

Simplified Criteria for Determining Applicability of Seveso Directive to an Establishment Handling Dangerous Wastes

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The importance of dangerous wastes in major-accident hazards control was emphasised by Directive 2003/105/EC. As pointed out in the amended Annex I to Directive 96/82/EC, the categorisation of these materials is not trivial since they are not classified according to Council Directive 67/548/EEC (classification of dangerous substances) or Directive 1999/45/EC (classification of dangerous preparations). The Seveso Directive should be applied to wastes which possess equivalent properties in terms of major-accident potential to Annex I substances and preparations. A simple approach based on the Council Directive 91/689/EEC hazardous wastes properties classification would be useful to determine the applicability of Seveso regulations to industrial establishments. Comparing the classification criteria stated in the above Directives, the Seveso categories can be related to the "H-classes" defined for wastes.

The resulting schema can be used for screening purposes or to determine in simple cases if Seveso regulations do apply or not. Although the proposed method is not exhaustive, the common availability of "H-classes" information for industrial wastes renders the identified criteria a simple tool for the identification of major-accident hazards that derive from wastes handling.

1. Seveso II Directive

The Council Directive 96/82/EC (the so-called Seveso II Directive), extended by the Directive 2003/105/EC, applies to the industrial establishments where dangerous substances are present in quantities exceeding the thresholds defined in Annex I to the Directive.

This Annex includes a list of named substances (Part 1) and a list of categories of substances and preparations (Part 2) which are reckoned as dangerous in relation to major-accident hazards.

The criteria for the classification of substances and preparations are stated in Part 2, Note 1, which refers to Council Directive 67/548/EEC and Directive 1999/45/EC. The note also indicates that: *«In the case of substances and preparations which are not classified as dangerous according to either of the above directives, for example waste, but which nevertheless are present, or are likely to be present, in an establishment and which possess or are likely to possess, under the conditions found at the establishment, equivalent properties in terms of major-accident potential, the procedures for provisional classification shall be followed in accordance with the relevant article of the appropriate Directive.»*

The test methods and classification rules found in Council Directive 67/548/EEC and Directive 1999/45/EC are hence applicable to verify if a particular waste is "dangerous".

2. Directive on hazardous waste

Council Directive 91/689/EEC and amendments regulate the management of hazardous waste.

A waste is considered hazardous if it shows one or more of the properties listed in Annex III to the Directive (H1 to H14). The Annex says that: *«The methods to be used are those described in Annex V to Directive 67/548/EEC, in the version as amended by Commission Directive 84/449/EEC, or by subsequent Commission Directives adapting Directive 67/548/EEC to technical progress.»*

Thus this Directive also refers to Council Directive 67/548/EEC for the classification of material properties as Seveso II Directive does.

3. Comparison between H-properties and Seveso categories

Since both Council Directive 91/689/EEC and Council Directive 96/82/EC refer to Council Directive 67/548/EEC for the classification of dangerous properties, it is possible to compare the H-classes defined in the former to the Seveso categories.

In the following paragraphs each Seveso category (abbr. SC hereafter) will be parsed and related to relevant H-properties and classes (abbr. HC hereafter).

3.1 SC 1: very toxic

This category is expressly included in HC H6 (toxic) definition, so, considering the set of all possible wastes, SC 1 is a subset of H6 and the quantity of SC 1 wastes is less or equal to the quantity of H6 wastes:

$$q(SC1) \leq q(H6) \quad (1)$$

3.2 SC 2: toxic

As above, this category is related to HC H6 (toxic): SC 2 is a subset of H6 and the quantity of SC 2 wastes is less or equal to the quantity of H6 wastes:

$$q(SC2) \leq q(H6) \quad (2)$$

3.3 SC 3: oxidizing

SC 3 is equivalent to HC H2 (oxidizing), thus the quantity of SC 3 wastes is equal to the quantity of H2 wastes:

$$q(SC3) = q(H2) \quad (3)$$

3.4 SC 4: explosive (UN/ADR 1.4)

According to Directive 2003/105/EC, the Seveso classification of explosive substances and preparations refers to UN/ADR Class 1 materials or, if this is not applied, to the R2 and R3 risk phrases. Since wastes shall be classified for their transportation, the

UN/ADR classification in division 1.4 will determine that the waste is in SC 4, independently of the H-properties.

$$q(SC4) = q(UN/ADR 1.4) \quad (4)$$

3.5 SC 5: explosive (UN/ADR 1.1/1.2/1.3/1.5/1.6, R2 or R3)

According to Directive 2003/105/EC, the Seveso classification of explosive substances and preparations refers to UN/ADR Class 1 materials or, if this is not applied, to the R2 and R3 risk phrases. Since wastes shall be classified for their transportation, the UN/ADR classification in divisions 1.1, 1.2, 1.3, 1.5 or 1.6 will determine that the waste is in SC 5, independently of the H-properties.

