

Draft

First General Administrative Regulation Pertaining the Federal Immission Control Act (Technical Instructions on Air Quality Control – *TA Luft*)

Dated 24th July 2002

Pursuant to § 48 of the Federal Immission Control Act as promulgated on 14 May 1990 (BGBl. [*Bundesgesetzblatt* - Federal Law Gazette] I p. 880), as amended by Article 2 of the Act of 27 July 2001 (BGBl. I p. 1950), the Federal Government decrees the following General Administrative Regulation after having heard the parties concerned:

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1 Scope of Application

These Technical Instructions serve to protect the general public and the neighbourhood against harmful effects of air pollution on the environment and to provide precautions against harmful effects of air pollution in order to attain a high level of protection for the environment altogether.

The provisions of these Technical Instructions shall be observed when

- a) examining applications for a licence to construct and operate a new facility (§ 6 para. (1) of the Federal Immissions Control Act) as well as to alter the location, nature or operation of an existing facility (§ 16 para. (1), also in connection with para. (4) of the Federal Immissions Control Act),
- b) examining applications to grant a partial licence, to render a provisional decision or to grant permission of early start (§§ 8, 8a and 9 of the Federal Immissions Control Act),
- c) examining whether an alteration is subject to licensing (§ 15 para. (2) of the Federal Immissions Control Act),
- d) deciding about subsequent orders (§ 17 of the Federal Immissions Control Act) and
- e) deciding about orders concerning the determination of the type and quantity of the emissions released from a facility and the immissions occurring within the sphere of influence of such facility (§ 26, also in connection with § 28 of the Federal Immissions Control Act).

The protection against harmful effects of odour immissions on the environment is not regulated by this Administrative Regulation; notwithstanding this, this Administrative Regulation regulates the prevention of harmful effects of odour emissions.

The requirements under 5.1 to 5.4 shall not apply to facilities subject to licensing insofar as requirements are made to the prevention and to the determination of emissions of air pollutants in Ordinances issued by the Federal Government.

Insofar as, regarding the obligations of operators of facilities not subject to licensing pursuant to § 22 para. (1) nos. 1 and 2 of the Federal Immissions Control Act, it shall be assessed whether harmful effects of air pollutants exist, the principles of determination and measures to assess harmful effects on the environment established under 4 shall apply. A determination of immission indicators pursuant to 4.6 shall not occur insofar as an individual test shows that the efforts to be made for this would lack proportionality. If facilities not subject to licensing substantially contribute to the development of harmful effects on the environment, it is to be checked whether all best available techniques by which to avoid such development have been applied. Harmful effects on the environment which cannot be avoided by applying the best available techniques shall be kept to a minimum. Insofar as, in order to fulfil the obligations arising from § 22 para. (1) nos. 1 and 2 of the Federal Immissions Control Act, requirements may be made to facilities not subject to licensing, the requirements for precautions under 5 which apply to facilities subject to licensing may also be used as a possible source of information. In the event of an order issued pursuant to §§ 24 and 25 of the Federal Immissions Control Act, clean air plans shall be observed.

2 Definitions of Terms and Units of Measurement

2.1 Immissions

For the purposes of this Administrative Regulation, immissions shall be air pollutants affecting humans, animals, plants, soil, water, atmosphere or cultural and any other property.

Immissions shall be indicated as follows:

- a) mass concentration, as mass of air pollutants in relation to the volume of air polluted; with gaseous substances, the mass concentration shall refer to 293.15 K and 101.3 kPa.
- b) deposition, as a time-related area cover caused by the mass of air pollutants.

2.2 Immission Indicators, Evaluation Parcels, Model Parcels

Immission indicators shall indicate the existing load, the additional load or the total load caused by the respective air pollutant. The existing load shall be indicated by an indicator which describes the existing load caused by a pollutant. The additional load shall be indicated by an indicator which describes the proportion of immissions which can be expected to be caused in the course of the project applied for (as regards facilities to be built) or which is actually caused (as regards existing facilities). As regards facilities to be built, the indicator for the total load shall be calculated on the basis of the existing load and the additional load indicators; as regards existing facilities, this indicator equals the existing load.

Evaluation parcels include those points in the vicinity of a facility for which immission indicators which indicate the total load are determined. Model parcels include those points in the vicinity of a facility for which the additional load is calculated (immissions projection).

2.3 Immission Values

The annual immission value shall be the concentration or deposition value of a substance averaged over one year.

The daily immission value shall be the concentration value of a substance averaged over one calendar day, taking into account the respective frequency limit for excess values (number of days) over one year.

The hourly immission value shall be the concentration value of a substance, averaged over a whole hour (e.g., from 8 a.m. to 9 a.m.), taking into account the respective frequency limit for excess values (number of hours) over one year.

2.4 Waste Gas Volume and Waste Gas Volume Flow

For the purposes of this Administrative Regulation, waste gases shall be carrier gases together with solid, liquid or gaseous emissions.

For the purposes of this Administrative Regulation, any data regarding the waste gas volume and the waste gas volume flow shall refer to standard conditions (273.15 K and 101.3 kPa) after subtraction of the humidity content of steam unless explicitly to be indicated otherwise.

2.5 Emissions

For the purposes of this Administrative Regulation, emissions shall be air pollutants originating from a facility.

Emissions shall be indicated as follows:

- a) mass of substances or groups of substances emitted as related to volume (mass concentration)
 - aa) of waste gas under standard conditions (273.15 K and 101.3 kPa) after subtraction of the humidity content of steam,
 - bb) of waste gas (f) under standard conditions (273.15 K and 101.3 kPa) after subtraction of the humidity content of steam,

- b) mass of substances or groups of substances emitted, related to time as a mass flow (emitted mass flow); the mass flow is the total emission level occurring in one hour of due operation of a facility under operating conditions which are most unfavourable to the maintenance of air quality;
- c) quantity of fibres emitted (fibre dust concentration), in relationship to the volume of waste gas under standard conditions (273.15 K and 101.3 kPa) after subtraction of the humidity content of steam;
- d) ratio of the mass of substances or groups of substances emitted to the mass of products generated or processed or to stocking density (emission factor); the mass ratio shall take into account the total emissions from the facility occurring over one day of due operation of such facility under operating conditions most unfavourable to the maintenance of air quality;
- e) amount of Odour Units of the odorous substances emitted, as related to the volume (odorous substances concentration) of waste gas at 293.15 K and 101.3 kPa before subtraction of the humidity content of steam; the odorous substances concentration is the olfactometrically measured ratio of volume flows when diluting a waste gas sample with neutral air down to the odour threshold, data shall be provided as a multiple to the odour threshold.

2.6 Emission Ratio and Emission Reduction Ratio

The emission ratio shall be the ratio of the mass of an air pollutant emitted in waste gas to the mass supplied together with fuels or charge substances; data shall be provided as a percentage.

The emission reduction ratio shall be the ratio of the mass of an air pollutant emitted in waste gas to the mass supplied together with crude gas; data shall be provided as a percentage. The odour reduction ratio is an emission reduction ratio.

2.7 Emission Standards and Emission Limits

Emission standards shall provide the basis for emission limits.

The emission limits shall be established in the licensing notice or in a subsequent order as

- a) permissible fibre dust, odorous substances or mass concentrations of air pollutants in waste gas provided that
 - aa) any daily mean values do not exceed the established concentration level and
 - bb) any half-hourly mean values do not exceed twice the established concentration level,
- b) permissible mass flows, as related to one hour of operation,
- c) permissible mass ratios, as related to one day (daily mean values),
- d) permissible emission ratios, as related to one day (daily mean values),
- e) permissible emission reduction ratios, as related to one day (daily mean values), or
- f) any other requirements to provide precautions against harmful effects of air pollutants on the environment.

2.8 Units and Abbreviations

μm	micrometre:	$1 \mu\text{m} = 0.001 \text{ mm}$
mm	millimetre:	$1 \text{ mm} = 0.001 \text{ m}$
m	metre:	$1 \text{ m} = 0.001 \text{ km}$
km	kilometre	
m^2	square metre	
ha	hectare:	$1 \text{ ha} = 10,000 \text{ m}^2$
l	litre:	$1 \text{ l} = 0.001 \text{ m}^3$
m^3	cubic metre	
ng	nanogram:	$1 \text{ ng} = 0.001 \mu\text{g}$
μg	microgram:	$1 \mu\text{g} = 0.001 \text{ mg}$
mg	milligram:	$1 \text{ mg} = 0.001 \text{ g}$
g	gram:	$1 \text{ g} = 0.001 \text{ kg}$
kg	kilogram:	$1 \text{ kg} = 0.001 \text{ Mg (t)}$

Mg	megagram (same as t: tonne)	
s	second	
h	hour	
d	day (calendar day)	
a	year	
°C	degrees Celsius	
K	Kelvin	
Pa	pascal:	1 Pa = 0.01 mbar (millibar)
kPa	kilopascal:	1 kPa = 1,000 Pa
MPa	megapascal:	1 MPa = 1,000,000 Pa
kJ	kilojoule	
kWh	kilowatt hour:	1 kWh = 3,600 kJ
MW	megawatt	
OU	Odour Unit	
OU/m ³	odorous substances concentration	
LU	livestock unit (1 livestock unit equals an animal live weight of 500 kg)	

2.9 Adjustment

Insofar as numerical values are to be checked in order to evaluate immissions or emissions (e.g. immission values, additional load values, irrelevance values, emission standards), the respective measurement variables and operands shall comprise one digit more than the numerical value used for evaluation. The last digit of the final result shall be adjusted in compliance with No. 4.5.1 of DIN 1333 (February 1992 version) and it shall be supplied in the same unit of measurement and with the same number of digits as the numerical value.

2.10 Existing Facilities

For the purposes of this Administrative Regulation, existing facilities shall be

1. facilities for which – by [insert: effective date of this Administrative Regulation] -
 - a) a licence for construction and operation pursuant to § 6 or § 16 of the Federal Immissions Control Act or a permission of early start pursuant to § 8a of the Federal Immissions Control Act has been granted and obligations pursuant to § 5 para. (1) nos. 1 or 2 of the Federal Immissions Control Act are established in such permission,
 - b) a partial licence pursuant to § 8 of the Federal Immissions Control Act has been issued or a provisional decision pursuant to § 9 of the Federal Immissions Control Act has been rendered, insofar as obligations pursuant to § 5 para. (1) nos. 1 or 2 of the Federal Immissions Control Act are established therein,
2. facilities which require notification pursuant to § 67 para. (2) of the Federal Immissions Control Act or which required notification pursuant to § 16 para. (4) of the Industrial Code before the Federal Immissions Control Act entered into force.

3 General Principles for Licensing, Preliminary Decisions and Permissions for Early Start

3.1 Examination of Applications for Licences to Construct and Operate a New Facility

Pursuant to § 5 para. (1) no. 1 in connection with § 5 para. (1) nos. 1 and 2 of the Federal Immissions Control Act, a licence for construction and operation shall only be granted if it is ensured that the facility is constructed and operated in a way which facilitates that

- a) the air pollution originating from the facility cannot induce harmful environmental effects for the general public and the neighbourhood and
- b) precautionary measures have been taken against harmful environmental effects which may be caused by air pollution originating from this facility.

As to the examination of the prerequisites for licensing, 4 and 5 of this Administrative Regulation shall apply.

3.2 Examining Applications to Grant a Partial Licence (§ 8 of the Federal Immissions Control Act) or to Render a Provisional Decision (§ 9 of the Federal Immissions Control Act)

Insofar as examination refers to an object with regard to which a partial licence is applied for or to the occurrence of specific prerequisites for licensing in a procedure to render a provisional decision, 3.1 shall apply.

In the event of a provisional decision about a site, it shall be examined pursuant to 3.1 whether there are obstacles to the construction and operation of a facility of the type envisaged on the site stated which are connected to clean-air maintenance.

In evaluating the entire facility, as is also stipulated by §§ 8 and 9 of the Federal Immissions Control Act, the examination shall be restricted to whether unremovable obstacles exist to the project which are connected to clean-air maintenance. In order to evaluate the basic eligibility for licensing of a facility, it shall suffice to establish

that the prerequisites of 3.1 can be met by applying technical or administrative measures; notwithstanding this, the type of project may not be altered by applying such measures.

3.3 Examining Applications for Permission of Early Start (§ 8a of the Federal Immissions Control Act)

A permission for early start to construct a facility shall only be granted if a decision in favour of the applicant can be expected. In this context, a brief examination of whether 4 and 5 are observed shall occur.

A positive statement may also be made if the requirements of clean-air maintenance may only be met if obligations which are still to be established are observed; in this event, however, it must be excluded that such obligations may affect the construction work approved pursuant to § 8a of the Federal Immissions Control Act to an extent which poses their implementation into question.

3.4 Examining whether an Alteration is subject to Licensing (§ 15 Para. (2) of the Federal Immissions Control Act)

If an envisaged alteration of location, nature or operation of a facility subject to licensing is notified, it shall be examined whether or not such alteration requires a licence. This shall be the case if the alteration can lead to adverse effects on the resources protected under § 1 of the Federal Immissions Control Act, which may be relevant for the examination pursuant to § 6 para. (1) no. 1 of the Federal Immissions Control Act unless the adverse effects are obviously minor and fulfilment of the obligations arising from § 6 para. (1) no. 1 of the Federal Immissions Control Act is guaranteed (§ 16 para. (1) of the Federal Immissions Control Act).

3.1 shall not apply to the examination of whether notified alterations may lead to adverse effects on clean-air maintenance. The reason for this is that examination shall not serve to clarify whether the licensing prerequisites have been met; the latter shall be dealt with in a licensing procedure, if applicable.

Additional air pollution shall require – except in cases pursuant to the second sentence of § 16 para. (1) of the Federal Immissions Control Act – a licence for alteration.

3.5 Examining Applications to Grant a Licence for Alteration

3.5.1 The Concept of Alteration

Pursuant to the first sentence of § 16 para. (1) of the Federal Immissions Control Act, a major alteration of location, nature or operation of a facility subject to licensing shall require a licence. At the same time, alterations shall only be deemed to comprise changes of the approved condition but not extended uses of an existing licence.

3.5.2 Alterations with Subsequent Orders

A major alteration shall not require a licence if its implementation serves to carry out a subsequent order pursuant to § 17 of the Federal Immissions Control Act in which it is laid down definitely in which way the location, nature or operation of the facility are to be altered.

3.5.3 Examination Volume

When deciding about granting a licence for alteration, 3.1 shall apply accordingly. The components of the facility and the processes which are intended to be altered and the components of the facility and the processes which would be affected by such alteration shall be checked. As far as other components of the facility and processes are concerned, it shall be checked whether precautionary requirements of this Administrative Regulation can be met with the consent of the operator of the facility when implementing the alteration envisaged. Carrying out these various measures simultaneously may result in fewer efforts and in an early adaptation to the requirements of this Administrative Regulation.

3.5.4 Corrective Measures

A licence for alteration which has been applied for may not be refused even if not all immission values are observed after such alteration has occurred but

- a) the alteration is exclusively or to a very high extent intended to reduce immissions,
- b) such alteration is not an obstacle to the observation of immission values at a later date and
- c) the actual situation does not require the licence to be revoked.

4 Requirements for the Protection against Harmful Effects on the Environment

4.1 Examining the Obligation to Protect

The provisions of 4 include

- immission values for the protection of human health, for the protection against significant nuisances or significant disadvantages and immission values for the protection against harmful effects on the environment due to deposition,
- requirements to determine the existing, additional and total load,
- established criteria which serve to evaluate immissions by drawing up comparisons with immission values,
- requirements in order to carry out a special-case examination.

These items are a tool by which to examine whether the protection against harmful effects on the environment caused by air pollutants emitted during facility operation is ensured.

In examining whether the protection against harmful effects of air pollutants on the environment is ensured (3.1 para. 1 letter a)), the competent authority shall first establish the extent of determination obligations.

As to pollutants whose immission values are established in 4.2 to 4.5, such determination of immission indicators shall -

- a) in the event of a low quantity of emission mass flows (cf. 4.6.1.1),
- b) in the event of a low existing load (cf. 4.6.2.1) or
- c) in the event of an irrelevant additional load (cf. 4.2.2 letter a), 4.3.2 letter a), third sentence of 4.4.1, 4.4.3 letter a) and 4.5.2 letter a)) -

not apply. In these cases, it can be assumed that harmful effects on the environment cannot be caused by the facility unless sufficient evidence speaks in favour of a special-case examination pursuant to 4.8, despite low mass flows pursuant to letter a) or despite a low existing load pursuant to letter b).

When establishing immission values, a tolerance range shall be taken into account for indicator determination. The immission values shall also apply with several

pollutants occurring simultaneously or if pollutants are subject to both chemical and physical transformation.

As to pollutants for which no immission values have been established, further determination shall only be necessary if the prerequisites of 4.8 are met.

4.2 Protection of Human Health

4.2.1 Immission Values

The protection against hazards for human health due to the air pollutants listed in Table 1 is ensured if the total load determined pursuant to 4.7 does not exceed the following immission values at any evaluation parcel.

Table 1: Substance Immission Values in order to Ensure the Protection of Human Health

Substance/Group of Substances	Concentration µg/m³	Averaging Period	Permissible Annual Frequency of Excess Values
sulphur dioxide	50	1 year	–
	125	24 hours	3
	350	1 hour	24
nitrogen dioxide	40	1 year	–
	200	1 hour	18
benzene	5	1 year	–
tetrachloroethane	10	1 year	–
suspended particulate matter (mw 10)	40	1 year	–
	50	24 hours	35

Substance/Group of Substances	Concentration µg/m³	Averaging Period	Permissible Annual Frequency of Excess Values
lead and inorganic lead compounds, contained in suspended particulate matter (mw 10), to be indicated as Pb	0.5	1 year	–

If and insofar as European Communities Directives include limits for poly-aromatic hydrocarbons, arsenic, cadmium, nickel or mercury, the provisions of this number shall apply to these immission values as of the date on which the respective national provision by which such Directives are implemented enters into force. Up to such date, an immission value of 0.02 µg/m³ shall be valid for cadmium and inorganic cadmium compounds contained in suspended particulate matter (mw 10) and to be indicated as Cd, with an averaging period of one year.

4.2.2 Licensing with Exceeded Immission Values

If the total load of an air pollutant listed under 4.2.1 which is determined in compliance with 4.7 exceeds the immission value at any evaluation parcel, a licence may not be refused on the grounds of such excess value, provided that, with regard to the respective pollutant,

- a) the indicator for the additional load caused by emissions from the facility at this evaluation parcel does not exceed 3.0 per cent of the annual immission value and if it is ensured by imposed obligation that further measures for clean-air maintenance, including, in particular, measures which reach beyond the best available techniques, are carried out or
- b) it is ensured by imposed condition that, as a rule no later than 12 months after the commissioning of the facility, remediation measures (dismantling, closing down, alteration) or other measures which ensure the observation of the

immission values pursuant to 4.2.1 are carried out at existing facilities of the applicant or third parties.

Improved disposal conditions shall only be taken into account when evaluating the eligibility for licensing if the measures taken at the facilities concerned in order to limit emissions of the respective pollutant comply with the best available techniques.

4.2.3 Licensing with Future Observation of Immission Values

Even if the total load of an air pollutant listed under 4.2.1 which is determined in compliance with 4.7 exceeds the immission value at any evaluation parcel, a licence may not be refused on the grounds of such excess value, provided that, with regard to the respective pollutant,

- a) in the legislation pursuant to Article 4, para. 5 of the Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management (OJ L 296 of 21 October 1996, p. 55), a respective limit value is defined the observation of which shall become mandatory on a certain date in the future and
- b) it is ensured that the facility will not considerably contribute to the immission value to be exceeded from the given date.

The requirement under para. 1 letter b) is met if

- a) by carrying out additional measures to reduce emissions from the facility, by using other raw materials, fuels or auxiliary materials, by altering the process runs or by improving the disposal conditions, the requirements under 4.2.2 can be met and if collateral licensing provisions (§ 12 of the Federal Immissions Control Act) stipulate that the measures which are necessary in order to meet these requirements are carried out before the date given in the EC Directive or
- b) the observation of an immission value can be deemed ensured because of a clean air plan, because facilities are closed down or because of alterations taking place at other sources, groups of sources or on the grounds of any other information.

The second sentence of 4.2.2 shall be applied to all cases of para. 2 *mutatis mutandis*.

4.3 Protection against Significant Nuisances or Significant Disadvantages due to Dustfall

4.3.1 Immission Value for Dustfall

The protection against significant nuisances or significant disadvantages due to dustfall is ensured if the total load determined in compliance with 4.7 does not exceed the immission values stated in Table 2 at any evaluation parcel.

