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ENTERPRISE DIRECTORATE-GENERAL

Single Market : regulatory environment, standardisation and New Approach
Standardisation

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M/326 EN

STANDARDIZATION MANDATE TO CEN
FOR THE DEVELOPMENT OF STANDARDISED METHODS FOR THE
CHARACTERISATION OF WASTE

I. MOTIVATION

Directive 99/31/EC on the landfill of waste lays down requirements for the design, operation, closure and after-care of landfills.

Article 4 of the Directive distinguishes three classes of landfills:

- landfills for hazardous waste
- landfills for non-hazardous waste
- landfills for inert waste

In accordance with Article 6, at each landfill class only waste which fulfils the relevant acceptance criteria set out in accordance with Annex II of the Directive may be accepted.

Pursuant to Article 16 of the Directive the Commission, assisted by the Committee established by Article 18 of Directive 75/442/EEC, shall set specific criteria and/or test methods and associated limit values for each class of landfill. In this work the general principles and procedures for testing and acceptance criteria set out in Annex II of the Directive shall be taken into account.

Proposals for standardised control, sampling and analysis methods are to be adopted by 16 July 2001.

CEN/TC 292 was founded in 1991 and has been working on standardised methods for the characterisation of waste since then. Some standards have been finalised already, but the majority of the work is still ongoing.

The Technical Adaptation Committee is working on a uniform waste characterisation and acceptance procedure. This is to be decided by 16 July 2002 and will define which test methods are needed.

This mandate contains preliminary requirements, some of which will be further developed. These requirements include the determination of the permeability of landfills, in accordance with Annex I point 3.5 of the Directive.

A mandate to CEN is needed to indicate the requirements of the Commission for the purposes of Directive 99/31/EC on the landfill of waste. This will allow CEN to

concentrate their work along these requirements and thus speed up the completion of the required standardised methods.

II. DESCRIPTION OF THE MANDATED WORK

The Commission entrusts CEN to develop standards as described in the Annex.

III. EXECUTION OF THE MANDATE

The standards shall be developed in accordance with the requirements as stated in the Annex, which are subject to changes and additions.

For the development of the above mentioned standards the following timetable is foreseen:

By September 2002

Water content	prEN	Calculation of dry matter by determination of dry residue or water content
Acid/Base Neutralisation Capacity (ANC/BNC)	prEN	Leaching behaviour tests – Influence of pH on leaching with initial acid/base addition
Partial digestion of the solid waste prior to elementary digestion, leaving the silicate matrix intact	EN	Digestion for subsequent determination of aqua regia soluble portion of elements in waste
Total digestion of the waste prior to elementary analysis	EN	Microwave assisted digestion with hydrofluoric (HF), nitric (HNO ₃) and hydrochloric (HCl) acid mixture for subsequent determination of elements in waste
Percolation test for inorganic constituents	prEN	Leaching behaviour of a waste material under standardised percolation conditions
Compliance leaching test for granular waste (L/S 2, 4mm; L/S 10, 4mm, L/S 2 and 8, 4mm; L/S 10,	EN	Compliance leaching test for granular waste and sludge (L/S 2, < 4mm; L/S 10, < 4mm, L/S 2 and 8, <

10mm)		4mm; L/S 10, < 10mm)
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By December 2005

Sampling, parts 1-6	part 1: EN (normative) parts 2-6: TR (informative)	
Pre-treatment of waste samples prior to digestion, analysis (and/or leaching testing)	EN	Pre-treatment of the laboratory sample prior to digestion and/or elemental analysis
Water content	EN	Calculation of dry matter by determination of dry residue or water content
Acid/Base Neutralisation Capacity (ANC/BNC)	EN	Leaching behaviour tests – Influence of pH on leaching with initial acid/base addition
Percolation test for inorganic constituents	EN	Leaching behaviour of a waste material under standardised percolation conditions
ph dependence test for inorganic constituents	EN	Leaching behaviour tests – Influence of pH on leaching with continuous pH control
Availability test for inorganic constituents	EN	
Dynamic monolithic leaching test for inorganic constituents	EN	Dynamic leaching test for monolithic waste
Compliance leaching test for inorganic monolithic waste of regular shape	EN	Compliance leaching test for monolithic material
Physical stability test for monoliths (assessment of monolithic character)	EN	Assessment of the monolithic character

The other standards mentioned in the Annex shall be developed at a future stage according to the priority as set out in the Annex.

CEN shall send to the Commission, within two months of their adoption, the standards in three linguistic versions (English, French and German) and the titles of

these standards in the other languages of the European Union. This information shall be submitted on paper and electronic support.

The Commission reserves the possibility of specifying additional and more detailed requirements for the sampling and testing methods for the characterisation of waste and for the measurement of the permeability of landfills at a later stage.

The standstill period referred to in Article 7 of Directive 98/34/EC (OJ L 217, 5.8.1998, p. 18) shall commence when CEN accepts this standardisation mandate.

Toolbox of testing methods and procedures for testing waste for landfilling.

1. Introduction

The TAC Subcommittee on the Landfill Directive is currently working on the development of criteria, testing methods and procedures for acceptance of waste at landfills (Annex II of the Landfill Directive). The Landfill Directive requires that a list of waste characterisation methods to be standardised shall be prepared by July 2001. This requirement was discussed at a meeting of some of the members of the TAC Subcommittee and the Commission in Copenhagen on 8 March 2001. Since the acceptance criteria and testing procedures are not yet in place (deadline July 2002), it was agreed to prepare a list, a so-called '*toolbox*' of methods for testing of waste, which the Member States would like to have available in a standardised form (as CEN or ISO standards). It was also agreed that the list should indeed be a toolbox from which the testing methods, which may eventually become required as part of the acceptance procedures, may be chosen. Application of the individual testing methods on the list will therefore not be mandatory unless an agreement stating differently should be reached at a later time to include certain test on a certain place in Annex-2 procedures.

A draft of this document has been discussed in a meeting with convenors of CEN-292 (30 March) and in the TAC-meeting (4 April). Remarks from these meetings and other remarks, made later on have been included in this draft as well.

A large number of tests are under preparation in CEN292. The latest drafts of each test have been studied in some more detail; relevant information of each test is included in the list more into detail, than in the draft of March. Within the table m.1. some rearrangements have been made, for a more practical presentation. From this investigation it became more clear where decisions have to be made on the options in the standards, the editing of the standards or the content of the standards. Decision points for TAC and decision and action points for CEN could be clearly recognised and formulated. Table m.5 gives a summary of the main decision points for each test, as well as for some general points.

One of the main points of attention is the option to come to more efficient development of CEN-test methods, by further development of a horizontal and a modular approach. It seems to be possible to introduce this approach into the relevant test methods without further delay of the development of the test methods, but it needs clear decisions and a stringent management of the standardisation process.

2. Toolbox of testing methods and procedures

In the Landfill Directive a large number of requirements is imposed with respect to the quality of the waste that may be accepted for landfill (see '**Decision document**', section I.1.1). In **Appendix a** of this 'Decision document' these requirements have been related to specific properties of the waste that have to be evaluated. For such an evaluation generally more than one testing method can be used. Otherwise, information from tests on certain properties is often also relevant for the evaluation of other requirements.

Based on the overview in **Appendix a** of the Decision document a survey of appropriate test methods and procedures has been drawn up in the tables **m.1** and **m.2**. In these tables the various columns are used for:

- the waste property or parameter (column 1)
- the relevance of this waste property or parameter as acceptance criterion ('function of the test', column 2);
- the specification of the requirements for the testing method (column 3);
- the performance requirements of the standards needed (column 4)
- the priority for the implementation of the Landfill Directive (column 5);
- reference to CEN-methods in preparation (column 6)
- the time schedule for CEN-methods in preparation (column 7) and
- remarks to CEN-methods in preparation in view of the requirements for the implementation of the Landfill Directive (column 8).

Table **m.1** specifies the requirements of the testing methods, not only for characterisation at level 1, but also at the other levels in the hierarchy of testing, so the testing methods mentioned may be appropriate as characterisation test, compliance test and/or (as far as relevant) on-site verification.

Table **m.2** contains some testing methods and procedures that are still under discussion. The required specifications of these items need not only more preparation but possibly also more research. For the implementation of Annex II these methods have a lower priority, so the TAC may postpone their decisions to a later stage (see par. 6 of this appendix **m**).

3. Performance requirements of the testing methods

Many testing methods or procedures mentioned in table **m.1** are needed for a quantitative comparison with limit values. Especially with respect to the constituents of the raw waste and its eluate the methods must render a sufficiently low detection limit, together with a reasonable accuracy. In the tables **m.3** and **m.4** the required performance requirements for the determination of individual constituents have indicative been specified for inert raw waste and its eluates respectively. More details on the required quality of the testing methods are presented in [1]. The tables **m.3** and **m.4** are still preliminary pending the discussion in the TAC Subcommittee on the specific elements needed to be verified and the corresponding limit values in the list (see sections **I.1.3**, **II.1.3**, **III.2** and **III.4** of the Decision document).

4. Development test methods on the short and long term.

The testing methods and procedures mentioned in table **m.1** are proposed as a gross list for the implementation of Annex II of the Council Directive. CEN could be asked to develop these tests and to check if existing testing methods and procedures could meet the specifications and performance characteristics. Next the limit values to be set in Annex II could be based on these testing methods. For some items the development of tests still should start on a European (CEN) level. Often national standards and experiences are available. CEN could make practical proposals on a short term with an optional time table, within the program of an 'umbrella' mandate.

In table **m.2** a list of properties is given for which the availability of test methods may be relevant on the longer run, but for which development still has to be started. For these methods the first step of development may be a state-of-the-art document with options and detailed proposals for the function(s) of the test in relation to the Landfill Directive and/or other regulations. Such a document should also contain a detailed proposal for the requirements of the tests and the timetable for development. A horizontal and modular approach for the development of these test meth-

ods should be part of the proposal. Further development of these tests by CEN should be followed in the TAC, after discussion of the state-of-the-art document and the proposals in the Landfill Directive as far as the method concerns this Directive.

