

Excavated soil

Analyses and relation with Landfill Directive in some EU countries



Jaap-Willem Hutter (Business Development Manager)

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ALcontrol Laboratories

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Who am I?

- Business Development Manager ALcontrol
- Responsible for:
 - Special projects, e.g. for SIKB, NEN, ministry VROM (a.o. project leader AS3000)
 - National and international Committees (NEN, SIKB, CEN, ISO)
 - Assessment of and implementation of new analytical developments
 - In NL: development of laboratory tests of granular waste for Landfills
 - FeNeLab (Dutch Federation of Laboratories, chair Environmental Council of directors)

Introduction



5th June 2009



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Introduction (1)

- Excavated soil:
 - Originates from decontamination projects, but also preparation of areas for building houses / offices
 - Defined as waste if it is not “clean” according to national soil regulations
 - In many countries: waste cannot be re-used as “soil”
 - ➔ excavated soil often has to be brought to a landfill
 - Extra problem: increased natural concentrations of Arsenic (As) and Antimony (Sb)
 - ➔ even acceptance on a landfill for inert waste sometimes not allowed

Introduction (2)

- This lecture:
 - Landfill Directive, implementation in several EU countries
 - Focus on analytical aspects
 - How do other EU countries deal with the problems ?

Landfill Regulations







Regulation (1)




- EU Landfill Directive, main aims:
 - The objective is to prevent or minimise the negative effects that landfill sites can have, such as pollution of water, soil and air, and emissions of methane, a powerful greenhouse gas.
 - Promote the recovery and recycling of waste (ban of certain types of waste from being put in landfill sites, for example used tyres)
 - Requires Member States to reduce the amount of biodegradable waste that they landfill to 35% of 1995 levels.



Regulation (2)

Country	Reference(s) to official documents	Remarks
EU 	COUNCIL DECISION of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)	
Netherlands 	<u>Implementatie Beschikking aanvaarding afvalstoffen op stortplaatsen</u> Staatscourant nr. 600, 13-11-2008: "... houdende wijziging van diverse besluiten in verband met de implementatie van beschikking nr. 2003/33/EG tot vaststelling van criteria en procedures voor het aanvaarden van afvalstoffen op stortplaatsen (PbEG L11) (Implementatie Beschikking aanvaarding afvalstoffen op stortplaatsen) <u>Sampling:</u> SIKB VKB protocol 1004: sampling granular waste for Landfills <u>Testing:</u> AP04-A, -V, -SB, -E en -U: analyses in granular waste and in eluates thereof	Start date: 16-7-2009 Document not ready yet: before 1/1/2010 there will be no certified sampler AP04: ready since okt. 2008. ALcontrol accredited.
United Kingdom 	Environmental Permitting Guidance "The Landfill Directive" For the Environmental Permitting (England and Wales) Regulations 2007, Updated May 2009	UK wrote its own legislation text, but for technical requirements added the EU text in Annexes.
Germany 	Verordnung über Deponien und Langzeitlager (Deponieverordnung - DepV); Artikel 1 V. v. 27.04.2009 BGBl. I S. 900; Geltung ab 16.07.2009	Starting date 16-7-2009

Regulation (3)

Country	Reference(s) to official documents	Remarks
Belgique (Flanders) 	<u>Flanders:</u> Titel II van het VLAREM, “Besluit van de Vlaamse regering houdende algemene en sectorale bepalingen inzake milieuhygiëne”, Hoofdstuk 5.2. INRICHTINGEN VOOR DE VERWERKING VAN AFVALSTOFFEN, 29-4-2009 <u>Walloon:</u> MONITEUR BELGE — 13.03.2003 — BELGISCH STAATSBLAD 12137, p. 12137 – 12155, Besluit van de Waalse Regering houdende sectorale voorwaarden voor de exploitatie van centra voor technische ingraving, <u>Brussels:</u> ??	
France 	Class III (type A): “Arrêté du Mars 2006 fixant la liste des types de déchets inerts ...” Class II (type B): “Arrêté du 9 septembre 1997 relatif aux décharges existantes et aux nouvelles installations de stockage de déchets ménagers et assimilés”. “Arrêté du 19 Janvier 2006 modifiant l’arrêté du 9 septembre 1997....” Class I (type C): “Arrêté du 30 Décembre 2002 relatif au stockage de déchets dangereux”	
Spain 	Implementation of national law in 2002	According to EU information: practice not in conformity with EU Directive (info May 2007)

Regulation (4)

- France, Class B and C
 - Each landfill must comply to local legislation/decision
 - Requirements are defined by the local authorities
 - Requirements are different per landfill according to its activities and geographic location
 - Requirements may differ from national legislation, mostly stricter
 - Local legislation prevails above national legislation
 - Enforcement by local environmental police (DRIRE)

Regulation (5)

• Netherlands, how is excavated soil dealt with?

