

GUIDELINES

Disposal of Wastes in Cement Plants

**Updated Edition
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Please note: This translation is for your convenience. It is not legally binding.

Legal status of this publication

This publication is an implementation guide issued by SAEFL in its capacity as a supervisory authority, and is addressed primarily to the enforcement authorities. It seeks to clarify undefined legal concepts contained in the relevant Acts and ordinances so as to facilitate consistent enforcement practices. Authorities who give due consideration to these guides can safely assume that federal law is being correctly implemented. Alternative approaches are, however, permissible provided they comply with the legal requirements. Guides of this kind (also referred to as guidelines, guidance, recommendations, handbooks, enforcement aids, etc.) are published by SAEFL in the series entitled «Applying environmental law».

Editor

Swiss Agency for the Environment, Forests
and Landscape (SAEFL)

*SAEFL is an agency of the Federal Department
of Environment, Transport, Energy and
Communications (DETEC)*

Note for the English readers:

*According to the «Swiss Federal law relating to the protection of Environment» **disposal** of wastes includes their recovery or placing in a landfill as well as the preliminary stages like collection, transport, storage and treatment.*

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1. Introduction

The raw materials for the production of Portland cement – mainly limestone and marl or clay – are mixed with the additives necessary to produce the correct cement constitution in the form of "raw meal". The raw meal is fed continuously through a preheater to the cylindrical rotary kiln of the cement plant, where it is burned in direct contact with the hot combustion gases from the burner for approx. 20 minutes at temperatures between 850 and 1450°C. In this stage, CO₂ is expelled from the limestone and the calcium, aluminium, silicon and iron compounds present in the raw meal combine to form cement clinker. After cooling, the clinker is interground together with approx. 10% gypsum and other constituents to produce the final "Portland cement".

Both the raw materials and the fossil fuels (mainly hard coal and heavy oil) may be substituted in part by waste of suitable composition. This is desirable in terms of conservation of resources. One must, however, ensure that the recovery or disposal of waste in cement plants occurs in an ecologically sound way. The quality of the clinker and cement produced must be maintained, both in terms of their material composition and their technical properties as building materials. Furthermore, they must not be misused as a sink for heavy metals, which should be concentrated and recycled as far as possible by suitable technical means. Also in terms of flue gas emission, the use of waste in cement plants must not lead to significantly higher emission of pollutants. It is therefore necessary to specify quality requirements for the waste employed, and in certain cases, to restrict its use.

The cement industry in Switzerland has set as objective to satisfy a large part of its thermal energy needs with suitable combustible waste. It is also interested in suitable incombustible waste as a substitute for mineral raw materials. The ability of cement plants to process large quantities of waste, particularly waste with high calorific value, influences waste planning by the Confederation and the cantons. Throughout Switzerland, the municipal waste incineration plants (MWI) in operation or under construction will soon reach sufficient capacity to incinerate all the municipal waste produced. Certain waste incineration plants, particularly in the large conurbations, are at present operating under capacity. However, this situation will change following the ban on landfilling of combustible waste due to come into force on January 1, 2000..

Furthermore, a number of special-waste incineration plants, processing mainly solid or viscous special wastes have reported free capacity. Nevertheless, liquid special wastes (waste oil, solvents) would present a disposal problem without the contribution of the cement industry. Thus, the various incineration routes available in Switzerland are both complementary and in competition with one another. This is why waste disposal in cement plants must take these specificities of the Swiss waste industry into account.

To ensure consistent implementation and coordination of waste planning, the present Guidelines clearly specify the types of waste that may be disposed of in cement plants and the requirements which must be observed. The Guidelines are based on the Ordinance on Air Pollution Control (OAPC), Appendix 2, subsection 111 (revised 15.12.1997). During the next revision of the Technical Ordinance on Waste (TOW), SAEFL will decide whether to include regulations on waste disposal in cement plants in the TOW.

In 1993, SAEFL established the working group "Waste in Cement Plants", comprising representatives of the cantons, the cement industry, the waste industry, environmental organizations and federal research institutes. This group prepared a report, published in draft form in 1994, the first part of which contained suggestions on requirements for alternative fuels. The complete report under the name of "Thesenpapier" (List of Proposals)¹ was published in June 1997 as No. 70 of the SAEFL Environment Materials. The report presents technical and scientific principles, ecological objectives and specific proposals for the requirements for disposal of waste in cement plants.

The criteria chosen are based on the concept of least total impact on the ecosystem combined with optimum deployment of resources. The working group has attempted the complex task of reconciling the demands of holistic environmental protection, waste and resource policy, waste economy and the CO₂ problematic. The procedure is a pragmatic one. The **Positive list** (list of permitted waste) which is the mainstay of this concept, is tailored to the waste situation in Switzerland with its 28 municipal waste and 5 special-waste incineration plants, and also contains exceptions for specific categories of waste. The resulting requirements are intended to be simple and easy to use, to optimize the disposal of waste in cement plants in the overall interest of the environment (as far as we understand it today). It is the wish of all those concerned that a cement plant that processes waste should remain a cement plant, i.e. neither its environmentally relevant emission nor its economic objectives should diverge from the typical range of commercial cement plants. The basic principles and requirements contained in the "Thesenpapier" (Chapter 6.1) are listed below.

Basic principles of the "Thesenpapier":

Waste may be disposed of in cement plants provided this

- is ecologically more advantageous than any other form of disposal and
- is in agreement with the waste planning of the Confederation and the cantons and
- is not in competition with a more ecological deployment of resources

Requirements in the "Thesenpapier":

- Disposal in cement plants must fulfill a *re-use objective*, i.e. substitution of the required fuels and materials (basic materials, grinding additives and process materials).
- Unavoidable dilution of *extraneous substances* to the cement production process must be minimized.
- The process must provide an overall solution for the relevant waste, i.e. no subsequent disposal problem should arise for the community as a whole.

¹ "Waste Disposal in Cement plants, Thesenpapier", Environment Materials No. 70, SAEFL, Documentation Service, CH-3003 Bern, Switzerland, 1997

SAEFL will periodically revise the Guidelines, and particularly the "positive list" in Appendix I. To this end, it will appoint an expert group comprising representatives of the cantons, the cement industry and the waste industry, which will convene at least once a year.

2. Scope of the Guidelines

The Guidelines specify which types of waste, according to Appendix 2, subsection 111, OAPC², are suitable for the production of cement clinker and Portland cement in Swiss plants, according to the SIA norm 215.002 (SN EN 197-1). The Guidelines also contain the requirements on how this waste must be handled.