In table m.1., some test methods are mentioned, for which (nearly) no work has been done yet.

In these cases it should be preferable to start with a state of the art document as well, to make it possible to get to clear agreements between TAC and CEN, about the work that will be started.

5. Selection of reference methods

In general for each property or parameter of waste to be judged against specified criteria only one standardised method should be used to verify the quality of the waste with the acceptance criteria of the Council Directive (*the 'Reference' method*). Should there be a choice of appropriate testing methods or procedures to determine the value of a specific waste property or parameter, the members of the TAC Subcommittee on the Landfill Directive have to make a proposal which of the available methods shall be used as reference. An important aspect in the selection of a reference method should be the applicability for related purposes, for instance in relation to the use of the same method for the implementation of other Council Directives. Another important aspect is the required quality performance of the methods.

Reference methods must be unambiguous with respect to the prescribed working instructions and procedures in the standard. As a consequence the standardised reference methods may not contain different procedures that can be selected freely by the user, unless the responsible Standardisation Committee has established full equivalence, for instance in a round robin or validation project. In all cases the TAC should specify which options are permissible

In certain cases it may be useful to have alternative tests available. E.g. for (non) hazardous waste limit values are higher than for inert waste. So sometimes cheaper or faster sampling techniques may be appropriate, if the results are comparable with the reference test. It shall be discussed if these alternative tests will be mentioned in Annex 2 as alternative tests, or if these tests are just prepared by CEN and these tests may be used in certain cases, if the user can declare that the results are comparable (based on a certain procedure for these declarations).

6. General objectives of testing: starting points for sampling and testing quality in Annex 2.

It must be realised, that test methods can't give 100% exact values. There is always a range of precision, depending on the quality of testing techniques, the sampling plan (selection of techniques and statistical aspects) and on the quality of the execution of the whole test procedure. It should be discussed in TAC which quality objectives should be chosen for testing on the three levels of testing and for the different kinds of waste materials.

Relevant aspects are e.g.:

- testing by a holder (to prove if his waste doesn't exceed the limit values)
- testing by a competent authority (check/prove if a waste batch exceeds the limit values)
- evaluating the highest value in a batch, or the average value
- the maximum size of a batch or a stream of waste to be tested
- different quality levels on the three test levels?

These kinds of questions should be answered in Annex 2 (or for a certain part in national legislation or other legislation?). The statements on these points should be the basis for the development of a sampling plan in each case.

Since it is not easy to make general regulations that can cover each kind of situation it should be worked out how to handle in the different situations.

The CEN-standards, as being worked out now, are based on getting clear instructions for each (type of) case from the legislator. So it is not possible in the Annex just to refer to CEN-standards for sampling and testing. It should be discussed thoroughly how to make a sensible and practicable relation between Annex 2 and the CEN standards. This might be worked out in a special working group of representatives of CEN and TAC.

7. Decisions to be made by the TAC Subcommittee¹

Table m1 gives an overview of all the relevant test methods for evaluating the quality of landfilled waste, as earlier discussed. TAC has to decide if this is the general (reference) list of methods for further development of Annex 2. This list may be fixed in an (umbrella) mandate to CEN. It is of great value for further development if this list can be agreed upon by the Commission / TAC and by CEN.

Reading the list and the explanations on the requirements for each test and the state of the art, it becomes clear that still a lot of work has to be done. Part of this work can be decided on in the short term. Other aspects need a step by step procedure that will need more time.

In table 5 for each test some points of discussion and decision have been mentioned if still necessary. Some general points of attention and decision have been summed up as well. Together it is a rather long list of points.
The main points are:

1. General logistic points:

- a. List of test methods; does the list give a complete (shopping) list for the three levels in the Annex?.
- b. Giving a(n umbrella) mandate to CEN.
- c. Further development of standards for test methods (only ?) on a horizontal and a modular basis?.
- c. Formation of a working group TAC/CEN, giving guidance to the further process of standardisation and developing proposals for special problems (like definitions on quality of test methods, editorial aspects of standards, development of the modular system, links between regulation and standardisation, etc.).
- d. Working group for definition proposals on sampling (treatment); general starting points from legislation and editorial connection standards ↔ legislation. (Ad hoc working group on sampling or combination c. and d.?)

2. Other main technical points on the way to standardisation:

- a. Selection of reference methods (and alternative methods as well, if relevant) (E.g. G.3-TOC, D2/4-Digestion, A1/2-Analyses-inorganics)
- b. Uniform definitions on quality criteria and selection of (target) levels for test methods.
- c. Statistical based test methods. Optimal representative test procedures.

¹ The content of the various tables in this appendix is the result of several documents and discussions. However, not all requirements and options for test methods have been discussed in detail yet. So, further discussions and contributions from Member States should be included before completion of the tables, especially with respect to the description of the requirements and the list of selected test methods.

- d. Unambiguous standards and unambiguous references to other standards, which need the same level of suitability and quality.
- e. For each test, one reference test only. Other tests may be chosen, if relevant from a practical point of view (e.g. costs and speed of testing) and if the same or well comparable results.
- f. All pre treatment steps in laboratory, to be standardised on the same systematic and statistic basis.

This is a draft list, Comments have been asked for, but not yet received from all who are concerned in this field. So other points of attention, discussion and decision may be added.

The main points could be discussed and decided upon in the TAC. Maybe a working group of TAC (or TAC and CEN) could guide the process and could care for preparing decisions on those points that in plenary TAC-meetings cannot have all the detailed attention as needed. Under an umbrella mandate, those further decisions could be included in the further standardisation process, step by step.

Table m.1: Toolbox of testing methods and procedures for characterisation of waste (Draft proposal 1-5-2001)

SAMPLING		REQUIREMENTS FOR THE LANDFILL DIRECTIVE			PROPOSALS BY CEN			
REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ¹ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ²	REMARKS TO CEN-METHODS IN PREPARATION IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
S.1	Sampling; Plan	Determination of the scope of a sampling plan. Establishment of sampling specifications for a certain case in a working document, covering the whole process of sampling in view of the subsequent testing procedures.	<ol style="list-style-type: none"> Instructions for a systematic and unambiguous determination of: <ul style="list-style-type: none"> the specific objectives of the sampling programme; statistical requirements for sampling (number of samples, sample size, etc.); appropriate techniques for sampling in the field; appropriate techniques for pre-treatment of samples in the field; appropriate techniques for sample packaging, preservation, storage transport and delivery. Instructions for: <ul style="list-style-type: none"> the selection of the organisation/personnel responsible for the plan; the procedural steps for preparation, check and formalisation of a sampling plan. <p><i>Remark:</i> Sampling should only be carried out when an agreed Sampling Plan is available. It should be carried out by qualified personnel and adequate/certified equipment.</p>	<p>The established steps should lead to representative samples with a quality of the samples that reflects:</p> <ol style="list-style-type: none"> the demands specified in annex II (to be drafted); other demands of the parties involved; a balance with the quality of other steps in the testing procedure. <p>As far as possible quantitative and qualitative information on the expected quality should be given, in relation to the demanded quality.</p>	High	<p>Work item 292002 Doc. WG1/N106 PrEN xxxx, Part 1</p> <p>Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.</p>	<p>St: 2000/06 Pr: 2002/06 Fv: 2003/12 Pu: 2004/09</p>	<p>The precise detail of each requirement within the sampling plan is not specified in the CEN-document: that remains subject of an agreement between the regulator and the other involved parties.</p> <p>The overall sampling programme design often involves iterative discussion between the involved parties. For regulatory purposes this aspect requires additional procedures (must be developed).</p> <p>Status of final standard unclear: normative (Europe (pre)standard) or informative (technical specifications)</p>

S.2	Sampling; Determination of sampling strategy on site, number of samples and locations of sampling	Statistical basis for the sampling procedure. To acknowledge various conditions in the field.	<ul style="list-style-type: none"> - Determination of relevant parameters, needed for a statistically adequate approach, based on the objectives of the test procedure; - Systematic approach of a sampling pattern; - Formulae for determining minimum increment size, sample size and number of samples. 	Methods must give insight in expected results in quality of sampling procedures chosen in a certain case	High	Work item 292001 Doc. WG1/N96 PrEN xxxx, Part 2 Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	St. 2000/06 Pr: 2002/06 Fv: 2003/12 Pu: 2004/09	Status of final standard unclear: normative (European (pre)standard) or informative (technical specifications)
S.3	Sampling; Techniques	Selection of adequate (reference) techniques and instructions on adequate usage of the methods.	<p>Selection of an appropriate and practical sampling technique(s) in order to realise the objectives of the sampling programme.</p> <p>Described techniques must cover sludges, paste-like substances, powders, granules and small crystals, and coarse or lumpy solid materials.</p> <p>Contents of the standard:</p> <ul style="list-style-type: none"> - List of reference sampling techniques; - Information on quality and instructions on the usage of the techniques; - Instructions on preference of (selection of) techniques for certain situations. 	<ul style="list-style-type: none"> - Selection must lead to adequate test methods for each type of situation; - Information on quality aspects in relation to quality objectives of the entire sampling procedure; - Statistically based methods should be first choice or mandatory. 	High	Work item 292017 Doc. WG1/N107 PrEN xxxx, Part 3 Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	St. 2000/06 Pr: 2002/06 Fv: 2003/12 Pu: 2004/09	Described techniques cover also mobile liquid waste, liquids and solids rendered mobile by heat and viscous liquids. Status of final standard unclear: normative (European (pre)standard) or informative (technical specifications)
S.4	Sampling; Sub-sampling and pre-treatment	Reduction of the sample size (mass) and/or the particle size in the field, with preservation of the characteristics of the sample.	<p>The sample pre-treatment procedures should cover:</p> <ul style="list-style-type: none"> - Statistical principles for size reduction. - Adequate equipment for size reduction. - Procedures and instructions for sample reduction in the field 	<ul style="list-style-type: none"> - Pre-treatment should be carried out in such a way as to obtain, at all stages, a sample that is representative of the overall sample. - Pre-treatment should not deteriorate the quality requirements of the entire sampling procedure. 	High	Work item 292018 Doc. WG1/N108 PrEN xxxx, Part 4 Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	St. 2000/06 Pr: 2002/06 Fv: 2003/12 Pu: 2004/09	Sample pre-treatment should only be carried out in the field if it is necessary to reduce the sample size for transportation and where the integrity of the sample and sub-samples can be assured. Status of final standard unclear: normative (European (pre)standard) or informative (technical specifications)

