composter takes into account when developing, implementing and reviewing the QMS.

NOTE 1 HACCP assessment identifies relevant hazards and establishes critical control points and critical limits for ensuring that any risks associated with product use are controlled within acceptable limits.

This PAS is for composts from a composting system into which only source segregated biowastes (see 3.66 and 3.9) and/or biodegradable non-waste materials are fed.

Inputs to the composting process are allowed to include digestate (whole digestate, separated fibre or separated liquor) from an anaerobic digestion facility that processes only source-segregated biowastes and/or biodegradable materials as inputs, that is compliant with PAS 110 (see 5.1.6 and its notes).

Digestate (whole digestate, separated fibre or separated liquor) from a non-PAS 110 anaerobic or aerobic digestion process is only allowed to be added to a PAS 100 composting process if the digestate is made only from input materials allowed by PAS 100 (see 5.1.6 and its Notes).

NOTE 2 See [c] in bibliography, section "References to documents that are not legislation". If in future PAS 110 includes Thermophilic aerobic digestion (TAD) (see 3.74) within its scope and the digestate from such a process complies with PAS 110, the digestate would be an eligible input material to a PAS 100 composting process.

NOTE 3 Attention is drawn to legislation that controls the use of digestates and the digestion process facilities that produce them (see 5.1). The production quality management and direct use of digestates in soil conditioning and other applications is specified in PAS 110:2014, where they are made using an anaerobic digestion process.

This PAS allows a composting process to utilize thermophilic aerobic digestion (TAD, see 3.74) for its sanitization step instead of aerobic composting (see Clause 7 Table 1) and the resulting compost can be claimed compliant with this PAS if all requirements are met. However, any whole digestate or separated liquor output arising from the TAD step that is not utilized in a subsequent aerobic composting step to form compost (see 3.17) is not allowed to be claimed compliant with this PAS.

NOTE 4 Requirements for the minimum quality of composts specify upper limits for human and animal pathogen indicator species, potentially toxic elements, microbial respiration rate (stability), physical contaminants, stones, and weed propagules. They also specify minimum plant response in a germination and growth test.

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

NOTE 5 Annex B provides recommendations on composting temperature, moisture and duration that indicate a composting environment that can eradicate plant pathogens. It also includes reference to the Food and Environment Research Agency's Code of practice for the management of agricultural and horticultural waste [k] and the European and Mediterranean Plant Protection Organization's Guidelines for the management of plant health risks of biowaste of plant origin [l].

PAS 100 is applicable to product-oriented composting processes and the composter is responsible for establishing and consistently fulfilling any additional quality needs the customer has.

Vermi-composting is within the scope of this PAS where it follows a sanitization step of thermophilic aerobic composting or TAD (see 6.3).

PAS 100 does not apply to composting activities that do not require registration with the regulator, such as composting at home.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM D6400, *Standard specifications for compostable plastics*

BS EN 13432, *Packaging – Requirements for packaging recoverable through composting and biodegradation – Test scheme and evaluation criteria for the final acceptance of packaging*

BS EN 13650, *Soil improvers and growing media – Extraction of aqua regia soluble elements*

BS EN 14995, *Plastics – Evaluation of compostability – Test scheme and specifications*

BS EN ISO 6579, *Microbiology of food and animal feeding stuffs – Horizontal method for the detection of Salmonella spp*

BS ISO 16772, *Soil quality – Determination of mercury in aqua regia soil extracts with cold-vapour atomic absorption spectrometry or cold-vapour atomic fluorescence spectrometry*

BS ISO 16649-2, *Microbiology of food and animal feeding stuffs – Horizontal method for the enumeration of B-glucuronidase-positive Escherichia coli – Part 2: Colony count technique at 44 °C using 5-bromo-4-chloro-3-indolyl-B-D-glucuronide*

NOTE In addition to the incubation instructions in BS ISO 16649-2:2001, 9.2.3, compost samples tested for PAS 100 purposes are required to undergo pre-incubation for an initial period of 4 hours at 37 °C, as per the “WARNING” text in the method’s 9.2.3 with regard to “presence of stressed cells”.