Waste may be used for various purposes in cement production depending on its composition and properties:

- a. Use as a **fuel**, either in the main burner at the clinker outlet of the rotating kiln or the inlet of the rotating kiln.
- b. Use as an **alternative raw material**; this includes both actual **substitution** of part of the normal raw material and use for any **corrective** adjustment of the elementary composition of the raw meal which may be necessary.
- c. Use **as constituent at the grinding stage** in the production of Portland cement.
- d. Use as a **process material**, e.g. aqueous waste that can be used, for example, for flame cooling for the purpose of NO_x reduction. Aqueous waste containing ammonia used for nitric oxide reduction is also of increasing importance.

Note: Many fuels, particularly those of low calorific value, contain a significant proportion of incombustible, inorganic substances that are incorporated to 100% in the product inside the cement kiln, i.e. are used as alternative raw materials (combination of uses a. and b. above).

3. Requirements for permitted waste

3.1 Basic principles

- a) In general, only bulk wastes of suitable composition, low in pollutants, can be disposed of in cement plants. This is particularly the case if the quality of the waste is comparable with that of the fuels or raw materials customarily used in the production of Portland cement.
- b) Municipal waste and specifically sorted municipal waste fractions (e.g. RDF, "refuse derived fuel"), as well as other waste comparable to municipal waste with respect to its origin, material properties, chemical and physical behaviour and chemical composition, shall not be disposed of in cement plants if it is not included in the Positive list (Appendix I) (the Positive list contains, for example, used paper and cardboard).

² Ordinance on Air Pollution Control (OAPC), SR 814.318.142.1, revision of 15.12.1997

- c) Cannot be disposed of in cement plants, heavily polluted special waste and other problematic special waste under the OMW³ which does not satisfy the requirements of Section 3, as well as other waste which, owing to its chemical composition, its material properties or its dangerousness, may influence the safety or the operation of a cement plant, or whose disposal therein would lead to a significantly increased environmental impact.

3.2 What kinds of waste are permitted?

Subject to the further requirements in Chapter 5 of these Guidelines, the following waste may be used as fuel or as raw material in cement plants:

- a. The types of waste included in the **Positive list (Appendix I)** are allowed. If this waste is listed as special waste or other waste subject to control under the OMW, the additional requirements of **Section 5.2.2** must be complied with.
- b. Waste not contained in the Positive list may be disposed of in cement plants provided the pollutant content complies with the **guidance values⁴ listed in Table 1**. Where special waste and other waste subject to control under the OMW is concerned, the additional requirements in **Section 5.2.2** apply.
- c. If necessary, the throughput of waste shall be restricted, i.e. if as a result of the disposal of waste the pollutant content in the clinker or cement exceeds the **guidance values⁴ in Table 2**, or if the concentration of particular substances is significantly increased (cf. Section 4.1).

³ Ordinance of 22 June 2005 on Movements of Wastes (OMW), SR 814.610

⁴ Cf. Appendix III

Table 1: Guidance values for pollutant content of wastes not contained in the positive list.

Element		Guidance value [mg/kg dry matter]			
		Column A for combustible wastes (left: in mg/MJ; right: in mg/kg, based on a lower calorific value of 25 MJ/kg)		Column B for wastes used as alternative raw materials	Column C for wastes used as constituents at the grinding stage in the production of Portland cement
		mg/MJ	mg/kg (at 25 MJ/kg)	mg/kg	mg/kg
Arsenic	As	0.6	15	20	30
Antimony	Sb	0.2	5	5	5
Barium	Ba	8	200	600	1000
Beryllium	Be	0.2	5	3	3
Lead	Pb	8	200	50	75
Cadmium	Cd	0.08	2	0.8	1
Chromium	Cr	4	100	100	200
Cobalt	Co	0.8	20	30	100
Copper	Cu	4	100	100	200
Nickel	Ni	4	100	100	200
Mercury	Hg	0.02	0.5	0.5	0.5
Selenium	Se	0.2	5	1	5
Silver	Ag	0.2	5	-	-
Thallium	Tl	0.12	3	1	2
Vanadium	V	4	100	200	300
Zinc	Zn	16	400	400	400
Tin	Sn	0.4	10	50	30
TOC, toxic organic compounds	No general guidance value. Special procedure according to OAPC, Appendix 2, subsection 719, and the rule of minimisation whenever substances such as PCB, dioxins or similar toxic compounds are suspected. For PCB in waste materials, the values specified in Section 5.2.2 or in the positive list are applicable. For organic compounds in general, Section 4.2 shall be observed.				

Notes to Table 1

Column A applies to wastes used as **fuel** introduced either in the main burner at the clinker outlet of the rotating kiln or the inlet of the rotating kiln. The guidance values in column A [mg/MJ] are based on the lower calorific value of the waste. For reasons of clarity, the guidance values in [mg/kg waste] are also given, based on a lower calorific value of 25 MJ/kg. The value of 25 MJ/kg corresponds to the calorific value of hard coal. If the calorific value of the waste is lower or greater than 25 MJ/kg, the permissible heavy metal content changes proportionally.

Column B applies to wastes used as **alternative raw materials** and **corrective raw materials** in producing clinker. This waste substitutes part of the raw material normally used or serves to correct the raw meal composition, i.e. the calcium, iron, silicon or aluminium content (according to the remarks on page 46 of the "Thesenpapier").

Column C applies to wastes used as constituents at the **grinding stage** in the production of Portland cement. Portland cement consists of 90-95% ground cement clinker and 5-10% of gypsum, as well as other constituents added at the grinding stage (according to pages 27 and 28 in the "Thesenpapier").

Note: Table 1 contains no guidance values for **process materials**. These are therefore only permissible if they are contained in the positive list.

4. Quality requirements for clinker, cement and flue gases

4.1 Quality of clinker and cement

Guidance values limiting the pollutant content of clinker and Portland cement are contained in Table 2 of these Guidelines. If the guidance values are exceeded⁵, the throughput of the waste used must be reduced. The cement plants must monitor the relevant parameters according to Section 5.1.b., subsection 2. Further, for those elements (Be, Cd, Hg and Tl) marked with an asterisk (*), no significant increase in the pollutant concentration of the clinker or cement may occur as a result of waste use (i.e. no topping up)⁵.