S.5	Sampling; Sample packaging, preservation, storage, transport and delivery	To preserve the characteristics of the waste sample prior to testing	<ul style="list-style-type: none"> - Selection of appropriate and practical methods for packaging, preservation, storage and transport for returning samples to the laboratory in order to realise the objectives of the sampling program. - The selection of methods for preservation and storage must relate to the stability properties of the samples. 	<p>All preservation steps for samples should be such as to avoid any accidental contamination by the sample container or derogation of the sample. Other changes in composition or behaviour should also be avoided. For cases that quality of samples may change during these procedures information should be given on the risks and instructions on minimising these risks</p>	High	<p>Work item 292019 Doc. WGI/N109 PrEN xxxxx, Part 5</p> <p>Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.</p>	<p>St: 2000/06 Pr: 2002/06 Fv: 2003/12 Pt: 2004/09</p>	<p>Status of final standard unclear: normative (European (pre)standard) or informative (technical specifications)</p>
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PRE-TREATMENT

REQUIREMENTS FOR THE LANDFILL DIRECTIVE				PROPOSALS BY CEN				
REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ⁱⁱⁱ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ^{iv}	REMARKS TO CEN-METHODS IN PREPARATION IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
P.1	Pre-treatment of solid waste samples prior to digestion, analysis and/or leaching testing	To pre-treat the laboratory sample prior to digestion, chemical analysis and/or leaching testing	<ul style="list-style-type: none"> - Methods for solid waste must cover techniques for drying, pre-crushing, sample division, and milling to < 250 µm grain size. - Quantitative, statistically based instructions on needed sample size and sample division in relation to low loss of precision for solid waste - Instructions for limitation of losses for moderately volatile components (i.a. organic components) - Instructions for reducing materials - Instructions on decrease of interferences (The methods must convert the solid sample into a form, which enables planned digestion/analyses/leaching to be carried out.)	<ul style="list-style-type: none"> -The pre-treatment should not deteriorate the representativity nature of the sample -The pre-treatment should not lead to losses of components of interest. - Precision: in relation to entire test procedure - Interferences: 	High	Work item 292030 Doc. WG 3/ N200rev1	St: Pr: Fv: Pu:	CEN document for sample preparation methods also cover sludges and liquid waste. CEN document gives no specific instructions about the preservation of sample properties or reproducible and representative results for the analysis of sub-samples. Remark: CEN-standard should be applicable for a (much) wider range of purposes (modular approach). Normative instructions are needed which are unambiguous and specific.
P.2	Preservation and storage of laboratory samples	To preserve extracts from solid waste or eluates from leaching tests, prior to chemical analysis	<ul style="list-style-type: none"> - Methods for laboratory samples must cover techniques for conservation of extracts - Instructions for limitation of losses of components - Instructions for materials with reducing properties or reactive components - Instructions for reducing interferences Remark: Separate standard needed? (see also S.4)		High	Not available as CEN method. Available guideline: ISO 5667 (1996)		ISO5667-3: Conservation of water samples. Accepted as EN-ISO. Being reviewed now.
P.3	Extraction of organic constituents from raw waste and eluates	To extract organic constituents from raw waste or its eluate	Methods for extraction with organic solvents, prior to analysis of organic constituents					

GENERAL WASTE PROPERTIES

REQUIREMENTS FOR THE LANDFILL DIRECTIVE

REQUIREMENTS FOR THE LANDFILL DIRECTIVE			PROPOSALS BY CEN					
REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ¹ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ²	REMARKS TO CEN-METHODS IN PREPARATION IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
G.1	Acid/Base Neutralisation Capacity (ANC/BNC)	To establish the buffer capacity of the waste (relevant for predominantly inorganic landfills)	<ul style="list-style-type: none"> - Method must render information about the resistance of the waste to pH-changes, e.g. by establishing the amount of acid or base required to reach and maintain a near-neutral pH-value that is desirable in most landfills. - To accelerate reaching equilibrium conditions size reduction of the test sample to particle size of 95% < 2 mm may be needed. 	<ul style="list-style-type: none"> - Unity of expression: Mol/kg - Quantitative detection limit should be: 0.01 Mol/kg 	High	Work item 292032 Doc. WG6/N226 PrEN xxxx, Part 1. Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	St: 2000/01 Pr: 2002/06 Fv: 2003/12 Pu: 2004/09	The test method is a parameter specific test as specified in: ENV 12920, 'Characterisation of waste – Methodology for the determination of the leaching behaviour of waste under specified conditions'.
G.2	Extractable organic matter in waste (PDOC)	To establish the extractable organic matter in the waste which is closely linked to degradable organic matter. (High PDOC may increase DOC-release and metal mobility).	<ul style="list-style-type: none"> - Method must render information about the potential (biological) degradability. - A quick measure may do, e.g. by NaOH extraction of the waste. <p><u>Remark:</u> The test is considered a refinement of the TOC analysis as TOC results may contain both non-degradable organic carbon and elementary carbon.</p>	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest quantitative level: - Interferences: 	Med	Not available as CEN method. National procedure available		
G.3	Carbon content of the (solid) waste: Total Organic Carbon (TOC)	To establish a rough upper limit for risks of Dissolved Organic Carbon (DOC) in the leachate through biodegradation, as well as to establish the relevance of incineration.	<ul style="list-style-type: none"> - Test method to be used for solid waste, sludges and sediments. - As far as possible the method should be identical as for other solid materials, such as primary and secondary construction materials; - TOC to be measured by determining Total Carbon (TC) and Total inorganic carbon (TIC): TOC = TIC - TC. (Total organic carbon (TOC) is the carbon that is converted into carbon dioxide by combustion and which is not liberated as carbon dioxide by acid treatment) 	<ul style="list-style-type: none"> - Unity of expression: % (mass to dry waste mass) - Lowest quantitative level: 0.1% - Precision: Target: SR < 10(?)% (Validation: 8-24%) - Interferences: 	High	Work item 292005 PrEN 13137	Pr: 1998/01 Fv: 2001/02 Pu: 2001/11	PrEN 13137 describes a direct and an indirect method for determination of TOC. The indirect method renders also TIC and TC. (PrEN 13137, method A) PrEN 13137 gives no quantitative information with respect to interferences and sources of error. Performance characteristics have been established in an European intercomparison study on five samples of waste and sludge and one synthetic mixture.

G.4	Redox potential	G.3a: Alternative to proposed reference method G3: Direct measurement of TOC	Direct measuring TOC: - First step: Carbonates removal with acid. - Second step: combustion and measuring of CO ₂ . <i>Remark:</i> Argument of not being proposed as reference method: - Method gives incorrect results in certain cases. - Precision in general not better than ref. method	- Unity of expression: mg/kg - Lowest quantitative level: 0.1% - Precision: Target: SR < 10(?)% (Validation: 6-26%) - Interferences:	Work item 292005 PREN 13137	Pr: 1998/01 Fv: 2001/02 Pu: 2001/11	PREN 13137 describes a direct and an indirect method for determination of TOC. The indirect method renders also TIC and TC, (PREN 13137, method A) while the direct method B. renders TOC only (by determining the carbon dioxide released on combustion between 900 and 1500°C).
		G.3b: Comparable method (alternative in certain cases): Loss on ignition	Determination of combustible species (Loss on ignition) for assessing the potential for incineration <i>Remark:</i> Argument of not being proposed as reference method: Method not relevant for landfilling. However, method may provide indicative (quick scan) information.	- Unity of expression: mg/kg - Lowest quantitative level: 0.1% - Precision: Target: SR < 10(?)% (Validation: 6-26%) - Interferences:	Work item 292 ... Doc. WG5/N459 (Loss on ignition)	St: Pr: Fv: Pu:	Method renders total combustible mass through ignition at 550°C to constant weight. Method is less specific compared to the TOC-method, but has already a widespread use in Member Countries.
G.4	Redox potential	To establish the redox status of a waste.	Method must render information about the redox status of a waste which may be a trigger to measure the redox capacity. <i>S: Redox potential as well in eluate!</i>	- Unity of expression: mV - Precision: ± 50 mV (Only indicative measurement necessary) - Interferences:	Not available as CEN method. National procedure available		
G.5	Reducing and oxidising capacity	To provide an indication of possible changes of redox capacity of the waste body.	Determination of the redox capacity by titration of the waste at L/S=2 l/kg with an oxidant or a reducing agent.	- Unity of expression: Mol/kg - Lowest level: - Precision: - Interferences:	Not available as CEN method. National procedure available		
G.6	Reactions between materials: generation of gas	Indication of inter- actions of wastes in the landfill such as generation of H ₂ gas or other gases. (Relevant for HW and NHW)	Waste must be subjected to high pH. (A test for gas formation at high pH may e.g. indicate the presence of metallic components capable of H ₂ formation, e.g. Al scrap, or NH ₃ formation from NH ₄ ⁺ containing wastes, etc., under landfill conditions by waste-waste interaction.)	- Unity of expression: l/kg - Lowest level: 0.1 l/kg - Precision: - Interferences:	Not available as CEN method. National procedure available		
G.7	Water content <i>Fr.+ Dry matter content</i>	Needed for expression of results and determination of L/S ratio. Also to be used as	Method must render the moisture content and/or the dry matter content of the waste. <i>Fr. and/or</i>	- Unity of expression: % (by weight) - Lowest level: 0.1 % - Precision:	Work item 292014 Doc. WG5/N181	St: Pr: 2002/06 Fv: 2003/11 Pu: 2004/08	CEN-document renders also method for liquids. Method for solids is based on determination of the remaining mass after drying to constant weight at 105 °C