If the waste is not classified in UN/ADR Class 1, then HC H1 (explosive) will be relevant since it is equivalent to the union of R2 and R3 dangers.

$$q(SC4) = q(UN/ADR 1.1/1.2/1.3/1.5/1.6) + q(H1 \text{ not UN/ADR 1}) \quad (5)$$

3.6 SC 6: flammable (Part 2 Note 3 (a))

The definition of flammable waste, i.e. HC H3-B (flammable) coincides with the flammable liquids in SC 6, therefore the quantity of SC 6 wastes is equal to the quantity of H3-B wastes:

$$q(SC6) = q(H3-B) \quad (6)$$

3.7 SC 7a: highly flammable (Part 2 Note 3 (b) (1))

This category is composed by:

- pyrophoric materials (corresponding to risk phrase R17), which are included in the definition of HC H3-A (highly flammable);
- flammable or highly flammable liquids in particular processing conditions that may create major-accident hazards.

The second condition should be verified in special cases, e.g. if the waste is distilled at high temperatures. Otherwise SC 7a is a subset of H3-A and the quantity of SC 7 wastes is less or equal to the quantity of H3-A wastes:

$$q(SC7a) \leq q(H3-A) \quad (7)$$

3.8 SC 7b: highly flammable (Part 2 Note 3 (b) (2))

This category is related to HC H3-A (highly flammable): SC 7b is a subset of H3-A and the quantity of SC 7b wastes is less or equal to the quantity of H3-A wastes:

$$q(SC7b) \leq q(H3-A) \quad (8)$$

3.9 SC 8: extremely flammable (Part 2 Note 3 (c))

This category is composed by:

- liquids with flash point ≤ 0 °C and boiling point ≤ 35 °C, which are included in the definition of HC H3-A (highly flammable);

- flammable gases, which are included in the definition of HC H3-A (highly flammable);
 - flammable or highly flammable liquids at a temperature above their boiling point.
- The last condition should be verified in special cases. Otherwise SC 8 is a subset of H3-A and the quantity of SC 8 wastes is less or equal to the quantity of H3-A wastes:

$$q(\text{SC8}) \leq q(\text{H3-A}) \quad (9)$$

3.10 SC 9(i): dangerous for the environment (R50)

This category is included in HC H14 (Ecotoxic) definition, so SC 9i is a subset of H14 and the quantity of SC 9i wastes is less or equal to the quantity of H14 wastes:

$$q(\text{SC9i}) \leq q(\text{H14}) \quad (10)$$

3.11 SC 9(ii): dangerous for the environment (R51/53)

As above, SC 9ii is a subset of H14 and the quantity of SC 9ii wastes is less or equal to the quantity of H14 wastes:

$$q(\text{SC9ii}) \leq q(\text{H14}) \quad (11)$$

3.12 SC 10(i): reacts violently with water (R14)

This dangerous property is not considered in Annex III to Council Directive 91/689/EEC, so there is no H-property that can be related to SC 10(i).

3.12 SC 10(ii): liberates toxic gas with water (R14)

The definition of HC H12 (wastes which release toxic or very toxic gases in contact with water, air or an acid) includes this category. SC 10ii is therefore a subset of H12 and the quantity of SC 10ii wastes is less or equal to the quantity of H12 wastes:

$$q(\text{SC10ii}) \leq q(\text{H12}) \quad (12)$$

4. Applicability of Seveso Directive to an Establishment Handling Dangerous Wastes

As discussed in the previous paragraphs, in many cases the quantity of dangerous wastes belonging to Seveso categories are correlated to the quantity of wastes labelled with particular H-properties.

In some fortunate cases there is an equivalency relation, in other cases the HC quantity is greater than or equal to the SC quantity and therefore represents a conservative estimate of the dangerous substances quantity needed to determine the applicability of Seveso II Directive.

