



Twinning Project IL/11
Implementation and Strengthening the Environmental Framework for
IPPC, Resource Efficiency and Eco-Management in Israel



Waste Classification – European Requirements

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Training on waste analysis
Activity 1





Waste Classification - the European Waste List

Classification based mainly on origin and in some cases on substance

Origin can be either

- a type of industry: e.g. chapter 01 mining industry; chapter 02 agriculture and food production, or
- a specific (technical) process: e.g. chapter 11 surface treatment; chapter 12 mechanical surface treatment, or
- a specific treatment process: e.g. 16 02 waste from dismantling of WEEEs, or
- a collection system: e.g. chapter 20 wastes from households and municipalities





Waste classification - the European Waste List

Substance (product) specific chapters, e.g.

- chapter 13 – oil wastes
- chapter 14 – solvent wastes n.o.s.
- chapter 16 06 – batteries
- chapter 16 08 – catalysts

Specific chapters:

- 15 01 – packaging wastes
- 19 – wastes from waste and waste water treatment
(differentiation between primary and secondary wastes)





Waste Classification – Analysis

Known origin and known (main) composition

- A) Absolute non hazardous entry – risk of contamination?
(if yes - specific analysis needed)
- A) Absolute hazardous entry – hazardous waste.
- B) Mirror entries:
 - calculation of hazardous components on basis of e.g. SDS
 - chemical analysis (mainly elements and specific organic compounds e.g. PAH, HC, PCB)
 - test for specific physical properties (e.g. flash point)





Hazardous Waste Codes

Types of mirror entries

- A) 1 : 1 – e.g. : 19 12 11* other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances vs. 19 12 12 other wastes (including mixtures of materials) from mechanical treatment of waste other than those mentioned in 19 12 11
- B) X : 1 – several non-hazardous entries and one catch all position for hazardous wastes, e.g.: 17 02 01 wood, 17 02 02 glass, 17 02 03 plastic vs. 17 02 04* glass, plastic and wood containing or contaminated with dangerous substances





Hazardous Waste Codes

Special cases

- C) Reference to a specific hazard, e.g.: 10 03 15* skimmings that are flammable or emit, upon contact with water, flammable gases in dangerous quantities (ADR H4.3) vs. 10 03 16 skimmings other than those mentioned in 10 03 15
- D) Packaging wastes: 15 01 10* all packaging with hazardous residues
- E) Packaging wastes: 15 01 11* - specific for acetylene containers (porous matrix with solvent like DMSO or acetone)





Hazardous Properties

A hazardous waste exhibits one or more hazardous properties HP1 to HP15.

The hazardous properties are listed in Annex 3 of the WFD 2008/98/EC.

HP1 to HP14 refer mainly to the classification and labelling of hazardous substances/chemicals in accordance with the Global Harmonized System (GHS) for the Classification and Labelling of Chemicals (H-Phrases = Hazardous Statements)

H2XY refers to physical hazards (flammable, explosive, ...)

H3XY refers to health hazards (toxic, irritant, ...)

H4XY refers to environmental hazards (aquatic toxicity,...)





H-Statements and Hazardous Properties

Hazardous Property		Hazard Statement Code and Concentration Limit	
HP1 ⁵	Explosive	Substance	H200, H201, H202, H203, H204, H240, H241
HP2	<u>Oxidising</u>	Substance	H270, H271, H272
HP3 ⁶	Flammable	Substance	H220, H221, H222, H223, H224, H225, H226, H228, H242, H250, H251, H252, H260, H261
HP4	Irritant – skin irritation and eye damage	Sum of the concentration of all substances	Sum of all substances with H314: > 1% Sum of all substances with H318: > 10% Sum of all substances with H315 and H319: > 20%
HP5	Specific Target Organ Toxicity (STOT)/Aspiration Toxicity	Substance	STOT SE 1-3: H370, H371, H335 >1% >10% >20% STOT RE 1-2: H372, H373: >1% >10% Asp. <u>Tox.</u> : H304: > 10%
HP6	Acute Toxicity	Sum of the concentration of all substances	Acute <u>Tox.</u> Oral 1-4: H300, H301, H302: >0,1%, 0,25%, 5%, 25% Acute <u>Tox.</u> Dermal 1-4: H310, H311, H312: >0,25%, 2,5%, 15%, 55% Acute <u>Tox.</u> Inhal. 1-4: H330, H331, H332: >0,1%, 0,5%, 3,5%, 22,5%
HP7	Carcinogenic	Substance	H350: > 0,1%, H351: > 1%
HP8	Corrosive	Sum of the concentration of all substances	Substances with H314 > 5%