Codex Alimentarius, *Food Hygiene (Basic Texts)* Fourth Edition (see Bibliography [o])

The following normative documents contain provisions which constitute provisions of BS ISO 16649-2:

BS ISO 7218, *Microbiology of food and animal feeding stuffs – General rules for biological examinations*

BS ISO 6887-1, *Microbiology of food and animal feeding stuffs – Preparation of test samples, initial suspension and decimal dilutions for microbiological examination – Part 1: General rules for the preparation of the initial suspension and decimal dilutions*

ORG 0020, *Standardised method for the determination of compost stability by measurement of evolved carbon dioxide*, Waste & Resources Action Programme, Banbury ¹⁾.

REAL MT PC&S, *Method to determine particle size distribution of compost and its physical contaminant and stone contents*, Renewable Energy Assurance Ltd, London.

REAL MT PRT, *Methods for testing plant response to composted material and its contamination by weed seeds and propagules*, Renewable Energy Assurance Limited, London ²⁾.

¹⁾ First published as Annex A in a report by Llewelyn, H. R., and Farrington, D., Development of standard laboratory based test to measure compost stability, Direct Laboratories, Wolverhampton. Report published by the Waste & Resources Action Programme, Banbury, January 2005, ISBN 1-84405-143-9.

²⁾ First published by the Waste & Resources Action Programme, Banbury, September 2010, version 1.0, ISBN 1-84405-425-X.

3 Terms and definitions

For the purposes of this PAS the following terms and definitions apply.

3.1 agriculture

includes horticulture, fruit growing, seed growing, livestock farming, the use of land as grazing land, meadowland, osier land ³⁾, land used for growing arable crops (such as cereals, oil seed rape and some types of vegetables) and biomass grown for non-food purposes, market gardens and nursery grounds, and woodlands where the land used is ancillary to the farming of land for other agricultural purposes

NOTE In this context, horticulture means only “soil-/field-grown horticulture”, a separate term which is defined further on in this section.

3.2 anaerobic digestion (AD)

process of controlled decomposition of biodegradable materials under managed conditions where free oxygen is absent, at temperatures suitable for naturally occurring mesophilic or thermophilic anaerobic and facultative bacteria species, that convert the inputs to a methane rich biogas and whole digestate

3.3 actively managed composting period

period of composting during which sanitization and stabilization normally occur

NOTE See 3.46 for definition of “maturation”.

3.4 additional compost grade

grade of compost that is not the principal compost grade

NOTE See 3.54 for definition of “principal compost grade”.

3.5 animal by-product (ABP)

entire bodies or parts of animals or products of animal origin referred to in Articles 4, 5 and 6 of EU Regulation 1774/2002 that are not intended for human consumption, including ova, embryos and semen

NOTE Articles 8, 9 and 10 of EU Regulation 1069/2009 [18], respectively state Category 1, Category 2 and Category 3 animal by-products. “Not intended for human consumption” also means material that at some point was intended for human consumption but which has become unfit for that purpose. Most arisings of catering waste (see 3.10 and 3.11) and “former foodstuffs” are Category 3 ABPs, which can be recovered using a composting process.

3.6 authorization

In the context of a composting activity, one of the following:

- in England and Wales, an Environmental Permit issued under the Environmental Permitting (England and Wales) Regulations 2007 [7], or a registered exemption from an Environmental Permit;
- in Scotland, a Licence issued under the Environmental Protection Act 1990 [1] as amended by the Waste Management Licensing (Scotland) Regulations 2011 [8], or a registered exemption from a Licence, or a PPC permit issued under the Pollution Prevention and Control (Scotland) Regulations 2012 [9]; or
- in Northern Ireland, a Licence issued under the Waste Management Licensing (Northern Ireland) Regulations 2003 [10], or a registered exemption from a Licence, or a PPC Permit issued under the Pollution Prevention and Control Regulations (Northern Ireland) 2003 [11].

3.7 blended material

mixture of a composted material and one or more other material(s)

NOTE Other materials can include mineral additives, e.g. sand, soil, peat, non-composted biodegradable residues, other substrates, e.g. coir and bark, nutrient sources, or other compost from a different production system. See 8.1.