DIGESTION OF RAW WASTE

REQUIREMENTS FOR THE LANDFILL DIRECTIVE

PROPOSALS BY CEN

REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ⁱ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ⁱⁱ	REMARKS TO CEN-METHODS IN PREPARATION IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
D.1	<p>Partial digestion of the solid waste prior to elementary analysis, leaving the silicate matrix in tact.</p> <p>A partial digestion method is needed in which the silicate matrix of the waste is left in tact (to determine the content of various elements according to a convention) prior to the analysis of aqua regia soluble elements.</p>	<p>To digest the solid waste for routine analysis of metals (elements).</p>	<p>- partial digestion method in which the silicate matrix of the waste is left in tact</p> <p>- digestion must be based on aqua regia solution</p> <p>- method must be applicable for determination of the constituents specified in table m.3, first section (elements) by e.g. AAS, ICP-AES or ICP-MS.</p> <p>A thermal heating apparatus must supply the heating of the aqua regia solution.</p> <p><u>Remark:</u> The required method provides rather uniform result, so it is chosen as reference method. In practice other, more practical methods are being used. However, this method is then often used for calibration of the alternative methods.</p>	<p>- Precision:</p> <p>- Interferences:</p>	High	<p>Work items 292013 PrEN 13657: 1999</p>	<p>St: 1999/07 Pr: 2001/03 Fv: 2001/03 Pu: 2001/12</p>	<p>In prEN 13657 for the heating of the aqua regia solution three methods are presented. No reasons for preference are given.</p> <p>The method in § 9.4, thermal heating, is proposed as reference method since it results in a rather reproducible standard result.</p> <p>Performance characteristics of all methods described have been established in an European intercomparison study on six samples of waste materials and sludges.</p>
	<p>D.1a. Alternative 1</p>	<p>Microwave assisted digestion (Closed vessel) A programmable microwave unit must supply heating of the aqua regia solution.</p> <p><u>Remark:</u> It is proposed to describe this method as a standard, as far as it is sure that the micro wave is calibrated in a way in which it leads to same results</p>	<p>- Precision:</p> <p>- Interferences:</p>			<p>Work items 292013 PrEN 13657: 1999</p>	<p>St: 1999/07 Pr: 2001/03 Fv: 2001/03 Pu: 2001/12</p>	<p>In prEN 13657 for the heating of the aqua regia solution three methods are presented. The method in § 9.2, microwave, closed vessel, describes a practical alternative; Comparability with the proposed reference test depends on the calibration of the microwave unit.</p>

D.2	Total digestion of the solid waste prior to elementary analysis	D.1b. Alternative 2	<p>Microwave assisted digestion (Open vessel) A programmable microwave unit must supply heating of the aqua regia solution.</p> <p><i>Remark:</i> It is proposed to describe this method as a standard, as far as it is sure that the micro wave is calibrated in a way in which it leads to same results</p>	<p>- Precision: - Interferences:</p>	Work items 292013 prEN 13657: 1999	St: Pr: 1999/07 Fv: 2001/03 Pu: 2001/12	In prEN 13657 for the heating of the aqua regia solution three methods are presented. The method in § 9.3, microwave, open vessel, describes a practical alternative; Comparability with the proposed reference test depends on the calibration of the microwave unit.
D.2		D.1c. Alternative 3	<p>A thermal heating apparatus must supply the heating of the aqua regia solution.</p> <p><i>Remark:</i> This method is in principle the same as the method mentioned under D2 as reference method. It is preferred that both methods are integrated by CEN, to one general test method that can be used for a wide range of materials as reference method.</p>	<p>- Precision: - Interferences:</p>	Work item 223071 CEN/TC 223 N 216	St: Pr: Fv: Pu:	Digestion method prior to the analysis of aqua regia soluble elements in soil improvers or growing media. Method is not applicable to e.g. liming materials, sewage sludge, rockwool and foam slabs. Performance characteristics have been established in an European intercomparison study on six samples of soil improvers and growing media.
D.2	D.1d. Alternative 4	<p>determination of trace elements - extraction with nitric acid</p> <p>- Total digestion method in which the complete matrix is destroyed, to determine the total content of various elements. - Method must be applicable for determination of the constituents specified in table m.3, first section (elements).</p> <p>Microwave assisted digestion (Closed vessel) <i>Remarks:</i> 1. Not necessary as basis for limit values in Annex II. Relevant to know the total content of constituents as basis for characterisation of wastes. 2. See also A.1a: direct method with X-rays.</p>	<p>- Precision: - Interferences: - Precision: - Interferences:</p>	Not available as CEN method. Available as national method.	St: Pr: Fv: Pu:	St: Pr: Fv: Pu: St: Pr: 1999/07 Fv: 2001/03 Pu: 2001/12 Fv: Delay?	Microwave assisted digestion with HF, HNO3 and HCl acid mixture for subsequent determination of elements. In prEN 13656 two methods are presented. No reasons for preference are given. Test method described in § 9.2, Microwave, closed vessel. Performance characteristics have been established in an European intercomparison study on six samples of waste materials/sludges.
D.2	D.2a. Alternative	Microwave assisted digestion (Semi-open vessel)	<p>- Precision: - Interferences:</p>	Work item 292012 prEN 13656: 1999	St: Pr: 1999/07 Fv: 2001/03 Pu: 2001/12	As D2, but test method described in § 9.3 Microwave wit semi-open vessel.	

D.3	Digestion of the solid waste prior to the analysis of anions	To prepare the solid waste sample for the determination of halogens, total cyanide and sulphate.	<p>- Method must be applicable to the digestion of waste for determination of the constituents specified in tables m.3/m.4, second section (anions).</p> <p>- Preparatory technique must be unambiguous.</p>	<p>- Precision:</p> <p>- Interferences:</p>	High	<p>For halogens and total sulfur: Work item 292007 WG 3/N 382 prEN xxxx</p>	<p>St:</p> <p>Pr:</p> <p>Fv:</p> <p>Pu:</p>	<p>CEN-document describes methods for determination of halogens and total sulfur (preparation for analysis by oxygen combustion in a closed system).</p> <p>Insoluble halides and sulfate present in the original sample or produced during the combustion step are not completely determined by these method(s).</p> <p>Other preparatory techniques are also allowed, e.g. high furnace combustion, acid digestion, alkaline fusion or Wickbold oxy-hydrogen flame combustion.</p> <p>Results of interlaboratory tests foreseen but not yet available.</p>
D. Re- mark			<p>Remark: For some analyses techniques no digestion is required. Those techniques give <i>total composition</i> like X-ray techniques (see A...) or neutron analyses techniques.</p>			<p>For CN (total) and SO_x: not available as CEN-method</p>		

ANALYSIS

REQUIREMENTS FOR THE LANDFILL DIRECTIVE

PROPOSALS BY CEN

REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ⁱ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ⁱⁱ	REMARKS TO CEN-METHODS IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
A.1	Analysis of inorganic constituents of solid waste and/or its eluate. (major, minor and trace elements)	For determination of the content of specified elements in extracts of solid waste, generated by digestion with an acid mixture or a leaching test.	<ul style="list-style-type: none"> - Methods must be appropriate for extracts, produced with different digestion techniques, as well as for (pre-served) eluates (modular approach) - Methods must generate the total content of the elements specified in tables m.3/m.4, first section under 'Elements': As, Ba, Cd, Co, Cr(total), Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Zn. - Methods also needed to generate the total content in extracts of the solid waste for the following major elements: Ca, (lowest level:mg/kg). <p>If certain generally used techniques for analysis can measure in relevant ranges of detection for waste, but not on the lowest level needed, these may be developed and included as well, as alternative, provide that:</p> <ul style="list-style-type: none"> - Precision is comparable - Alternative measures are cheaper and generally known/used techniques - (Quantitative) detection limits are sufficiently lower than limit values of certain classes of waste. 	<ul style="list-style-type: none"> - Unity of expression: µg/l for the measured content in the digestion extract or eluate; mg/kg for the calculated content in the solid waste. - Lowest level: see tables m.3/m.4 - Precision: see tables m.3/m.4 and [1] - Interferences: to be stated quantitatively 	High	For As, Cd, Cr(VI), Cu, Ni, Pb and Zn: Work item 292008 ENV 12506	Pr: 2000/01 Fv: Pu: 2000/01	ENV 12506 is developed for the analysis of eluates and not for digestion extracts of solid materials. It may be possible to use the same methods for both purposes. ENV 12506 does not give own procedures for analysis of constituents: it refers to other standards describing methods for, i.a., As, Cd, Cr(VI), Cu, Ni, Pb and Zn. The referred standards have primarily been developed and validated for the analysis of water samples . Performance characteristics for analysis of eluates have not been established. It is not clear if these standards are adequate for testing of waste. ENV12506; Methods are being validated for eluates
						For Hg: Work item 292008 PrEN 13370	Pr: 1998/09 Fv: 2000/10 Pu: 2001/06	PrEN 13370 is also developed for the analysis of eluates . It does not give own procedures: it refers to other (water) standards for, i.a., ammonium-N and Hg. Same remarks as for ENV12506. PrEN 13370; validation information for eluates available