H-Statements and Hazardous Properties

Hazardous Property		Hazard Statement Code and Concentration Limit	
HP9	Infectious		
HP10	Toxic for Reproduction	Substance	H360: > 0,3%, H361: >3%
HP11	Mutagenic	Substance	H340: >0,1%, H341: >1%
HP12	Release of an acute toxic gas	Substance	EUH029, EUH031, EUH032
HP13	Sensitising	Substance	H317, H334: >10%
HP14	<u>Ecotoxic</u> : Aquatic Toxicity		H400, H410, H411: >0,25%, H412: >2,5%, H413: >25%
	<u>Ecotoxic</u> : Damage to ozone layer		H420: > 0,1%
HP15	Waste capable of exhibiting a hazardous property listed above not directly displayed by the original waste		H205, EUH001, EUH019, EUH044 Leachate values in accordance with table 15

⁵ For testing refer to UN-RTDG/ADR class 1

⁶ For testing refer to UN-RTDG/ADR class 3, class 4.1, 4.2, 4.3, class 2F





Manual on Classification of Waste

Guidance Document

- Systematic of waste classification
- Reference values for hazardous properties (flash point, H-phrases in accordance with GHS/CLP)
- Heuristic approach for waste analysis/classification (analysis of elements – reference to most likely HP criteria of metal compounds)
- Sampling and chemical analysis
- Relevant information sources





Manual on Classification of Waste - Content

- I. Introduction
European Waste Catalogue, Waste Framework Directive
- II. Waste Classification, Hazardous Waste, Mirror Entries
 - II. a) Applicable Code/Codes
 - II. b) Mirror Entries, Data Sources, Analysis
- III. Hazardous Properties (HP), CLP Classification (H-Phrases)
- IV. Determination of Hazardous Properties, Trigger Values
- V. Sampling and Analysis
- VI. Practical Assessment





Manual on Classification of Waste – Referenz Values

Practical Assessment

- Leachate Values
- Concentration Limits – Metals – Organic Compounds

VII. Specific Components

- Overview of Classified Metals (Table 19) – Reference to C-Codes (OECD) and Y-Codes (Basel Convention)
- Reference Values for Organic Substances (Mineral Oil Hydrocarbon; PAH, PCB, BTEX, Volatile Hydrocarbons, POPs, Pesticides)
- Other Reference Values (Asbestos, Mineral Fibres, CN)





Manual on Classification of Waste

Examples for reference values for hazardous classification

- Copper
copper compounds mostly classified as H410 - trigger value 2.500 mg/kg (0,25%)
- Lead
lead compounds are classified as teratogenic H360 – trigger value 3.000 mg/kg (0,3%); however most compounds are also classified as H410 – trigger value 2.500 mg/kg (0,25%)
- POP-waste (original 12 POPs)
50 mg/kg (except PCDD/PCDF)





Manual on Classification of Waste

Examples for reference values for hazardous classification

- “New POPs”
Trigger value based “low POP content”
PFOS 10 mg/kg, PBDE 1.000 mg/kg
- PAH
Classified as carcinogenic (HP7) – trigger value
1.000 mg/kg; benzo[a]pyrene specific limit value of
50 mg/kg (mixtures with 50 ppm are already classified as
carcinogenic)
- BTEX
Benzene classified as carcinogenic (H350) –trigger value
1.000 mg/kg





