



SLOVENSKI STANDARD
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Characterization of waste - Methodology for the determination of the leaching behaviour of waste under specified conditions

Characterization of waste - Methodology for the determination of the leaching behaviour of waste under specified conditions

Charakterisierung von Abfall - Methodik zur Bestimmung des Auslaugungsverhaltens von Abfall unter festgelegten Bedingungen

Caractérisation des déchets - Méthodologie pour la détermination du comportement a la lixivation d'un déchet dans des conditions spécifiées

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 292 "Characterization of waste", of which the secretariat is held by NNI.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The purpose of this prestandard is to provide a methodology for the determination of the leaching behaviour of a waste under specified conditions i.e. in a disposal or utilization scenario within a specified time frame. The prestandard is designed to ensure that waste specific properties and scenario conditions are taken into account.

The methodology contains several steps, some of which make use of chemical, biological, physical and leaching tests. A selection of tests is made depending on the objective, that is the definition of the problem and the solution sought, the waste under consideration and the scenario to be evaluated.

It is recognized that based on the present state of knowledge it is not always possible to provide a clear solution.

Determination of leaching behaviour in the context of this methodology may provide information with relatively large uncertainties.

To avoid unnecessary duplication of work, reference can be made to existing documented information on specific waste characteristics and on previous evaluations of existing documented scenarios, provided that such reference is documented and justified in the study report for each step of the methodology to which it applies.

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1 Scope

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This prestandard specifies a methodology for the determination of the leaching behaviour of a waste under specified conditions (i.e. for a specified scenario including a specified time frame) in order to provide a solution to a defined problem. This applies to disposal and utilization scenarios.

The external conditions which have a direct influence on the release of constituents from a waste are considered. Migration of constituents leached from the disposal or the utilization site into the surrounding environment is not considered. The assessment of toxicity to humans or ecological impacts on flora and fauna as a secondary effect after release of constituents from the waste is not considered.

NOTE: Present knowledge of highly complex scenarios and wastes may limit the ability to provide a clear solution to a defined problem. An example may be the landfilling of complex mixtures of wastes.

2 Definitions

For the purposes of this prestandard, the following definitions apply:

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2.1 Scenario: Description of a set of normal and exceptional conditions relevant to a particular disposal or utilization situation for wastes for the determination of the leaching behaviour within a specified time frame.

NOTE: Disposal is defined in European Directive 91/156/EEC of 18 March 1991.

2.2 Release: Emission of constituents from a waste which pass through the external surface of a waste mass as specified in the considered scenario.

2.3 Leaching behaviour of a waste: Release and change in release from the waste upon contact with a leachant as affected by the conditions specified in the scenario.

NOTE: Those factors may be e.g. liquid/solid ratio, time, pH, redox potential, complexation, particle-size distribution.

2.4 Parameter specific test: Test aimed at measuring an intrinsic property of a waste or to measure the (interrelated) influence of specific parameters on the release from a waste in the considered scenario.

NOTE 1: Examples of intrinsic properties of waste are: diffusion coefficients, solubility, physical properties, etc.

NOTE 2: Examples of specific parameters influencing the leaching behaviour are: temperature, pH, liquid/solid ratio, redox potential, the flow rate of leachant, chemical properties, etc.

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2.5 Simulation test: Test aimed at simulating the combined effect of various parameters on the release in the scenario under consideration.

NOTE 1: A simulation test may be an accelerated test; care should to be taken in the use of acceleration tests for model validation purposes.

NOTE 2: Examples of simulation tests are lysimeter tests and large scale column tests.

2.6 Behavioural model: Set of relationships between on the one hand the leaching behaviour and on the other hand the relevant conditions of the considered scenario and the relevant properties of the waste under consideration.

NOTE: The behavioural model can vary in sophistication depending on the definition of the problem and the solution sought.

3 Description of the steps in the methodology

3.0 Outline

The methodology consists of the following steps:

- 1) definition of the problem and the solution sought;
- 2) description of the scenario;
- 3) description of the waste;
- 4) determination of the influence of parameters on leaching behaviour;
- 5) modelling of the leaching behaviour;
- 6) behavioural model validation;
- 7) conclusions ;
- 8) study report.

These steps are to be carried out to determine the leaching behaviour of the waste in the considered scenario to provide the solution sought to the defined problem (see Annex A).

NOTE: To avoid unnecessary duplication of work, reference can be made to existing documented information on specific waste characteristics and on previous evaluations of scenarios.