Table 2: Immission Value for the Protection against Significant Nuisances or Significant Disadvantages due to Dustfall

Group of Substances	Deposition g/(m²·d)	Averaging Period
Dustfall (non-dangerous dust)	0.35	1 year

4.3.2 Licensing with an Exceeded Immission Value

If the total load of dustfall which is determined in compliance with 4.7 exceeds the immission value at any evaluation parcel, a licence may not be refused on the grounds of such excess value, provided that

- a) the indicator for the additional load caused by emissions from the facility at this evaluation parcel does not exceed a value of 10.5 mg/(m²·d) – taken as an annual mean value -,
- b) it is ensured by imposed condition that, as a rule no later than 6 months after the commissioning of the facility, remediation measures (dismantling, closing down or alteration) which ensure the observation of the immission values are carried out at existing facilities of the applicant or third parties,
- c) observation of the immission value can be expected to have taken place after a transitional period because of measures connected to a clean air plan or

- d) a special-case examination pursuant to 4.8 reveals that due to special circumstances prevailing in this individual case significant disadvantages cannot be induced.

4.4 Protection against Significant Disadvantages, in particular Protection of the Vegetation and of Ecosystems

4.4.1 Immission Values for Sulphur Dioxide and Nitrogen Oxides

The protection against hazards for ecosystems due to sulphur dioxide or for the vegetation due to nitrogen oxides is ensured if the total load determined in compliance with 4.7 does not exceed the immission values listed in Table 3 at the relevant evaluation parcels of 4.6.2.6 para. 6.

Table 3: Immission Values for the Protection of Ecosystems and the Vegetation against Sulphur Dioxide and Nitrogen Oxides

Substance	Concentration µg/m³	Averaging Period	Protected Resource
sulphur dioxide	20	year and winter (1 October to 31 March)	ecosystems
nitrogen oxides, to be indicated as nitrogen dioxide	30	1 year	vegetation

It shall be checked in compliance with 4.8 whether the protection against any other significant disadvantages due to sulphur dioxide or nitrogen oxides is ensured. Such examination shall not apply if the additional load values for sulphur dioxide and nitrogen oxides pursuant to 4.4.3 are not exceeded at any evaluation parcel.

4.4.2 Immission Value for Hydrogen Fluoride; Ammonia

Notwithstanding para. 2, the protection against significant disadvantages due to hydrogen fluorides is ensured if the total load determined in compliance with 4.7 does not exceed the immission value listed in Table 4 at any evaluation parcel.

Table 4: Immission Value for the Protection against Significant Disadvantages due to Hydrogen Fluoride

Substance/Group of Substances	Concentration $\mu\text{g}/\text{m}^3$	Averaging Period
hydrogen fluorides and inorganic gaseous compounds of fluorine, to be indicated as fluorine	0.4	1 year

The protection against significant disadvantages arising from damage or harm caused to highly sensitive animals, plants and material goods is ensured if, with regard to hydrogen fluoride and inorganic gaseous compounds of fluorine, to be indicated as fluorine, an immission value of $0.3 \mu\text{g}/\text{m}^3$, averaged over one year, is observed.

It shall be checked in compliance with 4.8 whether the protection against significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems is ensured.

4.4.3 Licensing with Exceeded Immission Values

If the total load of an air pollutant listed under 4.4.1 and 4.4.2 which is determined in compliance with 4.7 exceeds any immission value listed in Table 3, in Table 4 or 4.4.2 para. 2 at any evaluation parcel, a licence may not be refused on the grounds of such excess value, provided that, with regard to the respective pollutant,

- a) the indicator for the additional load caused by emissions from the facility at this evaluation parcel does not exceed the values taken as yearly mean values which are listed in Table 5,

- b) it is ensured by imposed condition that, as a rule no later than 6 months after the commissioning of the facility, remediation measures (dismantling, closing down, alteration) which ensure the observation of the immission values of 4.4.1 or 4.4.2 are carried out at existing facilities of the applicant or third parties,
- c) observation of the immission value can be expected to have taken place after a transitional period because of measures connected to a clean air plan or
- d) a special-case examination pursuant to 4.8 reveals that due to special circumstances prevailing in this individual case significant disadvantages cannot be induced.

Table 5: Irrelevant Additional Load Values for Immission Values for the Protection against Significant Disadvantages

Substance/Group of Substances	Additional Load $\mu\text{g}/\text{m}^3$
sulphur dioxide	2
nitrogen oxides, to be indicated as nitrogen dioxide	3
hydrogen fluorides and inorganic gaseous compounds of fluorine, to be indicated as fluorine	0.04

4.5 Protection against Harmful Effects of Pollutant Deposition on the Environment

4.5.1 Immission Values for Pollutant Deposition

The protection against harmful effects of the deposition of air pollutants on the environment, including the protection against adverse soil alterations, is ensured if

- a) the total load which is determined in compliance with 4.7 does not exceed any immission value listed in Table 6 at any evaluation parcel and

- b) the evidence indicating that the relevant trigger and action values of Annex 2 of the Federal Soil Protection and Contaminated Sites Ordinance of 12 July 1999 (BGBl. I, p. 1554) have been exceeded by air pollutants at any evaluation parcel is insufficient.

Table 6: Immission Values for Pollutant Deposition

Substance/Group of Substances	Deposition $\mu\text{g}/(\text{m}^2 \cdot \text{d})$	Averaging Period
arsenic and its inorganic compounds, to be indicated as arsenic	4	1 year
lead and its inorganic compounds, to be indicated as lead	100	1 year
cadmium and its inorganic compounds, to be indicated as cadmium	2	1 year
nickel and its inorganic compounds, to be indicated as nickel	15	1 year
mercury and its inorganic compounds, to be indicated as mercury	1	1 year
thallium and its inorganic compounds, to be indicated as thallium	2	1 year

4.5.2 Licensing with Exceeded Immission Values for Pollutant Deposition or Exceeded Trigger and Action Values

If the total load of an air pollutant listed in Table 6 which is determined in compliance with 4.7 exceeds any immission value at any evaluation parcel or if the trigger and action values pursuant to 4.5.1 are exceeded, a licence may not be refused on the grounds of such excess value, provided that, with regard to the respective pollutant,

- a) aa) the indicator for the additional load caused by deposition of emissions from the facility amounts to more than 5 per cent of the respective immission value listed in Table 6 at any evaluation parcel or
- bb) the emissions from the tapped sources of the facility, depending upon the respective stack heights, do not exceed the mass flows listed in Annex 2 after 8,760 hours of operation or, with a total number of hours of operation other than this, the mass flow equivalent which has been calculated accordingly,
- b) it is ensured by imposed condition that, as a rule no later than 6 months after the commissioning of the facility, remediation measures (dismantling, closing down, alteration) which ensure the observation of the immission values pursuant to 4.5.1 or of the trigger and action values are carried out on existing facilities of the applicant or third parties,
- c) observation of these values can be expected to have taken place after a transitional period because of measures connected to a clean air plan or
- d) a special-case examination pursuant to 4.8 reveals that due to special circumstances prevailing in this individual case significant disadvantages including adverse soil alterations cannot be induced.

4.5.3 Special Cases with Exceeded Trigger and Action Values

If the trigger and action values pursuant to 4.5.1 letter b), the additional load values pursuant to 4.5.2 letter a) aa) and the minor emission mass flows pursuant to 4.5.2 letter a) bb) are exceeded, it shall be checked by means of a special-case examination pursuant to 4.8 whether and to which extent, on the grounds of such exceeded trigger and action values, adverse soil alterations may prevail which have been caused by air

pollutants. If adverse soil alterations are due to the natural characteristics of the soil or to effects other than caused by air pollutants, e.g. fertilization, legal measures to protect the soil shall be taken into account in order to avoid or reduce adverse soil alterations.

4.6 Determination of Immission Indicators

4.6.1 General

4.6.1.1 Determination during the Licensing Procedure

It is unnecessary to determine the immission indicators during the licensing procedure for the respective emitted pollutant if

- a) the emissions disposed of pursuant to 5.5 (mass flows) do not exceed the minor mass flows listed in Table 7 and
- b) the emissions disposed of pursuant to 5.5 (diffuse emissions) do not exceed 10 per cent of the minor mass flows listed in Table 7,

insofar as a special geographic situation or special circumstances do not require to proceed otherwise. The mass flow pursuant to letter a) is based upon averaging over the operating hours of one calendar week under operating conditions most unfavourable for clean-air maintenance during normal operation.

When determining the mass flow, the emissions contained in waste gas from the entire facility shall be taken into account; with a significant alteration, the emissions from the respective parts of the facility and from those parts of the facility which will be affected by the alteration shall be taken into account unless such additional emissions lead to the minor mass flows to be indicated in Table 7 to be exceeded for the first time. In this event, the emissions from the entire facility shall be taken into account.

Table 7: Minor Mass Flows

Pollutants	Minor mass flow kg/h
sulphur oxides (sulphur dioxide and sulphur trioxide), to be indicated as SO ₂	20
nitrogen oxides (nitrogen monoxide and nitrogen dioxide), to be indicated as NO ₂	20
benzene	0.05
tetrachloroethene	2.5
dust (regardless of dust contents)	1
lead and its compounds, to be indicated as Pb	0.025
hydrogen fluorides and inorganic gaseous compounds of fluorine, to be indicated as F	0.15
arsenic and its compounds, to be indicated as As	0.0025
cadmium and its compounds, to be indicated as Cd	0.0025
nickel and its compounds, to be indicated as Ni	0.025
mercury and its compounds, to be indicated as Hg	0.0025
thallium and its compounds, to be indicated as Tl	0.0025
benzo(a)pyrene* (as a main component of poly-aromatic hydrocarbons)	0.0025

4.6.1.2 Determination during the Monitoring Procedure

In order to determine the total load during the monitoring procedure, the same procedure shall be applied as in determining the existing load during the licensing procedure (cf. 4.6.2). If the possibility of imposing obligations on various polluters is considered, the immission proportions caused by each polluter shall be determined

* The minor mass flow for this pollutant shall only be relevant when an immission value for poly-aromatic hydrocarbons is established pursuant to 4. At the latest, this will be the case with the introduction of a respective immission value pursuant to 4.2.1 para. 2.

insofar as this is necessary in order to ensure due exercise of discretion. In this context, immissions shall be measured and the meteorological factors relevant to dispersion determined. The wind direction sectors and the location of the measuring parcels and model parcels shall be selected in a manner by which to ensure that the immissions measured and/or calculated can be allocated to the respective polluters.

4.6.2 Existing Load Determination

4.6.2.1 Criteria for the Need to Determine the Existing Load

With the competent authority's consent, it is not necessary to determine the existing load by carrying out individual measurements if it is established, subsequent to analysing the results obtained at measuring stations belonging to the immission measuring networks of the *Länder* and subsequent to an estimation or determination of the additional load or on the grounds of any other information, that the immission values for the respective pollutant can be observed at the maximum load point after the commissioning of the facility.

Moreover, notwithstanding para. 3, determination shall not be necessary if on the grounds of other information previously obtained, e.g. previous measuring, measuring results from similar areas, results of rough measuring or results of dispersion calculations or estimations, it can be established that, with regard to the respective pollutant, the following values apply at the maximum load point:

- the annual mean value is below 85 per cent of the concentration value,
- the maximum 24-hour value is below 95 per cent of the 24-hour concentration value (except for suspended particulate matter (mw 10)) and
- the maximum 1-hour value is below 95 per cent of the 1-hour concentration value,

- with regard to suspended particulate matter (mw 10), the 24-hour concentration value of 50 µg per m³ of air, averaged over the past three years, is not exceeded more frequently than 15 times per year.

Para. 2 shall not apply if, due to significant emissions from diffuse sources or due to special conditions in terms of operation, topography or meteorology, exceeded immission values cannot be excluded.

4.6.2.2 Measurement Planning

Measuring shall occur in compliance with a measuring plan agreed upon with the competent authority; in such a plan, all evaluation parcels, test objects, measuring period, measuring method, measuring frequency, duration of individual measuring in relationship to the respective sources and/or heights of sources, while taking into account the meteorological situation, shall be established.

4.6.2.3 Measuring Height

As a rule, immissions shall be measured at a height of 1.5 to 4 metres above ground and at a lateral distance of 1.5 metres from buildings. In wooded areas, it may be necessary to define measuring points at larger heights, depending on the height of the timber.

4.6.2.4 Measuring Period

As a rule, measuring periods shall stretch over 1 year. A measuring period may be reduced up to a total duration of 6 months if this is to cover the season with the most immissions to be expected. In other respects, shorter measuring periods are possible if it becomes clear during a measuring process that the applicant may be exempted from the obligation of immission measuring pursuant to 4.6.2.1.

4.6.2.5 Evaluation Area

The evaluation area shall be the area which is perfectly located within a circle around the centre of emission drawn by a radius equal to 50 times the actual stack height and in which the additional load, with regard to a model parcel, exceeds 3.0 per cent of the long-time concentration value.

Para. 1 applies with a disposal height for emissions of less than 20 metres above ground provided that the radius equals or exceeds 1 kilometre.

4.6.2.6 Evaluation Parcel Determination

Within evaluation areas, evaluation parcels shall be determined, in compliance with the following paragraphs, in a manner by which it is ensured that, in the competent authority's view, an evaluation of the total load is facilitated at the points with the supposed maximum relevant load with regard to protected resources which are not only temporarily exposed to such load at this place. Measuring which can only represent a very small area shall be avoided. Therefore, when selecting the evaluation parcels, the load level, its relevance to assess the eligibility for licensing and the exposition shall be examined.

Firstly, the model parcels with calculated maximum additional loads shall be carried over from the dispersion calculation carried out during the licensing procedure pursuant to Annex 3 and/or from a dispersion calculation carried out analogously during the monitoring procedure. As to pollutants for which only one immission value, a yearly mean value, has been established, only the calculated annual mean value shall be taken into account, as to pollutants with maximum daily or hourly values, such values shall be taken into account as well.

Secondly, the existing load of the evaluation area caused by other sources (including domestic fires and traffic) shall be assessed while taking into consideration the load structure. In particular, the possible influence of existing weak sources including roads shall be assessed. In doing so, information obtained previously shall be drawn upon. Additional determination in order to assess the existing load shall only occur insofar as the efforts needed to perform such determination are proportional.

Thirdly, the points with the highest total load to be expected shall be defined on the grounds of the determination pursuant to paras. 2 and 3. As a rule, two evaluation parcels shall be selected from the range of points thus obtained so that an evaluation of the supposed maximum risk due to long-term exposure and due to an exposure to

peak loads is facilitated. If only an immission value regarding the annual impact is established for the pollutant in question, one evaluation parcel will, as a rule, suffice.

With a highly inhomogenous structure of the existing load (e.g. dissected areas, special meteorological conditions, evaluation areas influenced by several low polluters), the number of evaluation parcels may be required to exceed two. If it is revealed that the immission structures of short-term peak loads and long-term load are identical, one evaluation parcel may suffice.

Evaluation parcels at which to check the immission values under 4.4.1 shall be defined in a way by which to ensure that they are located at a distance of more than 20 km from agglomerations or 5 km from other built-up areas, industrial facilities or roads.

The definition of evaluation parcels shall be explained in the measuring plan.

4.6.2.7 Measuring Method

As a rule, the existing load shall be determined continuously since intermittent measuring methods can only facilitate annual mean values to be derived with sufficient accuracy. Therefore, intermittent measuring methods shall only be considered if only an immission value for annual impact is established for the respective pollutant or if a determination of short-term peak load is dispensable.

Besides the methods which are described in Ordinances or Administrative Regulations pertaining to the Federal Immissions Control Act, in VDI Guidelines, DIN, CEN or ISO standards, any other method of proven identical accuracy may be applied.

4.6.2.8 Measuring Frequency

With continuous measuring, a minimum availability of 75 per cent shall be ensured as regards hourly mean values. If less than 90 per cent of the hourly mean values are available, the frequency of excess limit values (determined pursuant to 4.7.2 letter b)

and 4.7.3 letter b)) shall be expanded in order to obtain 100 per cent. These requirements to availability also apply to daily mean values obtained in measuring suspended particles load.

With intermittent measuring, the number of measuring values per measuring point shall be no less than 52. Insofar as experience shows that the requirement of an EC Directive to the data quality of the annual mean value to be derived from 52 measuring values is not met, the number of measuring values shall be increased accordingly. In order to assess the data quality of an annual mean value, DIN ISO 11222 (draft, April 2001 version) shall be drawn upon in connection with DIN V ENV 13005 (June 1999 version). The sampling periods shall be distributed evenly over the measuring period in order to ensure sampling results are representative of the whole period.

4.6.2.9 Measuring Values

The measuring values shall be determined in compliance with the time spans to which immission values are to refer, i.e. annual mean values, daily mean values and hourly mean values. With intermittent measuring methods, the sampling period shall, as a rule, be one hour.

4.6.2.10 Rough Measuring

Reducing the effort necessary for measuring pursuant to 4.6.2.7 and 4.6.2.8 shall be taken into consideration in order to

- secure an annual mean value of a size known from information previously obtained or
- provide proof, by means of rough measuring, that at sites where the load criteria pursuant to 4.6.2.1 are supposed to be met or exceeded, such criteria are met or exceeded. Subsequently, depending on the result, it may be necessary to carry out measuring pursuant to 4.6.2.7.

4.6.3 Existing Load Indicators

4.6.3.1 General

Immission measuring or similar determination of immission load may be drawn upon if such measuring or determination dates back no longer than 5 years and if the circumstances decisive for evaluation have not significantly changed over this period.

The existing load indicators shall be calculated on the basis of the hourly mean values obtained through continuous measuring and/or intermittent measuring methods at each evaluation parcel.

4.6.3.2 Determining the Existing Load Indicators

The indicator for annual existing immission load (AEIL) shall be the annual mean value derived from all hourly mean values.

The indicator for daily existing immission load (DEIL) shall be the excess frequency (number of days) by which the concentration value for 24-hour effective immission is exceeded.

The indicator for hourly existing immission load (HEIL) shall be the excess frequency (number of hours) by which the concentration value for 1-hour effective immission is exceeded.

4.6.3.3 Analysing the Measurement

The AEIL, DEIL and HEIL indicators shall be derived from all measuring values insofar as immission values are established for the respective pollutants and their annual, daily and hourly effect.

When indicating the DEIL and HEIL, the respective maximum daily and/or hourly mean value measured shall also be indicated.

4.6.4 Additional Load Indicators

4.6.4.1 General

The additional load indicators shall be derived from mathematical immission projections on the grounds of a mean annual frequency distribution or of a representative annual time series of wind direction, wind velocity and dispersion class. In this context, the calculating method pursuant to Annex 3 shall be applied.

4.6.4.2 Determining the Additional Load Indicators

The indicator for the annual additional immission load (AAIL) shall be the arithmetic mean derived from all individual proportions calculated for each model parcel.

The indicator for the daily additional immission load (DAIL) shall be

- ten times the AAIL arithmetic means calculated for each model parcel, if a mean annual frequency distribution of meteorological parameters is used, or
- the maximum daily mean value calculated for each model parcel, if a representative meteorological time sequence is used.

The indicator for the hourly additional immission load (HAIL) shall be the maximum hourly mean value calculated for each model parcel.

4.7 Observation of Immission Values

4.7.1 Annual Immission Value

The annual immission value for a pollutant is observed if the total of the existing load and the additional load measured at evaluation parcels is less than or equal to the annual immission value.

4.7.2 Daily Immission Value

- a) In any event, the daily immission value is observed
 - if the AEIL existing load indicator does not exceed 90 per cent of the annual immission value and
 - if the DEIL indicator reaches, as a maximum, 80 per cent of the excess frequency of the daily immission value permissible and
 - if all DAIL daily values do not exceed the equivalent of the difference between the daily immission value (concentration) and the annual immission value.

- b) In all other respects, the daily immission value is observed if the total load – determined by adding the yearly additional load to the daily existing load concentration values – is less than or equal to the immission concentration value for 24 hours or if an analysis shows that the permissible excess frequency is observed unless special circumstances of the individual case, e.g. rarely occurring high emission levels, require to evaluate otherwise.

4.7.3 Hourly Immission Value

- a) In any event, the hourly immission value is observed
 - if the AEIL existing load indicator does not exceed 90 per cent of the annual immission value and
 - if the HEIL indicator reaches, as a maximum, 80 per cent of the excess frequency of the permissible hourly immission value and
 - if no HAIL hourly values calculated for all model parcels exceed the equivalent of the difference between the hourly immission value (concentration) and the annual immission value.

- b) In all other respects, the hourly immission value is observed if the total load – determined by adding the yearly additional load to the hourly existing load concentration values – is less than or equal to the immission concentration value for 1 hour or if an analysis shows that the permissible excess frequency

is observed unless special circumstances of the individual case, e.g. rarely occurring high emission levels, require to evaluate otherwise.

4.8 Determination without Established Immission Values and in Special Cases

With air pollutants for which no immission values are established under 4.2 to 4.5 and in those cases in which reference is made to 4.8 it is necessary to examine whether harmful effects on the environment may be induced if sufficient evidence speaks in favour of this.

Such examination shall serve the purpose of

a) establishing to which effects the air pollution originating from the facility leads in the evaluation area; type and extent of such establishment are governed by the principle of proportionality;

and

b) evaluating whether such effects are to be deemed as hazards, significant disadvantages or significant nuisances to the general public or the neighbourhood; such evaluation shall be based upon the best available techniques and general experience of life.