		<p>Alternative or extra method.</p> <p>Method necessary for Annex II?</p>	<p>It has to be discussed whether it should be necessary of having a test method for Cr (VI)</p> <p><i>Remark:</i> This item is under preparation by CEN292; However it is not of special interest for Annex II. So the proposal is not to include it as a part of the mandate to CEN? Further on, the method describes a leaching test.....????</p>		<p>For: Ba, Cr (total), Co, Mo, Sb and Se: Not available as CEN-method</p> <p>For Cr-VI: Work item 292029 WG 3/N 376 Proposed new work item. Still discussion on technical content in the working group. Estimated date for discussion on the st.o.L art report in TC is June 2001.</p>	<p>St: 2002/06 Pr: 2003/11 Fv: 2004/07</p>	<p>Extraction method for the determination of the total content of Cr(VI) in raw waste (state of the art study available). Determination of Cr(VI) is demanded for car shredder residues (on raw waste)</p>
	<p>Alternative A.1a Total content with fast analysis procedure, without extraction step.</p> <p><i>Remark:</i> Method necessary for Annex II?</p>	<p>- Method generates direct information on total content of constituents in table m.3, (without digestion prior to analysis) - Small sample sizes needed: extra strain on sample pretreatment</p>	<p>- Unity of expression: µg/l for the measured content in the digestion extract or eluate; mg/kg for the calculated content in the solid waste. - Lowest level: see tables m.3/m.4 - Precision: see tables m.3/m.4 and [1] - Interferences: to be stated quantitatively</p>	High	<p>For most elements: Work item 2920.. WG 3/N 376 Proposed new work item</p>	<p>St: Pr: Fv: Pu:</p>	<p>Determination of elemental composition of waste by X-ray-fluorescence (Draft state-of-the-art document available). Quick screening method for simultaneous determination of a large number of elements in raw waste.</p>
A.2	<p>Analysis of inorganic constituents of solid waste and/or its eluate. (anions)</p>	<p>Method must generate information about the content of anions in extracts of digested solids and/or eluates, specified in table m.3/m.4, second section (anions: Br, Cl, CN-total, F and SO₄)</p> <p><i>Remark:</i> Methods for SO₄ in ENV 12506 and for CN in prEN 13370 are only suitable for water analysis; appropriate digestion methods for the solid waste not available.</p>	<p>- Unity of expression: µg/l for the measured content in the digestion extract or eluate; mg/kg for the calculated content in the solid waste. - Lowest level: see tables m.3/m.4 - Precision: see tables m.3/m.4 and [1] - Interferences: to be stated quantitatively</p>	High	<p>For Cl and SO₄: Work item 292008 ENV 12506 and</p>	<p>Pu: 2000/01</p>	<p>ENV 12506 is developed for the analysis of eluates and not for digestion extracts of solid materials. It may be possible to use the same methods for both purposes. ENV 12506 does not give own procedures for analysis of constituents: it refers to other standards describing methods for, i.a., Cl, NO₂ and SO₄. The indicated methods have primarily been developed and validated for the analysis of water samples. Performance characteristics for digested waste analysis have not been established. It is not clear if these standards are adequate</p>

									for testing of waste. ENV12506: Methods are being validated for eluates
									Pr: 1998/09 Fv: 2000/10 Pu: 2001/06 PrEN 13370 is also developed for the analysis of eluates . It does not give own procedures: it refers to other (water) standards for, i.a., CN-easily liberatable, and F. Same remarks as for ENV12506.
									For CN-easily liberatable, and F: PrEN 13370 For Br: Not available as CEN-method
									For asbestos: not available as CEN method; National standards available
									See leaching tests of ENV 12506
									Pr: 1998/09 Fv: 2000/10 Pu: 2001/06 PrEN 13370 describes also methods for analysis of As, Cd, Cr(VI), Cu, Ni, Pb, Zn, Cl, NO ₂ , and SO ₄ in eluates. PrEN 13370 describes also methods for the analysis of ammonium-N, AOX, Hg, phenol index, TOC, CN, and F in eluates.
									Not available as CEN-method; Available in ASTM (Maybe EN 872 (appropriate))
A.3	Asbestos in solid waste <i>Fr: This is unnecessary, since knowledge of the presence is already known by other regulations.</i>	To determine the presence of bound and loosely bound asbestos	- Method must generate information about the risk of exposure to (or content of) bound and loosely bound asbestos inhalation (dusting). - Further specification is needed of the types of asbest to be included in the test, the levels, etc.	- Unity of expression: mg/kg - Lowest level: see table m.3 - Precision: see table m.3 and [1] - Interactions:	Med				
A.4	pH	To establish the acidity of the eluate	Method must be applicable to eluates from all leaching tests		High				
A.5	Electrical conductivity	To establish possible interactions of different waste batches in case of high salt content in the eluate and to evaluate the global salt release	Method must be applicable to eluates from all leaching tests <i>Remark:</i> Rough indication of salt load in waste		High				
A.6	Total Dissolved Solids	To determine the total quantity of readily soluble salts and particles in the waste.	Method must generate information about Total Dissolved Solids (TDS) in the eluate	- Unity of expression: % (by weight) - Lowest level: 1 % - Precision: - Interactions:	Low				<i>Fr: Possibly standards for waste water?</i>

A.7	Dissolved Organic Carbon	To determine the Dissolved Organic Carbon in the eluate.	Dissolved Organic Carbon (DOC = TOC in eluate): to determine organic components that can enhance leaching of inorganic and other organic constituents (mobilisation). (In comparison with DOC mobilisation at neutral pH from a range of biodegradable wastes provides a method to quantify degradability)	<ul style="list-style-type: none"> - Unity of expression: µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interactions: 	High	Work item 292008 prENV 13370	Pr: 1998/09 Fv: 2000/10 Pu: 2001/06	PrEN 13370 does not give own procedures for analysis of constituents in eluates: it refers to other (water) standards for, i.a., DOC. Same remarks as for ENV12506.
A.8	Analysis of organic constituents of solid waste	To determine the content of PAH, mineral oil, BETX, phenols, organo-chlorinated pesticides, organic non-chlorinated pesticides, PCB, and EOX in the solid waste	<ul style="list-style-type: none"> - Methods must generate information about the total content of the organic groups specified in table m.3, fourth section (organics, sum parameter only). - PAH = (16 species?) 	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest level: see table m.3 - Precision: see table m.3 and [1] - Interferences: 	High	For PAH: not available as CEN-method, National standards available		
			<ul style="list-style-type: none"> - Mineral oil = ... C10-C40 - Gas chromatographic method as reference 	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest level: see table m.3 - Precision: see table m.3 and [1] - Interferences: 	High	For mineral oil: Work item 292006 PrEN 14039: 2000 <i>Alternative method:</i> Work item 292020 WG 3/N 383 PrEN xxxx	Pr: 2000/09 Fv: 2001/10 Pu: 2002/07	prEN 14039 describes a gas chromatography method for mineral oil. Not yet validated.
			- PCB =	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest level: see table m.3 - Precision: see table m.3 and [1] - Interferences: 	High	For PCB: Work item 292028 WG 3/N ... prEN xxxx Still discussion on technical content in the working group. Estimated date for approval TC is December 2001.	Pr: delay? St: 2001/12 Pr: 2002/12 Fv: 2004/05 Pu: 2005/02	CEN document describes a method for Polychlorinated Biphenyls (PCB) in waste
			- Phenols =	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest level: see table m.3 - Precision: see table m.3 and [1] - Interferences: 	High	For Phenols: Work item 292008 PrEN 13370	Pr: 1998/09 Fv: 2000/10 Pu: 2001/06	PrEN 13370 describes methods for, i.a., AOX and phenol index. The indicated methods have primarily been developed and validated for the analysis of water samples . Performance characteristics for digested waste analysis have not been established.

		<p>- BETX =</p> <p>- Organo chlorinated pesticides =</p> <p>- Organo non-chlorinated pesticides =</p> <p>- EOX =</p> <p>Alternative: GC/MS</p> <p><u>Remarks:</u></p> <p>- How to use this document? Only as guideline or as starting point for a standard on this subject?</p> <p>- To be used and/or standardised for Annex II?</p>	<p>- Unity of expression: mg/kg</p> <p>- Lowest level: see table m.3</p> <p>- Precision: see table m.3 and [1]</p> <p>- Interferences:</p>	High	<p>For BETX, organo chlorinated pesticides, organo non-chlorinated pesticides and EOX: not available as CEN-method; National standards available</p> <p>CEN/TC 292/WG 3/N 496</p> <p>ISO/TC 190/SC 3 N 393</p>	<p>St:</p> <p>Pr:</p> <p>Fv:</p> <p>Pu:</p>	<p>Useful guideline for the GC/MS identification of target compounds.</p> <p>Criteria for identification of target compounds in soil samples, based on the relative retention times and the intensity of selected diagnostic ions (3 PAH, 3 OCB, 2 PCB, 2 herbicides).</p>
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LEACHING TESTS

REQUIREMENTS FOR THE LANDFILL DIRECTIVE

PROPOSALS BY CEN

REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD	REFERENCE TO CEN-METHODS IN PREPARATION ⁱ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ⁱⁱ	REMARKS TO CEN-METHODS IN PREPARATION IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE
L.1	Percolation simulation test for inorganic constituents	<ul style="list-style-type: none"> - To determine the short-term leaching behaviour of waste under percolating conditions in the landfill - To determine the long-term leaching behaviour of waste under percolating conditions in the landfill 	<ul style="list-style-type: none"> - Method must generate information about the short and long term leaching behaviour as a function of L/S ratio, which relates to a time scale - L/S-range from 0.1 to 10 l/kg, under saturated percolating conditions (upflow) - Grain-size in the test should preferably be (95%)<4mm - Column diameter and height should be statistically adequate for obtaining a representative result. - The size of the sample, from which the test sample is taken, should be statistically adequate. - Method must reflect local equilibrium in the test. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter <p><u>Remarks:</u> (To be discussed)</p> <ol style="list-style-type: none"> 1. This method could be chosen as reference method: Under up-flow conditions in general more representative and reproducible test results can be obtained than in a down-flow test, as channelling is minimised. 2. For some materials a grain size 95% < 10 mm may be more appropriate in view of sample representativeness (To be checked if necessary and under which conditions) 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	High	Work item 292034 PrEN xxxx	Pr: 2001/12 Fv: 2003/06 Pu: 2004/03	

