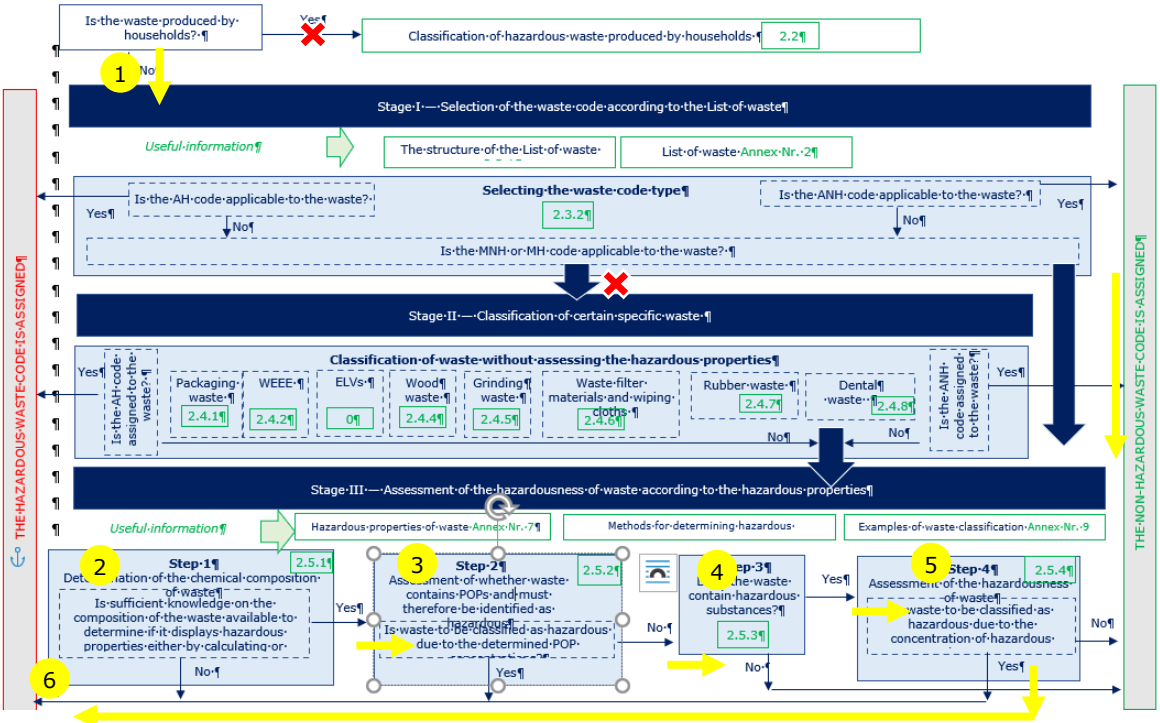
HAZARDOUS WASTE IDENTIFICATION GUIDE

ANNEX 9-2

EXAMPLE OF THE CLASSIFICATION OF FLY ASH WASTE

This Annex gives an example of the classification of fly ash[1]. It is known that ash was generated in a co-incinerator, and laboratory tests on the composition of waste were carried out. The purpose of this example is to provide a description of the steps necessary for the identification of hazardous waste, where the results of the waste composition tests are used for the assessment of hazardous properties.

The steps for the identification of waste based on the flowchart shown in Figure 1 of the Guide are described below (they are marked by yellow arrows in the figure).



Steps for the identification of waste

1

First, Stage I steps are performed to determine which type of waste code is to be attributed to the waste. Fly ash waste, like other waste from thermal processes, is classified in *Chapter 10 (Wastes from thermal processes)* of the LoW. Construction waste containing tar is classified in sub-chapter 10 01 *wastes from power stations and other combustion plants (except 19)*:

10	**WASTES FROM THERMAL PROCESSES**	
10 01	**wastes from power stations and other combustion plants (except 19)**	
10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)	AN
10 01 02	coal fly ash	AN
10 01 03	fly ash from peat and untreated wood	AN
10 01 04*	oil fly ash and boiler dust	AH
10 01 05	calcium-based reaction wastes from flue-gas desulphurisation in solid form	AN

[1] The example is based on the *Europese afvalstoffenlijst EURAL. Handleiding* (Belgium).