The guidance values for the heavy metal content of clinker in Table 2 are based on raw materials obtained from quarries being worked in Switzerland at the time of preparation of these Guidelines. The possibility cannot be ruled out that raw materials might later be acquired abroad or from other sources in Switzerland, making it impossible to comply with the guidance values in Table 2 owing to an increased content of certain minerals. Non-compliance of this nature is not covered by the Guidelines. However, waste that would lead to a further increase in already inadmissible values in the clinker would no longer be permitted in the cement plant concerned.

⁵ Cf. Appendix III

Table 2: Guidance values for pollutants⁶ in clinker and cement

Element		Guidance value [mg/kg]	
		for clinker	for Portland cement
Arsenic	As	40	-
Antimony	Sb	10	-
Barium	Ba	1000	-
Beryllium	Be	5 *	-
Lead	Pb	100	-
Cadmium	Cd	1.5	1.5 *
Chromium	Cr	150	-
Cobalt	Co	50	-
Copper	Cu	100	-
Nickel	Ni	100	-
Mercury	Hg	no guidance value for clinker (is not incorporated)	0.5 *
Selenium	Se	5	-
Thallium	Tl	2	2 *
Zinc	Zn	500	-
Tin	Sn	25	-
Chlorine (inorg.)	Cl	-	1000
Sulphur	S	-	3.5% SO ₃ ⁷

For those elements designated by "*", the use of waste must not lead to a significant increase in their content in clinker or Portland cement (i.e. no topping up)¹.

4.2 Flue gas quality

a. Basic principles

1. The requirements for emissions from cement plants are contained in the OAPC⁸. The general values for permitted emissions are contained in Appendix 1 of the OAPC and the supplementary provisions and exceptions in Appendix 2, subsection 11. When using waste in cement plants, the additional provisions for emissions of mercury specified in paragraph b below applies.
2. For peripheral facilities, e.g. temporary storage sites, transfer stations and feed systems to the cement kilns, the provisions in Appendix 1 of the OAPC apply.

b. Supplementary provision for mercury emission

Cement plants that dispose of waste must comply with the emission limit for mercury of 0.1 mg Hg/m³.

⁶ Cf. Appendix III

⁷The guidance value specified for sulphur is not an environmental limit value. It must be respected to ensure compliance with the quality standards for mineral binding agents (SIA Norm 215)

⁸ Ordinance on Air Pollution Control of 16 Dec. 1985 (OAPC, SR 814.318.142.1), revision of 15.12.97

c. No "topping up" of flue gas pollutants to limit value

Cement plants that dispose of waste must carry out checks and satisfy the responsible authorities that the disposal of waste causes no significant increase in pollutant emissions in the flue gas (i.e. no "topping up" of flue gas pollutants to limit value)⁹.

d. Emission of organic compounds

Cement plants that dispose of waste must measure the emissions of organic substances from the cement kiln, temporary storage (if present) and feeding systems at regular intervals. The quantity or quality of organic compound emissions can alter significantly when waste is combusted inappropriately in the secondary firing (i.e. incomplete combustion). This is also the case when organic compounds are emitted upon heating of waste added to the raw meal on heating. If necessary, the emission of organic compounds must be reduced by technical means.

5. Further requirements**5.1 Operation, monitoring and transport****a. Mixing of waste**

Mixing of (permitted) waste is allowed only if the pollutant content of each individual batch complies with the guidance values stipulated in the Guidelines (cf. in addition art. 10 TOW¹⁰, and for special waste, art. 5 OMW¹¹). However, the special provisions for CSS in Appendix II are excepted and may deviate from this.

b. Material inspection, emission monitoring and quality control

Cement plants that dispose of (permitted) waste must:

- (1) organise the necessary qualified personnel and the required technical equipment to ensure proper entrance control, temporary storage and disposal of the waste received;
- (2) by means of the specified measurements and material flow calculations, ensure that both the requirements regarding flue gas quality (Section 4.2) and those regarding pollutant content of the clinker and cement (Table 2, guidance values) are complied with;
- (3) carry out inspections on receipt of the waste (entrance controls), including the necessary chemical analyses to ensure that the waste delivered for disposal satisfies the requirements of these Guidelines and the cantonal provisions;
- (4) keep a log of the waste disposed, with information on its origin, type, quantity and composition, together with copies of the analyses carried out during entrance controls.

⁹ Cf. Appendix III

¹⁰ Technical Ordinance on Waste (TOW) of 10 Dec. 1990, SR 814.015

¹¹ Ordinance of 22 June 2005 on Movements of Wastes (OMW), SR 814.610

c. Temporary storage and other peripheral facilities (e.g. feed systems)

The temporary storage and peripheral facilities which a cement plant operates in connection with the disposal of waste must use state-of-the-art technology, comply with the requirements of Art. 37 TOW, and in particular comply with the following conditions:

- (1) the pollutants contained in the waste must not pass into the effluent;
- (2) the flue gases are to be captured and purified so they fulfil the requirements of the OAPC;
- (3) necessary safety measures must be taken (e.g. retention basin, fire safety installations);
- (4) waste must be stored and handled only by properly trained personnel;
- (5) for existing plants that do not comply with the present provisions, the canton stipulates a rehabilitation period pursuant to the aims of these Guidelines.

d. Waste transport

Transport of waste that, owing to its properties, is classified as "dangerous goods", is to be carried out according to currently valid regulations.

5.2 Disposal of special wastes and other waste subject to control in cement plants**5.2.1 Special wastes and other waste subject to control authorised in cement plants**

Disposal of special wastes [S] and other waste subject to control [ak] as specified in the LMW¹² must be carried out in appropriate facilities, according to the OMW. As a rule, special wastes and other wastes subject to control, which are combustible and highly polluted or otherwise problematic and cannot be recycled, should be incinerated in special-waste incineration plants. These Guidelines specify which special wastes and other wastes subject to control are authorised for disposal in cement plants, on condition that a cantonal authorisation under art. 8 OMW ("disposal permit") has been issued.

Disposal in cement plants is permitted for special waste that is either contained in the positive list (Appendix I), or that complies with the guidance values in Table 1. The remaining requirements, in particular the additional requirements given below, must be fulfilled. The requirements for use of CSS in Chapter 6 and Appendix II are excepted from this.