When evaluating whether a hazard, disadvantage or nuisance is significant, the following shall apply:

a) Hazards to human health shall always be considered significant. Whether hazards to animals and plants, soil, water, atmosphere as well as cultural and any other property shall be considered significant shall be evaluated in compliance with letters b) and c) hereof.

b) Disadvantages or nuisances shall be considered significant to the general public if they affect public welfare by their type, extent or duration.

c) Disadvantages or nuisances shall be considered significant to the neighbourhood if they are intolerable due to their type, extent or duration.

When evaluating pursuant to letters b) and c), special attention shall be paid to the following:

— the use of land established in land-use plans,

- identifications under aspects of land and technical planning,
- findings and decisions contained in clean air plans,
- possible imprints of the respective pollutant,
- the use of land with respect to the principle of mutual respect governing good neighbourly relations,
- restrictions for use agreed or imposed upon and
- remediation measures carried out or to be carried out at existing facilities of the applicant or third parties which are connected to the project.

When examining whether the protection against significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems is ensured, Annex 1 Determining the Mi

Examination pursuant to 4.8 as to whether the protection against significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems is ensured

The provisions under 4.8 stipulate that it is considered evidence for the occurrence of significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems if the minimum distances given in Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

are not observed.

As to facilities for farming or breeding of livestock the emission factors in Fehler! Verweisquelle konnte nicht gefunden werden. shall be used to determine the yearly ammonia emissions expected for the respective facility under conditions most unfavourable according to species, production specialization, livestock housing and commercial fertilizer storage and according to the respective stocking density. In the event of different species and different types of farming and breeding the respective yearly ammonia emissions shall be added up. The yearly ammonia emission can be used to identify the minimum distance in

Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

. It is considered evidence for the occurrence of significant disadvantages if such a minimum distance is not observed.

Table 11: Ammonia Emission Factors for Facilities for Farming or Breeding of Livestock

Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

shall be drawn upon. In this context, it is considered evidence for the occurrence of significant disadvantages if minimum distances are not observed.

Moreover, if there is evidence speaking in favour of the protection against significant disadvantages due to nitrogen deposition causing harm or damage to sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems (e.g. heathland, moorland, forests) not being ensured, a supplementary examination shall be carried out. In this

context, it shall be estimated, while taking into account the load structure, whether the facility contributes considerably to nitrogen deposition. When a livestock density of 2 livestock units per hectare of a rural district (*Landkreis*) is exceeded, this shall be deemed a point to be taken into consideration as evidence. During such examination, special attention shall be paid to the type of soil, the type of vegetation prevailing and the degree of nitrogen supply.

If evidence is obtained speaking in favour of the occurrence of significant disadvantages due to harm or damage caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems or caused by nitrogen deposition, the individual case shall be examined.

If a special-case examination pursuant to 4.5.2 letter d) is to be carried out, it shall, in particular, be examined whether and to which extent the deposition, with current or planned use (e.g. as a playground, as a residential area, as a park or leisure facility, as plots of land for industrial or commercial purposes and as cropland or grassland), may lead to harmful effects on the environment by indirectly affecting humans, animals, plants, foodstuffs and feedingstuffs. As a rule, the deposition values ensure the protection of playgrounds and residential areas. As to other areas, higher deposition values may be drawn upon. In this context, the deposition values listed in Table 8 shall serve as basic evidence for the occurrence of harmful environmental effects on cropland or grassland.

Table 8: Deposition Values as Basic Evidence Speaking in favour of Special-Case Examination

Substance/Group of Substances	Croplands $\mu\text{g}/(\text{m}^2 \cdot \text{d})$	Grassland $\mu\text{g}/(\text{m}^2 \cdot \text{d})$
arsenic	1,170	60
lead	185	1,900
cadmium	2.5	32
mercury	30	3
thallium	7	25

5 Requirements to Provide Precautions against Harmful Effects on the Environment

5.1 General

5.1.1 Contents and Meaning

The following provisions contain

- emission standards which can be avoided by applying the best available techniques,
- requirements to emission reduction in compliance with the best available techniques,
- other requirements to provide precautions against harmful effects of air pollutants on the environment,
- methods to determine emissions and
- requirements to the disposal of waste gases.

The provisions of 5.2 in connection with 5.3 shall apply to all facilities. Insofar as divergent provisions are stipulated in 5.4, these provisions shall rank before the respective provisions of 5.2, 5.3 or 6.2. Insofar as soot levels, mass ratios, emission ratios, emission reduction ratios or turnover ratios are established for specific substances or groups of substances, the requirements to mass concentrations of these substances or substance groups under 5.2 shall not apply. In any other respects, the requirements under 5.2, 5.3 or 6.2 shall remain unaffected. Supplementary to this, the emission minimization principle pursuant to 5.2.7 shall be taken into account.

The provisions take into account possible shifts of adverse effects from one protected resource to another; they are intended to ensure a high level of environmental protection altogether.

Insofar as Reference Documents about Best Available Techniques (BAT Reference Documents) of the European Commission which are version the framework of information exchange pursuant to Art. 16 para. 2 of the Council Directive of 24 September 1996 concerning integrated pollution prevention and control (IPPC

Directive, 96/61/EC, OJ L 257 of 10 October 1996, p. 26) were available when this Administrative Regulation was issued, the information contained therein has been taken into account while drawing up the requirements under 5.2, 5.3, 5.4 and 6.2.

Insofar as new or revised BAT Reference Documents are published by the European Commission after issuance of this Administrative Regulation, the requirements stipulated in this Administrative Regulation are not annulled by this. An advisory committee established by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety which consists of expert representatives of the parties concerned pursuant to § 51 of the Federal Immissions Control Act shall examine to which extent the information contained in the BAT Reference Documents points to requirements to emission reduction which reach beyond or supplement the requirements stipulated in this Administrative Regulation. This committee shall comment upon the extent of the progress made concerning the best available techniques in respect to the provisions established in this Administrative Regulation or upon the extent by which the provisions established in this Administrative Regulation require to be supplemented. Insofar as the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety has given notice about the progress achieved in respect of the best available techniques or about a necessary supplement pursuant to the procedure stipulated by § 31a para. (4) of the Federal Immissions Control Act, the authorities in charge of licensing and supervision shall no longer be obliged to publish the requirements of this Administrative Regulation conflicting with such publication. In these cases, the competent authorities shall take into account the progress achieved in respect of the best available techniques when taking decisions.

As to facilities which exist only at one German site, no respective provisions are stipulated under 5.4; in such a case, the competent authority shall have sole responsibility to evaluate the special technical features of such facility.

If requirements to take precautions against harmful effects of air pollution on the environment have already been issued for a facility subject to licensing on a case-to-case basis which exceed the requirements under 5.1 to 5.4, such requirements shall

remain binding in respect of § 5 para. (1) no. 2 of the Federal Immissions Control Act.

Insofar as 5.2 or 5.4 do not contain any or only incomplete provisions regarding emission reduction, BAT Reference Documents or Guidelines or standards of the VDI/DIN Air Pollution Prevention Manual shall be used as a source of information when determining the best available techniques on a case-to-case basis.

5.1.2 Taking into Account the Requirements during the Licensing Procedure

The requirements in compliance with the provisions of 5 shall be established for each emission source and for each air pollutant substance or substance group in the licensing notice insofar as a relevant proportion of such substances or substance groups is contained in crude gas. If the waste gases from several parts of the facility are gathered (collector line or collector stack), the requirements to reduce emissions shall be established in a way to ensure that the emissions generated do not exceed an emission level of the respective gases where they are disposed of individually. A substance is contained in the crude gas of a facility to a relevant extent if it cannot be excluded that a requirement under 5 is exceeded due to the composition of the crude gas.

If the observation of a specific mass flow or of a specific mass concentration is stipulated in 5, either the mass flow or – with an exceeded permissible mass flow – the mass concentration shall be limited in the licensing notice unless 5.2 or 5.4 contain explicit provisions stipulating that both the mass flow and the mass concentration shall be limited.

Emission limits in compliance with the permissible mass concentrations or mass flows contained in 5.2 or 5.4 can be waived if permissible mass ratios (e.g. g/Mg of the product generated, g/kWh of fuel energy used) are established instead and if it is proved by comparative observations involving the best available process and waste gas purification cleaning techniques that higher emission mass flows do not occur.

Special arrangements shall be drawn up for start-up or shut-off processes during which values exceeding twice the established emission limit cannot be avoided. In particular, such processes include processes during which

- a waste-gas purification facility has to be avoided for safety reasons (danger of deflagration, clogging-up or corrosion),
- a waste-gas purification facility is not fully effective because of insufficient waste-gas throughput or
- waste gas collection and purification is not feasible or only insufficiently feasible as receptacles are charged or emptied during intermittent manufacturing processes.

Insofar as averaging periods other than those stipulated in 2.7 are required for emission limits for operational or metrological reasons (e.g. batch operation, relatively long calibration periods), these shall be established accordingly.

If waste gas from a facility is used as combustion air or as a charge material for another facility, special arrangements shall be drawn up.

The amounts of air fed to a component of the facility for waste-gas cooling or thinning shall not be considered in determining the mass concentration. Insofar as emission standards refer to the oxygen content of waste gas, the mass concentrations measured in the waste gas shall be converted in line with the following equation:

$$E_B = \frac{21 - O_B}{21 - O_M} \times E_M$$

The following definitions apply:

E_M mass concentration measured,

E_B mass concentration, as related to reference oxygen content,

O_M oxygen content measured,

O_B reference oxygen content.

If waste-gas purification facilities are used to reduce emissions downstream, conversion may occur with regard to the substances for which the waste-gas

purification facility is operated only for those periods during which the oxygen content measured exceeds the reference oxygen content. With combustion processes involving pure oxygen or oxygen-enriched air, special arrangements shall be drawn up.

5.1.3 Basic Requirements for Integrated Pollution Prevention and Control

In order to ensure integrated emission prevention or minimization, techniques and measures shall be applied through which emission levels to air, water and soil are prevented or limited and through which a high level of environmental protection is achieved altogether; facilities safety, the impact of waste disposal on the environment and the economical and efficient use of energy shall be taken into account.

Unavoidable waste gases shall be collected at their place of origin insofar as the efforts necessary to achieve this are proportional. Any measures taken in order to limit emissions must be in compliance with the best available techniques. The requirements of this Administrative Regulation may not be met by applying measures by means of which environmental pollution is shifted to other media such as water or soil, despite better techniques available. These measures shall be targeted at both reducing the mass concentrations and the mass flows or mass ratios of the air pollutants originating from a facility. They shall be applied accordingly while the facility is in operation.

When establishing the requirements, special attention shall be paid to the following:

- selecting integrated process technologies with maximum product yields and minimum emission levels to the environment altogether,
- process optimisation, e.g. by optimising the use of charge materials and through coupled production,
- substituting carcinogenic, mutagenic or reproduction toxic charge materials,
- reducing the waste gas volume, e.g. by applying air circulation systems, while taking into account the requirements of health and safety legislation,
- saving energy and reducing emissions of gases with an impact on climate, e.g. by applying energetics optimisation methods in planning, building and

- operating facilities, through facility-internal energy recovery systems, by applying heat-insulation measures,
- preventing or reducing emissions of ozone-depleting substances, supplementary to the measures stipulated by the Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 (OJ L 244/1 of 29 September 2000), e.g. by substituting these substances, casing the facilities, encapsulating parts of facilities, generating a depression in encapsulated spaces and preventing facilities leakage, recording the substances in waste processing, applying optimised waste gas purification technologies and due disposal of recovered substances and of waste,
 - optimising start-up and shut-off processes and any other special conditions of operation,
 - the requirements of animal protection and of the physiological conditions of animals.

If substances pursuant to 5.2.2 class I or II, 5.2.4 class I or II, 5.2.5 class I or 5.2.7 may be emitted, the charge materials (raw and auxiliary materials) shall be selected, if possible, in a way as to ensure that emissions are kept at a low level.

Process cycles which may lead to increased emissions of substances pursuant to 5.2.2 class I or II or pursuant to 5.2.7 due to accumulation shall, if possible, be avoided by applying technical or administrative measures. Insofar as these process cycles are necessary for operation, e.g. when reclaiming production residues in order to recover metals, measures shall be taken in order to avoid increased emission levels, e.g. by means of targeted outward transfer of substances or by installing highly effective waste gas purification facilities.

Operational processes which involve cut-offs or the omission of waste gas purification facilities shall be designed and operated with a view to low emission levels and be specially monitored by recording suitable process indicators. Measures shall be provided for possible breakdowns of emission-reducing devices so as to reduce emissions immediately as much as possible while taking into consideration the principle of proportionality.

5.2 General Requirements to Emission Limits

5.2.1 Total Dust, including Micro Dust

The dust emissions contained in waste gas may not exceed a

mass flow of	0.20 kg/h
or a	
mass concentration of	20 mg/m ³ .

Even with a mass flow smaller than or equal to 0.20 kg/h, a mass concentration of 0.15 g/m³ in the waste gas may not be exceeded.

Notwithstanding this, 5.2.5 para. 3 shall apply.

5.2.2 Inorganic Particle Matter

With regard to the inorganic particle matter listed hereunder, the following total mass concentrations or mass flows contained in waste gas may not be exceeded; notwithstanding this, the requirements for class I substances shall refer to individual substances:

Class I

— mercury and its compounds, to be indicated as Hg	
— thallium and its compounds, to be indicated as Tl	
mass flow, per substance	0.25 g/h
or	
mass concentration, per substance	0.05 mg/m ³ ;

Class II

- lead and its compounds, to be indicated as Pb
- cobalt and its compounds, to be indicated as Co
- nickel and its compounds, to be indicated as Ni
- selenium and its compounds, to be indicated as Se
- tellurium and its compounds, to be indicated as Te

mass flow	2.5 g/h
or	
mass concentration	0.5 mg/m ³ ;

Class III

- antimony and its compounds, to be indicated as Sb
- chromium and its compounds, to be indicated as Cr
- easily soluble cyanides (e.g. NaCN), to be indicated as CN
- easily soluble fluorides (e.g. NaF), to be indicated as F
- copper and its compounds, to be indicated as Cu
- manganese and its compounds, to be indicated as Mn
- vanadium and its compounds, to be indicated as V
- tin and its compounds, to be indicated as Sn

mass flow	5 g/h
or	
mass concentration	1 mg/m ³ .

As to an occurrence of substances belonging to different classes, irrespective of para. 1, the total emission standards of class II may not be exceeded if substances of classes I and II occur simultaneously in waste gas and the emission standards of class III may not be exceeded if substances of classes I and III, of classes II and III or of classes I to III occur simultaneously in waste gas.

The inorganic particle matter not listed under names (substances of categories K3, M3, RE3 or RF3, risk phrases R 40, R 62 or R 63) for which there is good cause to believe it holds a potential of being carcinogenic, mutagenic or reproduction toxic shall be allocated to class III. In this context,

- the Index of Substances which can Cause Cancer, Genetic Changes or Limit Reproductive Capability (Technical Rules for Hazardous Substances 905) and
- Annex I of the Council Directive 67/548/EEC which corresponds to the list of hazardous substances pursuant to § 4a para. (1) of the Ordinance on Hazardous Substances (*Gefahrstoffverordnung, GefStoffV*)

shall be taken into account. In the event of classification differences among categories K, M or R, the stricter classification stipulated by the Technical Rules for

Hazardous Substances or in the Ordinance on Hazardous Substances shall be binding.

As long as the Technical Rules for Hazardous Substances or the Ordinance on Hazardous Substances do not contain any classification or evaluation, assessments by recognized scientific panels may be drawn upon, e.g. the classification of the Senate Commission for the Investigation of Health Hazards of Chemical Substances in the Work Area of the *Deutsche Forschungsgemeinschaft*. Moreover, the classifications of § 4a para. (3) of the Ordinance on Hazardous Substances shall apply.

Insofar as preparations are subject to classification pursuant to § 4b of the Ordinance on Hazardous Substances, their components and the respective proportions thereof shall be determined and taken into account when establishing the requirements to limit the emission level.

If waste gas disposal ensues under physical conditions (pressure, temperature) under which substances may be liquid or gaseous, the mass concentrations or mass flows pursuant to para. 1 shall be observed with regard to the total amount of solid, liquid and gaseous emissions.

5.2.3 Dust Emissions Occurring in Loading, Storing or Working Solid Substances

5.2.3.1 General

Suitable requirements shall be made to emission reduction with regard to facilities at which solid substances are loaded or unloaded, hoisted, transported, worked, prepared or stored if these substances may cause dust emissions due to their density, grain size distribution, grain shape, surface condition, abrasion resistance, shearing resistance, resistance to fracture, composition or due to their low humidity content.

While taking into account the principle of proportionality,

- the type and properties of solid substances and of their components (e.g. hazardousness and toxicity pursuant to § 4 of the Ordinance on Hazardous

Substances, possible effects on soil and water, possible development of explosible mixtures of dust/air, dusting propensity, humidity),

- the loading equipment or the loading method,
- the mass flow and the period during which emissions occur,
- the meteorological conditions,
- the location of the loading site (e.g. distance to residential areas)

shall be taken into account in particular while establishing such requirements.

The measures shall be established while also taking into account their possible effects on water and soil.

5.2.3.2 Loading or Unloading

When establishing requirements to be made to loading or unloading, the following measures may be considered:

MEASURES REGARDING THE LOADING METHOD

- minimizing the falling distance when discharging (e.g. with chutes involving guiding panels or reeds),
- automated discharging height adjustment with changing bulk heights,
- equipment adjustable to the respective bulk material (e.g. avoiding excess loads and missed discharging points with grippers),
- smooth start of loaded grippers,
- empty grippers are closed while re-set,
- minimized trimming and cleaning operations,
- automated loading operations;

MEASURES REGARDING THE LOADING EQUIPMENT

- regular equipment maintenance (e.g. testing gripper tips for tightness in order to reduce flow losses),
- grippers shut completely or to a large extent so as to avoid or reduce the effect of bulk materials being blown away at their surface,
- minimizing built-up (especially with grippers or, for example, when loading bellows which can be tightened are used on vertical loaders/telescopic chutes),

- chutes fitted with discharging tips and exhaust systems,
- vertical loaders fitted with cones and exhaust systems,
- reduced delivery speed with drop legs by installing special components or by using cascade chutes,
- thrower belt conveyors used outside closed rooms only to a very small extent,
- if possible, wheel loaders only used for humidified materials or materials not prone to dusting;

MEASURES REGARDING THE LOADING SITE

- facilities at which vehicles are loaded or unloaded (e.g. filling stations, chutes, trench bunkers and other discharging sites) cased completely or to a large extent (e.g. by applying gates or strip curtains at entrances and exits),
- funnels, points of receipt, different types of chutes equipped with exhaust systems (sufficient exhaust capacities allowed for in planning),
- improved exhaust efficiency (e.g. by using guiding panels),
- funnels (e.g. with reed valves, valve bottom, shuttle locks, lid),
- water atomisation at outlets and charging hoppers,
- windbreakers used during open-air loading and unloading processes,
- extended stand-by time of grippers after discharging at the discharging point,
- loading restrictions at high wind velocities,
- planning where to locate the loading site on the premises of the enterprise;

MEASURES REGARDING SOLID SUBSTANCES

- increased materials humidity, if necessary, by applying surface tension relaxation agents, insofar as humidity does not conflict with subsequent further processing, storage properties or the product quality of the materials loaded,
- applying dust bonding agents,
- pelletisation,
- standardized grain size (finest-grain separation),
- avoiding blockages,
- reducing the amount of loading processes.

5.2.3.3 Shipment or Transport

If vehicles are used for transport, closed receptacles (silo vehicles, containers, tarpaulin) shall be applied. Moreover, when materials are shipped or transported on the premises of the enterprise, facilities which are enclosed completely or which are enclosed to a large extent (e.g. cased conveyor belts, bucket conveyors, worm conveyors, feed screws or pneumatic conveyors) shall be applied. As to pneumatic conveyors, conveyed air which contains dust shall be fed to a dedusting system or kept within a closed cycle. Open-air conveying/transporting facilities (e.g. conveyor belts) shall be encapsulated or cased if possible.

If closed transportation receptacles are loaded with solid substances, the displaced air shall be collected and fed to a dedusting system.

Open-air discharging points shall be humidified, insofar as such humidifying does not conflict with subsequent further processing, storage properties or the product quality of the materials loaded. Alternatively, the discharging points may be encapsulated; air containing dust shall be fed to a dedusting system.

Openings in rooms (e.g. gates, windows) in which solid substances are transported or handled freely shall be kept closed where possible. Gates may only be opened if this is required for vehicles arriving or departing.

If dust emissions may develop due to the use of roadways, such roadways shall be enhanced with a cover of asphalt concrete, concrete or similar materials, they shall be kept in good condition and cleaned depending upon the amount of dirt accumulated on them. It shall be ensured that dirt accumulated on roadways caused by vehicles shall be avoided or removed after departure from the facility area. For this purpose, a tyre wash, sweeping machines, tyre-cleaning grates, for example, or other suitable systems may be used. The first sentence does not apply to roadways within quarries and sites on which mineral resources are extracted.