10 01 07	calcium-based reaction wastes from flue-gas desulphurisation in sludge form	AN
10 01 09*	sulphuric acid	AH
10 01 13*	fly ash from emulsified hydrocarbons used as fuel	AH
10 01 14*	bottom ash, slag and boiler dust from co-incineration containing hazardous substances	MH
10 01 15	bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14	MN
10 01 16*	fly ash from co-incineration containing hazardous substances	MH
10 01 17	fly ash from co-incineration other than those mentioned in 10 01 16	MN
10 01 18*	wastes from gas cleaning containing hazardous substances	MH
10 01 19	wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18	MN
10 01 20*	sludges from on-site effluent treatment containing hazardous substances	MH
10 01 21	sludges from on-site effluent treatment other than those mentioned in 10 01 20	MN
10 01 22*	aqueous sludges from boiler cleansing containing hazardous substances	MH
10 01 23	aqueous sludges from boiler cleansing other than those mentioned in 10 01 22	MN
10 01 24	sands from fluidised beds	AN
10 01 25	wastes from fuel storage and preparation of coal-fired power plants	AN
10 01 26	wastes from cooling-water treatment	AN
10 01 99	wastes not otherwise specified	AN

Since the appropriate entries (10 01 16* and 10 01 17) are mirror entries, it is necessary to assess whether the waste has hazardous properties in order to determine which waste code is to be assigned, i.e. to proceed to Stages II and/or III of the Guide. As fly ash waste does not fall within any of the waste streams listed in Stage II of the Guide, it is proceeded to the Stage III steps.

2

First, Step 1 of Stage III is performed, i.e. information on the waste composition is collected. Since the resulting waste is known to be fly ash from the co-incinerator (see above), tests have been carried out on concentrations of certain metals in the waste; given that fly ash may contain phosphorus and silicon compounds, concentrations of these elements have also been determined (see the table below).

Element/ Parameter	**Identified concentration of the element, in mg/kg**

Name	Labelling	
Chromium	Cr	110
Copper	Cu	630
Lead	Pb	78
Nickel	Ni	53
Zinc	Zn	1900
Aluminium	Al	128400
Phosphorus	P	119500
Silicon	Si	230000

3

As there is no information on the possible presence of POPs in the waste, Step 2 of Stage III is not performed.

4

The objective of Step 3 of Stage III is to determine whether the substances contained in waste identified by testing are hazardous (i.e. whether there is information of one or more hazard statements being assigned) and, if so, to collect information on their hazardous properties. Various sources of information may be used for this purpose, as specified in point 2.5.3 of the Guide.

Since the test results are determined at the element level and given that elements are mostly present in the composition of other chemical compounds, a 'worst case' compound has been selected for each element (see Annex 7-3 to the Guide for possible worst case compound examples); this data is used for subsequent steps. In accordance with Annex 7-3 of the Guide, the information has been verified on whether the 'worst case' compounds of the elements identified in the waste are classified as hazardous substances (i.e. whether they are assigned hazard statements and, if so, what hazard statements have been assigned).

To structure the data collected from the above data sources, it has been listed in the table (see below) containing the following information:

- Name/labelling of the parameter/element identified by testing;
- Concentrations determined during testing, mg/kg;
- Where a 'worst-case' compound is applied to elements, the atomic mass of the element, the molar mass of the compound, i.e. the data required for the recalculation of concentration assuming that the waste contains 'worst-case' compounds;
- Since the concentration limit in Annex III to the WFD is expressed as a percentage, the concentrations (mg/kg) determined by testing have also been converted to a percentage for evaluation purposes (where 'worst case' compounds have been selected, their concentrations have been recalculated).

To convert the concentrations determined in mg/kg into the percentage concentration, the determined value should be divided by 10,000; e.g. 5 mg/kg = 0.0005%.

The formula used to recalculate the concentration of the 'worst case' compound is as follows: *Compound concentration = (element concentration * molar mass of the compound)/atomic mass of the element, e.g.:*

for chromium (Cr atomic mass 51.990, concentration 110 mg/kg), the selected 'worst case' compound is CrO_3 (molar mass 99.990), which means that the 'worst case' compound concentration is

*110*99.99/51.99=212 mg/kg*

Information on the possible 'worst case' compounds of certain substances, the atomic masses of the elements and the molar masses of the compounds concerned is provided in Annex 7-3 to the Guide.