³⁾ Osier land is not included in Northern Ireland’s definition of agriculture.

3.8 biodegradable

capable of undergoing biologically-mediated decomposition

3.9 biowaste

waste of animal or plant origin which, for recovery purposes, can be decomposed by micro-organisms, other larger soil-borne organisms or enzymes

NOTE A narrower definition of biowaste in Article 3(4) of the EU Waste Framework Directive (2008/98/EC) [12], set for the purposes of that directive, is “biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants”. Article 3(1) of this Directive defines “waste” as “any substance or object which the holder discards or intends or is required to discard”. The following biodegradable materials are not “biowaste”: faecal matter (if not destined for incineration, landfilling or use in a biogas or composting plant), straw and other natural non-hazardous agricultural or forestry material used in farming or the production of energy from such biomass through processes or methods which do not harm the environment or endanger human health (see Article 2(1)(f) of Directive 2008/98/EC). Soil materials with no significant biowaste content that are within the scope of Article 2(1)(c) or 2(4) of Directive 2008/98/EC are not “biowaste”. For the purposes of this PAS, 3.9 “biowaste” applies, as guided by this note.

3.10 catering waste (including meat)

all waste food, including used cooking oil, originating in restaurants, catering facilities and kitchens, including central kitchens and household kitchens

NOTE Due to the risk of pathogen transfer from meat to non-meat food fractions at catering waste sources, EU Regulation 1069/2009 [18] includes any non-meat food fractions arising at the premises in the definition of “catering waste”, by using the word “all”. Most catering wastes are Category 3 ABPs. However, catering waste from means of transport operating internationally is classified as a Category 1 ABP, which is not permitted to be composted.

3.11 catering waste (excluding meat)

separately collected catering waste types where appropriately authorized measures have been taken to exclude meat at source

NOTE For further information on this type of catering waste see UK standards for catering waste section of Defra’s ‘Using animal by-products at compost and biogas sites’, downloadable from <https://www.gov.uk/guidance/using-animal-by-products-at-compost-and-biogas-sites#when-you-can-meet-uk-standards>. If catering waste excluding meat is subsequently mixed with any catering waste that includes meat, the mixture is classified as “meat-included catering waste” (see 3.10) and treated accordingly.

3.12 certification

third-party attestation related to products, processes, systems or persons

NOTE 1 In the context of PAS 100, assessment by a certification body covers all the requirements of PAS 100.

NOTE 2 In the context of the Compost QP [a] assessment by an approved certification body covers all the requirements of that protocol, including all those in the composter’s chosen, approved standard / specification (e.g. PAS 100).

3.13 certification body

organization responsible for assessing and certifying the conformity of production systems, products or other materials to one or more relevant standards

NOTE In this context, conformity of compost and its production process to the requirements of PAS 100.

3.14 competent authority

central authority of a Member State competent to ensure compliance with the requirements of the EU Animal By-products Regulation 1069/2009 [18] (as amended) or any authority to which that central authority has delegated that competence

NOTE In England, Wales and Scotland, the competent authority is ‘Animal and Plant Health Agency’ the executive agency of the Department for Environment, Food and Rural Affairs (Defra) and the Scottish Government. Animal and Plant Health Agency was formerly named the State Veterinary Service. In Northern Ireland the competent authority is the Department of Agriculture and Rural Development and within that, the Veterinary Service.

3.15 competent authority approval

approval from the competent authority for composting catering waste or animal by-products, according to a defined process at a specific location

NOTE The law requires each process treating catering waste or animal by-products to have approval from the competent authority. The assessment process starts with an “approval in principle” and progresses through a number of phases to approval.

3.16 competent authority validation

validation required by the competent authority in compliance with animal by-products regulations

3.17 compost

solid particulate material that is the result of composting, that has been sanitized and stabilized and that confers beneficial effects when added to soil, used as a component of a growing medium, or is used in another way in conjunction with plants

NOTE For the purposes of this PAS, the solid particles output resulting from a composting process that utilizes TAD instead of aerobic composting for its sanitization step is regarded as compost.