--Re-use of excavated soil is dealt with in “Regulation Soil Quality” (2008):

→ Soil quality is sub-divided in certain classes:

- “clean”: concentrations < back ground value
 - “living” quality: slightly contaminated
 - “industry” quality: more contaminated
 - “Highly contaminated”: has to be decontaminated or landfilled
- } Re-usable !

Regulation (6)

- **Netherlands, how is excavated soil dealt with?**

--Accepted re-use depends on the functions of the area:

Function	Actual soil quality	Which excavated soil may be applied?
Agriculture / nature	"Clean" soil	"Clean" soil
Agriculture / nature	"Living" quality	"Clean" soil
Agriculture / nature	"Industry" quality	"Clean" soil
Living	"Clean" soil	"Clean" soil
Living	"Living" quality	"Living" quality
Living	"Industry" quality	"Living" quality
Industry	"Clean" soil	"Clean" soil
Industry	"Living" quality	"Living" quality
Industry	"Industry" quality	"Industry" quality

Landfill types



–EU Directive

•5 sorts of Landfills:

- Inert waste,
➔ not in all EU countries (e.g. Netherlands)
- Non-hazardous waste
- Non-hazardous waste pursuant to Article 6(c)(iii)
- Hazardous waste
- Underground storage

Criteria per Landfill



General

– EU text:

- Gives limit values for granular waste
- monolithic waste: limit values have to be defined by member states

– Accepted higher limit values

- Up to **3 times higher** under certain circumstances, but not for:
 - DOC (inert, non-dangerous waste, dangerous waste landfills)
 - BTEX, PCB and mineral oil (inert waste landfill)
 - TOC and pH (dangerous waste landfill art. 6c (iii))
 - LOI and or TOC (leachate, dangerous waste Landfill)
 - TOC: **up to 2 time higher** acceptable for inert waste, leaching
- SO_4 :
 - Inert waste: 6000 mg/kgdm in leachate accepted instead of 1000, if $\text{CO} < 1500$ mg/l at $\text{LS}=0,1$ in percolation test
- **NB:** This part of the EU text is taken over by most EU countries (NL, Flanders, Germany, UK), **but not by France!**



Limit values,
granular waste,
batch test EN
12457-2 or -4

Limit values,
according to EU
text!
Member states
may have
different (lower)
values and extra
parameters!

Compound	A *)		B *)		C *)		D *)	
	Content	LS=10			Content	LS=10	Content	LS=10
	mg/kgds	mg/kgds			mg/kgds	mg/kgds	mg/kgds	mg/kgds
As		0.5	2			2		25
Ba		20	100			100		300
Cd		0.04	1			1		5
Cr		0.5	10			10		70
Cu		2	50			50		100
Hg		0.01	0.2			0.2		2
Mo		0.5	10			10		30
Ni		0.4	10			10		40
Pb		0.5	10			10		50
Sb		0.06	0.7			0.7		5
Se		0.1	0.5			0.5		7
Zn		4	50			50		200
Cl		800	15000			15000		25000
F		10	150			150		500
SO4		1000	20000			20000		50000
Phenolindex		1						
DOC		500	800			800		1000
TDS &)		4000	60000			60000		100000
LOI #)							10% on dm	
TOC #)	30000				50000		60000	
pH					> 6			
ANC					***)		***)	
BTEX	6							
PCB (7)	1							
Oil C10-40)	500							
PAK	**)							