The table below provides summary information on the results of the waste composition tests, as well as information on the H statements of the substances contained in waste, by each hazardous property (HP). This data clearly indicates that the substances contained in waste are hazardous; therefore, it should be proceeded to Step 4 of Stage III.

Results of the waste composition tests, 'worst case' compounds, hazard statements and relevant hazardous properties

Element/ Parameter	Identified concentration of the element, mg/kg	Additional data (for the worst case scenario calculations)					Recalculated concentration, %	Hazardous Properties								
		Compound	CAS No.	Atomic mass of the element	Molar mass of the compound	Calculated concentration of the compound, mg/kg		HP4	HP5	HP6	HP7	HP8	HP10	HP11	HP13	HP14
Cr	110	CrO_3	1333-82-0	51.990	99.990	212	0.021	H314	H372	H301 (3), H311 (3), H330 (2)	H350	H314.	H361	H340	H317, H334	H400, H410
Cu	630	$CuCl_2$	7447-39-4	63.550	134.450	1333	0.133	H315, H319		H301						H411
Pb	78	$PbCl_2$	7758-95-4	207.2	278.100	105	0.010		H373	H302, H332	H351		H360			H400, H410
Ni	53	$NiCl_2$	7718-54-9	58.69	129.590	117	0.012	H315	H372	H301(3), H331	H350		H360		H317, H334	H400, H410
Zn	1900	$ZnCl_2$	7646-85-7	65.38	136.280	3960	0.396	H314		H302		H314.				H400, H410
Al	128400	$AlCl_2$		26.98	97.88	465819	47	H314				H314				
P	119500	H3PO4		30.970	80.000	308686	31	H314		H302		H314				
Si	230000	SiO2		28.08	60.08	492108	49		H373							

5

Step 4 of Stage III intended to identify, using the information collected in the previous steps, whether waste has one or several hazardous properties due to the concentration of substances contained in waste. If waste is found to have at least one hazardous property, the waste is identified as hazardous.

Initial analysis of available data:

To avoid unnecessary actions, it is plausible to compare the data on the concentrations of substances contained in waste and on the hazard statements, which has been collected in previous steps, with the cut-off values referred to in Regulation No 1357/2014 before starting the assessment of the available data, thus determining which hazardous properties are to be assessed in accordance with the provisions of Regulation (EU) No 1357/2014 and whether all substances identified in the waste (in this case, the 'worst case' compounds) are to be included in the assessment. To this end, the above table has been supplemented with data on cut-off values set out in Regulation (EU) No 1357/2014 (see the green-marked row in the table below) and concentration limits (see the yellow-marked row in the table below) in cases where cut-off values are not set.

Results of the waste composition tests, 'worst case' compounds, hazard statements and relevant hazardous properties

Element/ Parameter	Identified concentration of the element, mg/kg	Additional data (for the worst case scenario calculations)					Recalculated concentration, %	Hazardous properties/cut values[2]/concentration limits[3]								
								HP4	HP5	HP6	HP7	HP8	HP10	HP11	HP13	HP14
		Compound	CAS No.	Atomic mass of the element	Molar mass of the compound	Calculated concentration of the compound, mg/kg		1%		min. 0.1%		1%			10%	min. 0.1%
									min.1%		min. 0.1%		min. 0.3%	min. 0.1%		
Cr	110	CrO_3	1333-82-0	51.990	99.990	212	0.021	H314	H372	H301 (3), H311 (3), H330 (2)	H350	H314.	H361	H340	H317, H334	H400, H410
Cu	630	$CuCl_2$	7447-39-4	63.550	134.450	1333	0.133	H315, H319		H301						H411
Pb	78	$PbCl_2$	7758-95-4	207.2	278.100	105	0.010		H373	H302, H332	H351		H360			H400, H410
Ni	53	$NiCl_2$	7718-54-9	58.69	129.590	117	0.012	H315	H372	H301(3), H331	H350		H360		H317, H334	H400, H410
Zn	1900	$ZnCl_2$	7646-85-7	65.38	136.280	3960	0.396	H314		H302		H314.				H400, H410
Al	128400	$AlCl_2$		26.98	97.88	465819	47	H314				H314				
P	119500	H_3PO_4		30.970	80.000	308686	31	H314		H302		H314				
Si	230000	SiO2		28.08	60.08	492108	49		H373							