In order to comply with this prestandard, reference to existing information shall be documented and justified in the study report for each step of the methodology to which it applies.

3.1 Step 1: Definition of the problem and the solution sought

The first step, in all cases, consists of defining the problem and the solution sought. This requires a description of the following:

- the type of scenario;
- the type(s) of waste;
- nature of the solution sought.

NOTE 1: Examples of scenarios are various types of disposal or utilization applications;

NOTE 2: Type(s) of waste may be referred to using the categorization of the European Waste Catalogue;

NOTE 3: Nature of the solution sought may be e.g.:

- data with reference to regulatory requirements;
- release after a specified time;
- comparison of treatment options;
- data relating to a specific set of technical requirements.

3.2 Step 2: Description of the scenario

This step consists of describing the normal and exceptional conditions which may influence the release of the waste under consideration in the considered disposal or utilization scenario with consideration to the relevant time frame.

The scenario shall be described by providing relevant details from the following items:

- mechanical and geotechnical conditions;
- hydrogeological and climatic conditions;
- biological conditions;
- use of the site at different points in time;
- exceptional conditions.

NOTE 1: Description of mechanical and geotechnical conditions can include the proposed preparation of the waste (including sorting, crushing, compaction etc.) or the dimensions of the disposal/utilization site, nature and thickness of layers above, below and around the waste, bulk density, expected lifetime of the containment system;

NOTE 2: Description of hydrogeological conditions can include: sources of leachant ingress, infiltration rate, details of leachant circulation and/or collection and removal, permeability of the surrounding materials and nature of the leachant; climatic conditions may be precipitation, wind, exposure to the sun and temperature variation;

NOTE 3: Description of biological conditions can include flora, fauna and micro-organisms;

NOTE 4: Description of the use of the site at different points in time can include demolition or construction of buildings, abandonment of disposal sites;

NOTE 5: Description of exceptional conditions can include rising of the ground water table, floodings, fires or earthquakes.

3.3 Step 3: Description of the waste

In this step the properties of the waste to be considered are described and documented. The properties listed shall be relevant to the type of waste and of disposal/utilization scenario.

NOTE: Relevant properties in this context may be the following:

- nature and origin of the waste;
- total chemical composition;
- physical properties (e.g. density, porosity, particle size distribution, water content);
- geotechnical properties (e.g. strength, permeability, thermodynamic stability) relevant to determine the water transport regime and whether to deal with the waste as granular or monolithic;
- mineralogy, chemical speciation.;
- chemical properties (e.g. acid neutralization capacity, reducing capacity, degradable organic matter content, thermodynamic stability).

3.4 Step 4: Determination of the influence of parameters on leaching behaviour

This step consists of identifying and determining the influence of the key chemical, physical, geotechnical, mechanical and biological parameters on the release from the waste in the considered scenario including the specified time frame. The rationale behind the selection of those key parameters shall be documented in the study report.

NOTE: Relevant parameters influencing the leaching behaviour of the waste in the considered scenario may be:

- *chemical parameters (e.g. nature of the leachant, effect of the chemical context of the disposal/utilization scenario in terms of pH, redox potential, CO₂, salinity, dissolved organic matter);*
- *physical parameters (e.g. sensitivity to temperature, moisture absorption capacity, particle size, consistency or rheology, water transport dynamics);*
- *mechanical and geotechnical parameters (e.g. permeability, effect of the mechanical factors, such as compaction, likely to be applied in the proposed disposal/utilization scenario in relation to durability and which may influence leaching behaviour through its effect on water transport);*
- *biological parameters (e.g. biodegradation, biotransformation, gas formation).*

Based on waste properties and the scenario under consideration, the appropriate tests to assess release under the specified conditions are selected. The rationale behind the selection of parameter specific tests or simulation tests shall be documented in the study report.

The selected tests are performed.

NOTE: When appropriate information is already available, it can be used in accordance with 3.1.

3.5 Step 5: Modelling of leaching behaviour

This step consists of forming and subsequently applying a behavioural model from a logical hierarchy of the influence of the relevant physical, geotechnical, biological and chemical parameters identified in step 4. Thus a set of relationships describing the leaching behaviour of the waste in the considered scenario is provided.

The above described logical hierarchy includes simplification i.e. elimination of parameters shown to be negligible or irrelevant. The sophistication of the model will depend on the defined problem and the solution sought.

NOTE: The model may even be a simple equation for extrapolation to a certain time frame.

The model shall provide a simulation and forecast for the targeted time frame in the