*)	Landfill types	A: Inert waste B: Non-dangerous waste C: Non-dangerous waste art. 6c (iii) D: Dangerous waste
**)	PAH	NL: 40 mg/kgdm (PAK-VROM) Germany: 30 mg/kgdm, PAK-EPA Belgium (Flanders): limit value for ind. PAH, highest for chryseen: 400 mg/kg UK: 100 mg/kgdm
***)	ANC (acid neutralisation capacity)	No requirements, has to tested <u>NB</u>: not mentioned in NL regulation!!
&)	TDS	Can be used alternatively to the values for SO₄ and Cl. <u>NB</u>: this has not been taken over by France! → In France always TDS has to be tested and compared with the limit values
#)	LOI / TOC	either LOI or TOC can be used

Criteria per Landfill (4), deviations in some countries

Netherlands	<ul style="list-style-type: none"> •ANC not mentioned in the text
France	<ul style="list-style-type: none"> •No possibility for higher concentrations than mentioned in tables •Inert waste: higher values for SO₄ not possible??
Belgium (Flanders)	<ul style="list-style-type: none"> •Extra parameters for non-dangerous waste: •Extractable non-polar compounds •Total extractable organohalogenic compounds •Total solvents (non-specific) •Stability (“steekvastheid”) •Limit values defined for monolithic waste •pH in leachate •Phenolindex also in leachates other than inert waste •Cr (VI), Ammonium, CN-total, Nitrit in leachates for some landfills
Germany	<ul style="list-style-type: none"> •Has Landfills K 0, K I, K II, K III and K IV (inert, non-dangerous, non-dangerous art. 6c (iii), dangerous waste and underground landfill). Limit values for K 0, K II, K III are the same as in EU text. Limit values for K I are tighter •Antimony: limit values for batch test not valid as long as C0 resp. $\leq 0,1$ mg/l, $\leq 0,12$ mg/l, $\leq 0,15$ mg/l, $\leq 1,0$ mg/l in the percolation test for resp. Landfills K 0, K I, K II, and K III. •Extra parameters: •LOI / TOC in waste for every Landfill •“Extractable Lipophylic compounds” in waste •pH in leachate for each Landfill •Phenolindex in leachate for all Landfills •Free cyanide
UK	None

Sampling and Analyses



Sampling (1)

Country	Reference(s) to official documents
EU	<ul style="list-style-type: none"> •Independent and qualified persons and institutions •Up to individual member states: •Sampling may be carried out by producers (with appropriate quality system) •As long as there are no EN standards: national standards or draft CEN standards (not existing yet!)
Netherlands	<ul style="list-style-type: none"> •<i>By person or organization acknowledged by Ministry of VROM (Environment)</i> •Deadline: 16-7-2009 implementation in NL ➔ By then no samplers certified!!
United Kingdom	<p>Reference to EU Landfill directive. Extra:</p> <ul style="list-style-type: none"> •Keep samples for at least 1 month
Germany	<ul style="list-style-type: none"> •To be carried out by competent staff. •Document to be used: LAGA PN 98 – „Richtlinie für das Vorgehen bei physikalischen, chemischen und biologischen Untersuchungen im Zusammenhang mit der Verwertung/Beseitigung von Abfällen, Stand 2002, ISBN: 978-3-503-07037-4“

Sampling (2)

Country	Reference(s) to official documents
Belgium (Flanders)	<u>Flanders:</u> <ul style="list-style-type: none">•Procedures, methods and instruments have to be approved by the authority.•Each sampling has to be approved by a recognized environmental expert, unless the samples are taken by this environmental expert or by a recognized laboratory. <u>Walloon:</u> No special requirements <u>Brussels:</u> ??
France	No special requirements as far as we know.
Spain	??

Testing



Testing (1)

–Basic characterisation

- Always required for wastes not regular generated
- For wastes regular generated only required once

–Compliance testing: acceptance criteria per landfill type

- Content of organic parameters
- Leaching

Testing (2)