5.2.3.4 Working or Preparation

Machines, equipment or other systems used to work solid substances (e.g. by breaking, grinding, sifting, screening, mixing, palletising, briquetting, heating, drying, cooling) shall be encapsulated or fitted with emission-reducing technologies of similar effect.

Charging points and discharging points shall be encapsulated; air containing dust shall be fed to a dedusting system. Alternatively, charging points and stacking points can be humidified, insofar as such humidifying does not conflict with subsequent further processing, storage properties or the product quality of the materials loaded.

Waste gas containing dust from the working units shall be collected and purified.

5.2.3.5 Storage

5.2.3.5.1 Enclosed Storage

When establishing the requirements for storage, enclosed construction systems (e.g. silos, bunkers, magazines, warehouses, containers) shall be preferred as an option. Insofar as storage facilities are not completely enclosed, the development of dust shall be minimized – especially in passable storage facilities – by using storage receptacles or storage sites which are designed appropriately in terms of dimensions and by using devices to shelve or pick products stored which are designed appropriately in terms of dimensions. Waste gases from charging or discharging units and displaced air from receptacles shall be collected and fed to a dedusting system. All charging devices shall be provided with an anti-overcharging mechanism. Silo and container discharging outlets may be emptied or sealed in a dust-tight manner, e.g. by applying bellows with an integrated exhaust system and a cone; likewise, it is possible to use rotary valves combined with a discharging conveyor or pneumatic transport mechanism.

5.2.3.5.2 Open-Air Storage

When establishing requirements to be made for setting up or extracting piles or to operate open-air homogenisation facilities, the following measures may be considered:

- covering the surface (e.g. with mats),
- surface grassing,
- spraying the pile with dust-bonding agents while the pile is set up,
- surface solidification,
- piles, charging points and discharging points shall be humidified sufficiently, where necessary by applying surface tension relaxation agents, insofar as such humidifying does not conflict with subsequent further processing, storage properties or the product quality of the materials loaded.
- charging or extraction protected by earth banks,
- conveyor belts with adjustable height,
- plants as windbreakers,
- aligning the longitudinal axis of the pile with the main wind direction,
- limiting piles in height,
- refraining, to a large extent, from set-up or extraction work under weather conditions which favour emission formation (e.g. long-term aridity, freeze periods, high wind velocities).

By roofing, encapsulating or by applying a combination of both measures, such storage facilities, including peripheral facilities, may be converted – taking into account the provisions of 5.2.3.1 para. 2 – into partly or completely enclosed storage facilities.

5.2.3.6 Special Components

If solid substances contain substances pursuant to 5.2.2 class I or II, pursuant to 5.2.5 class I or pursuant to 5.2.7 or if such substances have been absorbed by solid substances, the most efficient measures in compliance with 5.2.3.2 to 5.2.3.5 shall be applied; storage shall occur pursuant to 5.2.3.5.1. The first sentence does not apply if the amount of special components contained in a rerun which can be separated from

the materials and is obtained through sifting with a 5-millimetre mesh does not exceed the following values, all of which refer to dry mass:

- substances pursuant to 5.2.2 class I, 5.2.7.1.1 class I or 5.2.7.1.2 50 mg/kg,
- substances pursuant to 5.2.2 class II, 5.2.7.1.1 class II or 5.2.7.1.3 0.50 g/kg,
- substances pursuant to 5.2.7.1.1 class III 5.0 g/kg.

5.2.4 Inorganic Gaseous Substances

The mass concentrations or mass flows of the inorganic gaseous substances listed hereunder shall not be exceeded, in terms of waste gas content:

Class I

- arsine
 - cyanogen chloride
 - phosgene
 - phosphine
- | | |
|----------------------------------|-------------------------|
| mass flow per substance | 2.5 g/h |
| or | |
| mass concentration per substance | 0.5 mg/m ³ ; |

Class II

- bromine and its gaseous compounds, to be indicated as hydrogen bromide
 - chlorine
 - hydrocyanic acid
 - fluorine and its gaseous compounds, to be indicated as hydrogen fluoride
 - hydrogen sulphide
- | | |
|----------------------------------|-----------------------|
| mass flow per substance | 15 g/h |
| or | |
| mass concentration per substance | 3 mg/m ³ ; |

Class III

- ammonia
- gaseous inorganic compounds of chlorine, unless included in class I or class II, to be indicated as hydrogen chloride
 - mass flow per substance 0.15 kg/h
 - or
 - mass concentration per substance 30 mg/m³;

Class IV

- sulphur oxides (sulphur dioxide and sulphur trioxide), to be indicated as sulphur dioxide
- nitrogen oxides (nitrogen monoxide and nitrogen dioxide), to be indicated as nitrogen dioxide
 - mass flow per substance 1.8 kg/h
 - or
 - mass concentration per substance 0.35 g/m³.

In waste gases generated by thermal or catalytic post-combustion facilities, nitrogen monoxide and nitrogen dioxide emissions, to be indicated as nitrogen dioxide, may not exceed a mass concentration of 0.20 g/m³; simultaneously, carbon monoxide emissions may not exceed a mass concentration of 0.10 g/m³. Insofar as the gases fed to the post-combustion system contain concentrations of nitrogen oxides or other nitrogen compounds which are not low, case-to-case requirements shall be established; in this context, nitrogen monoxide and nitrogen dioxide emissions, to be indicated as nitrogen dioxide, may not exceed a mass flow of 1.8 kg/h or a mass concentration of 0.35 g/m³.

5.2.5 Organic Substances

With regard to organic substances contained in waste gas, except organic particle matter,

- a total mass flow of 0.50 kg/h
- or
- a total mass concentration of 50 mg/m³,

each of which to be indicated as total carbon, may not be exceeded.

With regard to **existing facilities** with an annual mass flow of organic substances amounting to as much as 1.5 Mg/a, to be indicated as total carbon, the emissions of organic substances contained in waste gas may not exceed a mass flow of 1.5 kg/h, to be indicated as total carbon, notwithstanding para. 1. The amount of hours of operation during which mass flows ranging above 0.5 kg/h up to 1.5 kg/h shall not exceed 8 hours of operation per day.

With regard to organic particle matter, except for substances of class I, the requirements under 5.2.1 shall apply.

Within the mass flow or the mass concentration for total carbon, the organic substances allocated to classes I (substances pursuant to Annex 4) or II, even if several substances of identical class occur simultaneously, may not exceed the following mass concentrations or mass flows contained in waste gas, each of which to be indicated as mass of organic substances:

Class I

mass flow	0.10 kg/h
or	
mass concentration	20 mg/m ³ ;

Class II

- 1-bromo-3-chloropropane
- 1,1-dichloroethane
- 1,2-dichloroethylene, cis and trans
- ethanoic acid
- methyl formiate
- nitroethane
- nitromethane
- octamethylcyclotetrasiloxane
- 1,1,1-trichloroethane

- 1,3,5-trioxane
 - mass flow 0.50 kg/h
 - or
 - mass concentration 0.10 g/m³.

Supplementary to the requirements pursuant to the first sentence of para. 4, as to an occurrence of substances belonging to different classes, the total emission values of class II may not be exceeded if substances of classes I and II occur simultaneously in waste gas.

The organic substances or their secondary products not listed under their names in Annex 4 which comply with one of the following categories or meet one of the following criteria:

- there is good cause to believe they are carcinogenic or mutagenic (categories K3 or M3, risk phrase R 40),
- there is good cause to believe they are reproduction toxic (categories RE3 or RF3, risk phrases R 62 or R 63) while taking into account their effective strength,
- limit value for air at the workplace below 25 mg/m³ applicable,
- they are toxic or very toxic,
- may cause irreversible harm or damage,
- may cause sensitization when inhaled,
- they are highly odour-intensive,
- slowly degradable and accumulative,

shall, on principle, be allocated to class I. In this context,

- the Index of Limit Values relating to the Air at the Workplace (Technical Rules for Hazardous Substances 900), the Index of Substances which can Cause Cancer, Genetic Changes or Limit Reproductive Capability (Technical Rules for Hazardous Substances 905) and
- Annex I of the Council Directive 67/548/EEC which corresponds to the list of hazardous substances pursuant to § 4a para. (1) of the Ordinance on Hazardous Substances

shall be taken into account. In the event of classification differences among categories K, M or R, the stricter classification stipulated by the Technical Rules for

Hazardous Substances or in the Ordinance on Hazardous Substances shall be binding. Insofar as the emission standards of class I cannot be observed with proportional efforts as regards organic substances which are allocated to class I on the grounds of the criteria mentioned above, emission limits shall be established on a case-to-case basis.

As long as the Technical Rules for Hazardous Substances or the Ordinance on Hazardous Substances do not contain any classification or evaluation, assessments by recognized scientific panels may be drawn upon, e.g. the classification of the Senate Commission for the Investigation of Health Hazards of Chemical Substances in the Work Area of the *Deutsche Forschungsgemeinschaft*. Moreover, the classifications of § 4a para. (3) of the Ordinance on Hazardous Substances shall apply.

Insofar as preparations are subject to classification pursuant to § 4b of the Ordinance on Hazardous Substances, the components of such preparations and the respective proportions of such components shall be determined and taken into account when establishing emission-limiting requirements.

5.2.6 Gaseous Emissions during the Processing, Hoisting, Decanting or Storage of Liquid Organic Substances

When processing, hoisting, decanting or storing liquid organic substances

- a) whose steam pressure is equal to or greater than 1.3 kPa at a temperature of 293.15 K,
- b) with a mass content of more than 1 per cent of substances pursuant to 5.2.5 class I, 5.2.7.1.1 class II or III or 5.2.7.1.3,
- c) with a mass content of more than 10 mg per kg of substances pursuant to 5.2.7.1.1 class I or 5.2.7.1.2 or
- d) which contain substances pursuant to 5.2.7.2

the measures by which to avoid and reduce emissions pursuant to 5.2.6.1 to 5.2.6.7 shall be applied.

5.2.6.1 Pumps

Pumps technologically designed to be tight such as canned motor pumps, magnetic drive pumps, pumps with double-action mechanical seals and a sealing or locking medium, pumps fitted with double-action mechanical seals and seals dry to atmosphere, diaphragm pumps or bellows pumps.

Existing pumps for liquid organic substances pursuant to 5.2.6 letter a) which do not comply with any of the features listed under letters b) to d) and which do not meet the requirements pursuant to para. 1 may continue to be used until replaced by new pumps. After this Administrative Regulation has entered into force, the competent authority shall demand inventories to be drawn up and monitor the continuous replacement of pumps and the maintenance work done prior to such replacement in the framework of plant supervision.

5.2.6.2 Compressors

If gases or vapours which meet one of the criteria pursuant to 5.2.6 letters b) to d) are compressed, multiple sealing systems shall be used. If wet sealing systems are used, the sealing liquid applied on the compressor may not be de-aerated. If dry sealing systems are used, e.g. when feeding inert gas or exhausting the amount of materials to be conveyed leaking out, waste gases let out shall be collected and fed to a gas collecting system.

5.2.6.3 Flanged Joints

As a rule, flanged joints shall only be used where they are necessary for reasons regarding process technology, safety or maintenance. In this event, technically tight-flanged joints in compliance with VDI Guideline 2440 (November 2000 version) shall be used.

When selecting the seal and designing the flanged joints, the characteristic sealing values pursuant to DIN 28090-1 (September 1995 version) or DIN V ENV 1591-2 (October 2001 version) shall apply.

The observation of a specific leakage ratio amounting to 10^{-5} kPa·l/(s·m) shall be proved by carrying out type testing in compliance with VDI Guideline 2440 (November 2000 version).

As to **existing flanged joints**, 5.2.6.1 para. 2 regarding the replacement of seals shall apply. With regard to existing flanged joints, inventories need not be drawn up.

5.2.6.4 Blockage and Control Devices

In order to seal spindle guides of blockage and control devices such as valves or gates,

- metal bellows with a high-grade seal and a downstream safety packing gland or
- sealing systems of similar effect

shall be used.

Sealing systems shall be deemed to be of similar effect if the temperature-specific leakage ratios can be kept during the proof procedure pursuant to VDI Guideline 2440 (November 2000 version).

As to existing blockage and control devices, 5.2.6.1 para. 2 shall be applied *mutatis mutandis*.

5.2.6.5 Sampling Points

Sampling points shall be encapsulated or fitted with blockage and control devices in a way to ensure that emissions may only occur when sampling; in sampling, the sealing medium shall either be re-fed or collected completely.

5.2.6.6 Decanting

In decanting, it is a priority to take measures to avoid emissions, e.g. vapour recovery in connection with bottom loading or below-surface filling. Extracting and feeding the waste gas to a waste gas purification facility may be approved if vapour recovery is not a viable technical option or where the necessary efforts are disproportionate.

Vapour recovery systems shall be operated in a way to ensure that the flow of organic substances is only released when the vapour recovery system is connected

and so that the vapour recovery system and the facilities connected to it may not let out gas to the atmosphere during the recovery process due to their design, except for emissions released for safety reasons.

5.2.6.7 Storage

In order to store liquid organic substances, fixed roof tanks connected to collector gas lines or connected to a waste gas purification facility shall be used.

Notwithstanding the first sentence, crude oil to be stored in storage tanks with a volume of more than 20,000 m³ may also be stored in floating roof tanks sealed effectively at their edges or in fixed roof tanks with an internal floating roof if emissions are reduced by at least 97 per cent as compared to fixed roof tanks without an internal floating roof.

Moreover, notwithstanding the first sentence, the tank need not be connected to collector gas lines or to a waste gas purification facility as regards liquid organic substances pursuant to 5.2.6 letter a) which do not meet any of the criteria of letters b) to d) and which are stored in fixed roof tanks with a volume below 300 m³. Insofar as storage tanks are set up and operated above ground, the outer wall and the roof shall be covered with suitable paint whose total heat reflection ratio permanently amounts to a minimum of 70 per cent.

Gases and vapours let out from pressure relief fittings and discharging facilities shall be disposed of to the gas gathering system or fed to a waste gas purification facility insofar as this does not conflict with safety-related aspects.

Waste gases occurring during inspection or while the storage tanks are cleaned shall be fed to a post-combustion system or similar measures shall be applied to reduce emissions.

5.2.7 Carcinogenic, Mutagenic or Reproduction Toxic Substances and Slowly Degradable, Accumulative and Highly Toxic Organic Substances

The emissions of carcinogenic, mutagenic or reproduction toxic substances or emissions of slowly degradable, accumulative and highly toxic organic substances which are contained in waste gas shall be limited as much as possible while taking into account the principle of proportionality (emissions minimization principle).

5.2.7.1 Carcinogenic, Mutagenic or Reproduction Toxic Substances

Substances shall be deemed carcinogenic, mutagenic or reproduction toxic if,

- in the Index of Substances which can Cause Cancer, Genetic Changes or Limit Reproductive Capability (Technical Rules for Hazardous Substances 905) or
- in Annex I of the Council Directive 67/548/EEC which corresponds to the list of hazardous substances pursuant to § 4a para. (1) of the Ordinance on Hazardous Substances,

they are allocated to one of the following categories: K1, K2, M1, M2, RE1, RE2, RF1 or RF2 (risk phrases R 45, R 46, R 49, R 60 or R 61). In the event of classification differences among categories K, M or R, the stricter classification stipulated by the Technical Rules for Hazardous Substances or in the Ordinance on Hazardous Substances shall be binding.

As long as the Technical Rules for Hazardous Substances or the Ordinance on Hazardous Substances do not contain any classification or evaluation, assessments by recognized scientific panels may be drawn upon, e.g. the classification of the Senate Commission for the Investigation of Health Hazards of Chemical Substances in the Work Area of the *Deutsche Forschungsgemeinschaft*. Moreover, the classifications of § 4a para. (3) of the Ordinance on Hazardous Substances shall apply.

Insofar as preparations are subject to classification pursuant to § 4b of the Ordinance on Hazardous Substances, the components of such preparations and the respective proportions of such components shall be determined and taken into account when establishing emission-limiting requirements.

5.2.7.1.1 Carcinogenic Substances

With regard to the substances listed hereunder, the following total mass concentrations or mass flows contained in waste gas may not be exceeded as a minimum requirement, even where several substances of one class occur simultaneously:

Class I

- arsenic and its compounds (except for arsine), to be indicated as As
- benzo(a)pyrene
- cadmium and its compounds, to be indicated as Cd
- water-soluble compounds of cobalt, to be indicated as Co
- chromium(VI) compounds (except for barium chromate and lead chromate), to be indicated as Cr
 - mass flow 0.15 g/h
 - or
 - mass concentration 0.05 mg/m³;

Class II

- acrylamide
- acrylonitrile
- dinitrotoluenes
- ethylene oxide
- nickel and its compounds (except for nickel metal, nickel alloys, nickel carbonate, nickel hydroxide, nickel tetracarbonyl), to be indicated as Ni
- 4-vinyl-1,2-cyclohexene-diepoxy
 - mass flow 1.5 g/h
 - or
 - mass concentration 0.5 mg/m³;

Class III

- benzene
- bromoethane
- 1,3-butadiene
- 1,2-dichloroethane
- 1,2-propylene oxide (1,2-epoxy propane)
- styrene oxide
- o-toluidine

- trichloroethene
- vinyl chloride
 - mass flow 2.5 g/h
 - or
 - mass concentration 1 mg/m³.

As to an occurrence of substances belonging to different classes, notwithstanding para. 1, the total emission standards of class II may not be exceeded if substances of classes I and II occur simultaneously in waste gas and the emission standards of class III may not be exceeded as a total if substances of classes I and III, of classes II and III or of classes I to III occur simultaneously in waste gas.

The carcinogenic substances not listed under their names shall be allocated to the classes of substances to which they are best comparable with regard to effective strength; in this context, an evaluation of effective strength shall be carried out on the grounds of a risk calculation, e.g. by applying the unit-risk approach. Insofar as emission standards pertaining to the class determined for carcinogenic substances which have been classified on the basis of the allocation system described above cannot be observed with proportional efforts, emission limits shall be determined on a case-to-case basis while taking into account the emissions minimization principle.

Fibres

The following fibre dust concentrations may not be exceeded with regard to emissions of the carcinogenic fibrous substances listed hereunder where they are contained in waste gas:

- asbestos fibres 1·10⁴ fibres/m³
(e.g. chrysotile, crocidolite, amosite),
- biopersistent ceramic fibres 1.5·10⁴ fibres/m³
(e.g. consisting of aluminium silicate, aluminium oxide, silicon carbide, potassium titanate), insofar as they are included in No. 2.3 of the Technical Rules for Hazardous Substances 905 as “man-made crystalline ceramic fibres” or comprised in Annex I of the Council Directive 67/548/EEC (which corresponds to the list of hazardous substances pursuant to § 4a para. (1) of the

Ordinance on Hazardous Substance) under the entry “ceramic mineral fibres”

- biopersistent mineral fibres 5·10⁴ fibres/m³,
insofar as they meet the criteria established for “inorganic fibre dusts (except for asbestos)” under No. 2.3 of the Technical Rules for Hazardous Substances 905 or for “biopersistent fibres” pursuant to Annex IV No. 22 of the Ordinance on Hazardous Substances.

In the event that criteria of the Technical Rules for Hazardous Substances and of the Ordinance on Hazardous Substances diverge from each other, the respective stricter criteria shall be binding.

In individual cases, the emissions of carcinogenic fibrous substances may be limited by determining a total dust emissions value while taking into account the emissions minimization principle.

5.2.7.1.2 Mutagenic Substances

Insofar as mutagenic substances or preparations are not covered by the requirements made to carcinogenic substances, a mass flow below 0.15 g/h or a mass concentration below 0.05 mg/m³ shall be achieved with regard to emissions of mutagenic substances contained in waste gas. Insofar as these emission standards cannot be observed with proportional efforts, emissions of such substances contained in waste gas shall be limited while taking into account the emissions minimization principle.

5.2.7.1.3 Reproduction Toxic Substances

Insofar as reproduction toxic substances or preparations are not covered by the requirements made to carcinogenic or mutagenic substances, emissions of reproduction toxic substances contained in waste gas are to be limited while taking into account the emissions minimization principle and while taking into consideration the effective strength of the substance.

5.2.7.2 Slowly Degradable, Accumulative and Highly Toxic Organic Substances

The dioxins and furans listed in Annex 5, to be indicated as totals pursuant to the procedure established therein, may not exceed

a mass flow in waste gas of 0.25 µg/h

or

a mass concentration in waste gas of 0.1 ng/m³,

as a minimum requirement. The sampling period shall be at least 6 hours; it shall not exceed 8 hours.

As to further organic substances which are slowly degradable and accumulative and highly toxic at the same time or which, due to other highly harmful effects on the environment, may not be allocated to class I of 5.2.5 (e.g. polybrominated dibenzodioxins, polybrominated dibenzofurans or polyhalogenated biphenyles), emissions shall be limited while taking into account the emissions minimization principle.

5.2.8 Odour-Intensive Substances

Requirements shall be made to reduce emissions at facilities which may emit odour-intensive substances during normal operation or due to operational fault liability, including, for example, the casing of facilities, encapsulating parts of facilities, generating a depression in encapsulated spaces, appropriate storage of charge substances, products and wastes, process control.