3.18 composter

business enterprise, organization, community initiative or person(s) responsible for the production of compost

3.19 composting

process of controlled biological decomposition of biodegradable materials under managed conditions that are predominantly aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat that convert the inputs to compost and / or mulch

NOTE Composts and mulches can confer benefits to the soils and media to which they are applied and the plants those soils or media support.

This definition of composting is appropriate to the aims and scope of this PAS. It is recognized that there are other forms of composting that are unlikely to be managed sufficiently to achieve and sustain thermophilic temperatures (see 3.75). Home composting is such an example. Vermicomposting is maintained within a very restricted, low temperature range suitable for the existence of appropriate, selected species of worms. For the purposes of this

PAS a composting process that utilizes TAD (see 3.74) instead of aerobic composting for its sanitization step may be regarded as a composting process.

3.20 composting / composted / compost batch

identifiable quantity of material that progresses through a composting system and when fully processed, has similar characteristics throughout

NOTE Composting systems that operate on a continuous- or plug-flow basis will carry out monitoring and assessment on a series of “portions of production” rather than batches. Where “composting batch” is used elsewhere in this PAS, composters operating such systems may interpret this as “portion of production”. A mass balance approach that takes account of composting process throughput rates (input tonnage and weight reduction over a known period of time) can be used to allocate and trace each portion of production. Clause 7.2 requires that the composter’s appropriate QMS document(s) identify typical, maximum and minimum composting batch sizes.

3.21 composting / composted / compost batch code

unique reference for a composting / composted / compost batch

NOTE In this definition “batch” can also mean portion of production. For simplicity, the composted / compost batch code can remain the same as the composting batch code, provided that the material comprises solely the “carried forward” composting batch. Composters operating continuous-flow or plug-flow systems should interpret “compost batch code” as “portion of production code”.

3.22 compost grade

means of differentiating composts from the same composting process in terms of their particle size ranges

NOTE Normally derived by passing composted material through screening machinery; each screening step normally resulting in one stream of particles that have fallen through the screen’s apertures / moving plates and a second stream of particles that have not fallen through. The number of grades produced by a single screening step depends on machine design and chosen settings when in use.

3.23 control (noun) ⁴⁾

state wherein correct procedures are being followed and criteria are being met

3.24 control (verb)

to take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan

3.25 corrective action

any action to be taken when the results of monitoring at the critical control point (CCP) indicate a loss of control

3.26 critical control point (CCP)

step at which control can be applied and is essential to prevent or eliminate a hazard or reduce it to an acceptable level of risk

3.27 critical limit (CL)

criterion which separates acceptability from unacceptability

NOTE The critical limit for any parameter will depend on how the product is manufactured and intended to be used. In PAS 100 context, assess critical limits appropriate to the compost production process, taking account of how the compost is intended to be used.

3.28 customer

first point of contact from the compost producer that receives compost

NOTE They may be acting on behalf of the end user, part of a supply chain or may be the end user directly.

3.29 deviation

failure to meet a critical limit

⁴⁾ Definitions 3.23 to 3.27, 3.29, 3.35, 3.39, 3.40, 3.41, 3.50, 3.72, 3.80, 3.81 and text within 4.4 are from the Codex Alimentarius, Food Hygiene Basic Texts (see reference [o] in the bibliography's section on 'References that are not legislation' and Annex A for more information). Minor changes have been made to some to make them more appropriate within the context of compost production.

3.30 digested materials

whole digestate resulting from an anaerobic or aerobic digestion process, and any subsequently separated fibre or liquor

NOTE 1 Given the scope of this PAS and PAS 110, "digested material" includes any separated fibre that undergoes a subsequent aerobic stabilization step, without addition of further biodegradable materials.

NOTE 2 See definitions of terms, whole digestate (3.86), separated fibre (3.63) and separated liquor (3.63).