[2] According to Regulation (EU) No 1357/2014; where the table does not include a cut-off value, cut-off values are not used for the assessment of the relevant hazardous property. Note: in the Lithuanian version of Regulation (EU) No 1357/2014, the term 'cut-off value' is used. In some cases, threshold values (cut-off values) are different for various hazard statements, in which case the table shows the minimum concentration limits with the reference 'min.' next to them.

[3] In accordance with Regulation (EU) No 1357/2014; see also Annex 7-1 and Annex 8 to the Guide. In some cases, concentration limits are different for various hazard statements, in which case the table shows the minimum concentration limits with the reference 'min.' next to them. Where cumulative concentration limits are applied, the table indicates 'sum.'.

Based on the information in the table above, the initial analysis of the available data has been performed:

- The test results show that the waste does not contain components with the H statements indicating the possible hazardous properties of the waste, such as HP 1 (explosive), HP 2 (oxidising), HP 3 (flammable), HP 12 (release of an acute toxic gas).

Information on the classification of hazard statements as hazardous properties can also be found in Annex 7-1 to the Guide.

- Depending on the origin of the waste (fly ash waste is unlikely to be infectious), no assessment is carried out for the hazardous property HP 9 (infectious);
- With regard to the properties HP 4, HP 6, HP 8, and HP 14 (cut-off values for these properties are set out in Regulation (EU) No 1357/2014), the assessment must include only the 'worst case' compounds:
  - HP 4 for aluminium and phosphorus,
  - HP 6 for copper, zinc and phosphorus,
  - HP 8 for aluminium and phosphorus,
  - HP 14 for zinc;
- For HP 5, no threshold value (cut-off value) is established; however, the concentration limits are set at 1% (H372) and 10% (H373), which are not exceeded in a number of cases; therefore, no assessment is performed for HP 5.
- With regard to the properties HP 7, HP 10, and HP 11, no threshold values (cut-off values) are set; however, in all cases the concentration of the substances is below the minimum concentration limit; therefore, no assessment is required to determine whether the waste has these hazardous properties;
- **This means that the assessment of the properties HP 4, HP 6, HP 8, and HP 14 is required to determine whether waste should be classified as hazardous.**