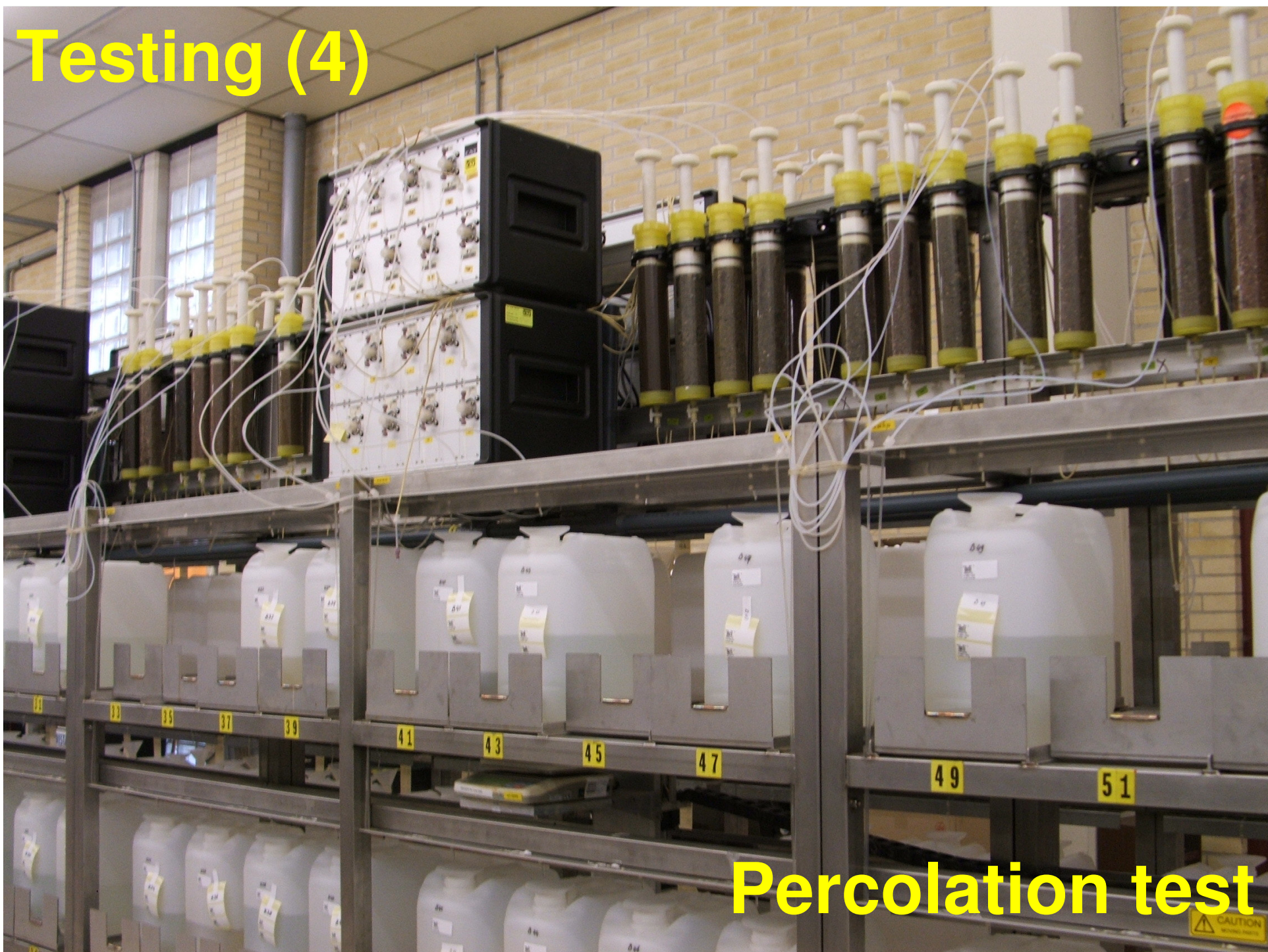
–Basic characterisation

- Basic information on the waste (type and origin, composition, consistency, leachability and — where necessary and available — other characteristic properties)
- Basic information for understanding the behaviour of waste in landfills and options for treatment
- Assessing waste against limit values
- Detection of key variables (critical parameters) for compliance testing and options for simplification of compliance testing (leading to a significant decrease of constituents to be measured, but only after demonstration of relevant information). Characterisation may deliver ratios between basic characterisation and results of simplified test procedures as well as frequency for compliance testing

Testing (3)

–Compliance testing

- For regular arising waste streams
- Must be related to results of basic characterisation
- Results must be checked against criteria per landfill type (see slide 15)
- Has to be carried out at least once each year
- Each EU member country may choose which leaching test to use
 - Percolation test
 - Batch test
 - Stand test



Testing (4)