As a rule, odour-intensive waste gases shall be fed to waste gas purification facilities or measures of similar effect shall be taken. Waste gases shall be disposed of as stipulated in 5.5.

When determining the extent of the requirements on a case-to-case basis, special attention shall be paid to the waste gas volume flow, the mass flow of odour-intensive substances, local dispersion conditions, the duration of emission and the distance between the facility and the next area of protected use (e.g. residential area) existing or such area established in a development plan. Insofar as the surroundings

of the facility can be expected to be affected by odour, any options to further reduce emissions by applying best available techniques shall be used.

Insofar as it is not possible or not sufficient to limit emissions of individual substances or substance groups, e.g. with regard to amines, or of total carbon, the emission-reducing requirement shall be determined for facilities with waste gas purification facilities as an odour-reduction value to be determined olfactometrically or as an odorous substance concentration value.

5.2.9 Soil-Contaminating Substances

If the precautionary values for soil pursuant to Annex 2 of the Federal Soil Protection and Contaminated Sites Ordinance (*Bundes-Bodenschutz- und Altlastenverordnung*), the mass flows pursuant to Annex 2 and the additional load values pursuant to 4.5.2 letter a) aa) are exceeded, precautionary measures shall be identified by which to determine the obligations to take precautions in detail in compliance with the second sentence of § 3 para. (3) of the Federal Soil Protection and Contaminated Sites Ordinance, such measures reaching beyond the measures stipulated in 5 of this Administrative Regulation if the annual loads established in 5 of Annex 2 of the Federal Soil Protection and Contaminated Sites Ordinance are exceeded during the operation of the facility.

5.3 Measuring and Monitoring Emissions

5.3.1 Measurement Sites

If a license is issued for a facility, measurement sites or sampling points shall be demanded to be provided for and they shall be determined in detail. Measurement sites shall be sufficiently large, easily passable, designed and selected in a way by which to facilitate that emission measuring will be representative of the emissions from the facility and that such measuring will be accurate from a metrological point of view. The recommendations of VDI Guideline 4200 (December 2000 version) shall be taken into account.

5.3.2 Individual Measurements

5.3.2.1 Initial and Recurrent Measurements

It shall be demanded that after construction, significant alteration and subsequently, the emissions levels of all air pollutants for which emissions limits are to be determined in compliance with the licensing notice pursuant to 5.1.2 shall be determined repeatedly through measurements carried out by an agency designated to do so pursuant to § 26 of the Federal Immissions Control Act.

Initial measurements to take place after construction or significant alteration shall be carried out when fault-free operation is reached, no earlier, however, than after three months of operation and no later than six months after commissioning.

Initial or recurrent measurements shall not be demanded if emissions are determined pursuant to 5.3.3 or 5.3.4.

Individual measurements pursuant to para. 1 need not be carried out if other tests, e.g. with regard to furnishing proof about the effectiveness of emission-reducing facilities, the composition of fuels or charge materials or process conditions, provide sufficiently reliable results to establish that emission limits are not exceeded.

Recurrent measurements shall be demanded after expiry of three-year periods. As to facilities whose emissions are limited as a mass flow, such periods may be extended to five years.

5.3.2.2 Measuring Plans

Measurements by which to assess emissions shall be carried out in a way by which to ensure that the results will be representative of the emissions from the facility and that they will be comparable to each other in the event of comparable facilities and operating conditions. Measuring plans shall be in compliance with VDI Guideline 4200 (December 2000 version) and VDI Guideline 2448 Part 1 (April 1992 version). The competent authority may demand measuring plans to be previously agreed with it.

With regard to facilities where operating conditions remain unchanged to a great extent in terms of time, a minimum of 3 individual measurements shall be carried out during fault-free operation with a maximum emission level and a minimum of one measurement each shall be carried out for states of operation occurring regularly with a floating emission behaviour, e.g. for cleaning or regenerating work or during relatively long start-up or shut-off processes. With regard to facilities where operating conditions are subject to change in terms of time, a sufficient number of measurements shall be carried out, as a minimum, however, six measurements shall be carried out during states of operation which can cause maximum emission levels by experience.

As a rule, individual measurements shall be carried out over half an hour; the result of such individual measurement shall be determined and to be indicated as a half-hourly mean value. In special cases, e.g. with batch operation or low mass concentrations contained in waste gas, averaging periods shall be adapted accordingly.

With regard to substances which occur in various states of aggregation, special measures shall be taken while measuring in order to collect all respective proportions (e.g. in compliance with VDI Guideline 3868 Part 1, December 1994 version).

5.3.2.3 Measuring Methods Selection

Measurements by which to assess emissions shall be carried out while applying measuring methods and measuring instruments representing the best techniques available in metrology. The detection limit for the measuring method should amount to less than one tenth of the emission limit to be monitored. Emission measurements shall occur while taking into consideration the guidelines and standards for measuring methods listed in the VDI/DIN Air Pollution Prevention Manual referred to in Annex 6. Sampling shall comply with VDI Guideline 4200 (December 2000 version). Moreover, measuring methods of guidelines on emission reduction contained in the VDI/DIN Air Pollution Prevention Manual shall be taken into account.

Total carbon shall be determined by means of suitable continuous measuring instruments (e.g. based upon the measuring principle of a flame ionisation detector). The measuring instruments used shall be calibrated while defined substances or substance mixtures containing such substances or other substance mixtures are emitted or calibration shall be carried out mathematically on the grounds of response factors to be defined on the basis of propane calibration. In the event of complex substance mixtures, a representative response factor shall be drawn upon. In cases justified as exceptions, total carbon may also be determined by determining the amount of carbon which can be retrieved through silica gel absorption.

5.3.2.4 Analysing and Evaluating the Measuring Results

A measurement report regarding the result of the measurements shall be demanded to be compiled and immediately submitted. The measurement report shall contain details about measuring plans, the result of each individual measurement, the measuring method applied and the operational conditions which are relevant to evaluate the individual values and the measuring results. It shall also include details about fuels and charge materials and about the state of operation of the facility and of the emission-reducing facilities; it shall comply with Annex B of VDI Guideline 4220 (September 1999 version).

In the event of initial measurements after construction, of measurements taken after significant alteration or of recurrent measurements the requirements shall in any event only be deemed observed if the result of each individual measurement, including measurement uncertainty, does not exceed the emissions limit established in the licensing notice.

If subsequent orders which are based upon the determination of emissions demand additional measures to reduce emissions, measurement uncertainty shall be taken into account to the operator's benefit.

An examination as to whether the measuring method complies with the best available techniques in metrology, especially with regard to its measuring uncertainty, shall be required in cases in which the measurement result, including measurement

uncertainty, exceeds the established emission limit. In case of excess values, further examination (e.g. examining facility-specific reasons) shall be required.

5.3.2.5 Measuring Odour-Intensive Substances

If the emissions of odour-intensive substances are limited by determining an odour reduction value for a waste gas purification facility or as an odorous substances concentration when a facility is licensed, such limits shall be checked by carrying out olfactometric measurements.

5.3.3 Continuous Measuring

5.3.3.1 Measurement Programme

Emissions from relevant sources shall be monitored through continuous measuring, taking into consideration para. 4, if mass flows established in 5.3.3.2 are exceeded and respective emission limits are established. A source shall, as a rule, be considered relevant if its emissions constitute over 20 per cent of the entire mass flow of the facility. When mass flows are determined, the stipulations in the licensing notice shall prevail.

If it is to be expected that a facility will repeatedly exceed the emission standards established in the licensing notice, e.g. when changing its mode of operation, or due to the fault-liability of an emission reduction facility, continuous emission measuring may also be requested for lower mass flows than those established under 5.3.3.2. For facilities with emission reduction facilities which have to be repeatedly shut down during undisturbed operation for safety reasons, or the efficiency of which has to be reduced considerably, mass flows resulting from the remaining precipitation capacities shall be applied.

The requirement of continuous monitoring of a source shall be waived if it emits for less than 500 hours in any one year or is less than 10 % of the annual emission of the facility.

Insofar as air-polluting substances in waste gas are in constant relation to each other, continuous measuring may be restricted to a lead component. Continuous emission measuring may again be waived if attainment of emission standards may be adequately proven by applying other tests, e.g. continuous efficiency demonstrating the effectiveness of emission reduction facilities (e.g. by measuring the combustion chamber temperature in a thermal post-combustion facility instead of measuring the mass concentration of organic substances, or by determining the differential pressure in fabric filters instead of measuring the mass concentration of the particles in waste gas), composition of fuels or raw materials, or processing conditions.

5.3.3.2 Mass flow thresholds for continuous monitoring

Facilities with particles mass flows of 1 to 3 kg/h shall be equipped with measuring instruments at their relevant sources which are capable of continuously monitoring the functioning of the waste gas purification facility and the established emission limits (qualitative measuring instruments).

Facilities with particles mass flows of over 3 kg/h shall be equipped with measuring instruments at their relevant sources which continuously determine dust emission mass concentrations.

Facilities with dust emissions of substances under 5.2.2 or 5.2.5 Class I or 5.2.7 shall be equipped with measuring instruments at their relevant sources which continuously determine the total particles concentrations if the emission mass flow is more than five times greater than one of the relevant mass flows.

At facilities emitting gaseous substances in excess of the following mass flows, relevant sources shall be equipped with measuring instruments which continuously determine the mass concentrations of the respective substances:

- sulphur dioxide 30 kg/h,
- nitrogen monoxide and nitrogen dioxide, to be indicated as nitrogen dioxide 30 kg/h,
- carbon monoxide as lead substance for evaluating the efficiency of combustion processes 5 kg/h,

— carbon monoxide, all other cases	100 kg/h,
— fluorine and gaseous inorganic fluorine compounds, to be indicated as hydrogen fluoride	0.3 kg/h,
— gaseous inorganic chlorine compounds, to be indicated as hydrogen chloride	1.5 kg/h,
— chlorine	0.3 kg/h,
— hydrogen sulphide	0.3 kg/h.

If sulphur dioxide mass concentrations are measured continuously, sulphur trioxide mass concentrations shall be determined during calibration and included in the calculation. If individual measurements show that nitrogen dioxide proportions in the nitrogen oxide emissions account for less than 10 per cent, continuous measuring of nitrogen dioxide shall be waived and its proportion be calculated.

Facilities with mass flows of organic substances, to be indicated as total carbon, exceeding for

— substances under 5.2.5 Class I	1 kg/h,
— substances under 5.2.5	2.5 kg/h

shall be equipped with measuring instruments at their relevant sources which continuously determine the total carbon.

Facilities with mass flows of mercury and its compounds of over 2.5 g/h, to be indicated as Hg, shall be equipped with measuring instruments at their relevant sources which continuously determine mercury mass concentrations, unless it has been reliably proven that the mass concentrations are less than 20 per cent of those specified in 5.2.2 Class I.

The competent authority shall require facilities emitting substances listed under 5.2.2 Classes I and II or substances listed under 5.2.7 to be equipped with continuous measuring instruments to determine the mass concentrations if the mass flow exceeds one of the respective mass flows over five times and if suitable measuring instruments are available.

5.3.3.3 Reference Values

Facilities with emission mass concentrations requiring permanent monitoring shall be equipped with measuring and evaluation instruments to continuously determine and record operational parameters, e.g. waste gas temperature, waste gas volume flow, humidity content, pressure, oxygen content, each including relevant status signals, which allow the evaluation and assessment of continuous measuring.

The continuous measuring of operational parameters may be waived if these, from experience, show only slight deviations which are minor for emission evaluation, or may be determined by other methods with sufficient certainty.

5.3.3.4 Selecting Instruments to Determine Emission Levels

Continuous measuring shall be carried out by suitable measuring and evaluation instruments which allow permanent value determination and recording of the factors to be monitored according to 5.3.3.2, 5.3.3.3 or 5.3.4 as well as the assessment according to 5.3.3.5.

A requirement shall be that an agency which has been determined by the authority responsible under *Land* law certifies the correct installation of the continuous measuring instrument.

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety shall publish in the GMBI. [*Gemeinsames Ministerialblatt* – Joint Ministerial Gazette], after consultation with the competent Land authorities, guidelines for the qualification test, installation, calibration and maintenance of measuring instruments. The measuring instruments recognized as suitable by the *Länder* shall be published in the *Bundesanzeiger* (Federal Gazette) by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

5.3.3.5 Evaluating and Assessing Measurement Results

Measured values shall generally be used to derive half-hourly mean values for each successive half hour. If necessary, the half hourly mean values shall be converted to the respective reference values and kept on file with the relevant status signals. The

evaluation shall be made using suitable emissions calculators whose installation and parameterisation has been inspected by a designated agency. The data shall be transmitted to the authority by telemetry upon request.

For each calendar day, a daily mean value, related to the daily operating time, shall be derived from the half-hourly mean values and kept on file.

The facility complies with requirements if the emission limits established in the licensing notice or in a subsequent order are not exceeded; if limits are exceeded, this shall be reported separately and the competent authority informed immediately.

The operator shall be required to draw up evaluations of the continuous measurement results in a calendar year which shall be submitted to the competent authority within three months after the end of each calendar year. Measurement results shall be kept on file by the operator for at least 5 years. The requirement to submit the evaluation shall not apply if the data are submitted to the competent authority by telemetry.

5.3.3.6 Calibration and Functional Testing of Instruments for Continuously Determining Emissions

It is a requirement for instruments for continuously determining emissions to be calibrated and tested with regard to their functioning by an agency determined by the competent *Land* authority for calibrations. The calibration shall be carried out pursuant to VDI Guideline 3950 Part 1 (December 1994 version). In special cases, e.g. during batch operation, for calibration periods exceeding half an hour, or for other averaging periods, the averaging period shall be adapted accordingly.

Calibrations of measuring instruments shall be repeated subsequent to a significant alteration, otherwise every 3 years. Reports on the outcome of the calibration and the functional tests shall be submitted to the competent authority within 8 weeks.

Functional testing of instruments for continuously determining emissions shall be repeated annually.

The operator shall be required to ensure regular maintenance and functional tests of the measuring instruments.

5.3.4 Continuous Determination of Special Substances

A requirement for facilities emitting substances according to 5.2.2, 5.2.5 Class I or 5.2.7 is daily determination of the mass concentration of these substances in waste gas, as a daily mean value in relation to the daily operating time if over ten times the mass flows established therein is exceeded.

If daily mean values vary only slightly, determining the daily mean value of the mass concentration of these substances in waste gas may also be carried out after longer periods of time, e.g. on a weekly, monthly or annual basis. Determining special substance emissions may be waived if other tests, e.g. continuous functional control of the waste gas purification facility, show with sufficient certainty that emission limits are not exceeded.

The observation of the requirements according to 5.2.7.2 shall be proven by permanently recording or determining suitable operational values or waste gas parameters if continuous emission monitoring cannot be requested due to missing measuring instruments.

The operator shall be required to draw up evaluations of the permanent monitoring of special substances emissions which shall be submitted to the competent authority within three months after the end of each calendar year. Measurement results shall be kept on file by the operator for at least 5 years.

5.3.5 Equivalency to VDI Guidelines

In addition to the procedures described in the VDI Guidelines referred to in 5.3, other procedures established as equivalent may also be applied.

5.4 Special Provisions for Certain Types of Facilities

The special requirements for certain types of facilities contained in 5.4 are arranged according to the Annex of the Ordinance on Installations Subject to Licensing (4. BImSchV) as promulgated on 14 March 1997 (BGBl. I, p. 504), as last amended

by Article 4 of the Act of 27 July 2001 (BGBl. I, p. 1950), and apply only to those types which are particularly mentioned. Notwithstanding this, the provisions of 5.1.1, para. 2, shall apply.

5.4.1 Heat Production, Mining, Energy

5.4.1.2 Facilities under 1.2: Furnaces

5.4.1.2.1 Facilities for Generating Electricity, Steam, Hot Water, Process Heat or Heated Waste Gas in Furnaces Using Coal, Coke, including Petroleum Coke, Coal Briquettes, Peat Briquettes, Fuel Peat or Untreated Wood with a Firing Thermal Capacity of less than 50 MW

REFERENCE VALUES

Emission standards for furnaces using coal, coke, including petroleum coke, or coal briquettes shall refer to a volume content of oxygen in waste gas of 7 per cent and for furnaces using peat briquettes, fuel peat or untreated wood to a volume content of oxygen in waste gas of 11 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST

Dust emissions in waste gas shall not exceed the following mass concentrations:

- | | | |
|----|---|-------------------------|
| a) | for facilities with a firing thermal capacity of 5 MW or more | 20 mg/m ³ , |
| b) | for facilities with a firing thermal capacity of less than 5 MW | 50 mg/m ³ , |
| c) | for facilities with a firing thermal capacity of less than 2.5 MW,
which exclusively use untreated wood, | 100 mg/m ³ . |

INORGANIC PARTICULATE MATTER

5.2.2 shall not apply, with the exception of furnaces using petroleum coke.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed mass concentrations of 0.15 g/m³.

For individual furnaces with a firing thermal capacity of less than 2.5 MW, the emission standard shall apply to nominal load operations only.

NITROGEN OXIDES

Nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed the following mass concentrations:

- a) for untreated wood 0.25 g/m³,
- b) for other fuels
 - aa) for fluidised bed furnaces 0.30 g/m³,
 - bb) for other furnaces in facilities with a firing thermal capacity
 - of 10 MW or more 0.40 g/m³,
 - of less than 10 MW 0.50 g/m³.

For fluidised bed furnaces using coal, dinitrogen oxide emissions in waste gas shall not exceed mass concentrations of 0.15 g/m³.

SULPHUR OXIDES

When fossil fuels are used, the sulphur dioxide and sulphur trioxide emissions in waste gas, to be indicated as sulphur dioxide, shall not exceed the following mass concentrations:

- a) for fluidised bed furnaces 0.35 g/m³
or, in case this mass concentration cannot be attained with proportional efforts, a sulphur emissions ratio of 25 per cent,
- b) for other furnaces
 - aa) for hard coal 1.3 g/m³,
 - bb) for other fuels 1.0 g/m³.

When untreated wood is used, 5.2.4 shall not apply.

HALOGEN COMPOUNDS

5.2.4 shall not apply.

ORGANIC SUBSTANCES

When untreated wood is used, emissions of organic substances in waste gas, to be indicated as total carbon, shall not exceed a mass concentration of 10 mg/m³. The requirements in 5.2.5 for emissions of organic substances of Classes I and II shall not apply.

CONTINUOUS MEASURING

Individual furnaces with a firing thermal capacity of 5 to 25 MW shall be equipped with measuring instruments which continuously determine dust emission mass concentrations qualitatively.

Individual furnaces with a firing thermal capacity of over 25 MW shall be equipped with measuring instruments which continuously determine dust emission mass concentrations.

Individual furnaces with a firing thermal capacity of 2.5 MW or over shall be equipped with measuring instruments which continuously determine carbon monoxide emission mass concentrations.

The second sentence of 5.3.3.1, para. 4, shall apply with respect to sulphur oxides insofar as the operator keeps a record of sulphur content, the lower calorific value of the fuel used, and of the added sorbents, keeps the record on file for five years and submits it, upon request, to the competent authority.

EXISTING FACILITIES

Existing facilities shall comply with requirements to restrict dust emissions and carbon monoxide and sulphur oxides emissions no later than eight years after the entry into force of this Administrative Regulation.

For individual furnaces with a firing thermal capacity of less than 2.5 MW, the carbon monoxide emissions in waste gas shall not exceed a mass concentration of 0.25 g/m³; the emission standard shall apply to nominal load operations only.

CONTINUOUS MEASURING

The requirement to be equipped with a measuring instrument which continuously determines carbon monoxide emission mass concentrations shall not apply to existing individual furnaces with a firing thermal capacity of 2.5 to 25 MW.

5.4.1.2.2 Facilities for Generating Electricity, Steam, Hot Water, Process Heat or Heated Waste Gas in Furnaces using Heating Oils, Emulsified Natural Bitumen, Methanol, Ethanol, Untreated Vegetable Oils or Vegetable Oil Methyl Esters with a Firing Thermal Capacity of less than 50 MW

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 3 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST

When heating oils listed in DIN 51603 Part 1 (March 1998 version), methanol, ethanol, untreated vegetable oils or vegetable oil methyl esters are used, 5.2.1 shall not apply. When these substances are used, the soot level shall not exceed the value 1. Waste gases shall be free of oil derivatives if filter paper used for soot measuring does not show any visible marks of oil derivatives.

When other liquid fuels are used, notwithstanding 5.2.1, a higher dust emission standard up to a maximum of 50 mg/m^3 may be approved, insofar as the emission standards of 5.2.2 and 5.2.7.1.1 are not exceeded.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed a mass concentration of 80 mg/m^3 .