5.2.2 Additional requirements for special waste and other waste subject to control disposed of in cement plants

- a. Special waste and other waste subject to control disposed of in cement plants shall not originate from the production, preparation, distribution or use of potent biologically active substances (e.g. production of pharmaceuticals), or have a detrimental effect on occupational health for any other reason.
- b. Unless otherwise stipulated in the positive list, the content of halogenated organic compounds shall not exceed 1 percent by weight and that of PCB/ PCT (for wastes used as fuel substitute) 10 mg/kg. When the waste is used as an alternative raw material, as a grinding aid or as process material, its PCB/PCT content must be kept as low as possible and on no account exceed 1 mg/kg. The canton specifies the requirements for each particular case. Excessive analysis costs should be avoided.

¹² Ordinance of the DETEC of 18 October 2005 on Lists for the Movements of Waste, SR 814.610.1

- c. Cement plants may accept (permissible) special waste and other waste subject to control only from the following consignors:
- (1) Industrial works in which the waste originates, and only if it arises directly from a defined process and in large quantities. Producers of special waste and other waste subject to control may mix large batches provided each batch alone complies with the guidance values, and an explicit LMW code applies to the resulting mixture (e.g. codes 14 06 02 or 13 02 08). In all other cases, mixing is prohibited (Art. 5 OMW and Art. 10 TOW).
 - (2) Companies that accept special waste and other waste subject to control for treatment and have the necessary cantonal licence. In producing large batches for delivery to the cement plants, such companies may intermix special waste only if each individual batch satisfies the relevant criteria for pollutant content (prohibition of mixing, Art. 5 OMW and Art. 10 TOW).

6. Special requirements for preparation and use of “alternative solid fuels”

6.1 Initial context

In Switzerland, the company Cridec SA in Eclépens (Canton of Vaud) operates a facility for mixing certain types of waste with sawdust or other cellulosic carrier materials. The alternative fuel prepared in this way, known under its French name of CSS (Combustibles solides de substitution) is supplied to a neighbouring cement plant as fuel. A new production plant was commissioned at the end of 1995, i.e. before the present Guidelines came into force.

Most of the special waste currently processed by Cridec is not contained in the positive list (Appendix I of these Guidelines). Special requirements for this waste are specified so as to enable the firm of Cridec to modify the existing plant in accordance with the new provisions. As a result, unsuitable waste fractions must be removed and handled by other means (e.g. in a special-waste incineration plant) to ensure that the specified limits on pollutant loads are not exceeded. SAEFL is preparing guidelines to define the acceptance requirements for waste used as fuel in municipal waste incineration plants (MSWI) and to make these requirements tighter than is currently the practice.

6.2 Proof of need for new facilities

New facilities for the production of CSS can only be authorised if proof of need has been brought. At present, this is not the case in Switzerland: there are enough domestic incineration facilities specialised in the disposal of problematic and highly polluted special wastes in operation.

6.3 Requirements for the use of CSS and its preparation

- a. All cement plants which use CSS must comply with the requirements of these Guidelines concerning clinker and cement quality, flue gas pollutants, operation and control apply to cement plants. The special requirements of Appendix II apply to the composition of waste mixtures allowed as alternative fuels.
- b. Installations that produce CSS or that mix special waste and other waste subject to control for the purpose of producing CSS must comply with the special requirements of Appendix II of these Guidelines. If not otherwise specified in Appendix II, the requirements of Section 5.2. apply.

Appendix I

Positive List

The positive list specifies the wastes that can be disposed of in cement plants, despite the fact that, as experience shows, they exceed the guidance values in Table 1. The disposal of the waste in question in cement plants is permitted either on ecological grounds, to guarantee sufficient disposal capacity is available, or owing to a lack of other suitable treatment plants.

SAEFL will periodically review the positive list to establish whether certain types of waste should be removed or if new types should be added. To this end, SAEFL appoints an expert group comprising representatives of the cantons, the cement industry and the waste processing industry. The expert group convenes at regular intervals, at least once a year. The expert group can also suggest to SAEFL any changes in the Guidelines that it deems necessary.

Status May 2007

Positive list / A) Alternative fuels

Status: May 2007

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
A1	13 01 10 [S] 13 01 11 [S] 13 01 12 [S] 13 01 13 [S]	Hydraulic oils Non-chlorinated insulating oils	These shall comply with the guidance values in Table 1, column A, if not otherwise permitted in the supplement	organic halogen compounds PCB/PCT	1% p.wt. 50 mg/kg
A2	05 01 05 [S] 13 02 05 [S] 13 02 06 [S] 13 02 07 [S] 13 02 08 [S] 13 04 01 [S] 13 04 02 [S] 13 04 03 [S] 16 01 13 [S]	Motor and gearbox oils Mineral oil mixtures Other lubricating oils	These shall comply with the guidance values in Table 1, column A, if not otherwise permitted in the supplement	Lead Zinc organic halogen compounds PCB/PCT	Pb 800 mg/kg Zn 1000 mg/kg 1% p.wt. 50 mg /kg
A3	03 01 04 [ak] 03 01 05 [ak] 15 01 03 [ak] 15 01 10 [S] 17 02 97 [ak] 17 02 98 [ak] 19 12 06 [ak] 19 12 07 [ak] 20 01 37 [ak] 20 01 98 [ak]	Used wood	Used wood, for example from building sites, building demolition, conversions, renovation, furniture and packaging, from which metals and bulk contaminants have been removed. Recovery independent of compliance with guidance values in Table 1, column A. Determination of the pollutant immissions into the clinker and emissions in the flue gas must be ensured based on appropriate sampling and analysis.	---	---
A4	19 08 05 []	Sewage sludge from municipal wastewater treatment plants	Recovery independent of compliance with guidance values in Table 1, column A. Throughput is dependent, among other things, on preservation of linker and cement quality (as per Table 2 of the Guidelines) and flue gas (as per chapter 4 of the Guidelines). Suitable technical measures shall in particular be taken to limit mercury emissions. The prohibition of topping up (i.e. no significant increase) for the pollutants listed in Table 2 must be observed.	---	---

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / A) Alternative fuels**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
A5	16 01 03 [ak] 19 12 04 []	Car tyres and other rubber waste	Disposal of tyres and industrial rubber waste such as used conveyor belts, buffers and escalator belts is allowed, but not of chlorinated rubber or other chlorinated polymer compounds or sports ground coverings containing Hg. The throughput depends, among other things, on compliance with clinker quality (Table 2 of the Guidelines). Among other things, car tyres contain zinc compounds. The guidance value for zinc in clinker limits the quantity that may be used.		---
A6	19 12 01 []	Paper, cardboard	Only paper and cardboard fractions from separate collections and industrial paper waste that owing to its poor quality or market saturation cannot be recycled. Available data indicate that the pollutant content of used paper and cardboard complies with the guidance values in Table 1, column A. In justified cases, the cantonal agency responsible can require analyses to be carried out and, if necessary, restrict the quantity incinerated.		---