Annex 8 to the Guide includes the diagrams used for the assessment

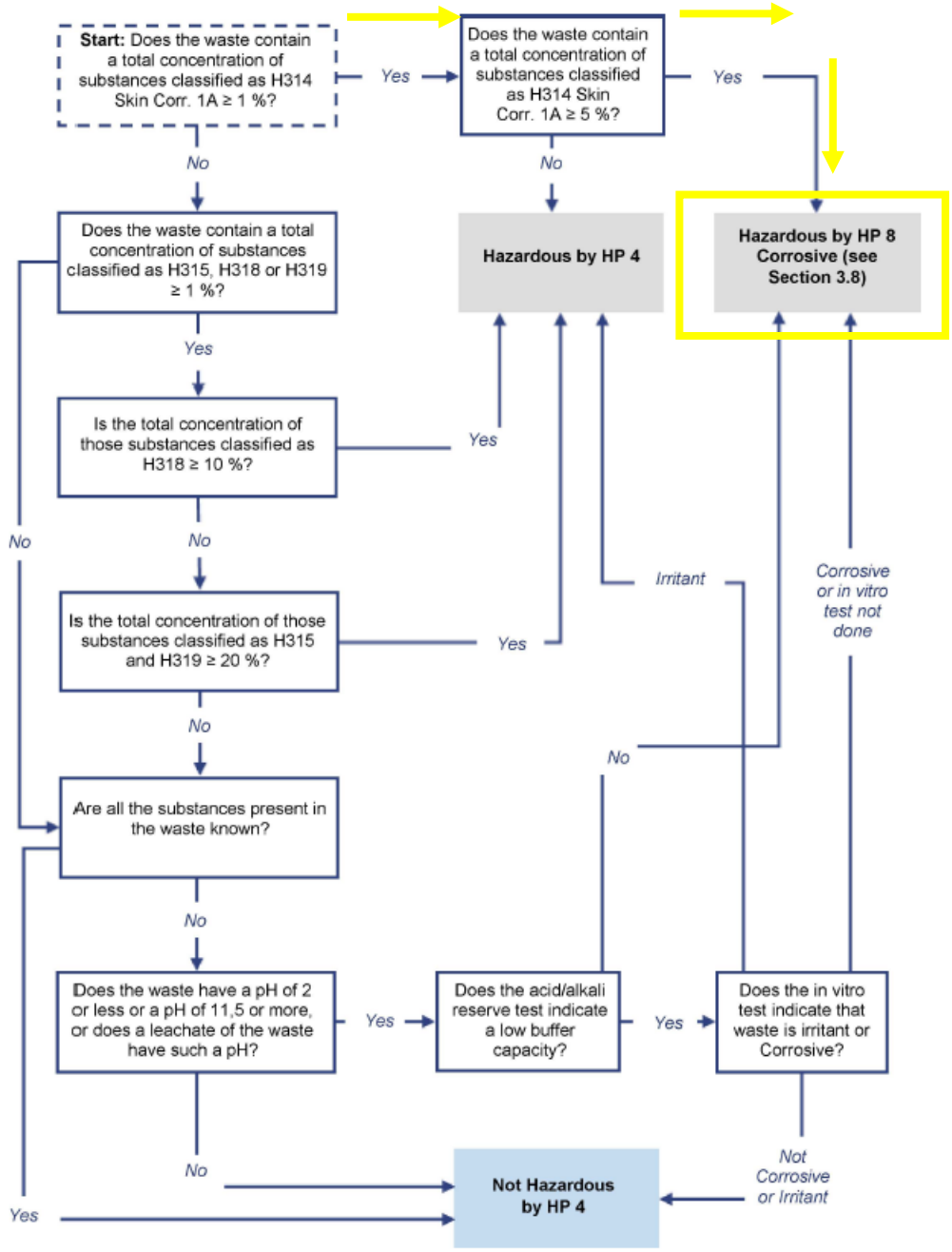
Assessment of whether waste should be identified as hazardous due to the property HP 4

As stated above, the assessment must only be carried out for the 'worst case' compounds of aluminium and phosphorus:

Element/ Parameter	Identified concentration of the element, mg/kg	Additional data (for the worst case scenario calculations)					Recalculated concentration, %	HP4 1%
		Compound	CAS No.	Atomic mass of the element	Molar mass of the compound	Calculated concentration of the compound, mg/kg		
Al	128400	$AlCl_2$		26.98	97.88	465819	47	H314
P	119500	H_3PO_4		30.970	80.000	308686	31	H314
						Sum	78	

Note: Regulation (EU) No 1357/2014 states:

Note that wastes containing substances classified as H314 (Skin corr.1A, 1B or 1C) in amounts greater than or equal to 5% will be classified as hazardous by HP 8. HP 4 will not apply if the waste is classified as HP 8.



The assessment has shown that waste should be classified as hazardous; however, it is important to note that it is classified as hazardous due to the presence of the property HP 8, in accordance with the above provisions of the Regulation and the presented diagram.

Note: Since the purpose is to identify the code to be used for the waste, no further assessment is carried out.

Thus, the steps in Stage III of the Guide have led to the conclusion that the assessment of the hazardous substance concentrations in the waste by the 'worst case' compounds do not reveal the hazardous property HP 8 in the waste.

6

As indicated above, the steps in Stages I and III of the Guide have proven that the waste contains hazardous substances; considering the available concentrations of such substances, the waste must be identified as hazardous, i.e. the code 10 01 16* must be assigned:

10	**WASTES FROM THERMAL PROCESSES**	
10 01	**wastes from power stations and other combustion plants (except 19)**	
10 01 16*	fly ash from co-incineration containing hazardous substances	MH
~~10 01 17~~	~~fly ash from co-incineration other than those mentioned in 10 01 16~~	~~MN~~