L.2	Percolation simulation test for inorganic constituents	-To determine/simulate the short term and long term leaching behaviour, including simulating conditions of specific scenarios under specific conditions	<ul style="list-style-type: none"> - Method must generate information about the short and long term leaching behaviour as a function of L/S ratio which relates to a time scale - L/S-range from 0.1 to 10 l/kg, under saturated percolating conditions. - Percolation velocity, L/S-range, upflow or downflow, etc. could be made variable, related to specific circumstances (specific conditions in specific scenario's). - Grain-size in the test should preferably be (95%)<4mm - Column diameter and height should be statistically adequate for obtaining a representative result. - The size of the sample, from which the test sample is taken, should be statistically adequate. - Method must generate chemical equilibrium in the test. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter <p><u>Remarks:</u> (To be discussed)</p> <ul style="list-style-type: none"> - This method could be used as alternative for L.1 under strict specified upflow and velocity conditions - Is it necessary to select an alternative percolation test in Annex II - Could this test with different conditions be unambiguously used as mandatory test or could it only be used as a characterisation test, especially for certain specific situations? 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	Med	Work item 292035 Still discussion on technical content in the working group. Estimated date for approval TC is May 2002.	Pr: 2003/05 Fv: 2004/11 Pu: 2005/08	
L.3	Compliance leaching test for granular waste	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1 (L.1). Alternative L.3	<ul style="list-style-type: none"> - 1-step batch test at L/S = 2 l/kg - Grain size 95% < 4 mm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. Duration of the test should reflect this - The method should show a good agreement/correlation with the results of a corresponding comprehensive test at level 1. - The main aspects of the test are that it is of short duration (maximum 1 - 2 days for this batch test as such), 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	High	EN 12457-1	Pr: 1999/11 Fv: 2001/06 Pu: 2002/03	

L.3.a	Compliance leaching test for granular waste	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1 (L.1). Alternative L.3a	<ul style="list-style-type: none"> - does not require costly special equipment and produces sufficiently reliable results. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter - 1-step batch test at L/S = 10 l/kg - Grain size 95% < 4 mm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. Duration of the test should reflect this - The method should show a good agreement/correlation with the results of a corresponding comprehensive test at level 1. - The main aspects of the test are that it is of short duration (maximum 1 - 2 days for this batch test as such), does not require costly special equipment and produces sufficiently reliable results. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	High	EN 12457-2	Pr: 1999/11 Fv: 2001/06 Pu: 2002/03	
L.3.b	Compliance leaching test for granular waste	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1 (L.1). Alternative L.3b	<ul style="list-style-type: none"> - 2-step batch test at L/S = 2 and at 8 l/kg - Grain size 95% < 4 mm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. Duration of the test should reflect this - The method should show a good agreement/correlation with the results of a corresponding comprehensive test at level 1. - The main aspects of the test are that it is of short duration (maximum 1 - 2 days for this batch test as such), does not require costly special equipment and produces 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	High	EN 12457-3	Pr: 1999/11 Fv: 2001/06 Pu: 2002/03	

L.3.c	Compliance leaching test for granular waste	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1 (L.1). Alternative L.3c	<p>sufficiently reliable results.</p> <ul style="list-style-type: none"> - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter 	<ul style="list-style-type: none"> - 1-step batch test at L/S = 10 l/kg - Grain size 95% < 10 mm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. - Duration of the test should reflect this - The method should show a good agreement/correlation with the results of a corresponding comprehensive test at level 1. - The main aspects of the test are that it is of short duration (maximum 1 - 2 days for this batch test as such), does not require costly special equipment and produces sufficiently reliable results. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter <p><u>Remarks:</u></p> <ul style="list-style-type: none"> - It should be discussed which of the four alternative tests should be chosen as reference - Could one of them be chosen as reference? Does it depend on differences in situations and differences in questions to be answered, which of the tests is relevant? - Is it necessary to use all 4 of them, or could the number be decreased, e.g., based on results of validation tests and other investigations? 	High	EN 12457-4	Pr: 1999/11 Fv: 2001/06 Fu: 2002/03		
L.4	pH dependence test for inorganic constituents	To determine the leaching behaviour of waste under	<ul style="list-style-type: none"> - Leaching must be established at externally driven pH-conditions in the range from pH=3 till pH = 12. - 8-step batch test, each at L/S = 10 l/kg 	<ul style="list-style-type: none"> - Unity of expression: mg/kg and µg/l - Lowest level: see table m.4 - Precision: see table m.4 and [1] - Interferences: 	High	Work item 292033 Doc. WG6/N227 PrEN xxxxx,	St: Pr: 2002/06 Fv: 2003/12	The test method is a parameter specific test as specified in: ENV 12920, 'Characteri-	

	<p>L.5 Availability test for inorganic constituents</p> <p><i>Fr: To be discussed on the basis of a state of the art document, with proposals for the use of a test.</i></p>	<p>altered pH conditions (generated by neutralisation of the landfill or by inter- actions of different waste batches).</p>	<ul style="list-style-type: none"> - Grain size 95% < 4mm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. Duration of the test should reflect this - The main aspects of the test are that it does not require costly special equipment and produces sufficiently reliable results at pH-conditions other than own pH. - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter 	<ul style="list-style-type: none"> - Precision: - Interferences: 		<p>Part 2 (see also work item 292032)</p> <p>Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.</p>	<p>Pu: 2004/09</p>	<p>sation of waste – Methodology for the determination of the leaching behaviour of waste under specified conditions’.</p>
		<p>To determine the potential availability of inorganic constituents for leaching under optimised (but not extreme) conditions</p>	<ul style="list-style-type: none"> - The method must assess the potentially leachable amount of various constituents from a landfilled waste material over a very long period of time and under changing conditions. - The method must be useful as a screening tool to determine a relevant analytical programme for other leaching tests. - Leaching must be established at externally driven pH-conditions at a level of pH= 7 and pH = 4, at L/S = 100 l/kg - Grain size 95% < 250 µm - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate - Method must aim at reaching equilibrium in the test. Duration of the test should reflect this - The main aspects of the test are that it provides an upper limit of release under any environmentally or land-fill scenario-relevant condition - Other aspects are that the test is of short duration, does not require costly special equipment and produces sufficiently reliable results - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) 	<ul style="list-style-type: none"> - Unity of expression: mg/kg - Lowest level: - Precision: - Interferences: 	<p>High</p>	<p>Included in Work item 292010</p>	<p>St: 2002/06 Fv: 2003/11 Pu: 2004/08</p>	

			<ul style="list-style-type: none"> - Before analysis the eluate must be filtered through a 0.45 µm filter <p><u>Remarks:</u></p> <ul style="list-style-type: none"> - Could be a screening test to identify the leaching of insignificant amounts of constituents. 				
L.6	Dynamic Monolith Leaching test for inorganic constituents	To determine the long-term behaviour of monolithic materials in which several processes are important. This is relevant for evaluating waste behaviour as monolith in a landfill (e.g. stabilised waste).	<ul style="list-style-type: none"> - Method must generate information about mechanisms controlling leaching (diffusion, dissolution, etc.) of monolithic materials of a certain minimum size (>800??cm³) as a function of time and with predetermined durability for disposal at a landfill for monolithic waste - Results of the test must be expressed in mg/m² after 2 days of testing. With adequate formulae it must be able to make extrapolations for the long term - Test procedure and test circumstances must allow the measuring of rather low emissions, e.g. by choosing adequate relation between sample size, amount of water and duration of the test steps. - Test should be adequate for obtaining a representative result. - The size of the sample, from which the test sample is taken, should be statistically adequate - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter 	<ul style="list-style-type: none"> - Unity of expression: mg/m² - Lowest level: - Precision: - Interferences: 	High	<p>Work item 292... Doc. WG6/N468</p> <p>Still discussion on technical content in the working group.</p>	<p>St: Pr: Fv: Pu:</p>
L.7	Compliance leaching test for inorganic constituents of monolith waste of regular shape	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1 (L.6).	<ul style="list-style-type: none"> - The method should show a good agreement/correlation with the results of a corresponding comprehensive test at level 1. - The main aspect of the test is that it is of short duration, does not require costly special equipment and produces sufficiently reliable results - Test procedure and test circumstances must allow the measuring of rather low emissions, e.g. by choosing adequate relation between sample size, amount of water and duration of the test steps. - Test should be adequate for obtaining a representative results. - The size of the sample, from which the test sample is taken, should be statistically adequate 	<ul style="list-style-type: none"> - Unity of expression: mg/m² - Lowest level: - Precision: - Interferences: Due to the short duration of the test surface wash-off must be prevented or accurately quantified (may dominate the release) 	High	<p>Work item 292010 Doc. WG2/N124</p> <p>Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.</p>	<p>St: 2002/12 Pr: 2004/06 Pu: 2005/02</p>

L.8	Physical stability test for monoliths (assessment of the monolithic character of a waste material)	Decision tool to distinguish whether testing as monolith in a diffusion simulation test is acceptable, because of sufficient durability in the long term	<ul style="list-style-type: none"> - No significant loss of constituents from the test during the whole procedure (e.g. volatile constituents, sedimentation in the apparatus or on the glassware, etc. of the apparatus) - Before analysis the eluate must be filtered through a 0.45 µm filter - Materials must be stable on the long term (thousands of years): no significant loss or destruction of the material, e.g. by reaction with water, carbonation, other chemical reactions, temperature, physical stress, etc. - Stability must also be guaranteed in situations that the conditions are (temporally) worse than the design circumstances, e.g. in periods covers are leaking more than designed. 	High	Work item 292031 Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	St: Pr: 2002/12 Fv: 2004/06 Pu: 2005/02	
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- i Only methods that are made available or being prepared by CEN/TC 292 or related TC's are mentioned here.
When stated as 'not available' appropriate standardised methods are possibly available in individual Member States, e.g. as national standards.
- ii Legend: **St:** start as work item; **Pr:** draft standard; **Fv:** formal vote for publication in CEN/TC; **Pu:** publication as standard
- iii This is not really an intrinsic waste property but depends also on the physical placement of the waste in the landfill.