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / A) Alternative fuels**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
A7	-	Petroleum coke	Like coal, petroleum coke has been used for many years as a fuel in cement plants. It has been included in the positive list owing to its specific contamination with vanadium and nickel. For these elements, the guidance values opposite apply:	Vanadium Nickel	V 1000 mg/kg Ni 300 mg/kg
A8	03 03 05 [] 03 03 10 []	Paper sludge (incl. that from used paper)	May be used in cement plants if the guidance values opposite and for the other pollutants with the values in Table 1, column A, of the Guidelines are complied with. The throughput depends, among other things, on compliance with clinker quality (Table 2 of the Guidelines). Suitable technical measures shall be taken to limit mercury emission to max. 0.1 mg Hg/Nm ³ flue gas. The prohibition on topping up (i.e. no significant increase) for the pollutants listed in Table 2 must be observed.	Lead Cadmium Chromium Cobalt Copper Molybdenum Nickel Mercury Zinc	Pb 500 mg/kg Cd 5 mg/kg Cr 500 mg/kg Co 60 mg/kg Cu 600 mg/kg Mo 20 mg/kg Ni 80 mg/kg Hg 5 mg/kg Zn 2000 mg/kg
A9	02 01 04 [] 07 02 13 [] 12 01 05 [] 15 01 02 [] 16 01 19 [] 17 02 03 [] 20 01 39 []	Plastics (graded and mixtures)	Clean plastics waste from separate collection, i.e. not mixed with household waste, or homogeneous plastics fractions from industry and agriculture, if these cannot be recycled. Plastics waste shall comply with the guidance values opposite and, for the other pollutants with the values in Table 1, column A, of the Guidelines. The values are applicable to a calorific value of 25 MJ/kg.	Antimony Barium Cadmium Copper Tin ¹ Zinc	Sb 300 mg/kg Ba 2000 mg/kg Cd 2 mg/kg Cu 150 mg/kg Sn 10 (50) mg/kg Zn 1500 mg/kg

1) The value of 50 mg/kg remains valid until an analytical method which reliably detects a threshold value of 10 mg/kg becomes available

Positive list / A) Alternative fuels**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
A10	-	Polyester, PET	Homogeneous polyester waste of industrial origin or from take-back systems/separate collection and that cannot be recycled as secondary raw material. Polyester waste must comply with the guidance values in Table 1, column A, of the Guidelines, if not otherwise specified in the supplement. ¹³	Antimony Barium Cadmium organically compounded chlorine	Sb 800 mg/kg Ba 2000 mg/kg Cd 10 mg/kg Cl 2% p.wt.
A11	19 12 04 []	Polyurethane, PUR foam	Pressed residues from the disposal of cooling appliances (i.e. insulating foam containing CFC). Polyurethane waste must comply with the criteria in Table 1, column A, of the Guidelines, excepting those in the supplement ¹⁴	Barium Zinc	Ba 2000 mg/kg Zn 1500 mg/kg
A12	07 01 04 [S] 07 02 04 [S] 07 03 04 [S] 07 04 04 [S] 07 05 04 [S] 07 06 04 [S] 07 07 04 [S] 14 06 03 [S]	Weakly halogenated solvents with chlorine content $\leq 2\%$	They must comply with the criteria in Table 1, column A, of the Guidelines. NB. The increase of the allowed chlorine concentration can only be envisaged for cement plants equipped with a chlorine bypass or an equivalent technical facility. Chlorine bypasses must be operated according to state-of-the-art standards and in particular without production of secondary wastes (kiln dust).		---

¹³ *Antimony compounds* are used as additives (brighteners) in the production of PET. An increase in the guidance value for this element has therefore been indicated. The value of 10 mg/kg for *cadmium* permits any plastics fractions containing cadmium to be excluded even when less sensitive analytical methods are used. Experience shows this is sufficient to distinguish PET fractions containing cadmium from those without.

¹⁴ State-of-the-art dismantling of cooling appliances results in a PUR fraction with a higher zinc content.

Positive list / A) Alternative fuels**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
A13	07 01 03 [S] 07 02 03 [S] 07 03 03 [S] 07 04 03 [S] 07 05 03 [S] 07 06 03 [S] 07 07 03 [S] 09 01 03 [S] 14 06 02 [S] 20 01 13 [S]	Solvents and solvent-contaminated wastes	They must comply with the criteria in Table 1, column A of the Guidelines, excepting those mentioned in the supplement.	Tin	Sn 300 mg/kg

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / B) Raw materials**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
B1	19 01 13 [S] 19 01 14 [S]	Ash from the incineration of paper sludge	Ash from paper sludge incineration plants must comply with the guidance values in Table 1, column B, of the Guidelines, if not otherwise specified in the supplement:	Lead Cadmium Copper Zinc PCDD/PCDF	Pb 250 mg/kg Cd 5 mg/kg Cu 250 mg/kg Zn 2000 mg/kg 10 ng TEQ/kg
B2	10 09 03 []	Waste from smelting works, i.e. sands, dust, slag and furnace linings, provided the waste in question is not special waste under LMW	Must comply with the guidance values in Table 1, column B, of the Guidelines, unless stipulated otherwise in the supplement. The prohibition on topping up (i.e. no significant increase) pollutants listed in Table 2, column B, of the Guidelines must be observed.	Lead Chromium Cobalt Copper Nickel Loss on ignition TOC	Pb 200 mg/kg Cr 600 mg/kg ¹⁵ Co 150 mg/kg Cu 200 mg/kg Ni 150 mg/kg max. 8% max. 1%
B3	20 03 03 [] 20 03 06 [S]	Waste from road cleaning	Sludge from road-sludge collectors and other waste from road maintenance. Following allocation by the canton and after consultation with the cement plant concerned this waste need not comply with the guidance values in Table 1, column B, of the Guidelines.		---
B4	11 02 07 [S]	Contaminated calcium residues from tin recycling	This residue may be disposed of provided the guidance values for waste in Table 1, column B, of the Guidelines are complied with and unless otherwise specified in the supplement.	Lead Cadmium Chromium Zinc Tin	Pb 100 mg/kg Cd 5 mg/kg Cr 400 mg/kg Zn 1'500 mg/kg Sn 100 mg/kg

¹⁵ Use of this waste must not lead to a significant increase in the chromate content of the clinker.