Given the maximum quantity of waste for each HC that may be present in an establishment, the following associations can be used for a screening:

- wastes labelled as **H1** belong to SC 5;
- wastes labelled as **H2** belong to SC 3;

- wastes labelled as **H3-A** may belong to SC 7a, SC 7b or SC 8 (SC 8 being the most critical for applicability because it has the lowest qualifying quantities);
- wastes labelled as **H3-B** belong to SC 6;
- **H4 and H5** properties are not relevant to Seveso II Directive;
- wastes labelled as **H6** may belong to SC 1 or SC 2 (SC 1 being the most critical for applicability because it has the lowest qualifying quantities);
- **H7 to H11** properties are not relevant to Seveso II Directive;
- wastes labelled as **H12** belong to SC 10(ii);
- **H13** property is not relevant to Seveso II Directive;
- wastes labelled as **H14** may belong to SC 9(i) or SC 9(ii) (SC 9(i) being the most critical for applicability because it has the lowest qualifying quantities).

Moreover, wastes classified under **UN/ADR 1** class must be counted in SC 4 (UN/ADR 1.4 division) or SC 5 (other divisions).

Since the quantities evaluated with the above criteria are conservative approximations of the mass of dangerous wastes concerning SC, they can be counted in the summations required by Seveso II Directive (Directive 2003/105/EC, Annex I, Part 2, Note 4) with the other dangerous substances and preparations present in the establishment to exclude the application of Articles 6 and 7 or Article 9 (depending on the chosen qualifying quantities) if all the pondered sum resulting for toxic, flammable and ecotoxic groupings are less than 1.

If at least one of the summations gives a value greater than or equal to 1, the establishment operator will have two options:

- 1) accept the application of the relevant Seveso Articles and notify the quantities of dangerous wastes assessed with the above method (this option may be convenient if the establishment would anyhow be subject to Seveso Directive because of the presence of other dangerous substances);
- 2) proceed with specific tests on the significant wastes (e.g. determination of the flash-point for an H3-A waste) or equivalent evaluations based on the composition of the waste to select the correct Seveso Category and re-assess the pertinent summations.

For example let us consider an establishment where only the following hazardous materials are present:

- hydrofluoric acid (T+) in the maximum quantity of 3 t,
- a toxic waste (H6) in the maximum quantity of 4 t.

The toxic waste may belong to SC 1 (if "very toxic") or SC 2 (if only "toxic").

With the availability of only this information, it is verifiable that in the worst case (assuming the waste is "very toxic") the establishment is not subject to Article 9, because the summation of SC 1 and SC 2 gives:

$$q(\text{HF}) / Q(\text{SC 1 - Art. 9}) + q(\text{waste}) / Q(\text{SC 1 - Art. 9}) = 3/20 + 4/20 = 0,35 < 1 \quad (13)$$

but it is subject to Articles 6 and 7, because:

$$q(\text{HF}) / Q(\text{SC 1 - Art. 6}) + q(\text{waste}) / Q(\text{SC 1 - Art. 6}) = 3/5 + 4/5 = 1,4 > 1 \quad (14)$$

It would then be opportune to deepen the evaluation by analysing the composition or properties of the waste, because if it would result classifiable as toxic (SC 2), the summation for Articles 6 and 7 would become:

$$q(\text{HF}) / Q(\text{SC 1 - Art. 6}) + q(\text{waste}) / Q(\text{SC 2 - Art. 6}) = 3/5 + 4/50 = 0,68 < 1 \quad (15)$$

and the establishment would not be subject to Notification.

5. Caveats

Besides of the specific details reported in section 3 (e.g. SC 10(i) is not related to any H-property), a generic consideration must be pointed out: if a waste contains one of the named substances reported in Annex I Part 1 of Directive 2003/105/EC, in a relevant concentration (according to Council Directive 67/548/EEC), the waste quantity has to be compared to the qualifying quantities for that specific substance (which must be used as divisors in the summation rule).

It has to be underlined that the method suggested in this paper has no official relevance, because, as quoted in section 1, the waste should be classified according to the procedures for provisional classification of Council Directive 67/548/EEC or Directive 1999/45/EC.

6. Conclusions

A comparison of the classification criteria stated in Directive 2003/105/EC (amendment to Seveso II Directive) and Council Directive 91/689/EE (Directive on hazardous waste) was done to find possible relations between the Seveso categories and the "H-properties" defined for waste.

The resulting schema can be used for screening purposes or to determine in simple cases if Seveso regulations do apply or not to an establishment where hazardous wastes are present.

Although the proposed method is not exhaustive, the common availability of "H-classes" information for industrial wastes renders the identified criteria a simple tool for the identification of major-accident hazards that derive from wastes handling.