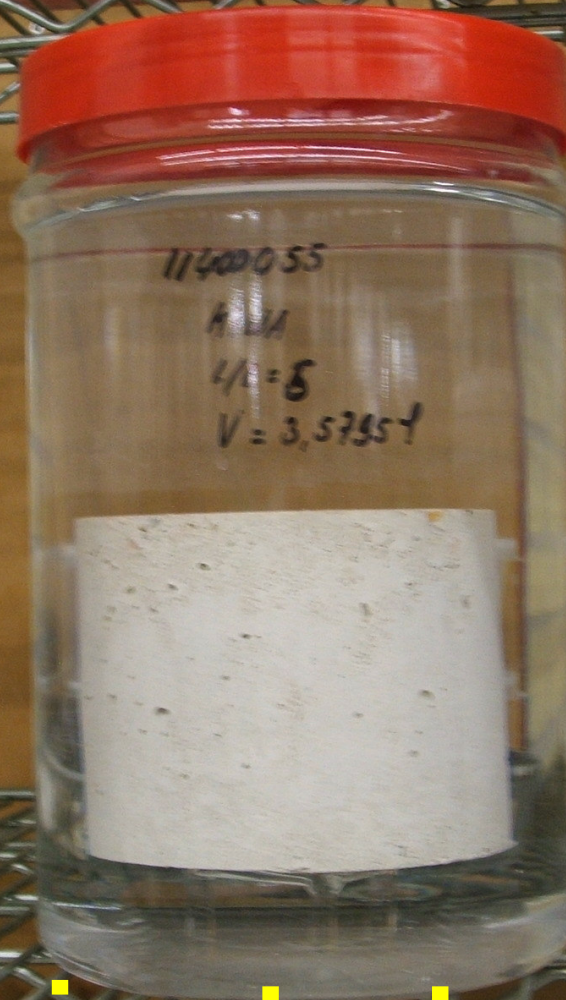
Percolation test

Testing (5)



Batch test

Testing (6)



Diffusion test = Stand test

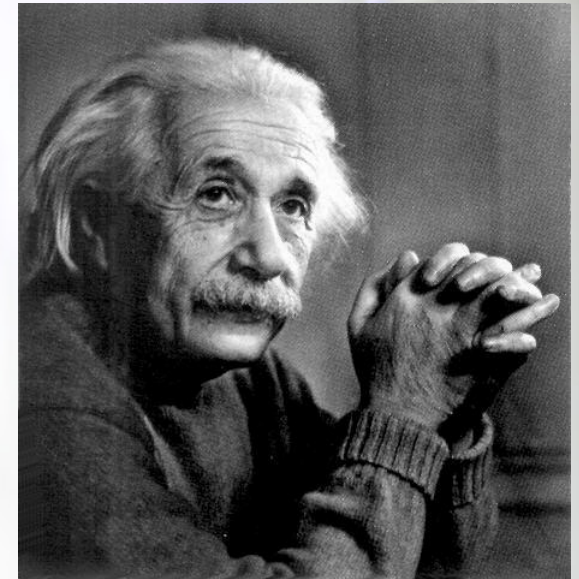
Testing (7)

–Leaching options chosen by several EU countries

EU text	<p>Open choice for:</p> <ul style="list-style-type: none"> • LS = 2 (EN 12457-1 or -3, 2-step batch test), • LS = 10 (EN 12457-2 or -4, 1-step batch test), • LS = 0,1 (EN 14405, 1st step percolation test), <p>Monolithic waste: stand test (= diffusion test)</p>
Netherlands	<ul style="list-style-type: none"> • Batch test, EN 12457-4, material < 10mm • Percolation test: EN 14405, 1st step percolation test → may be used sometimes, e.g. for SO₄
France	Batch test, EN 12457-2 (< 4 mm) *)
Belgium (Flanders)	<ul style="list-style-type: none"> • DIN 38414-S4 (= EN 12457-4) for granular waste • Percolation test: EN 14405, 1st step percolation test → may be used sometimes, e.g. for SO₄ • NEN 7345 (stand test = diffusion test) for monolithic waste on landfills for non-dangerous waste
Germany	<ul style="list-style-type: none"> • Batch test: EN 12457-4, but particles < 40 mm! → basically to be used • Percolation test: EN 14405, 1st step percolation test → may be used sometimes, e.g. for Sb and SO₄. • Stand test: LAGA EW 98 T; Monolithic material
UK	Reference to EU text → open choice!