Positive list / B) Raw materials

Status: May 2007

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
B5	17 05 03 [S] 17 05 05 [S] 17 05 07 [S] 17 05 93 [] 17 05 94 [] 17 05 95 [] 17 05 96 [ak] 19 13 01 [S] 19 13 02 [] 19 13 03 [S] 19 13 04 []	Residue from soil cleaning facilities, soil, concrete and mixed demolition waste, mainly contaminated with organic substances Residues from soil washing facilities, soil, concrete and mixed demolition waste, mainly contaminated with organic compounds	<p>For these wastes, different regulations apply. We are dealing here with residues from the remediation of contaminated sites. The authority concerned must decide in each individual case whether disposal in a cement plant is permissible. In general, residues from soil washing and preparation facilities that are contaminated with organic compounds may be disposed of in cement plants if the organic components are completely combusted and the cement plant is equipped with a flue gas treatment system appropriate to handle organic substances (e.g. active carbon filters). The waste must comply with the requirements for alternative raw materials (pollutant concentrations in Table 1, column B), and the following supplement applies:</p> <p>Exceptions to the guidance values in Table 1, column B, of the Guidelines are specified in the supplement for a series of heavy metals. A maximum of four of these exceptions may be invoked in any individual case. Should the content of five or more heavy metals exceed the guidance values in Table 1, column B, then disposal in cement plants is not permissible.</p> <p>The same requirements also apply to contaminated materials that for technical reasons cannot be recycled or whose recycling is not beneficial for environmental reasons (e.g. contaminated concrete), and which are therefore dispatched to a cement plant with appropriate flue gas treatment. When contaminated soil is to be disposed of in cement plants without prior preparation, its pollutant content must be expressed relative to the fine particle fraction (particles less than 63 micrometer). Thus, for example, sandy soil with 50% fine particle fraction and an effective chromium content of 90 mg/kg has a chromium content relative to the fine particle fraction of 180 mg/kg ($100/50 \times 90$). The pollutant content relative to the fine particle fraction calculated in this way must fulfil the above regulations on pollutant content.</p>	<p>see page 4/6</p> <p>Antimony Sb 20 mg/kg Lead Pb 500 mg/kg Cadmium Cd 5 mg/kg Chromium Cr 500 mg/kg Cobalt Co 100 mg/kg Copper Cu 500 mg/kg Nickel Ni 500 mg/kg Mercury Hg 2 mg/kg Zinc Zn 1.500 mg/kg Tin Sn 100 mg/kg PCDD/PCDF 10 mg TEQ/kg PCB 50 mg/kg</p>	

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / C) Corrective raw materials**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
C1		Materials similar to ores with high proportions of calcium, silica, iron or aluminium	<p>While raw mix substitutes are similar to rocks, corrective raw materials have the characteristics of ores. This is why they are treated separately in the positive list. Depending on the corrections required, wastes with high proportions of calcium, silica, iron and aluminium may be suitable as corrective raw materials. Such “ores” typically contain minor constituents. Should these minor constituents not comply with the criteria of Table 1, column B, of the Guidelines, the waste can only be used as corrective raw material under the following three conditions:</p> <ul style="list-style-type: none"> ● its quality must be comparable with corrective raw materials commonly used for the production of Portland cement; ● the recovery in a cement plant must be ecologically more advantageous than any other form of disposal; ● this form of recovery must not be in competition with an alternative that allows a more ecological use of resources. <p>Since only small amounts are generally involved, the different wastes are not mentioned individually in the positive list. The plant concerned must cooperate with the supplier and the competent authority in investigating to what extent the conditions of the positive list are satisfied. Following the principles of these Guidelines, the plant commits itself to limit the throughput in order to assure that the requirements for the quality of clinker, cement and flue gas as per chapter 4 of the Guidelines are fulfilled. The expert group will be informed of the decisions that have been taken.</p>		

Positive list / D) Grinding additives

Status: May 2007

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Guidance value 1)
D1	19 01 13 [S] 19 01 14 [S]	Ash from the incineration of paper sludge	Ash from paper sludge incineration plants used as grinding additive must comply with the guidance values in Table 1, column C, of the Guidelines, unless otherwise permitted in the supplement.	Barium Lead Cadmium Copper Zinc	Ba Pb Cd Cu Zn not specified 250 mg/kg 5 mg/kg 250 mg/kg 2000 mg/kg
D2	10 01 05 [] 10 01 07 []	Gypsum from sulphate precipitation in flue gas desulphurisation plants (REA gypsum)	The gypsum waste used must comply with the guidance values in Table 1, column C, of the Guidelines with the addition in the supplement:	Selenium	Se 20 mg/kg
D3	19 04 01 []	Vitrified residues from high-temperature waste treatment	Slag from high-temperature processes, such as for example DEGLOR, HSR, Thermoselect, Seiler, Plasmox: The guidance values in Table 1, column C, of the Guidelines must be complied with if not otherwise permitted in the supplement.	Chromium Copper Cr-VI in the eluate, according to TOW Test 2	Cr Cu 2.000 mg/kg 600 mg/kg 0.01 mg/l in the eluate
D4	10 01 17 []	Fly ash from coal firings	The fly ash used must comply with the criteria listed in column 1 of the table included in the Annex of the execution aid "Import und Verwendung von Kohleflugaschen und Hochofenschlacken" (available in German and French).		
D5	10 02 01 [] 10 02 02 []	Blast furnace slag	The blast furnace slag used must comply with the criteria listed in column 2 of the table included in the Annex of the execution aid "Import und Verwendung von Kohleflugaschen und Hochofenschlacken" (available in German and French).		

Adding constituents at the grinding stage must not lead to an accumulation of organic substances in the cement, in particular of those compounds difficult to degrade and / or highly toxic (e.g. dioxins).

