

DRAFT ZANZIBAR NATIONAL STANDARD

Methods of test for Solid Waste – Part 1: Preparation of Samples for Analysis

ZANZIBAR BUREAU OF STANDARDS

Foreword

This draft Zanzibar National standard has been developed by the Soil and Air Quality Technical Committee (TCE2). In accordance with Zanzibar Bureau of Standards general procedures, this draft standard is presented to the public in order to receive any technical comment concerns.

Technical Committee Representatives

This Draft Zanzibar National Standard was prepared by the Soil and Air Quality Technical Standard committee which consists of representatives from the following organizations:

Chief Government Chemist Agency (CGCLA)
Department of Environment (DoE)
State University of Zanzibar (SUZA)
Tanzania Meteorological Authority (TMA)
Zanzibar Environmental Management Authority (ZEMA)
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Introduction

Due to the rapid growth of urban areas, the problem of solid waste disposal has assumed an important position. The method of treatment or disposal of solid waste depends on its composition and characteristics. Accurate determination of the composition and characteristics of solid waste requires representative and properly prepared samples. Since solid waste is generally heterogeneous, a sample collected or prepared improperly may not adequately represent the waste stream and may consequently lead to inaccurate or unreliable analytical results.

In reporting the result of a test or analysis, made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with ZNS 94, *Rounding off numerical values*.

Methods of test for Solid Waste – Part 1: Preparation of Samples for Analysis

1 Scope

This standard prescribes a method for preparation of samples of solid waste for physical, chemical and microbiological analysis. It excludes industrial waste, un-treated bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities.

2 Normative references

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

ZNS 416:2021, *Glossary of terms relating to solid wastes*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in ZNS 416:2021 and the following shall apply.

3.1

bio-medical waste (including domestic sanitary waste)

part of dry waste generated during the medication/treatment including sanitary napkins, diapers, contaminated gauge etc including expired medical items

3.2

crude sample

original/preliminary sample collected before further processing or detailed analysis

3.3

hammer mill

a category of high-speed equipment which have pivoted or fixed hammers to crush or shred solid waste.

3.4

homogenization

intensive mixing of a solid waste sample to obtain a sufficiently uniform and representative sample for analysis

3.5

pulverization

crushing of material into small pieces

3.6

rasper(rasp mill)

a size reduction unit having a large vertical drum with heavy hinged arms rotating horizontally over a rasp and sieve floor.

3.7

rotating mixer

mechanical mixing device in which a container or drum is rotated to tumble and thoroughly mix solid materials, producing a more uniform and representative sample

3.8

solid waste

includes solid or semi-solid domestic waste including sanitary waste, commercial waste, institutional waste, catering and market waste and other non - residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste.

3.9

windrow

long, narrow pile of organic waste/material arranged in rows

4 Preparation of sample for analysis

Crude samples are not ready for examination. The three basic operations required to prepare the sample for detailed analysis are drying, grinding or pulverizing, and mixing. They should be ground and homogenized further after drying. After grinding, it is subjected to mixing in a rotating mixer. The standard protocol of coning and quartering shall be followed before proceeding for further processing of the sampling. The procedure for all types of organic materials is essentially similar, if compost samples have already been coarsely ground either in a hammer mill or rasping device.

NOTE: If any moisture is found condensed on the walls of the container, it should be reabsorbed in the sample. When handling refuse, the analyst should use gloves, if possible of neoprene-coated canvas. He should also wear a face mask, such as a surgical mask, when preparing samples, especially when they are in finely divided form.

5 General requirements of sampling

It is of utmost importance for all analyses that the samples be representative. cursory samplings reveal very little about the true composition of the material and may lead to erroneous conclusions.

5.1 Refuse

5.1.1 A mobile hammer mill shall be used to take a crude sample of solid waste for grinding and homogenization.

5.1.2 Quantity of representative samples shall be taken at variable intervals depending on the amount of waste. In accordance with the purpose of the analysis, 2 to 4 individual samples may be ground together in order to reduce the number of samples during more lengthy tests.

5.1.3 The ground refuse has to be mixed intensively. During mixing, about 10 to 20 small individual portions are taken and filled into air tight plastic bags in quantities of 1 to 2 kg, to be stored as samples. This heterogeneous mixture is the crude sample of solid waste.

5.2 Compost

Grab samples (1 to 2 kg) shall be taken from as many parts of the windrow as possible and well mixed. It shall be ensured that equal amounts are taken from all parts. The actual sample of 1 to 2 kg shall be taken from this mixture. In the same way compost samples shall be taken from the test material in plastic baskets and small windrows. The mixture obtained in this way is the crude

sample of compost.