NITROGEN OXIDES

Nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed the following mass concentrations:

- a) When heating oils defined in DIN 51603 Part 1 (March 1998 version), are used in boilers with a safety device setting value (e.g. safety temperature limiter, safety pressure valve) where the following values are exceeded
 - aa) a temperature smaller than 110 °C or excess pressure smaller than 0.05 MPa 0.18 g/m³,
 - bb) a temperature of 110 to 210 °C or excess pressure smaller than 0.05 to 1.8 MPa 0.20 g/m³,
 - cc) a temperature greater than 210 °C or excess pressure greater than 1.8 MPa 0.25 g/m³,with respect to the reference value for organically combined nitrogen of 140 mg/kg pursuant to Annex B of DIN EN 267 (November 1999 version),
 - b) for other liquid fuels 0.35 g/m³.
- when heating oils defined in DIN 51603 Part 1 (March 1998 version) are used, the organically combined nitrogen content of the fuel shall be determined pursuant to ASTM 4629–91 (1991 version). The measured mass concentrations of nitrogen monoxide and nitrogen dioxide, to be indicated as nitrogen dioxide, shall be converted to the reference value for organically combined nitrogen, as well as to the reference conditions of 10 g/kg air humidity and 20 °C combustion air temperature.

SULPHUR OXIDES

When fluid fuels with a higher mass content of sulphur are used as light heating oil pursuant to the Ordinance on the Sulphur Content of Light Fuel Oil and Diesel Fuel (3. BImSchV) of 15 January 1975 (BGBl. I, p. 264), as last amended on 21 December 2000 (BGBl. I, p. 1956), as currently applicable, the sulphur dioxide and sulphur trioxide emissions in waste gas, to be indicated as sulphur dioxide, shall not exceed a mass concentration of 0.85 g/m³.

Divergent to the first sentence, individual furnaces with a firing thermal capacity of up to 5 MW shall only use fluid fuels other than heating oils with a mass content of sulphur for light heating oil pursuant to the 3. BImSchV, as currently applicable, if it

is ensured (e.g. by the sulphur content in the fuel or by desulphurisation facilities) that no higher sulphur dioxide emissions are generated than if a heating oil with a mass content of sulphur pursuant to the 3. BImSchV, as currently applicable, is used.

INDIVIDUAL MEASUREMENTS

When heating oils listed in DIN 51603 Part 1 (March 1998 version), which do not exceed the approved sulphur mass content for light heating oil in the 3. BImSchV, as currently applicable, methanol, ethanol, untreated vegetable oils or vegetable oil methyl esters are used, 5.3.2.1 shall not apply to total dust and sulphur oxides.

CONTINUOUS MEASURING

Individual furnaces with a firing thermal capacity of 10 MW or more using heating oils listed in DIN 51603 Part 1 (March 1998 version), methanol, ethanol, untreated vegetable oils or vegetable oil methyl esters which form part of a common facility with a firing thermal capacity of 20 MW or more, shall be equipped with measuring instruments which continuously determine the soot level pursuant to DIN 51402 Part 1 (October 1986 version) and the carbon monoxide mass concentrations in waste gas.

Individual furnaces with a firing thermal capacity of 20 MW or more using methanol or ethanol shall be equipped with a measuring instrument which continuously determines carbon monoxide emission mass concentrations in waste gas.

Individual furnaces with a firing thermal capacity of less than 20 MW using heating oils, with the exception of heating oils listed in DIN 51603 Part 1 (March 1998 version), or emulsified natural bitumen shall be equipped with a measuring instrument which continuously determines dust emission mass concentrations qualitatively; individual furnaces with a firing thermal capacity of 20 MW or more shall be equipped with measuring instruments which continuously determine mass concentrations of particles and carbon monoxide emissions in waste gas.

EXISTING FACILITIES

Existing facilities using heating oils – with the exception of heating oils listed in DIN 51603 Part 1 (March 1998 version), which do not exceed the approved sulphur mass content for light heating oil in the 3. BImSchV, as currently applicable – shall

comply with requirements to restrict dust emissions and sulphur oxides emissions no later than ten years after the entry into force of this Administrative Regulation.

5.4.1.2.3 Facilities for Generating Electricity, Steam, Hot Water, Process Heat or Heated Waste Gas in Furnaces Using Gaseous Fuels, particularly Coke Oven Gas, Mine Gas, Gas from Steel Mills, Refinery Gas, Synthesis Gas, Mineral Oil Gas from the Tertiary Mining of Mineral Oil, Sewer Gas, Biogas, Untreated Natural Gas, Liquid Gas, Gases from the Public Gas Supply or Hydrogen, with a Firing Thermal Capacity of less than 50 MW

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 3 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST

Dust emissions in waste gas shall not exceed the following mass concentrations:

- a) when gases from the public gas supply, liquid gas, hydrogen, refinery gas, sewer gas or bio gas are used 5 mg/m³,
- b) when other gases are used 10 mg/m³.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed a mass concentration of 50 g/m³ when gases from the public gas supply are used and 80 g/m³ when other gases are used.

NITROGEN OXIDES

Nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed the following mass concentrations:

- a) when heating oils from the public gas supply are used in boilers with a safety device setting value (e.g. safety temperature limiter, safety pressure valve) when the following values are exceeded
 - aa) a temperature smaller than 110 °C or excess pressure smaller than 0.05 MPa 0.10 g/m³,
 - bb) a temperature of 110 to 210 °C or excess pressure smaller than 0.05 to 1.8 MPa 0.11 g/m³,
 - cc) a temperature greater than 210 °C or excess pressure greater than 1.8 MPa 0.15 g/m³,
- b) when other gases are used, with the exception of process gases containing nitrogen compounds, 0.20 g/m³;
- c) when process gases containing nitrogen compounds are used, nitrogen oxides emissions in waste gas shall be reduced using the best available techniques.

SULPHUR OXIDES

Sulphur dioxide and sulphur trioxide emissions in waste gas, to be indicated as sulphur dioxide, shall not exceed the following mass concentrations:

- a) for liquid gas 5 mg/m³,
- b) for gases from the public gas supply 10 mg/m³,
- c) for coke oven gas or refinery gas 50 mg/m³,
- d) for biogas or sewer gas 0.35 g/m³,
- e) for mineral oil gas used as fuel for steam production during tertiary measures in mineral oil mining, 1.7 g/m³,
- f) for fuel gases commonly used by iron and steel plants and coking plants,
 - aa) for blast furnace gas 0.20 g/m³,
 - bb) for coke oven gas 0.35 g/m³,
- g) for other fuels 35 mg/m³.

5.4.1.2.4 Mixed Fuel and Multiple Fuel Furnaces with a Firing Thermal Capacity of less than 50 MW

MIXED FUEL FURNACES

For mixed fuel furnaces, the emission standards determined for the respective fuels shall be established by comparing the energy applied with each fuel to the total amount of applied energy. The emission standards relevant to each furnace may be reached by adding the values in such manner.

Divergent to para. 1, the provisions apply to the fuel for which the highest emission standard applies if, during the operation of the facility, this fuel accounts for at least 70 per cent of the total amount of applied energy and, in the case of facilities in mineral oil refineries, for at least 50 per cent. In plants using distillation and conversion residues of mineral oil treatment processes for their own purposes, the amount of the most relevant fuel may be lower if the emission concentration in waste gas which shall be attributed to this most relevant fuel does not exceed the value given for this fuel in the first sentence.

MULTIPLE FUEL FURNACES

For multiple fuel furnaces, those regulations shall be in effect which apply to the particular fuel; notwithstanding, the requirements for reducing dust emissions of solid fuels shall apply for a period of four hours after the conversion from solid to gaseous fuels or to heating oil listed in DIN 51603 Part 1 (March 1998 version).

FLUIDISED BED FURNACES

For fluidised bed furnaces operated as mixed fuel furnaces or multiple fuel furnaces, the dust emission standards of 5.4.1.2.1 shall apply.

5.4.1.2.5 Furnaces of Drying Facilities

The requirements under 5.4.1.2.1, 5.4.1.2.2 or 5.4.1.2.3 shall apply to furnaces whose waste gases or flames dry goods not in direct contact. The following requirements shall apply to furnaces where goods are dried in direct contact to their waste gases or flames.

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 17 per cent; insofar as a volume content of oxygen in waste gas other than this is required for processing or product quality reasons, the reference oxygen content shall be defined on an individual basis.

FUELS

Furnaces shall be operated with the following fuels:

- a) gaseous fuels,
- b) liquid fuels which do not cause higher sulphur oxides emissions than heating oils listed in DIN 51603 Part 1 (March 1998 version) with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, or
- c) coals which do not cause higher sulphur oxides emissions than hard coal with a sulphur mass content of less than 1 per cent, as related to a lower calorific value of 29.3 MJ/kg; for individual processes during which other combustible materials are used, special arrangements shall be drawn up.

5.4.1.3 Facilities under 1.3:

Facilities for Generating Electricity, Steam, Hot Water, Process Heat or Heated Waste Gas in Furnaces Using Solid or Liquid Fuels other than under 1.2

When straw or similar plant products (e.g. cereals, grasses, miscanthus) are used, the following requirements shall apply to furnaces with a firing thermal capacity of less than 50 MW:

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 11 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST

Dust emissions in waste gas shall not exceed the following mass concentrations:

- a) for facilities with a firing thermal capacity of 1 MW or more 20 mg/m³,
- b) for facilities with a firing thermal capacity of less than 1 MW 50 mg/m³.

INORGANIC PARTICLE MATTER

5.2.2 shall not apply.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed a mass concentration of 0.25 mg/m³.

For individual furnaces with a firing thermal capacity of less than 2.5 MW, the emission standard applies to nominal load operations only.

NITROGEN OXIDES

Nitrogen monoxide and nitrogen dioxide emissions in waste gas shall, to be indicated as nitrogen dioxide, not exceed the following mass concentrations:

- a) for facilities with a firing thermal capacity equal to or greater than 1 MW 0.40 g/m³,
- b) for facilities with a firing thermal capacity smaller than 1 MW 0.50 g/m³.

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that the requirements for emissions of organic substances pursuant to Classes I and II do not apply.

CONTINUOUS MEASURING

Individual furnaces with a firing thermal capacity of 5 to 25 MW shall be equipped with measuring instruments which continuously determine dust emission mass concentrations qualitatively.

Individual furnaces with a firing thermal capacity of more than 25 MW shall be equipped with measuring instruments which continuously determine dust emission mass concentrations.

Individual furnaces with a firing thermal capacity equal to or greater than 2.5 MW shall be equipped with measuring instruments which continuously determine carbon monoxide emission mass concentrations in waste gas.

EXISTING FACILITIES

TOTAL DUST

Existing facilities shall comply with requirements to restrict dust emissions no later than eight years after the entry into force of this Administrative Regulation.

CONTINUOUS MEASURING

The requirement to be equipped with a measuring instrument which continuously determines carbon monoxide emission mass concentrations shall not apply to existing individual furnaces with a firing thermal capacity of 2.5 to 25 MW.

5.4.1.4 Facilities under 1.4: Internal Combustion Engines (including Internal Combustion Engines under 1.1 and 1.2)

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 5 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST, INCLUDING THE CONTENT OF CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

Dust emissions in waste gas from compression ignition engines operated on liquid fuels shall not exceed the maximum mass concentrations of 20 mg/m³.

Dust emissions in waste gas from internal combustion engines exclusively used during emergencies or operated for up to 300 hours per year during periods of peak load (e.g. for generating electricity, supplying gas or water) shall not exceed the maximum mass concentrations of 80 mg/m³.

The best available techniques to further reduce emissions, particularly with respect to engine design, shall be applied.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed the following mass concentrations:

- a) for compression ignition engines and spark ignition engines operated on liquid fuels, and for compression ignition engines (pilot injection engines) and spark ignition engines operated on gaseous fuels, with the exceptions of biogas, sewer gas or mine gas, 0.30 g/m³,
- b) for spark ignition engines operated on biogas or sewer gas with a firing thermal capacity of
 - aa) 3 MW or more 0.65 g/m³,
 - bb) less than 3 MW 1.0 g/m³,
- c) for spark ignition engines operated on mine gas, 0.65 g/m³,
- d) for pilot injection engines operated on biogas or sewer gas with a firing thermal capacity of
 - aa) 3 MW or more 0.65 g/m³,
 - bb) less than 3 MW 2.0 g/m³;

when biogas, sewer gas and mine gas are utilized, the best available techniques to further reduce carbon monoxide emissions, particularly with respect to engine design, shall be applied.

Carbon monoxide emission standards shall not apply to internal combustion engines exclusively used during emergencies or operated for up to 300 hours per year during periods of peak load (e.g. for generating electricity, supplying gas or water); all possible emission reduction measures with respect to engine design shall be applied.

NITROGEN OXIDES

Nitrogen monoxide and nitrogen dioxide emissions in waste gas shall not exceed the following mass concentrations, to be indicated as nitrogen dioxide:

- a) for compression ignition engines operated on liquid fuels with a firing thermal capacity of
 - aa) 3 MW or more 0.50 g/m³,

- | | | |
|-----|---|-------------------------|
| bb) | less than 3 MW | 1.0 g/m ³ , |
| b) | for gas-powered compression ignition engines (pilot injection engines) and spark ignition engines | |
| aa) | for pilot injection engines operated on biogas or sewer gas with a firing thermal capacity of | |
| | — 3 MW or more | 0.50 g/m ³ , |
| | — less than 3 MW | 1.0 g/m ³ , |
| bb) | for lean-burn engines and other four-stroke Otto engines operated on biogas or sewer gas, | 0.50 g/m ³ , |
| cc) | for pilot injection engines and lean-burn engines operated on other gaseous fuels, | 0.50 g/m ³ , |
| c) | for other four-stroke SI engines | 0.25 g/m ³ , |
| d) | for two-stroke engines | 0.80 g/m ³ ; |

when biogas, sewer gas and mine gas are utilized in pilot injection engines with a firing thermal capacity of less than 3 MW, all possible measures with respect to engine design to further reduce nitrogen oxides emissions shall be applied.

Nitrogen oxides emission standards shall not apply to internal combustion engines used exclusively during emergencies or operated for up to 300 hours per year during periods of peak load (e.g. for generating electricity, supplying gas or water).

SULPHUR OXIDES

When liquid mineral fuels are used, only heating oils listed in DIN 51603 Part 1 (version March 1998) with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, or diesel fuels with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, may be used, or equivalent measures shall be applied.

When gaseous fuels are used, the requirements under 5.4.1.2.3 shall apply, provided that a conversion is made to a reference oxygen content in waste gas of 5 per cent.

When biogas and sewer gas are utilized, the best available primary techniques to further reduce emissions (gas purification) shall be applied.

ORGANIC SUBSTANCES

Formaldehyde emissions in waste gas shall not exceed a mass concentration of 60 g/m^3 . The requirements in 5.2.5 shall not apply to emissions of other organic substances.

The best available techniques to further reduce organic substances emissions shall be applied.

5.4.1.5 Facilities under 1.5: Gas Turbines with a Firing Thermal Capacity of less than 50 MW (including Gas Turbines under 1.2)

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 15 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

TOTAL DUST

5.2.1 shall not apply.

When liquid fuels are used, the soot level shall not exceed the value 2 during continuous operation and the value 4 during start up.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas shall not exceed a mass concentration of 0.10 g/m^3 during operation with a load of 70 per cent or more.

NITROGEN OXIDES

When natural gas is used, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 75 g/m^3 , to be indicated as nitrogen dioxide, during operation with a load of 70 per cent or more. For gas turbines operating solo with an efficiency of more than 32 per cent at $15 \text{ }^\circ\text{C}$, 101.3 kPa and a relative air humidity of 60 per cent (ISO conditions), the emission

standard of 75 mg/m³ shall be increased in line with the percentage improvement of efficiency.

When other gaseous or liquid fuels are used, emissions of nitrogen monoxide and nitrogen dioxide in the waste gas from gas turbines shall not exceed a mass concentration of 0.15 g/m³, to be indicated as nitrogen dioxide.

Emission standards for nitrogen oxides shall not apply to gas turbines used exclusively during emergencies or operated for up to 300 hours per year during periods of peak load for the gas supply.

SULPHUR OXIDES

When liquid fuels are used, only heating oils listed in DIN 51603 Part 1 (March 1998 version) with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, or diesel fuels with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, may be used, or equivalent measures to reduce emissions shall be applied.

EXISTING FACILITIES

NITROGEN OXIDES

Existing facilities shall comply with requirements to restrict nitrogen dioxides emissions no later than ten years after the entry into force of this Administrative Regulation; the requirements for new facilities to restrict nitrogen oxides emissions shall not apply to existing individual aggregates with a mass flow of nitrogen oxides of up to 20 Mg/a, to be indicated as nitrogen dioxide.

5.4.1.9/10 Facilities under 1.9 and 1.10:

5.4.1.9.1 Facilities for Grinding or Drying Coal

5.4.1.10.1 Facilities for Briquetting Lignite and Hard Coal

TOTAL DUST

a) Hard coal

Dust emissions shall not exceed a mass concentration of 75 mg/m³ (f) in the clouds and vapours.

b) Lignite

Dust emissions in waste gas shall not exceed a mass concentration of 75 mg/m^3 (f) during vapour dedusting, prop dedusting and prop jaw fog dispersals.

EXISTING FACILITIES

TOTAL DUST

Lignite

For existing facilities, dust emissions in waste gas shall not exceed a mass concentration of 75 mg/m^3 during interior dedusting if, because of the risk of explosion, wet waste gas purification processes have to be used.

5.4.1.11 Facilities under 1.11:

Facilities for the Dry Distillation of Hard Coal (Coking Plants)

UNDERGRATE FIRING

a) Reference values

Emission standards for furnace waste gases shall refer to a volume content of oxygen in the waste gas of 5 per cent.

b) Dust

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m^3 .

c) Nitrogen oxides

During the initial measurement, nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed 0.50 g/m^3 ; the best available techniques to reduce high emissions caused by aging, particularly with respect to improved combustion, shall be applied.

d) Fuel

The mass concentration of sulphur compounds in the undergrate gas, to be indicated as sulphur, shall not exceed 0.80 g/m^3 .

CHARGING COKE OVENS

Dust emissions shall be avoided when drawing off coal from the coal bunker into the lorries.

Filling gases shall be collected. During bulk feeding operations, filling gases shall be fed into the crude gas. During compacting, filling gases shall be passed on to the crude gas or adjacent oven as far as this is feasible. Filling gases which may not be passed on shall be burned. Dust emissions in the combustion waste gas shall not exceed a mass concentration of 10 mg/m³.

When the coal is graded, filling gas emissions shall be reduced and, as far as possible, prevented by sealing the grading opening.

FILLING HOLE LIDS

Emissions at filling hole lids shall be avoided as far as possible, e.g. by using filling hole lids with large sealing surfaces, by packing the filling hole lids after each charging of the oven, and by regular cleaning of filling hole frames and filling hole lids before closing the filling holes. Oven ceilings shall be freed from coal residues regularly.

RISER PIPE LIDS

Riser pipe lids shall be equipped with water dip tanks or adequate systems in order to avoid emissions; riser pipes shall be cleaned regularly.

COKE OVEN OPERATING MACHINERY

The machinery for operating the coke oven shall be equipped with systems for cleaning the sealing surfaces on the oven door frames.

COKE OVEN DOORS

Coke oven doors with a technically gas-tight seal shall be used. The gaskets shall be pushed against the frame of the chamber exerting spring resistance or using other technology, which seals as efficiently. The sealing surfaces of the oven doors shall be cleaned regularly. The best available techniques to further reduce emissions, particularly with respect to single-chamber pressure regulation, exhaust systems and other technical features, shall be applied.

COKE PUSHING

Waste gases shall be collected during coke pushing operations and fed into a dedusting system; dust emissions shall not exceed a mass concentration of 5 mg/m³ or the mass ratio of 5 g per Mg of coke.

COKE COOLING

Low-emission procedures shall be applied for coke cooling, e.g. dry coke cooling; dust emissions in waste gas from dry coke cooling shall not exceed a mass concentration of 15 mg/m³ and dust emissions from wet coke cooling shall not exceed the mass ratio of 10 g per Mg of coke.

OPERATING MANUAL

The measures for emissions reduction in coke oven operations shall be established in an operating manual, particularly so as to guarantee properly sealed openings, ensure that only completely roasted coke is pushed out, and prevent the escape of unburned gases into the atmosphere.

COKING BY-PRODUCT PLANTS

The requirements under 5.4.4.1m.2, 5.4.4.1p.1 and 5.4.4.4 shall apply accordingly to facilities in the category of coking by-product plants. If the process gas also contains hydrogen sulphide in addition to ammonia, the waste gas shall be fed into a sulphuric acid or sulphur recovery system by means of post-combustion.

EXISTING FACILITIES

COKE COOLING

For existing facilities with a wet quenching installation for coke cooling, dust emissions from the quenching tower shall not exceed the mass ratio of 25 g per Mg of coke. In the event of a basic renewal of the coke cooling system, the requirements for new facilities shall be observed.

5.4.2 Rock and Soil, Glass, Ceramics and Building Materials

5.4.2.3 Facilities under 2.3:

Facilities for the Production of Cement Clinkers or Cements, insofar as Fuels under 1.2 are Used Exclusively

STORAGE

Clinker materials shall be stored in silos or enclosed areas equipped with exhaust and dedusting systems.

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in the waste gas of 10 per cent.