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / E) Process materials**Status: May 2007**

No.	LMW Code	Description of the waste	Remarks / Requirements	Supplement	Standard value 1)
E1	06 02 03 [S]	Effluents containing ammonia	<p>Certain aqueous wastes can be valorised by use as DeNOx agent or for flame temperature regulation in the cement production process (injection in the temperature range of 900-950°C). Process materials are not mentioned in Table 1 of the Guidelines. These are treated as individual cases in the positive list. The permissible level of heavy metal contamination is based on the guidance values opposite. Specifically, this applies to:</p> <p>effluents containing ammonia, e.g. from the ammonia stripping process in effluent treatment plants.</p>	Arsenic As Lead Pb Cadmium Cd Chromium-VI CrVI Chromium III CrIII Cobalt Co Copper Cu Nickel Ni Mercury Hg Silver Ag Zinc Zn Tin Sn TOC	0.1 mg/l 0.5 mg/l 0.1 mg/l 0.1 mg/l 2.0 mg/l 0.5 mg/l 0.5 mg/l 2.0 mg/l 0.01 mg/l 0.1 mg/l 2.0 mg/l 2.0 mg/l not specified
E2	07 01 01 [S] 07 02 01 [S] 07 03 01 [S] 07 04 01 [S] 07 05 01 [S] 07 06 01 [S] 07 07 01 [S] 07 01 04 [S] 07 02 04 [S] 07 03 04 [S] 07 04 04 [S] 07 05 04 [S] 07 06 04 [S] 07 07 04 [S] 16 01 15 []	Aqueous waste not contaminated with halogenated solvents	<p>Are permitted as DeNOx agent (flame cooling, with direct injection). With two exceptions, the guidance values of the above category E1 apply to heavy metals. The exceptions and additions are given in the guidance values opposite:</p> <p>The content of each individual heavy metal in the clinker shall not increase by more than 10% with respect to clinker produced without waste.</p>	Chromium VI CrVI Copper Cu Organic halogenated compounds (e.g. halog. solvents) TOC	0.5 mg/l 1.0 mg/l 50 mg/kg relative to TOC 250 mg Cl/l not specified

1): Definition according to the Methodology paper; exceptions with regard to Table I of the Guidelines

Positive list / E) Process materials**Status: May 2007**

E3	09 01 01 [S]	Developer baths (photographic and reproduction developers, bleach, fixative and sensitising baths and mixed photographic effluent)	Are permitted as DeNOx agents (flame cooling, with direct injection; SNCR process with injection into the precalciner). With seven exceptions, the guidance values of category E1 apply to heavy metals. The exceptions and additions mentioned are given in the supplement opposite. Heavy metal fractions in clinker must not increase by more than 50% for silver and more than 10% for each of the other heavy metals individually with respect to a production using no wastes.	Chromium VI	CrVI	0.5 mg/l
	09 01 02 [S]			Chromium total	Cr	5.0 mg/l
	09 01 05 [S]			Copper	Cu	20 mg/l
	09 01 13 [S]			Silver	Ag	100 mg/l
				Lead	Pb	1.5 mg/l
				Tin	Sn	20 mg/l
				Zinc		5.0 mg/l
				Organic halogenated compounds e.g. halog. solvents	PCB	1 mg Cl/l
				TOC		not specified

Appendix II

Requirements for the disposal of special wastes in the form of alternative solid fuels (Combustibles solides de substitution, CSS)

1. Introductory remarks

This Appendix contains the special requirements mentioned in Chapter 6 of the Guidelines for preparation and use of CSS. Unless otherwise specified in this Appendix, the general provisions of the Guidelines apply.

2. Requirements for CSS

a) Annual load

As CSS are produced selectively, it is possible to affect their composition. The requirements for CSS limit the permissible annual load of certain heavy metals and other pollutants. So that modification of the plant and its mode of operation can comply with the new guidance values, the permissible annual load is reduced in two steps according to Table A II/1. For heavy metals not specified there, the guidance values in Section 3.2, Table 1, column A, of the Guidelines apply.

Tab. AII/1: Permissible pollutant loads in CSS (basis: 15,000 t CSS per year)

Pollutant		Max. annual load in t/a			Content in mg/kg		
		up to 2000	up to 2004	after 2004	up to 2000	up to 2004	after 2004
Lead	Pb	12.0	9.0	6.0	800	600	400
Cadmium	Cd	0.15	0.075	0.075	10	5	5
Chromium	Cr	7.5	4.5	4.5	500	300	300
Copper	Cu	15.0	7.5	7.5	1000	500	500
Nickel	Ni	4.5	3.0	3.0	300	200	200
Zinc	Zn	75.0	60.0	60.0	5000	4000	4000
Halogenated organic compounds					< 0.5 weight %		
Poorly degradable toxic halogenated organic compounds (e.g. PCB)					< 10 mg/kg		

If Cridec produces less than 15,000 t CSS a year, the annual loads (in t/a) decrease proportionally to the quantity of CSS produced. The contents indicated are to be regarded as guide values. They are intended for monitoring individual deliveries.

b) **Quality control**

Quality controls must ensure, first, that the annual pollutant loads in the alternative fuels produced do not exceed the values given in Table A II/1 and, second, that the cement plant complies with the specified exhaust values and the guidance values for clinker. The quality of the individual CSS deliveries to the cement plants must be documented in an appropriate form and samples retained to enable the annual loads to be subsequently checked on the basis of the documents and (if necessary) further analysis. The average monthly values of the individual pollutant loads must be checked periodically, at least once every six months, by the competent cantonal authorities.

3. Requirements for waste allowed in CSS production

a) **Basic principles**

Waste for conversion to CSS must in general have the following properties: have a low heavy-metal content, be largely free of halogens, contain only traces of poorly degradable halogenated organic compounds (such as PCB), and few VOCs (volatile organic compounds such as solvents), not be self-igniting, have a high ignition temperature, and be harmless from the point of view of toxicity and occupational hygiene. In general should be converted to CSS only waste that cannot be fed directly into the burner without disproportionate technical expenditure because of its physical properties.

b) **Permitted waste**

Only waste specified in Table A II/4 may be used for the production of CSS. Additionally, the general restrictions in Tables AII/2 and AII/3 apply.

Tab. AII/2: General restrictions for problematic substances in waste used for the production of CSS

Halogenated organic compounds	max. 1% per weight
Poorly degradable halogenated organic compounds (e.g. PCB)	max. 50 mg/kg
Solvent content	below 15%
Ignition point	above 55 °C
The waste shall not derive from the production, preparation, distribution or use of highly active or biologically active substances, or be otherwise problematic from the point of view of occupational health.	

Tab. AII/3: Guidance values for maximum tolerable heavy metal content in waste permitted for production of CSS.

Designation		Guidance value in [mg/kg]
Lead	Pb	600
Cadmium	Cd	10
Chromium	Cr	400
Copper	Cu	500
Nickel	Ni	300
Zinc	Zn	4.000
all other heavy metals	according to Table 1 of the Guidelines	

Quality controls according to Chapter 2, section b), must be carried out, to ensure that the permitted annual loads of Table A II/1 are not exceeded.