Manual on Classification of Waste

Leachate values

Basel H13 (HP15) – capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above

Landfill directive – limit values for co-disposal of hazardous wastes (leachate comparable with non hazardous wastes)

Sb: 0,07 mg/l	As: 0,2 mg/l	Ba: 10 mg/l
Pb: 1 mg/l	Cd: 0,1 mg/l	Cr: 1 mg/l
Cu: 5 mg/l	Ni: 1 mg/l	Hg: 0,02 mg/l
Se: 0,05 mg/l	Zn: 5 mg/l	





Classification of Waste (of unknown origin/composition)

Waste analysis:

- Test on hazardous properties
- Chemical analysis for hazardous substances (mainly heavy metals, specific organic compounds)
- Analysis of the matrix (what type of material)

Classification based on all results with the „best fitting“ code





Example from Austria

Big-bag with a blue-grey material, no declaration



Seemed to be wet – filter sludge?

“Standard analysis“:

DM: 15% (dry matter)

Elements (XRF-Analysis):

Al: 26.921 ppm	Sb: 418 ppm	Cd: 65 ppm	Pb: 0,05%
Ca: 4%	Hg: 3 ppm	Cu: 2,86%	Ni: 32,9%
Fe: 1,22%	Cr: 0,2%		





Example from Austria

Chemical analysis:

pH: 8,2 CN: < 20 ppm HC: 200 ppm TOC: 3.2%

Classification: metal hydroxide sludge, main constituents Ni, Cu, Ca

Origin: most likely electroplating (chapter 11 01)

Ni-compounds classified as carcinogenic (H350) – HP7

Classification: 11 01 09* sludges and filter cakes containing dangerous substances

Alternative classification: 19 02 05* sludges from physico-chemical treatment containing dangerous substances





Example from Austria

Big-bag with a grey (metallic ?) powder



XRF-Analysis

Zn: 47% SiO₂: 10% Pb: 6,3%

Sn: 3,3% Cd: 0,013%

Filter dust?

11 05 03* solid waste from gas
treatment (hot galvanizing)

10 02 07* steel mill dust

Most likely 10 02 07* (hazardous due to lead content – HP10)





Where is an analysis required ?

Classification by waste generator

- Analysis of critical parameters in case of mirror entries (if calculation is not feasible)
- Eventually test of physical properties (e.g. flash point)
All relevant information should be passed to waste recycler/disposer !!!

Analysis by waste recycler/disposer

- Input control, critical parameters, contaminants, content on valuable material
- Characterisation before landfilling
- Characterisation of RDF or other “waste products” (QM)





Waste Analysis – Landfill Directive

3 Step approach

1. Basic characterization of a waste stream

Origin? Homogeneous? Leachate behaviour? Specific parameters for total content (TOC, HC)? Behaviour in the landfill (possible interaction with other wastes)?

Decide on relevant parameters for compliance test.

2. Compliance test

Test of a specific batch.

3. On site control

Visual inspection, verification of documents, quick tests





Basic Characterization

Only guidelines on EU level – MS decides on testing

Mainly leachate tests (four different tests – documentation!)

Compulsory total content

- TOC (30.000 mg/kg DM for inert waste)
- BTEX (6 mg/kg DM for inert waste)
- PCB (1 mg/kg DM for inert waste)
- HC (C10-C40, 500 mg/kg DM for inert waste)
- PAH (to be decided by the MS)

Other parameters to be decided by the MS (heavy metals)





Basic Characterization

Compulsory total content

- TOC (5% for co-disposal of hazardous wastes)
- LOI (10% for hazardous wastes)
- TOC (6% for hazardous wastes)

Other parameters to be decided by the MS (heavy metals)

Additional tests requested by MS:

e.g. shear strength, permeability (solidified wastes)





Waste Analysis for RDF

EN 15359:2011 Solid recovered fuels. Specifications and classes

- Sampling system for waste stream
- Classification based on median and 80 percentile for parameters
- Reference to heating value (mg/MJ)
- Emission relevant parameters
- Product relevant parameters (cement production)





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Contact & information

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