3.31 duty of care

any individual who is the holder of controlled waste is obliged under law to ensure that the waste is managed properly, is recovered or disposed of safely, does not cause harm to human, animal or plant health or pollution of the environment, and is transferred only to someone who is authorized to receive it

NOTE Duty of care applies to any person who produces, imports, carries, keeps, treats or disposes of controlled waste or, as a broker, has control of such waste, i.e. it applies to anyone who is the holder of controlled waste. It is a requirement in section 34 of the Environmental Protection Act 1990 (as amended) [1] and associated regulations. Article 13 of the EU Waste Framework Directive (2008/98/EC) [12] obliges those who manage waste to ensure their activities are carried out 'without endangering human health, without harming the environment and, in particular: (a) without risk to water, air, soil, plants or animals; (b) without causing a nuisance through noise or odours; and (c) without adversely affecting the countryside or places of special interest'.

3.32 end user(s)

individuals or organizations that obtain compost from a composter or third party with the intention of using it

3.33 exemption

exemption from the need to hold an authorization, allowed by the regulator in certain circumstances

NOTE 1 See 3.6 for definition of authorization; see 3.84 for definition of waste management licence.

NOTE 2 In Scotland, a composting activity is exempt from waste management licensing if it meets the requirements of regulation 18 and Schedule 3 of the Waste Management Licensing (Scotland) Regulations 2011) [10]. The exempt activity is registered with the regulator. Separate exemptions exist in the nations/provinces/administrations of the UK for spreading composted, controlled biowastes on land.

3.34 fit-for-purpose

having all of the properties and characteristics necessary for its intended use(s)

NOTE *In the context of PAS 100, “fit-for-purpose” compost passes all PAS 100 obligatory tests and any additional parameter tests and limits the composter has committed to fulfilling in his/her quality policy or in a written agreement with a compost customer.*

3.35 flow diagram

systematic representation of the sequence of steps or operations used in the production or manufacture of each compost grade

3.36 growing medium

material, other than soils in situ, in which plants are grown

[SOURCE: PD CR 13456:1999]

3.37 harm

physical injury or damage to the health of people or damage to property or the environment

[SOURCE: ISO/IEC Guide 51]

NOTE *Within the context of this PAS, harm also includes injury or damage to the health of plants, the health and welfare of animals, and pollution of the environment. Harm can be caused by one or more unwanted biological, chemical or physical agents in compost or by its misuse.*

3.38 hazard

potential source of harm

3.39 hazard analysis

process of collecting and evaluating information on hazards and conditions leading to their presence, to decide which are significant for the production of compost that is fit-for-purpose

NOTE *This is carried out when drawing up the HACCP plan.*

3.40 HACCP plan

document prepared in accordance with the principles of HACCP to ensure control of hazards that are significant for the production, storage, supply and use of compost without harm

3.41 Hazard Analysis and Critical Control Point (HACCP) study

system which identifies, assesses, and controls hazards which are significant for compost safety and quality

NOTE *In the context of this PAS, the focus of safety is those hazards which are significant for the production and use of composted materials without harm to the environment (including human, animal, plant and soil health).*

3.42 horticulture (soil-/field-grown)

raising of plants in soil in-situ, in a field or under protective cover

NOTE *Includes the commercial raising of plants referred to in the definition of “agriculture” and some types of vegetables, fruit, flowers and bulbs, hardy and other nursery stock, herbs as well as some protected crops grown in soil in-situ.*

3.43 input material

source segregated biowaste or source segregated biodegradable material intended for feeding or that is fed into a composting process

NOTE 1 *See further criteria in Clause 5.*

NOTE 2 *See Annex B of the Compost QP [a] for the list of acceptable input materials (selected from the European Waste Catalogue [13].*

3.44 laboratory

building or a room where analytical tests are carried out on compost samples as required by PAS 100

3.45 land manager

natural or legal person, or a group of natural or legal persons, whatever legal status is granted to the group and its members by national law, whose holding is situated within the EU and who exercises a land management activity

3.46 maturation

period of lower rate biodegradation than in preceding steps of composting (sanitization and stabilization)

NOTE For the purposes of this PAS, this step occurs after the actively managed period, prior to or after any compost screening. "Maturation" is a monitored and evaluated phase of managed composting, even if it does not undergo 'action' treatment; it is not to be regarded as "compost storage". The regulator requires that composting batches undergoing maturation are kept within the area covered by the composting permit/waste management licence/exemption.