4. Requirements for production and use of CSS

a) State of the art

Processes must comply with the regulations concerning water protection, air pollution control (e.g. emissions of organic substances) and safety (e.g. explosion protection), both in converting waste to CSS and for temporary storage by the CSS producer and at the cement plants. Open shredding and mixing without exhaust air treatment is, for example, not state of the art.

b) **Entrance controls, including the necessary chemical analyses**, must ensure that only permitted special waste is converted to CSS, and that problematical, heavily polluted waste or waste fractions that are unsuitable for other reasons are dispatched to appropriate special-waste incineration plants.

c) Acceptance of premixed waste

No premixed waste can be accepted.

d) Combustion

CSS shall be introduced directly into the main burner of the cement kiln.

Tab. AII/4: Waste permitted in the production of CSS

LMW code	Description of the waste	Restrictions	
04 02 10 []	Organic matter from natural products (e.g. grease, wax)	Waste containing solvents (solvent content max. 15%) are permitted, provided the peripheral plants at the cement works (e.g. temporary storage, feeding systems including transport to the cement plants) comply with the OAPC regulations and correspond to the state of the art in terms of safety.	
04 02 16 [S]*	Dyestuffs and pigments containing dangerous substances		
04 02 17 [S]*	Dyestuffs and pigments other than those mentioned in 04 02 16		
05 01 03 [S]	Tank bottom sludges		
05 01 06 [S]	Oily sludges from maintenance operations of the plant or equipment		
05 01 08 [S]	Other tars (from petroleum refining and pyrolytic treatment of coal)		
05 06 03 [S]			
07 01 08 [S]	Other still bottoms and reaction residues		
07 02 08 [S]			
07 03 08 [S]			
07 04 08 [S]			
07 05 08 [S]			
07 06 08 [S]			
07 07 08 [S]			
08 01 11 [S]*	Waste paint and varnish containing organic solvents or other dangerous substances		See below for meaning of (*)
08 01 12 [S]*	Waste paint and varnish other than those mentioned in 08 01 11		
08 01 13 [S]*	Sludges from paint or varnish containing organic solvents or other dangerous substances		
08 01 14 [S]*	Sludges from paint or varnish other than those mentioned in 08 01 13		
08 01 15 [S]*	Aqueous sludges containing paint or varnish containing organic solvents or other dangerous substances		
08 01 16 [S]*	Aqueous sludges containing paint or varnish other than those mentioned in 08 01 15		
08 01 17 [S]*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances		
08 01 18 [S]*	Wastes from paint or varnish removal other than those mentioned in 08 01 17		

08 01 19 [S]*	Aqueous suspensions containing paint or varnish containing organic solvents or other dangerous substances
08 01 20 [S]*	Aqueous suspensions containing paint or varnish other than those mentioned in 08 01 19
08 01 21 [S]*	Waste paint or varnish remover
08 02 01 [S]*	Waste coating powders
08 03 07 [S]*	Aqueous sludges containing ink
08 03 08 [S]*	Aqueous liquid waste containing ink
08 03 12 [S]*	Waste ink containing dangerous substances
08 03 13 [S]*	Waste ink other than those mentioned in 08 03 12
08 03 14 [S]*	Ink sludges containing dangerous substances
08 03 15 [S]*	Ink sludges other than those mentioned in 08 03 14
08 04 09 [S]*	Waste adhesives and sealants containing organic solvents or other dangerous substances
08 04 10 [S]*	Waste adhesives and sealants other than those mentioned in 08 04 09
08 04 11 [S]*	Adhesive and sealant sludges containing organic solvents or other dangerous substances
08 04 12 [S]*	Adhesive and sealant sludges other than those mentioned in 08 04 11
08 04 13 [S]*	Aqueous sludges containing adhesives or sealants containing organic solvents or other dangerous substances
08 04 14 [S]*	Aqueous sludges containing adhesives or sealants other than those mentioned in 08 04 13
08 04 15 [S]*	Aqueous liquid waste containing adhesives or sealants containing organic solvents or other dangerous Substances
08 04 16 [S]*	Aqueous liquid waste containing adhesives or sealants other than those mentioned in 08 04 15
10 08 12 [S]	Tar-containing wastes from anode manufacture
10 11 19 [S]	Solid wastes from on-site effluent treatment containing dangerous substances

12 01 12 [S]	Spent waxes and fats
13 04 01 [S]	Bilge oils from inland navigation
13 04 02 [S]	Bilge oils from jetty sewers
13 04 03 [S]	Bilge oils from other navigation
13 05 01 [S]	Solids from grit chambers and oil/water separators
13 05 02 [S]	Sludges from oil/water separators
13 05 06 [S]	Oil from oil/water separators
13 05 07 [S]	Oily water from oil/water separators
13 05 08 [S]	Mixtures of wastes from grit chambers and oil/water separators
15 01 01 []	Paper and cardboard packaging
15 01 02 []	Plastic packaging
15 01 03 [ak]	Wooden packaging
15 01 05 []	Composite packaging
15 01 06 []	Mixed packaging
15 01 09 []	Textile packaging
15 01 10 [S]	Packaging containing residues of dangerous substances or special waste or contaminated by dangerous substances or special waste
16 07 08 [S]	Wastes containing oil
19 08 09 [ak]	Grease and oil mixture from oil/water separation containing only edible oil and fats
19 08 10 [S]	Grease and oil mixture from oil/water separation other than those mentioned in 19 08 09
19 11 05 [S]*	Sludges from on-site effluent treatment containing dangerous substances
19 11 06 [S]*	Sludges from on-site effluent treatment other than those mentioned in 19 11 05
20 01 26 [S]	Oil and fat other than those mentioned in 20 01 25
20 01 27 [S]*	Paint, inks, adhesives and resins containing dangerous substances
20 01 28 [S]*	Paint, inks, adhesives and resins other than those mentioned in 20 01 27

- * Fractions containing heavy metals (e.g. anti-corrosive paints or workshop sludges possibly classified under code 19 11 05 or 19 11 06) must be separated out by advance information of consignors and adequate entrance controls and disposed of in a special-waste incineration plant, or, if possible, recycled. The specified annual pollutant loads must not be exceeded. Exclusion of these fractions must be carried out so as to ensure compliance with the stepwise decrease in heavy metal loads specified in Tab. AII/1.