*) More grinding may lead to higher leaching of compounds

Quality



$$D = \frac{1}{c} \frac{1}{l} \frac{dl}{dt} = \frac{1}{c} \frac{1}{P} \frac{dP}{dt}$$

$$D^2 = \frac{1}{P^2} \frac{P_0 - P}{P} \sim \frac{1}{P^2} \quad (1a)$$

$$D^2 = \frac{KQ}{3} \frac{P_0 - P}{P} \sim \frac{1}{2} KQ \quad (2a)$$

$$D^2 \sim 10^{-53}$$

$$e \sim 10^{-26}$$

$$P \sim 10^8 \text{ G.J.}$$

$$\lambda \sim 10^{10} (10^{11}) \text{ J}$$

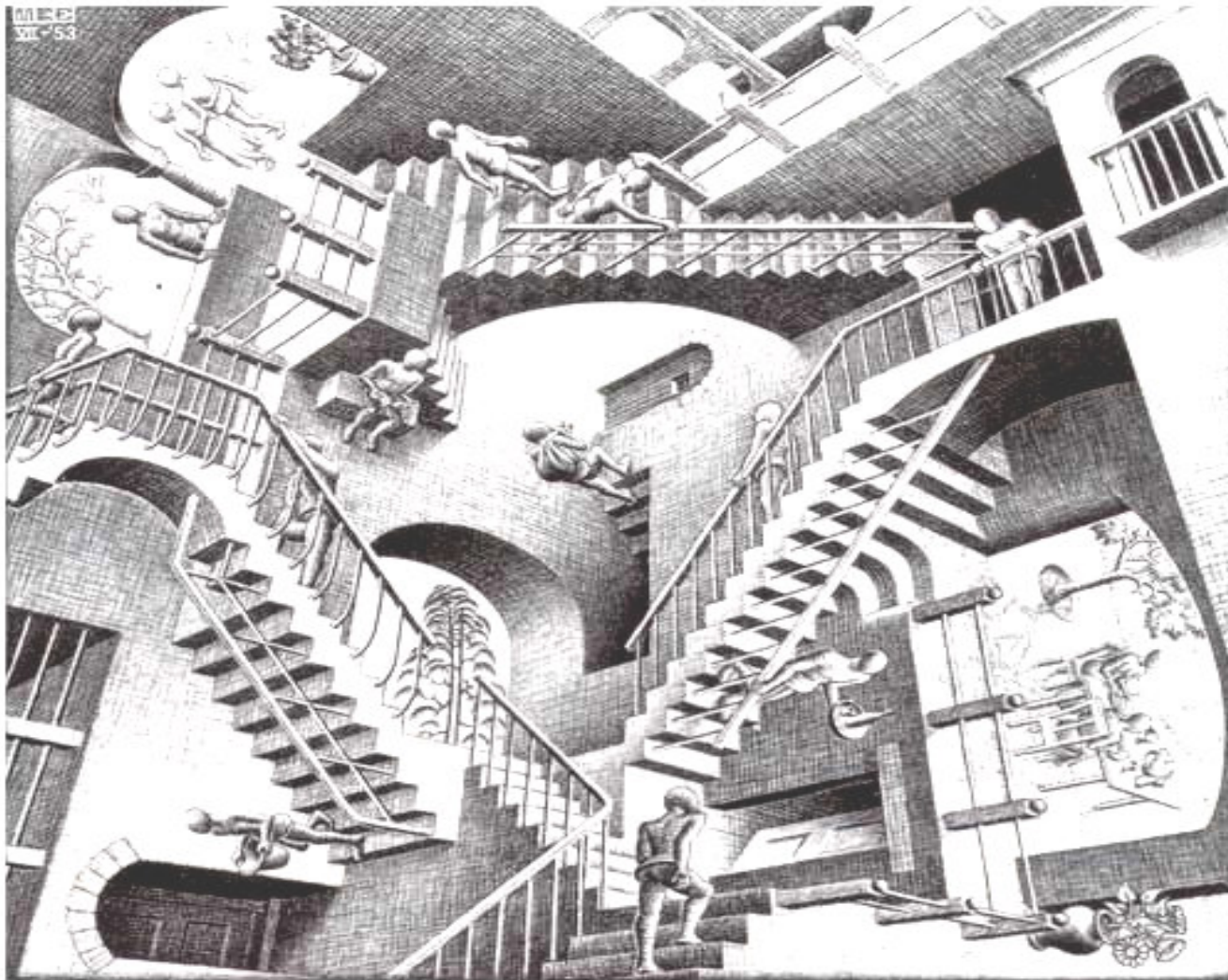


Quality (1)