AMMONIA

The requirements in 5.2.4 shall not apply to ammonia emissions. If wastes with relevant quantities of substances containing ammonium are used as raw materials and their use is not regulated by the Ordinance on Incinerators for Waste and Similar Combustible Materials (17. BImSchV) of 23 November 1990 (BGBl. I, p. 2545), last amended by the Ordinance of 23 February 1999 (BGBl. I, p. 186), as currently applicable, the materials shall be put into the furnace entrance or the calcinator.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in the waste gas from cement furnaces shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide. The best available techniques to further reduce emissions, particularly by using improved combustion, shall be applied.

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply. Insofar as wastes containing relevant quantities of organic substances are used as raw materials and their use is not regulated by the 17. BImSchV, as currently applicable, the materials shall be put into the furnace entrance or the calcinator.

CARCINOGENIC SUBSTANCES

5.2.7.1.1 shall apply, provided that emissions of benzene in the waste gas from cement furnaces shall not exceed a mass concentration of 1 mg/m³ if possible, and shall not exceed a mass concentration of 5 mg/m³.

CONTINUOUS MEASURING

The requirements under 5.3.3.2 shall not apply to emissions of carbon monoxide, fluorine and inorganic gaseous fluorine compounds and inorganic gaseous chlorine compounds.

5.4.2.4 Facilities under 2.4:

Facilities for Burning Limestone, Bauxite, Dolomite, Gypsum, Diatomite, Magnesite, Quarzite or Fire Clay

REFERENCE VALUES

Emission standards shall refer to moist waste gas for facilities for the production of hydrate lime or dolomite.

TOTAL DUST

When electrostatic precipitators are used, divergent to 2.7 a) bb), all half-hourly mean values shall not exceed a mass concentration of 50 mg/m³.

NITROGEN OXIDES

Emissions of nitrogen dioxide and nitrogen monoxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide. For the manufacture of hard quicklime or sintering dolomite in rotary furnaces, divergent to the first sentence, nitrogen dioxide and nitrogen monoxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed a mass concentration of 1.5 g/m³; the best available techniques to further reduce emissions, particularly with respect to improved combustion, shall be applied.

WASTE GAS RECYCLING

For rotary furnaces for burning gypsum, a mass concentration of sulphur dioxide and sulphur trioxide, to be indicated as sulphur dioxide, and of nitrogen dioxide and

nitrogen monoxide, to be indicated as nitrogen dioxide, determined for operation with waste gas recycling shall be converted to the waste volume flow for operation without waste gas recycling.

EXISTING FACILITIES

TOTAL DUST

Existing facilities for burning gypsum which equipped with electrostatic precipitators and using lignite dust as fuel shall comply with requirements to restrict dust emissions no later than eight years after the entry into force of this Administrative Regulation.

Hydrogen Sulphide

For lime shaft furnaces with mixed fuels, hydrogen sulphide emissions in waste gas shall not exceed a mass concentration of 3 g/m³ where possible; the best available primary and other techniques to further reduce hydrogen sulphide emissions shall be applied.

5.4.2.7 Facilities under 2.7: Facilities for Bloating Perlite, Slate or Clay

REFERENCE VALUES

Emission standards shall refer to moist waste gas and to a volume content of oxygen in the waste gas of 14 per cent.

SULPHUR OXIDES

5.2.4 shall apply to facilities for bloating clay or slate, provided that emissions of sulphur dioxide and sulphur trioxide in waste gas, to be indicated as sulphur dioxide, shall not exceed a mass concentration of 0.75 g/m³.

CARCINOGENIC SUBSTANCES

5.2.7.1.1 shall apply to facilities for bloating clay or slate, provided that emissions of Class III substances in waste gas shall not exceed a mass concentration of 1 mg/m³ where possible, and shall not exceed a mass concentration of 3 mg/m³.

5.4.2.8 Facilities under 2.8:

Facilities for the Production of Glass, insofar as it is Manufactured from Waste Glass, including Facilities for Producing Glass Fibres

REFERENCE VALUES

Emission standards are referenced for flame-heated glass melting furnaces to a volume content of oxygen in the waste gas of 8 per cent, as well as for flame-heated pot furnaces and day tanks to a volume content of oxygen in the waste gas of 13 per cent.

INORGANIC PARTICLE MATTER

If the use of lead or selenium is required for reasons of product quality, 5.2.2 shall apply, provided that emissions of Class II substances in waste gas do not exceed a mass concentration of 3 mg/m³; if substances from several classes are present, irrespective of 5.2.2 para. 1, the mass concentration for coinciding Class II and III or coinciding Class I to III substances shall not exceed 4 mg/m³. The use of lead or selenium shall be documented.

If foreign fragments are used for the production of container glass, 5.2.2 shall apply, provided that emissions of lead and its compounds in waste gas shall not exceed a mass concentration of 0.8 mg/m³, to be indicated as Pb; if several Class II substances are present, the mass concentration for substances of this class shall not exceed a total of 1.3 mg/m³. If substances from several classes are present, irrespective of 5.2.2 para. 1, the mass concentration for coinciding Class II and III or coinciding Class I to III substances shall not exceed 2.3 mg/m³. The input of foreign fragments shall be documented.

FLUORINE AND ITS INORGANIC GASEOUS COMPOUNDS

5.2.4 shall apply, provided that emissions of fluorine and its inorganic gaseous compounds in waste gas, to be indicated as hydrogen fluoride, shall not exceed a mass concentration of 5 mg/m³. Measures to reduce emissions of fluorine and its inorganic gaseous compounds by using raw materials with lower levels of fluorine compounds shall be applied; if the use of fluorides is required for reasons of product

quality, the quantity used shall be restricted to that which is essential and documented.

SULPHUR OXIDES

Sulphur dioxide and sulphur trioxide emissions in waste gas, to be indicated as sulphur dioxide, shall not exceed the mass concentrations listed in Table 9:

Table 9: Emission Standards for Sulphur Dioxide and Sulphur Trioxide, to be Indicated as Sulphur Dioxide, for Facilities under 2.8

Facilities for the Production of Glass	Gas-fired (g/m³)	Oil-fired (g/m³)	Operating Conditions
container glass or sheet glass	0.40	0.80	
container glass	0.80	1.5	Near stoichiometric mode for primary NO _x reduction, full recirculation of filter dust, sulphate purification as well as content of own and foreign fragments of more than 40 mass per cent, as related to the mixture.
sheet glass	0.80	1.5	Near stoichiometric mode for primary NO _x reduction, full recirculation of filter dust and a sulphate content required for the quality of the glass of more than 0.45 mass per cent, as related to the mixture.
glass for consumer goods	0.20	0.50	

Facilities for the Production of Glass	Gas-fired (g/m³)	Oil-fired (g/m³)	Operating Conditions
glass for consumer goods	0.50	1.4	Near stoichiometric mode for primary NO _x reduction, full recirculation of filter dust and a sulphate content required for the quality of the glass of more than 0.45 mass per cent, as related to the mixture.
glass fibres	0.20	0.80	
glass fibres	0.80	1.4	Full recirculation of filter dust and a sulphate content required for the quality of the glass of more than 0.40 mass per cent, as related to the mixture.
glass wool	0.050	0.80	
glass wool	0.10	1.4	Content of own and foreign fragments of more than 40 mass per cent, as related to the mixture
special glass	0.20	0.50	
special glass	0.40	1.0	full recirculation of filter dust
water glass	0.20	1.2	
frits	0.20	0.50	

In operating conditions other than those to be indicated for the maximum permissible emission standards for a glass product in Table 9, lower emission standards shall be defined on an individual basis if these operating conditions involve a lower sulphur input into the mixture or lower mass concentrations of sulphur oxides in the crude gas.

Emission limits for mixed fuel furnaces or multiple fuel furnaces shall be defined on a case-to-case basis.

The recirculation of filter dusts, the use of foreign fragments and the sulphate content in the mixture shall be documented.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide. For horseshoe flame tanks and cross burner tanks with a waste gas volume flow of less than 50 000 m³/h, divergent to the first sentence, nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed a mass concentration of 0.50 g/m³ if possible, and shall not exceed a mass concentration of 0.80 g/m³; the best available techniques to further reduce emissions, particularly using improved combustion, shall be applied.

If nitrate purification is required for reasons of product quality, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 1.0 g/m³, to be indicated as nitrogen dioxide, during the nitrate purification process. The nitrate input shall be documented.

CARCINOGENIC SUBSTANCES

5.2.7.1.1 shall apply to the production of container glass, provided that emissions of Class I substances in waste gas shall not exceed the maximum mass concentration of 0.5 mg/m³.

If the use of arsenic compounds as purification agents is required for reasons of product quality, 5.2.7.1.1 shall apply, provided that emission standards for Class I substances, except arsenic and its compounds, shall apply; in this case, emissions of arsenic and its compounds in waste gas, to be indicated as As, shall not exceed the maximum mass flow of 1.8 g/h or the maximum mass concentration of 0.7 mg/m³; measures to reduce high emissions of arsenic, e.g. by using purification processes without arsenic or antimony, shall be applied.

If the use of cadmium compounds is required for glass coloration for reasons of product quality, 5.2.7.1.1 shall apply, provided that emission standards for Class I substances, except cadmium and its compounds, shall apply; in this case, emissions of cadmium and its compounds in waste gas, to be indicated as Cd, shall not exceed the maximum mass flow of 0.5 g/h or the maximum mass concentration of 0.2 mg/m³.

The input of arsenic and cadmium compounds shall be documented.

SPECIAL PROVISIONS

Special provisions shall be made for glass melting tanks fired by oxygen fuel and electrically heated glass melting tanks. The specific energy consumption of comparable modern glass melting tanks fired by air fuel and the efficiency of waste gas purification facilities shall be used as criteria. Reference is made to Guideline VDI 2578 (November 1999 version).

EXISTING FACILITIES

TOTAL DUST

For existing facilities equipped with electrostatic precipitators and meeting the requirements of 6.2.3.3, dust emissions in waste gas shall not exceed a mass concentration of 30 mg/m^3 .

NITROGEN OXIDES

For existing facilities with horseshoe flame tanks or cross burner tanks, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.80 g/m^3 , to be indicated as nitrogen dioxide; moreover, it shall be examined to what extent, with additional waste gas reduction measures, an emission standard of 0.50 g/m^3 may be requested.

These requirements to restrict nitrogen oxides shall be observed no later than eight years after the entry into force of this Administrative Regulation; during the specified period, at the end of each tank's lifetime, appropriate structural alterations to the melting tank shall be carried out, using the best available techniques to reduce nitrogen oxides emissions.

If nitrate purification is required for reasons of product quality, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed the following mass concentrations, to be indicated as nitrogen dioxide, during the nitrate purification process:

- | | | |
|----|--|-----------------------|
| a) | for a waste gas volume flow of $5\,000 \text{ m}^3/\text{h}$ or more | 1.0 g/m^3 , |
| b) | for a waste gas volume flow of less than $5\,000 \text{ m}^3/\text{h}$ | 1.2 g/m^3 . |

The nitrate input shall be documented.

**5.4.2.10 Facilities under 2.10:
Facilities for Burning Ceramic Products**

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in the waste gas of 17 per cent.

TOTAL DUST

5.2.1 shall apply to the use of packed bed filters, provided that during the intermittent dosage or intermittent circulation of the sorption agent dust emissions in waste gas shall not exceed a mass concentration of 40 mg/m³.

INORGANIC PARTICLE MATTER

5.2.2 shall apply to the use of enamels or matter containing lead, provided that emission standards for Class II substances, except lead and its compounds, shall apply. For emissions of lead and its compounds in waste gas, to be indicated as Pb, a mass flow of 2.5 g/h or a mass concentration of 0.5 mg/m³ shall not be exceeded if possible and a mass concentration of 3 mg/m³ shall not be exceeded. Measures to reduce high emissions of lead and its compounds by using lead-free enamels and matter shall be applied.

FLUORINE AND ITS INORGANIC GASEOUS COMPOUNDS

5.2.4 shall apply, provided that emissions of fluorine and its inorganic gaseous compounds in waste gas, to be indicated as hydrogen fluoride, shall not exceed a mass concentration of 5 mg/m³. For intermittently operated furnaces, divergent to the first sentence, emissions of fluorine and its inorganic gaseous compounds in waste gas shall not exceed a mass flow of 30 g/m³ or a mass concentration of 10 mg/m³.

The best available primary and secondary techniques to further reduce emissions of fluorine and its inorganic gaseous compounds, particularly the use of raw materials with lower levels of fluorine compounds, shall be applied.

SULPHUR OXIDES

Emissions of sulphur dioxide and sulphur monoxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as sulphur dioxide.

NITROGEN OXIDES

Emissions of nitrogen dioxide and nitrogen monoxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide.

ORGANIC SUBSTANCES

If post-combustion takes place outside the furnace, emissions of organic substances in waste gas shall not exceed a mass concentration of 20 mg/m³, to be indicated as total carbon; the requirements for emissions of Class I and II organic substances defined in 5.2.5 shall not apply.

CARCINOGENIC SUBSTANCES

5.2.7.1.1 shall apply to furnaces with no external post-combustion, provided that emissions of benzene in waste gas shall not exceed a mass concentration of 1 mg/m³ if possible, and shall not exceed a mass concentration of 3 mg/m³.

EXISTING FACILITIES

TOTAL DUST

For existing facilities operated using a packed bed filter or without a dedusting system, dust emissions in waste gas shall not exceed a mass concentration of 40 mg/m³; the best available techniques to further reduce dust emissions shall be applied.

SULPHUR OXIDES

For existing facilities, emissions of sulphur dioxide and sulphur trioxide in waste gas, to be indicated as sulphur dioxide, shall not exceed a mass concentration of 750 mg/m³.

5.4.2.11 Facilities under 2.11:

Facilities for Melting Mineral Substances, including Facilities for the Production of Mineral Fibres

REFERENCE VALUES

Emission standards are referenced for facilities which are fired with fossil fuels to a volume content of oxygen in waste gas of 8 per cent.

FLUORINE AND ITS INORGANIC GASEOUS COMPOUNDS

5.2.4 shall apply, provided that emissions of fluorine and its inorganic gaseous compounds in waste gas, to be indicated as hydrogen fluoride, shall not exceed a mass concentration of 5 mg/m³. Measures to reduce emissions of fluorine and its inorganic gaseous compounds by using raw materials with low levels of fluorine compounds shall be applied; if the use of fluorides is required for reasons of product quality, the quantity used shall be restricted to that which is essential and documented.

SULPHUR OXIDES

For the production of rock wool, emissions of sulphur dioxide and sulphur trioxide in waste gas, to be indicated as sulphur dioxide, shall not exceed the following mass concentrations:

- | | |
|---|-------------------------|
| a) for only natural stones or a mixture | 0.60 g/m ³ , |
| b) for a mass per cent of minerally combined bricks of less than 45, as related to the mixture, | 1.1 g/m ³ , |
| c) for a mass per cent of minerally combined bricks of 45 or more, as related to the mixture, and with full recirculation of filter dust, | 1.5 g/m ³ . |

For other proportions of minerally combined bricks or when there is not full recirculation of filter dust, emission standards shall be defined on an individual basis.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide. For horseshoe flame tanks and cross burner tanks with a waste gas volume flow of less than

50 000 m³/h, divergent to the first sentence, nitrogen monoxide and nitrogen dioxide emissions in waste gas, to be indicated as nitrogen dioxide, shall not exceed a mass concentration of 0.50 g/m³ if possible, and shall not exceed a mass concentration of 0.80 g/m³; the best available techniques to further reduce emissions, particularly with respect to improved combustion, shall be applied.

For cupola furnaces with thermal post-combustion, divergent to 5.2.4, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.35 g/m³, to be indicated as nitrogen dioxide.

EXISTING FACILITIES

TOTAL DUST

For existing facilities equipped with electrostatic precipitators and meeting the requirements of 6.2.3.3, dust emissions in waste gas shall not exceed a mass concentration of 30 mg/m³.

NITROGEN OXIDES

For existing facilities with horseshoe flame tanks or cross burner tanks, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.80 g/m³, to be indicated as nitrogen dioxide; moreover, it shall be examined to what extent, with additional waste gas reduction measures, an emission standard of 0.50 g/m³ may be requested.

These requirements to restrict nitrogen oxides shall be observed no later than eight years after the entry into force of this Administrative Regulation; during the specified period, at the end of each tank's lifetime, appropriate structural alterations to the melting tank shall be carried out using the best available techniques to reduce nitrogen oxides emissions.

If nitrate purification is required for reasons of product quality, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed the following mass concentrations, to be indicated as nitrogen dioxide, during the nitrate purification process:

- | | | |
|----|--|------------------------|
| a) | for a waste gas volume flow of 5 000 m ³ /h or more | 1.0 g/m ³ , |
| b) | for a waste gas volume flow of less than 5 000 m ³ /h | 1.2 g/m ³ . |

The nitrate input shall be documented.

5.4.2.15 Facilities under 2.15: Asphalt Mixing Plants

REFERENCE VALUES

Emission standards are referenced to a volume content of oxygen in waste gas of 17 per cent, and, divergent to this, to a volume content of oxygen in waste gas of 13 per cent for thermal oil curing aggregates.

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases containing dust from the mineral rotary dryer, the asphalt granulate dryer (parallel dryer), the transport units for hot minerals, the washer and the mixer shall be collected and fed into a dedusting system.

Crushers for recycled asphalt shall be encapsulated and equipped with effective installations to reduce dust emissions, e.g. water sprinklers.

The best available techniques to reduce the production temperature for asphalt, e.g. by means of additives or processing measures, shall be applied.

CARBON MONOXIDE

When gaseous or liquid fuels are used, carbon monoxide emissions in waste gas shall not exceed a mass concentration of 0.50 g/m³. When solid fuels are used, carbon monoxide emissions in waste gas shall not exceed a mass concentration of 0.50 g/m³ if possible, and shall not exceed a mass concentration of 1.0 g/m³.

ORGANIC SUBSTANCES

Waste gases from the vicinity of the mixer outflow, the transfer points to the mixer, the transport units for the bituminous mixture and the transfer points to the loading silos which containing organic substances shall be collected and fed into a suitable waste gas purification facility (e.g. by feeding the waste gases into the mineral rotary dryer as combustion air).

Emissions of organic substances when the bitumen storage tanks are filled shall preferably be avoided by using the vapour recovery technique.

The requirements in 5.2.5 for emissions of Class I and II organic substances shall not apply.

CARCINOGENIC SUBSTANCES

5.2.7.1.1 shall apply, provided that emissions of Class III substances in waste gas do not exceed a mass concentration of 1 mg/m³ if possible, and do not exceed a mass concentration of 5 mg/m³.

EXISTING FACILITIES

ORGANIC SUBSTANCES

For existing facilities, during the operation of an asphalt granulate dryer (parallel dryer), emissions of organic substances in waste gas, to be indicated as total carbon, shall not exceed a mass concentration of 50 mg/m³ if possible, and shall not exceed a mass concentration of 0.10 g/m³; the requirements for emissions of Class I and II organic substances defined in 5.2.5 shall not apply.

For existing facilities, waste gases from the vicinity of the mixer outflow, transfer points to the mixer, transport units for the bituminous mixture and transfer points to the loading silos which contain organic substances shall be collected and fed into the waste gas stack; moreover, it shall be examined whether additional emission reduction measures, e.g. feeding the emissions into the mineral rotary dryer as combustion air, may be requested.

When the bitumen storage tanks are filled, less expensive measures may be used for existing facilities than for new facilities, e.g. feeding waste gases with organic substances into the transport units for hot minerals.

Collection of waste gases from the vicinity of the mixer outflow, transfer points to the mixer, transport units for the bituminous mixture and transfer points to the loading silos, as well as the use of the vapour recovery technique or a comparable waste gas purification facility, may be waived if, for facilities with an output of

- a) 200 Mg per hour or more, there is a minimum distance of 500 m,
 - b) less than 200 Mg per hour, there is a minimum distance of 300 m
- to the next residential area, existing or planned.

5.4.3 Steel, Iron and Other Metals, including their Processing

5.4.3.1 Facilities under 3.1:

Facilities for Roasting, Smelting or Sintering Ores

5.4.3.1.1 Iron Ore Sintering Plants

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected warm at the point of origin, e.g. sintering belt, coke grinding equipment, mixing bunker, in the vicinity of sintering belt discharge, sinter cooling and sinter screening, and fed into a waste gas purification facility.

Filter dust shall be recycled as far as possible.

INORGANIC PARTICLE MATTER

5.2.2 shall apply, provided that lead emissions in waste gas from the sintering belt shall not exceed a mass concentration of 1 mg/m³.

STANDSTILLS CAUSED BY MALFUNCTIONS

The requirements for total dust and inorganic particle matter shall not apply during standstills of the sintering belt caused by malfunctions until normal operation is resumed; however, the dedusting system shall be operated at maximum precipitation capacity.

SULPHUR OXIDES

Emissions of sulphur dioxide and sulphur monoxide in waste gas from the sintering belt shall not exceed a mass concentration of 0.50 g/m³, to be indicated as sulphur dioxide.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas from the sintering belt shall not exceed a mass concentration of 0.40 g/m³, to be indicated as nitrogen dioxide.