5.3 Sewage Sludge

Before a sample is taken, the sewage sludge shall be well homogenized. However, too intensive mixing with a high-speed agitator should be avoided if the sample is to be used in dehydration tests (flocculation and filtration tests). The sewage sludge obtained in this way is the crude sample of sewage sludge.

5.4 Residue after Incineration of Bio-medical Waste

5.4.1 The crude sample shall be taken directly from the conveying system under examination if possible. Fly ash and riddlings shall be taken from the corresponding areas.

5.4.2 The size of the sample shall depend on the kind of information sought and the structure of the material. In the case of single samplings (which may have a random composition), a large quantity should be taken and prepared. For longer examination periods, in which several single samples are taken at smaller intervals representative samples shall be taken.

5.4.3 Depending on the information sought, 2 to 4 single samplings may be ground and mixed in order to limit the number of samplings for lengthier tests. The mixture obtained in this way is the crude sample of Bio-medical waste.

6 Drying

A laboratory oven may be used for drying a small sample, and an industrial oven for a large sample. Weigh a pan, transfer the material to it and reweigh.

NOTE: The mass of the sample and dry in an oven at 70 to 75 °C for 24 h if the material is combustible, otherwise dry at 105 ± 1 °C.

Remove the sample and allow to cool, preferably in a desiccator. Weigh, and again place in the oven for 1 to 2 h. Repeat the process of heating, cooling and weighing till the difference in mass between two successive weighings is less than one percent of the total previous loss in mass. Calculate the moisture content as percentage of the original mass. However, if microbiological tests are also to be conducted, drying shall be done at 40 to 50 °C. The number of samples shall depend on the analysis requirements.

7 Grinding or pulverizing

7.1 Waste material may contain glass, ferrous and non-ferrous metals, plastics, etc. Glass and ceramics may be separated by judicious sieving, plastics may be hand-picked as they are not degradable and interfere in the determination of carbon/nitrogen ratio, and ferrous metals may be removed by a strong magnet. After removal of these, proceed with grinding using a hammer-mill, grinding mill or pulverizer.

7.2 The remaining material may be ground with an appropriate pulverizing equipment (crushing mill, hammer mill, ball mill, knife mill) until it becomes a farinaceous, homogeneous powder which is sifted through a 0.5 mm screen. The screening residue should be ground thoroughly to particles of the smallest size possible. The material in the form of sample is now ready for analysis.

7.3 Procedure for Combustibles

Place the sample collection box under the grinding machine. Plug the lead into the power outlet. Open the cut off in the dust collecting system. Oil the grinder bearings with engine oil. Put on personal safety equipment. Start the motor and feed the sample into the mill. Turn off the grinder motor and turn off

the blower. Clean out the grinder and add this material to the ground sample.

NOTE: It is advisable to wear a transparent plastics face shield while feeding the material into the grinder. The analyst should not use his hand to help push material into the grinder past the feed slot. Do not open any grinding device while it is running. If the grinder clogs, turn off the motor before cleaning the apparatus.

7.4 Procedure for Compost

In a standard compost plant, the compost (final product) has to pass through 4 mm sieve. While preparing the sample in the laboratory, further grinding may be required for specific analytical procedures.

7.4.1 Grinding of Compost

- a) put a 2 mm sieve into the grinding mill. Care should be taken to not to lose any material after weighing the sample.
- b) replace the 2 mm sieve with a 1 mm sieve, if necessary, and regrind the sample retained on the sieve.
- c) brush out all inside surfaces of the mill into a separate container.
- d) put this material through a micro mill.
- e) add the product to the main sample.

7.5 Procedure for Non-Combustibles

Adjust the movable pulverizer plate to give a maximum size of about 2 mm. Put the sample through the pulverizer. Screen the ground material through 2 mm and 250-micron sieves. The material passing through the 250-micron sieve is the required sample.

8 Mixing

The final mixing or homogenization is accomplished by transferring the sample to a suitable container that is not more than half filled by it. Close the container tightly, position it in a rotating mixer and allow to mix for not less than 2 h. Reduce the mixed sample in size if desired, by passing it through a sample splitter or by quartering. Weigh all metal, ceramic, plastics and glass removed during processing.

9 Environmental consideration

Waste generated during sampling shall be segregated in accordance with the composition of solid waste, namely recyclable waste, biodegradable waste and non -recyclable waste in receptacles as specified by local government authority/ council.

Reference

IS 9234 (Part 1): 2021, *Methods of Sampling and Test for Solid Waste*

DRAFT FOR STAKEHOLDERS COMMENT