3.47 mature, maturity

state of composted material which exhibits a very low rate of biodegradation and which is not harmful to humans or animals and does not exert phytotoxic effects in any application

NOTE See also definition of term 3.69, "stable".

3.48 mesophilic micro-organisms

micro-organism species for which optimum growth temperatures are within the range 30 °C to 45 °C

3.49 methods of test

procedures for testing samples of materials

NOTE Where available for any one or more parameters, this PAS specifies recognized national, European Community or international standards published by the British Standards Institution (BSI), the European Committee for Standardization (CEN) and the International Organization for Standardization (ISO).

3.50 monitor

act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control

3.51 mulch

material spread and allowed to remain on the soil surface to conserve soil moisture, suppress weeds and shield soil particles from the erosive forces of raindrops and runoff

[SOURCE: adapted from PD CR 13456:1999]

NOTE Nutrients in the mulch will slowly become available to plants as its particles gradually biodegrade. The total amounts and rates at which different nutrients are released is influenced by the nature of the particles comprising the mulch (e.g. their carbon to nitrogen ratio and particle size distribution). The use of mulch should be considered in calculating land use and application.

3.52 phytotoxin

substance that is toxic to plants

NOTE Toxicity effects might include delayed seed germination or inhibited plant development and rate of growth.

3.53 potentially toxic element (PTE)

chemical element that has potential to have toxic effects on humans, flora or fauna, or can do so in combination with other chemical elements

NOTE Some PTEs are also known as "heavy-" or "transition metals", such as lead, cadmium, chromium, mercury, copper, zinc and nickel. These are the seven PTEs specified in Table 3 of this PAS.

3.54 principal compost grade

grade of compost for which PAS 100 conformance is claimed, or intended to be claimed, normally the one that is composted for the shortest total time and includes sufficient particles less than 2 mm to support plant germination and growth

NOTE For example, the principal grade could not be a 10 mm to 40 mm mulch grade because it would not contain the fine particles that are necessary for plant response and weed seed tests. Although not necessarily made from every batch of compost production, the principal grade should be made on a frequent basis and the quantity made over a year should be at least as much as any additional compost grade (see 3.4) for which PAS 100 conformance is claimed.

3.55 quality control

part of quality management focused on fulfilling quality requirements

NOTE Implemented through a series of systems and activities, which are integrated in daily work, and enable frequent, or continuous, verification of product quality. Examples are checks on process conditions throughout every processing step, digested material sample test results and the effects of any corrective actions taken.

3.56 quality management system (QMS)

management system to direct and control an organization with regard to quality

NOTE *In the context of composting, it is a system for planning, achieving and demonstrating effective control of all operations and associated quality management activities necessary to achieve compost that is fit-for-purpose. Where specific controls are applied, they are monitored and recorded, and their efficacy evaluated both during and after process validation. Corrective actions are defined.*

3.57 quality protocol (QP)

set of criteria for the production, placement on the market, storage and use of products derived from defined types and sources of waste, such that any risks to the environment and to human and animal health are acceptably low when any such product may, under certain circumstances, be used without waste regulatory controls, in those countries in which the QP applies

NOTE *A QP also sets out how compliance with its criteria can be demonstrated. Under a QP, the product should be used in accordance with good practice, and appropriate guidance is referred to where available and suitable for use of the product in end markets allowed by the QP.*

3.58 risk

combination of the probability of occurrence of harm and the severity of that harm [ISO/IEC Guide 51]

NOTE *Can mean the potential realization of unwanted, adverse consequences to human life, health, property or the environment associated with a hazard. Consideration of a hazard does not necessarily mean that it is applicable. For each of any hazard deemed applicable, identifying a way to control the associated risk within an acceptable level is part of HACCP planning (see 3.40).*

3.59 sanitary, sanitized

degree of processing and biodegradation at which any human and animal pathogens present have been reduced to acceptable levels (see Table 3, items 1 & 2)

NOTE *to 3.59 and 3.60 See Annex B for recommendations for eradication or reduction of plant pathogens. Composters should operate the sanitization step so that it also reduces any plant pathogens to an acceptably low level, or preferably eradicates them.*

3.60 sanitization

biological processes that together with conditions in the composting batch eradicate human and animal pathogens or reduce them to acceptably low, sanitary levels