- EU text: *“Laboratories shall have proven experience in waste testing and analysis and an efficient quality assurance system.”*
- France: no special requirements in Regulation
- NL: ISO 17025, accreditation per individual test, according to extra requirements in “AP04” document (testing of building materials and granular waste)
- UK: see EU text
- Germany: ISO 17025 accreditation, or other acknowledged laboratories
- Belgium (Flanders): proven experience in testing and analyzing waste and working with an efficient quality assurance system



Some problems



Laboratories

Some problems (1)

- TDS sometimes high
- As, Sb sometimes high (natural background in some soils)

Some problem (2)

–Possible solutions

- **TDS** (most countries, not France):

- Use SO_4 and Cl instead of TDS
- Use possibility for increased limit values
 - » up to 3 times for many parameters
 - » SO_4 6 times higher for inert waste if criteria with percolation test are met

- **Sb** (Germany)

- Use of percolation test instead of batch test

- **As**

- No countries with specific solution

Conclusions

- In many EU countries excavated soil has to be treated as waste and cannot be re-used and has to be landfilled
- Netherlands: system focused on as much as possible re-use of excavated soil
- Main problems: increased leaching values of TDS, Arsenic and Antimony
- EU Landfill Directive gives possibilities for increased values for TDS (through Sulfate): not taken over by France
- Some countries give possibilities for increased values of Antimony (Germany)
- Some countries have stricter requirements than EU text and even more parameters to test (Germany, Belgium – Flanders)
- Some countries have almost the same requirements as EU text (UK and Netherlands)
- Countries may potentially solve problems by taking over the EU text!

Literature, references (1)

- **EU:** Nr. 2003/33/EG: “... tot het vaststellen van criteria en procedures voor het aanvaarden van afvalstoffen op stortplaatsen overeenkomstig artikel 16 en Bijlage II van Richtlijn 1999/31/EG betreffende het storten van afvalstoffen”, 19-12-2002.
- **NL:** Staatscourant nr. 600, 13-11-2008: “... houdende wijziging van diverse besluiten in verband met de implementatie van beschikking nr. 2003/33/EG tot vaststelling van criteria en procedures voor het aanvaarden van afvalstoffen op stortplaatsen (PbEG L11) (Implementatie Beschikking aanvaarding afvalstoffen op stortplaatsen)
- **NL:** 2e Kamer, 2008-2009, 30782, nr. 14, Lijst van vragen en antwoorden m.b.t. bovenstaande tekst uit Staatscourant 600, 13-11-2008.
- **NL:** AP04, onderdelen A, V, SB, U, en E
- **NL:** SIKB VKB protocol 1004
- **UK:** Environmental Permitting Guidance “The Landfill Directive”, For the Environmental Permitting (England and Wales) Regulations 2007, Updated May 2009
- **Germany:** Verordnung über Deponien und Langzeitlager (Deponieverordnung - DepV); Artikel 1 V. v. 27.04.2009 BGBl. I S. 900; Geltung ab 16.07.2009,

Literature, references (2)

- **Walloon:** Besluit van de Waalse Regering houdende sectorale voorwaarden voor de exploitatie van centra voor technische ingraving, MONITEUR BELGE — 13.03.2003 — BELGISCH STAATSBLAD 12137, p. 12137 – 12155
- **Flanders:** Titel II van het VLAREM, “Besluit van de Vlaamse regering houdende algemene en sectorale bepalingen inzake milieuhygiëne”, Hoofdstuk 5.2. INRICHTINGEN VOOR DE VERWERKING VAN AFVALSTOFFEN, 29-4-2009
- **France:**
 - Class III (type A): “Arrêté du Mars 2006 fixant la liste des types de déchets inerts ...”
 - Class II (type B): “Arrêté du 9 septembre 1997 relatif aux décharges existantes et aux nouvelles installations de stockage de déchets ménagers et assimilés”. “Arrêté du 19 Janvier 2006 modifiant l’arrêté du 9 septembre 1997....”
 - Class I (type C): “Arrêté du 30 Décembre 2002 relatif au stockage de déchets dangereux”

Questions?