Table m.2: Research items for future tests and procedures for characterisation of waste (Draft proposal 30-4-2001)

RESEARCH ITEMS FOR FUTURE TESTS AND PROCEDURES							
REQUIREMENTS FOR THE LANDFILL DIRECTIVE							
REF	WASTE PROPERTY OR PARAMETER	FUNCTION OF THE TEST	REQUIREMENTS FOR THE TEST METHOD	PERFORMANCE REQUIREMENTS OF THE STANDARDS	PRIORITY FOR LD		
PROPOSALS BY CEN							
			REFERENCE TO CEN-METHODS IN PREPARATION ⁱ (or Work Items of CEN/TC's)	TIME SCHEDULE PROPOSED BY CEN ⁱⁱ	REMARKS TO CEN-METHODS IN VIEW OF THE REQUIREMENTS FOR THE LANDFILL DIRECTIVE		
R.1	Ecotoxicity <i>Fr: This work has to be connected with the work under development to characterise hazardous waste</i>	To determine the ecotoxicity of leachate from a landfill ?? <i>Fr: To determine the ecotoxicity of solids and eluates. Global characterisation which may be useful to detect unexpected contamination of a waste.</i>	- Applicability of such tests for a first general scan to detect certain risks? - Applicability of such tests as acceptance criterion for the landfill of waste not yet discussed? - Indication of how to use data as a first scan and/or in a regulatory framework	To be discussed on the basis of a state of the art document, with proposals for the use of a test.	Low	Work item 292027 Doc. WG 7/N 15 PREN ... Still discussion on technical content in the working group. Estimated date for approval TC is June 2001.	Preparation of waste samples for ecotoxicity tests. Determination of a test battery for characterisation of ecotoxicological properties of waste is not included
R.2	Eluate preservation	Instructions on the preservation and handling of eluate samples	- Selection of methods suitable for eluate preservation and handling: adopt existing methods as far as possible	To be discussed on the basis of a state of the art document, with proposals for the use of a test.	Low	CEN/TC 230 EN-ISO 5667-3:1995	Useful information about methods which are generally suitable for the preservation and handling of liquid samples. Not a normative document
R.3	Percolation simulation test for organic constituents	To determine the short- and long-term leaching behaviour of organic constituents of waste under percolative conditions in the landfill	- Investigation: for which organic (groups of) constituents a leaching test could be developed and used in an appropriate way? - Method must generate information about the short and long term leaching behaviour (as a function of L/S ratio, which relates to a time scale) under saturated percolating conditions. - Information should be available on the relation between leaching in the lab and in the field. - Role of DOC release crucial for mobility of water insoluble organics.	To be discussed on the basis of a state of the art document, with proposals for the use of a test.	Low	Not available	

R.4	Compliance leaching test for granular waste for organic constituents	To check/establish the compliance with some characteristics of the waste as determined by full characterisation at level 1.	- There should be an adequate relation with a characterisation test (R.3.)	To be discussed on the basis of a state of the art document, with proposals for the use of a test.	Low	Not available	
R.5	Diffusion simulation test for organic constituents	To determine the long-term behaviour of organic constituents of monolithic materials. (Check on diffusion controlled leaching behaviour).	- Investigation: for which organic (groups of) constituents a leaching test could be developed and used in an appropriate way? - Method must generate information about diffusion controlled leaching of materials with predetermined durability for disposal at a landfill for monolithic waste. - Information should be available on the relation between leaching in the lab and in the field. - Behaviour of DOC crucial in test	To be discussed on the basis of a state of the art document, with proposals for the use of a test.	Low	Not available	

- i Only methods that are made available or being prepared by CEN/TC 292 or related TC's are mentioned here.
When stated as 'not available' appropriate standardised methods are possibly available in individual Member States, e.g. as national standards.
- ii Legend: **St**: start as work item; **Pr**: draft standard; **Fv**: formal vote for publication in CEN/TC; **Pu**: publication as standard

Sweden: An 'Oxidised availability test' is missing

Table m.3: Relevant concentration levels for constituents of inert raw waste

Constituents of inert raw waste	Content	
	Testing requirement (Quantitative) (mg/kg)	Testing requirement (Qualitative = 'Detection limit') (mg/kg)
Elements:		
As	5 – 15	1.5 – 5
Ba	60 – 200	20 – 60
Cd	1 – 3	0.3 – 1
Co	20 – 50	7 – 20
Cr (total)	30 – 100	10 – 30
Cu	15 – 50	5 – 15
Hg	0.5 – 50	0.1 – 0.5
Mo	15 – 50	5 – 15
Ni	15 – 50	5 – 15
Pb	50 – 150	15 – 50
Sb	5-10	2-5
Se	2-5	1-2
Sn	10 – 30	3 – 10
Zn	50 – 150	15 – 50
Anions:		
Br	30 – 100	20 – 50
Cl	100 – 200	15 – 50
CN (total)	2 – 5	0.7 – 2
F	50 – 150	15 – 50
SO ₄	100 – 200	30 – 100
Other inorganic constituents:		
Asbestos bound	1-5	<1
Asbestos loosely bound	<1	<1
Organics:		
Total Organic Carbon (TOC)	5000	1000
PAH (sum of 10 or 16)	5 – 15	2 – 5
Mineral oil	50 – 150	15 – 50
BTEX	0.2 – 0.4	0.05 – 0.2
Phenols + organochloro pesticides (sum)	0.05 – 0.15	0.02 – 0.05
Non-chloro pesticides (sum)	0.05 – 0.15	0.02 – 0.05
PCB (sum of 7)	0.05 – 0.15	0.02 – 0.05
EOX	0.5 – 1.5	0.2 – 0.5

Remark to table m.3 This table gives an impression of the constituents for which tests should be able to generate adequate data.

The needed detection levels still should be discussed. In Memorandum 'Quality Requirements for test methods that have to be developed by CEN' (1) some general points of attention and discussion on quality aspects of tests and analyses have been presented. In this document proposals for deciding on the magnitude of detection levels have been given as well. These points and values still have to be discussed.

For each constituent two levels are presented for quantitative detection limits and for qualitative detection limits. In each case, the highest level is connected to a minimum quality, that would be needed for evaluating a material against the limit values in Annex 2 for inert waste. The lowest level could be relevant if Member States would use more strict

limit values or in cases where concerned parties want to detect the quality of a material on a lower level below the limit value, to be more sure about the distance between the limit value and the real value in the material.

In this example a factor 3 has been used between the lowest and the highest level for having a first general feeling about possible target values for detection. Final values can be discussed and included in the list after agreements on (the magnitude of) limit values for inert waste and other waste in TAC.

Having more than one value in the list for each constituent may be relevant if not only reference tests will be developed but alternative tests as well. Maybe some of these alternative test cannot deliver such low detection limits, but can give quite good results on a higher level. So, maybe it could be useful as well to compare the qualifications of candidate alternative tests with the limit values that will be proposed for non-hazardous waste and for hazardous waste.

Table m.4: Relevant concentrations levels in eluates of inert waste

Constituents	Concentrations in mixed eluates (based on L/S = 10 l/kg)	
	Testing requirement (Quantitative as needed)	Testing requirement (Qualitative as needed = 'Detection limit')
	(µg/l)	(µg/l)
Elements:		
As	5 - 15	1.5 - 5
Ba	10 - 25	10
Cd	0.1 - 0.2	0.02 - 0.07
Co	2 - 5	1 - 2
Cr (total)	3 - 10	1 - 3
Cu	3 - 10	1 - 3
Hg	0.03 - 0.05	0.02
Mo	2 - 5	1 - 2
Ni	2 - 5	1 - 2
Pb	3 - 10	1 - 3
Sb	0.2 - 0.6	0.07 - 0.2
Se	0.1 - 0.2	0.03 - 0.1
Sn	1 - 2	0.1 - 0.8
Zn	10 - 50	5 - 15
Anions:		
Br	10 - 20	5 - 10
Cl	1,000 - 3,000	100 - 500
CN (total)	2 - 5	1.5 - 2
F	50 - 100	15 - 30
SO ₄	1,000 - 15,000	100 - 500
Other constituents:		
DOC	2,000 - 5,000	1,000 - 2,000

Remark to table m.4.

See remarks for table m.3.