NOTE *See Table 3, items 1 and 2.*

3.61 screening (of composted material)

process stage that separates compost particles according to their size, in order to achieve one or more separate grades of compost in terms of particle size range

3.62 senior management

individual, or team of individuals, at the highest level of organizational management who have the day-to-day responsibilities of managing an organization, and who hold(s) specific executive powers conferred onto him/her/them with and by authority of the organization's board of directors and/or its shareholders

3.63 separated fibre

fibrous fraction of material derived by separating the coarse fibres from whole digestate

NOTE *It is normally separated using a separator or centrifuge to reduce its moisture content to such an extent that it can be stored, sampled, tested and used as a stackable, "solid" material. As a guideline, if ≥ 23 % mass/mass of the separated fibre is dry matter it is likely to be stackable, "solid" material.*

3.64 separated liquor

liquid fraction of material remaining after separating coarse fibrous particles from whole digestate

NOTE *It is normally separated using a separator or centrifuge to remove coarse fibres.*

3.65 sewage sludge

solid, semi-solid or liquid by-product arising from the treatment of sewage or from septic tanks or similar installations

NOTE *The term "biosolids" is an alternative also used especially as fertilizer in agriculture.*

3.66 source segregated

materials or biowastes of the types and sources sought, that are stored, collected and not subsequently combined with any other non-biodegradable wastes, or any potentially polluting or toxic materials or products, during treatment or storage (before or after treatment)

NOTE Source segregated materials can include collection of a mixture of biowaste/biodegradable material types, from more than one source. It is acknowledged that for some types/sources of biowaste low levels of physical contamination could occur, which can trigger rejection of an input material load or physical contaminant removal prior to shredding and forming the biowaste / biodegradable material into composting batches. See 5.1.3 regarding packaged biowastes/biodegradable materials.

3.67 sharps

man-made contaminants that are greater than 2 mm in any dimension that can cause physical injury to a person or animal who comes into contact with these materials, including a person who handles composted materials without protective gloves

3.68 soil improver/soil conditioner

material added to soil in situ primarily to maintain or improve its physical properties, and which can improve its chemical and/or biological properties or activity

[SOURCE: PD CR 13456:1999]

3.69 stable, stabilized

degree of processing and biodegradation at which the rate of biological activity has slowed to an acceptably low and consistent level and will not significantly increase under favourable, altered conditions

NOTE This may be indicated by a downward trend in temperatures within the composting mass and, amongst other parameters, slower oxygen uptake rate or carbon dioxide evolution. Stable compost is unattractive to vermin, without noxious odour and does not support the re-growth of pathogens. It can still contain substances from natural or anthropogenic sources that are insufficiently biodegraded such that they exert phytotoxic effects in some applications.

3.70 stabilization

biological processes that together with conditions in the composting mass give rise to compost that is nominally stable

NOTE After stabilization, biodegradation will continue to occur, albeit at a slower rate.

3.71 standard operating procedures (SOPs)

procedures for producing compost

NOTE The SOPs cover details of each critical control point, the critical limits of each relevant parameter, other aspects of the HACCP plan, and operational aspects of the QMS. Composting carried out under an environmental permit/waste management licence follows procedures stated in the operational management plan approved by the regulator. PAS-related procedures can be incorporated in it but are normally stated in separate SOPs document, which complements and cross-references the environmental permit/waste management licence and regulator-approved operational management plan.

3.72 step

point, procedure, operation or stage in compost production, from receipt of input materials through to storage and dispatch of compost

3.73 stones

extraneous, hard mineral matter greater than 4 mm in any dimension

NOTE Does not include glass, plastic or metal, but does include pebbles and pieces of aggregate, concrete and pottery.

3.74 thermophilic aerobic digestion (TAD)

process of controlled decomposition of biodegradable materials, where naturally occurring micro-organism species suited to thermophilic, aerobic conditions convert the biodegradable materials into water vapour, carbon dioxide rich gasses and whole digestate

3.75 thermophilic micro-organisms

micro-organism species for which optimum growth temperatures are within the range 45 °C to 80 °C