Table m.5: Discussion points and decision points for LFD-TAC Subcommittee and for CEN (Draft 30-4-2001)

DISCUSSION AND DECISION ITEMS FOR IMPLEMENTATION OF TEST METHODS IN THE LANDFILL DIRECTIVE			
REFERENCE TO TABLES m.1 and m.2	DISCUSSION POINTS IN VIEW OF THE LANDFILL CRITERIA	PROPOSALS/DECISION POINTS FOR TAC/COMMISSION	PROPOSALS/QUESTIONS FOR CEN
General;	Starting points for standards: a-Mandate b- Modular built up system of standards c- Horizontal approach (between subjects/TC's) d- Unambiguous standards e- Normative references to dated other standards only f- Statistical basis as far as possible g- Only reference methods / or alternative methods as well? h- Normative standards (or informative?) j- Validated standards, as far as possible k- Quantitative lowest detection limits m- Precision; general quantitative/qualitative target values	a- Decision on mandate/ umbrella mandate b1- Decision on TAC/CEN guidance group for execution of the mandate b2- Starting points modular system; realisation, as soon as possible. c- Starting points horizontal approach; no different standards in different area, if not strict necessary d- Starting point; unambiguous references from legislation to standards e- Only reference to dated standards f- Statistical basis as far as possible g- Default is: only one reference method; in special cases alternative methods, if good argued and identical results. h- Default is: normative standards; other types of documents only if unavoidable and specifically agreed. j- Validation is desirable. If not directly, as soon as possible later on. k- Deciding on a list of quantitative lowest detection levels m1- Standards must inform about precision and lead to measuring results with a known level of precision; m2- Decision on minimal desired or wished (indicative) target levels of precision?	b- General CEN decision. Development strict modular system; introduction in new, revised and PrEN→EN standards c- General CEN decision. Active coordination and realisation within CEN. d- uniform edit of standards (structure, definitions, etc.); revision drafts, etc e- check all references on suitability and quality; choose specific (dated) standards as reference. f- revision (drafts) as soon as possible g- revision (draft) standards to make unambiguous specific references possible h- Depending on decision in TAC j- Programming validation; parallel to standardisation procedure or as soon as possible after finalising standardisation procedure m1- Check on performance of test methods; uniform definitions. m2- Revising (draft) (pre) standards where possible; adding information and introduction normative and informative elements on precision
S.1 to S.5 (sampling methods)	S.0. General criteria for sampling S.1. Sampling plan S.2. Sampling strategy (formulae, instructions, etc) S.3. Sampling techniques (description main techniques) S.4. Sampling pre treatment in the field S.5. Sampling packaging, transport preservation, etc.	a- Decision on general criteria from legislation for different objectives for which tests formally are used. b- Decision on system to link legislation (Annex 2) unambiguously with standards. c- Decision on use of standards S.1.-S.5 as normative of informative documents	a. check sampling standards on unambiguous relation with general demands and general legislative criteria b. Development of special (covering) documents for relation between standards and legislation (as far as necessary from further decisions) c. Change standards to normative standards as far as needed or wished by TAC
P.1 to P3. (test methods for pre-treatment of laboratory samples) P.1. pre treatment solid waste samples, prior to digestion or	a- Stricter, normative instructions or general qualitative guidelines? b- Pre treatment for extraction of inorganics only? What for leaching tests, analyses, other steps?	a- Pre treatment on a systematic, unambiguous and normative basis b- Standards for pre treatment for each of the steps in laboratory, each in balance with sampling quality.	a- Revision of all the paragraphs in standards on pre treatment, to transfer them to the same systematic and normative basis. b- Include pre treatment in the modular system as a separate module, to be used in each case

DISCUSSION AND DECISION ITEMS FOR IMPLEMENTATION OF TEST METHODS IN THE LANDFILL DIRECTIVE			
REFERENCE TO TABLES m.1 and m.2	DISCUSSION POINTS IN VIEW OF THE LANDFILL CRITERIA	PROPOSALS/DECISION POINTS FOR TAC/COMMISSION	PROPOSALS/QUESTIONS FOR CEN
prior to leaching tests (inorganics) P.2. pre treatment extracts from solid waste digestion or eluates from leaching tests, prior analyses (inorganics) P.3. pre treatment for extraction from solid waste or pre treatment eluates from leaching tests, prior analyses (organics)	c- Statistical basis for each of the tests?	c-The same systematic and statistic approach for each of the pre treatment steps.	where pre treatment is needed. c- Include concrete, statistical based, requirements, in balance with the actual sampling procedure.
G.1 to G.10 (general waste properties)	G.2. PDOC; new method in CEN G.3. TOC; several methods available. G.4. Redox potential G.5. Reducing and oxidising capacity G.6. Reactions between materials G.8. Load bearing capacity G.9. Shear G.10. Permeability	G.3. Selection of reference method G.2.+ G4 - G.10: Decision, based on state of the art document and proposals.	G.2. - Development State of art document + proposal (Med. Pr) G4. - Development State of art document + proposal (Low. pr) G5. - Development State of art document + proposal (Low. pr) G5. - Development State of art document + proposal (Low. pr) G.8, G.9, G.10: - Development State of art document + proposal (Low. pr) in co-operation with relevant CEN-TC's
D.1 to D.3 (digestion methods)	a- Do we need total or partial digestion? b- If partial digestion is needed, which of the test methods? c- One reference method only? Or (more practical) alternative method(s) as well? d- Test methods for total digestion for characterisation (see also A.)	a- Reference method: prEN 13657, par. 9.4 aqua regia with thermal heating? b- Alternative: prEN 13657, par.9.2/3 microwave? c- Methods to be made uniform with other (pr)EN's; and so with standards of other TC's? d- Test methods for total digestion needed as test method in Annex 2?	- Depending on decisions of TAC
A.1 and A.2 (content of inorganic constituents)	a- relevant elements and anions (see table m.3) b- approve or amend the list of performance requirements (detection limits and precision) c- Only (sophisticated new) reference methods or other methods with same quality and commonly in use in many labs.	a- Approve list of requirements (constituents, levels, quality requirements) b- Only reference tests or also alternative tests? c- Reference methods to be chosen. If other methods are more practical in certain situations and have the same quality, they may be chosen as alternatives	a- Check proposed tests on quality requirements; select adequate test methods only. b- Add methods for constituents that are not yet covered c. A proposal for selection of reference tests and alternatives.
A.1.a and A.2a (Remark)	- Same or different methods (A1. and A2.) for analyses of solids and analyses of eluates.?	b. Decision on proposals of CEN	a. Check if different procedures are necessary; → proposals.
A.3 (asbestos)	- Selection of the method.	- Decide on starting points for the test	- State of the art document, with proposals - Develop test
A.4. (pH in eluates)			

**DISCUSSION AND DECISION ITEMS FOR IMPLEMENTATION OF TEST METHODS
IN THE LANDFILL DIRECTIVE**

REFERENCE TO TABLES m.1 and m.2	DISCUSSION POINTS IN VIEW OF THE LANDFILL CRITERIA	PROPOSALS/DECISION POINTS FOR TAC/COMMISSION	PROPOSALS/QUESTIONS FOR CEN
A.5. (Electrical Conductivity)			
A.6, A.7 (TDS and DOC)	- TDS and DOC	- Decide on test method for TDS and DOC	- Develop test on TDS; State of the art document and proposal.
A.8 (content of organic constituents)	a- approve or amend the list of organics in table m.2 b- approve or amend the list of performance requirements c- Only (sophisticated new) reference methods or other methods with same quality and commonly in use in many labs.	a- Approve list of requirements (constituents, levels, quality requirements) b- Only reference tests or also alternative tests? c- Reference methods to be chosen. If other methods are more practical in certain situations and have the same quality, they may be chosen as alternatives	a- Check proposed tests on quality requirements. b- Add methods for constituents that are not yet covered c. A proposal for selection of reference tests and alternatives.
A.8a: Remark:	- Same or different methods (A.8.) for analyses of solids and analyses of eluates, as far as test methods for leaching of organics would be developed in future?	b. Decision on proposals of CEN	a. Check if different procedures are necessary; → proposals.
A.9. (Analyses with X-ray techniques, etc.)	- Is there a special function for direct, non destructive, techniques (as X-ray) for characterisation of waste or for (fast) checks on quality of waste?	a- Do these techniques have a formal function in Annex 2. Or could they be used for quality control as an alternative test?	b. Further development, depending on decision of TAC.
L1, L.2 (percolation tests for granular waste)	Percolation test under <i>upflow</i> conditions (L1), or under specific conditions for specific scenario's (L2)	a- Selection of one 'Reference test' with upflow conditions? Or the method, usable for special conditions in specific scenario's? b- Special function for the other test in the Annex ? c- Needed levels of detection; table m.4.?	d- Further development of selected test(s). e- Validation of selected test(s)
L.3 (Compliance test for granular waste)	- 4 variants of the batch test have been developed. L/S = 2, L/S = 10, L/S = 2 and 8 (together 10) and L/S=10 with bigger particle size.	a- Including all tests in the list, or selection at this moment. b- What criteria for selection? c- Could one of the tests be used as reference test? Or is it possible in each case to choose a batch test as compliance test that provides results closest to the characterisation test?	d- Finalisation of selected test(s). e- Validation of selected test(s)
L.4, (pH dependence test)	-	-	- Further development
L.5 (availability test)	-	- Discuss the (potential) role(s) of the test	- Further development
L.6 (Diffusion test for monoliths)	-	-	- Making of a work item
L.7 (Compliance diffusion test for monoliths)	-	-	- Further development
L.8 (Stability test for monoliths)	- Which objectives should be the basis for a test.	b- Discuss objectives, based on a technical document of CEN	a-Preparation of a discussion and decision document for TAC

Tests in table m2. (Research items for optional future tests)			
R1 - R5		b. Decision in TAC, based on CEN-	a. Preparation state of the art documents and proposals for each of

		documents and other information on needs, usability and priority.	the items
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Remarks:

State of the art document and proposals:

For new items, it is desirable to start with a state of the art document on the subject, with motives, options, requirements and proposals for the development of a new test. On the basis of such a document, and on other information available, it may be discussed in the TAC if such a test (and which of the alternatives) should be developed. In CEN it should be discussed, which TC should develop it, in co-operation with what other TC's high / medium / low priority:

As far as it is not possible to work on these tests the same time, the priority levels in table m.1. give the sequence of the work. If the work still has to be started, in 2001 at least a state of the art document should be ready to decide on by TAC and CEN. Only for the test methods in table m.2. it is not necessary to prepare those documents in 2001

Values in table m.3 and m.4.

The limit values in the tables m.3. and m.4. are indicative. These values should be discussed further. Indicative limit values for inert waste could provide reference levels for these limit values.

References

- [1] Memorandum 'Quality Requirements for test methods that have to be developed by CEN', Distributed in TAC 4-4-2001 and mailed afterwards to TAC-members)