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that emissions of organic substances in waste gas from the sintering belt shall not exceed a mass concentration of 75 mg/m³, to be indicated as total carbon.

DIOXINS AND FURANS

5.2.7.2 shall apply, provided that emissions of dioxins and furans in waste gas shall not be exceed a mass concentration of 0.1 ng/m³ if possible, and shall not exceed a mass concentration of 0.4 ng/m³.

EXISTING FACILITIES

TOTAL DUST

For existing facilities equipped with electrostatic precipitators, warm dust emissions in waste gas from the sintering belt and in the vicinity of sintering belt discharge, sinter cooling and sinter screening (area dedusting), shall not exceed a mass concentration of 50 mg/m³.

INORGANIC PARTICLE MATTER

For existing facilities equipped with electrostatic precipitators, 5.2.2 shall apply, provided that lead emissions in waste gas from the sintering belt shall not exceed a mass concentration of 2 mg/m³.

5.4.3.1.2 Facilities for Roasting, Smelting or Sintering Non-ferrous Metal Ores

5.4.3.1.1 shall apply accordingly.

**5.4.3.2 Facilities under 3.2:
Facilities for Producing, Manufacturing or Smelting Pig Iron or Steel**

5.4.3.2a Integrated Iron and Steel Plants

5.4.3.2a.1 Blast Furnace Operations

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases containing dust shall be collected at the point of origin, e.g. in the blast furnace pouring bay, at the point of blast furnace burdening, at the point of blast furnace charging, and fed into a waste gas purification facility; notwithstanding, their development may also be prevented during blast furnace tapping by extensive inert gas blanketing, e.g. a nitrogen atmosphere.

BLAST FURNACE TOP GAS

Blast furnace top gas shall be actively recycled; if blast furnace top gas cannot be recycled for safety reasons or in emergencies, it shall be fed into a flare.

REGENERATOR

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 3 per cent.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

5.4.3.2a.2 Oxygen Steel Works

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases containing dust shall be collected at the point of origin, e.g. at the point of pig iron decanting, deslagging, desulphurisation, converter charging and emptying, crude steel treatment, and fed into a dedusting system; notwithstanding,

their development may also be prevented during transfer of liquid pig iron by extensive inert gas blanketing, e.g. a carbon dioxide atmosphere.

Filter dust shall be recycled as far as possible.

CONVERTER GAS

Converter gas shall be actively recycled. If converter gas cannot be recycled for safety reasons or in emergencies, it shall be fed into a flare.

EXISTING FACILITIES

TOTAL DUST

Existing secondary dedusting systems equipped with electrostatic precipitators shall comply with requirements to restrict dust emissions no later than eight years after the entry into force of this Administrative Regulation.

CONVERTER GAS

Converter gas in existing facilities shall be recycled as actively as possible. If converter gas cannot be recycled, it shall be fed into a flare; in this event, the dust content in the flare gas after dedusting shall not exceed a mass concentration of 50 mg/m³.

5.4.3.2b Facilities for Manufacturing or Smelting Pig Iron or Steel including Continuous Casting

5.4.3.2b.1 Electric Steel Works

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. for electric arc furnaces primarily using extraction facilities at the hole in the furnace roof and secondarily using suction or hooding for the process stages of charging, smelting and tapping, and fed into a waste gas purification facility.

Filter dust shall be recycled as far as possible.

TOTAL DUST

Dust emissions in waste gas from steel works with electric arc furnaces shall not exceed a mass concentration of 5 mg/m³; divergent to 2.7 a) bb), all half-hourly mean values shall not exceed three times this mass concentration.

EXISTING FACILITIES

TOTAL DUST

Dust emissions in waste gas from electric arc furnaces, to be indicated as the daily mean value, shall not exceed a mass concentration of 10 mg/m³.

5.4.3.2b.2 Electroslag Remelting Plants

FLUORINE AND ITS INORGANIC GASEOUS COMPOUNDS

Emissions of fluorine and its inorganic gaseous compounds in waste gas shall not exceed a mass concentration of 1 mg/m³, to be indicated as hydrogen fluoride.

5.4.3.3 Facilities under 3.3:

Facilities for the Production of Non-ferrous Unrefined Metals

5.4.3.3.1 Facilities for the Production of Non-ferrous Unrefined Metals except Aluminium and Ferro-alloys

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. at the point of loading, smelting, refining and casting, and fed into a waste gas purification facility.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 5 mg/m³.

INORGANIC PARTICLE MATTER

5.2.5 shall apply, provided that emissions of inorganic particle matter in waste gas shall not exceed the following mass concentrations:

- a) Class II substances in total a mass concentration of 1 mg/m³, in lead works a mass concentration of 2 mg/m³,
- b) Class III substances in total a mass concentration of 2 mg/m³.

SULPHUR OXIDES

5.4.4.1m.2 shall apply accordingly to waste gases with a high content of sulphur dioxide.

MEASUREMENT AND MONITORING OF SULPHUR OXIDES EMISSIONS

For facilities with operating conditions which primarily remain constant with time, the duration of the averaging period shall correspond to the batch duration, but not exceed 24 hours; for continuous measuring, divergent to 2.7 a) bb), all half-hourly mean values shall not exceed three times the mass concentrations established.

FUELS

When liquid or solid fuels are used, the sulphur mass content in the fuel shall not exceed 1 per cent, as related to a lower calorific value of 29.3 MJ/kg for solid fuels, unless an equivalent emission standard for sulphur oxides is achieved by means of a waste gas purification facility; when coals are used, only coals which do not cause higher sulphur oxides emissions than hard coal with a sulphur mass content of less than 1 per cent, as related to a lower calorific value of 29.3 MJ/kg, shall be used.

CARCINOGENIC SUBSTANCES

In copper smelters, 5.2.7.1.1 shall apply, provided that emission standards for Class I substances, except arsenic and its compounds, shall apply. Emissions of arsenic and its compounds (except arsine), to be indicated as As, in waste gas shall not exceed the maximum mass flow of 0.4 g/h or the maximum mass concentration of 0.15 mg/m³; notwithstanding, in waste gas from anode furnaces, these emissions shall not exceed the maximum mass concentration of 0.4 mg/m³.

DIOXINS AND FURANS

5.2.7.2 shall apply, provided that emissions of dioxins and furans in waste gas do not exceed a mass concentration of 0.1 ng/m³ if possible, and do exceed a mass concentration of 0.4 ng/m³.

EXISTING FACILITIES

SULPHUR OXIDES

For existing facilities, emissions of sulphur dioxide and sulphur trioxide in waste gas – except process waste gases fed into facilities pursuant to 5.4.4.1m.2 – shall not exceed a mass concentration of 0.50 g/m³, to be indicated as sulphur dioxide.

5.4.3.3.2 Facilities for the Production of Ferro-alloys in Electrothermal or Metallothermal Processes

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 5 mg/m³.

5.4.3.3.3 Facilities for the Production of Aluminium from Ores in Electrolytic Processes with Preburnt Discontinuous Anodes

BUILDING AND OPERATIONAL REQUIREMENTS

Electrolytic furnaces shall be built as enclosed constructions. Opening of the furnaces and the frequency of the anode effect shall be limited to an extent necessary for operational requirements; the mode of operation of the electrolytic furnaces shall be automated as far as possible.

Filter dust shall be recycled as far as possible.

TOTAL DUST

Dust emissions in waste gas

- a) of the electrolytic furnaces shall not exceed the mass ratio of
10 mg/m³
and

- b) of the electrolytic furnaces including waste gases discharged from the furnace house shall not exceed the mass ratio of 2 kg per Mg of Al.

FLUORINE AND ITS INORGANIC GASEOUS COMPOUNDS

Emissions of fluorine and its inorganic gaseous compounds, to be indicated as hydrogen fluoride, in waste gas

- a) of the electrolytic furnaces shall not exceed the mass ratio of 1 mg/m³ and
- b) of the electrolytic furnaces including waste gases discharged from the furnace house shall not exceed the mass ratio of 0.5 kg per Mg of Al.

5.4.3.3.4 Facilities for the Production of Aluminium from Secondary Raw Materials

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. at the point of loading, smelting, refining, alloying and casting.

Hexachlorethane shall not be used for smelting.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide, to be indicated as nitrogen dioxide, in waste gas from rotary drum furnaces operated on oxygen fuel shall not exceed a mass concentration of 0.50 g/m³.

FUELS

When liquid fuels are used, only liquid fuels that do not cause higher sulphur oxides emissions than heating oils defined in DIN 51603 Part 1 (March 1998 version) with a

sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, shall be used.

5.4.3.4 Facilities under 3.4:

Facilities for Melting, Alloying or Refining Non-ferrous Metals

5.4.3.4.1 Facilities for Melting, Alloying or Refining Non-ferrous Metals except Aluminium

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. at the point of loading, smelting, refining, alloying and casting.

Hexachlorethane shall not be used for smelting.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass flow of 50 g/h or a mass concentration of 5 mg/m³.

INORGANIC PARTICLE MATTER

5.2.2 shall apply, provided that emissions of dust particles of Class II substances in waste gas from lead refining facilities shall not exceed a mass concentration of 1 mg/m³.

FUELS

When liquid fuels are used, only liquid fuels that do not cause higher sulphur oxides emissions than heating oils defined in DIN 51603 Part 1 (March 1998 version) with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, shall be used.

DIOXINS AND FURANS

5.2.7.2 shall apply, provided that emissions of dioxins and furans in waste gas from copper shaft furnaces shall not be exceed a mass concentration of 0.1 ng/m³ if possible, and shall not exceed a mass concentration of 0.4 ng/m³.

5.4.3.4.2 Smelting Facilities for Aluminium

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. at the point of loading, smelting, refining, alloying and casting.

Hexachlorethane shall not be used for smelting.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide, to be indicated as nitrogen dioxide, in waste gas from rotary drum furnaces operated on oxygen fuel burners shall not exceed a mass concentration of 0.50 g/m³.

FUELS

When liquid fuels are used, only liquid fuels that do not cause higher sulphur oxides emissions than heating oils defined in DIN 51603 Part 1 (March 1998 version) with a sulphur mass content for light heating oil pursuant to the 3. BImSchV, as currently applicable, shall be used.

5.4.3.6 Facilities under 3.6: Rolling mills

5.4.3.6.1 Thermal and Thermal Treatment Furnaces

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 5 per cent.

NITROGEN OXIDES

For heating furnaces, e.g. pusher furnaces and walking beam furnaces, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide.

ORGANIC SUBSTANCES

For thermal treatment furnaces for tinfoils, the requirements in 5.2.5 shall not apply to emissions of organic substances. The best available techniques to further reduce emissions of organic substances, particularly with respect to technical features, shall be applied.

5.4.3.7/8 Facilities under 3.7 and 3.8: Foundries

5.4.3.7.1 Iron, Malleable Iron and Steel Foundries

5.4.3.8.1 Foundries for Non-ferrous Metals

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin as far as possible, e.g. in the vicinity of sand reprocessing, moulding, casting, cooling, pouring, core moulding and cleaning of castings, with the exception of iron, malleable iron and steel foundries with an output of less than 20 Mg cast parts per day and foundries for non-ferrous metals with an output of less than 4 Mg per day for lead and cadmium, or less than 20 Mg per day for other non-ferrous metals; this exemption shall also apply to facilities for smelting non-ferrous metals. Waste gases from the smelting facilities for iron, malleable iron and steel foundries shall be collected irrespective of the output.

In principle, hexachlorethane shall not be used for smelting. Insofar as the use of hexachlorethane is required for smelting in the manufacture of cast products from aluminium alloys with high standards of quality and safety, and for grain refining in the production of the magnesium alloys AZ81, AZ91 and AZ92, the consumption of hexachlorethane shall not exceed 1.5 kg per day. The input of hexachlorethane shall be documented.

CARBON MONOXIDE

Waste gases containing carbon monoxide in cupola furnaces with lower blast furnace gas extraction shall be collected and post-combusted. Carbon monoxide emissions in waste gas shall not exceed 0.15 g/m³.

SULPHUR OXIDES

Emissions of sulphur dioxide and sulphur monoxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as sulphur dioxide.

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that amine emissions in waste gas shall not exceed a mass flow of 25 g/h or a mass concentration of 5 mg/m³. The requirements under 5.2.5 para. 1 shall not apply to total carbon.

BENZENE

5.2.7.1.1 shall apply, provided that benzene emissions in waste gas shall not exceed a mass flow of 5 g/h or a mass concentration of 5 mg/m³. The best available techniques to further reduce benzene emissions, particularly with respect to technical features, shall be applied, e.g. making changes to the feedstocks for core production and casting, blasting air into shell casting facilities, using waste gases containing benzene as combustion air in cupola furnaces.

EXISTING FACILITIES

TOTAL DUST

Existing facilities equipped with wet type precipitators shall comply with requirements to restrict dust emissions no later than eight years after the entry into force of this Administrative Regulation.

CARBON MONOXIDE

Existing cupola furnaces with lower blast furnace gas extraction shall comply with requirements to restrict carbon monoxide emissions no later than eight years after the entry into force of this Administrative Regulation.

ORGANIC SUBSTANCES

Existing facilities shall comply with requirements to restrict amine emissions no later than eight years after the entry into force of this Administrative Regulation.

**5.4.3.9 Facilities under 3.9:
Facilities for Applying Metallic Protective Layers**

5.4.3.9.1 Facilities for Applying Metallic Protective Layers to Metal Surfaces Using Molten Baths and Fluxing Agents

BUILDING AND OPERATIONAL REQUIREMENTS

In galvanizing facilities, waste gases from the galvanizing kettle shall be collected e.g. using housing or exhaust hoods, and fed into a waste gas purification facility.

TOTAL DUST

Dust emissions in waste gas from the galvanizing kettle shall not exceed a mass concentration of 5 mg/m³.

The result of an individual measurement shall be established over several dips; the measuring period corresponds to the total of the individual dipping periods and shall normally be half an hour. The dipping period equals the time span between the first and last contact of the object to be galvanized and the galvanizing bath.

INORGANIC CHLORINE COMPOUNDS

Galvanizing facilities shall be constructed and operated so that through sufficient pickling capacities and the observation of the pickling parameters of temperature and acid concentration, emissions of inorganic gaseous chlorine compounds from the pickling bath in waste gas are minimized and a mass concentration of 10 mg/m³, to be indicated as hydrogen chloride, is not exceeded. The existence of sufficient pickling capacities and the observation of the pickling parameters shall be documented.

If a chlorine concentration in waste gas of 10 mg/m³ may be exceeded owing to the pickling parameters of temperature and acid concentration, the waste gases shall be collected and fed into a waste gas purification facility. Emissions of gaseous inorganic chlorine compounds in waste gas shall not exceed a mass concentration of 10 mg/m³, to be indicated as hydrogen chloride.

**5.4.3.10 Facilities under 3.10:
Facilities for the Surface Treatment of Metals by Pickling or Burning Using
Hydrofluoric or Nitric Acid**

EXISTING FACILITIES

NITROGEN OXIDES

For existing facilities for the continuous pickling of high-grade steels with mixed caustics containing nitric acid, nitrogen monoxide and nitrogen dioxide emissions, to be indicated as nitrogen dioxide, in waste gas shall not exceed a mass concentration of 0.35 g/m³ if possible and shall not exceed a mass concentration of 0.70 g/m³.

**5.4.3.21 Facilities under 3.21:
Facilities for the Production of Lead Accumulators**

SULPHURIC ACID FUMES

Sulphuric acid fumes occurring during forming shall be collected and fed into a waste gas purification facility; emissions of sulphuric acid in waste gas shall not exceed a mass concentration of 1 mg/m³.

5.4.4 Chemical Products, Drugs, Refining and Processing of Mineral Oil

**5.4.4.1 Facilities under 4.1:
Facilities for Manufacturing of Substances or Groups of Substances Using
Chemical Transformation**

EXISTING FACILITIES

TOTAL DUST

5.2.1 shall apply, provided that emissions of dust particles in waste gas from existing facilities operating discontinuously or quasi-continuously which do not emit more annually than facilities with a mass flow of 0.20 kg/h when operating continuously shall not exceed a mass concentration of 50 mg/m³.

5.4.4.1b Facilities for the Production of Oxygenic Hydrocarbons

5.4.4.1b.1 Facilities for Cyclohexane Oxidation

BENZENE

Benzene emissions in waste gas shall not exceed a maximum mass concentration of 3 mg/m³.

5.4.4.1d Facilities for the Production of Nitrogenous Hydrocarbons

5.4.4.1d.1 Facilities for the Production of Acrylonitrile

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases from the reaction system and the absorber shall be fed into a combustion system. Waste gases resulting from the cleaning of reaction products (distillation) as well as refilling processes shall be fed into a waste gas scrubbing system.

ACRYLONITRILE

Acrylonitrile emissions in waste gas from the combustion facility shall not exceed the maximum mass concentration of 0.2 mg/m³.

5.4.4.1d.2 Facilities for the Production of Caprolactam

CAPROLACTAM

Caprolactam emissions in waste gas shall not exceed a mass concentration of 0.10 g/m³.

5.4.4.1h Facilities for the Production of Basic Plastic Materials

5.4.4.1h.1 Facilities for the Production of Polyvinyl Chloride (PVC)

BUILDING AND OPERATIONAL REQUIREMENTS

Dryer waste gas shall be used as combustion air in furnaces if possible.

MONOMERIC RESIDUES

Vinyl chloride (VC) residues contained in the polymer shall be kept as low as possible at transition points between the closed system and treatment or drying within the open system; the following maximum monthly mean values shall not be exceeded:

- a) suspension PVC 80 mg of VC per kg of PVC,
- b) emulsion PVC and microsuspension PVC 0.50 g of VC per kg of PVC.

The best available primary techniques (e.g. multi-stage de-aerating) or other techniques to further reduce vinyl chloride (VC) residues shall be applied.

5.4.4.1h.2 Facilities for the Production of Viscose Products

HYDROGEN SULPHIDE AND CARBON DISULPHIDE

In the total waste gas, including the extracted indoor air and air extracted by an auxiliary machine

- a) for the manufacture of textile rayons
 - aa) hydrogen sulphide emissions shall not exceed a mass concentration of 50 mg/m³
 - bb) and carbon disulphide emissions shall not exceed a mass concentration of 0.15 g/m³,
- b) for the manufacture of artificial sausage skin and sponge cloth
 - aa) hydrogen sulphide emissions shall not exceed the mass concentration of 50 mg/m³
 - bb) and carbon disulphide emissions shall not exceed the mass concentration of 0.40 g/m³

2.7 a) bb) shall not apply.

The best available techniques to reduce high emissions of hydrogen sulphide and carbon disulphide shall be applied, particularly encapsulating the machines with waste gas collection and purification.

5.4.4.1h.3 Facilities for the Production of Polyurethane Foams, except Facilities under 5.11

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin as far as possible.

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply to facilities for the manufacture of thermally insulating polyurethane foams powered by pure hydrocarbons (e.g. pentane) as fuel gas.

5.4.4.1h.4 Facilities for the Production of Polyacrylonitrile Fibres

EXISTING FACILITIES

BUILDING AND OPERATIONAL REQUIREMENTS

In existing facilities, dryer waste gas shall be used as combustion air in furnaces if possible.

ACRYLONITRILE

Acrylonitrile emissions in waste gas from the dryer shall not exceed the maximum mass concentration of 15 mg/m³. Acrylonitrilic waste gases caused by reaction boilers, intensive de-aerating, suspension collectors and washing filters shall be subject to waste gas scrubbing or absorption; acrylonitrile emissions in waste gas shall not exceed the maximum mass concentration of 5 mg/m³.

In existing facilities, when polymers are spun into fibres, waste gases with an acrylonitrile content of more than 5 mg/m³ shall be fed into a waste gas purification facility. Acrylonitrile emissions in waste gas from the washers during wet spinning shall not exceed the maximum mass concentration of 5 mg/m³.

The best available primary techniques (e.g. reduction of the monomeric residues) or other techniques to further reduce acrylonitrile emissions shall be applied.

5.4.4.1h.5 Facilities for the Production of Polyethylene Using Polymerisation under High Pressure

EXISTING FACILITIES

ORGANIC SUBSTANCES

In existing facilities emissions of organic substances in waste gas from the granulate de-aerating system shall not exceed a mass concentration of 80 mg/m³, to be indicated as total carbon. The requirements under 2.5 for emissions of Class II organic substances and I shall not apply.

5.4.4.11 Facilities for the Production of Gases

5.4.4.1n Facilities for the Production of Bases

5.4.4.11.1/5.4.4.1n.1 Facilities for the Production of Chlorine or Alkali Lye

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities for the production of chlorine or alkali lye shall not be constructed for the diaphragm process using asbestos or for the amalgam process.

CHLORINE

Chlorine emissions in waste gas shall not exceed a mass concentration of 1 mg/m³; notwithstanding, in facilities for the production of chlorine with complete liquefaction, chlorine emissions in waste gas shall not exceed a mass concentration of 3 mg/m³.

EXISTING FACILITIES

MERCURY

In existing facilities for alkali chloride electrolysis using the amalgam process, mercury emissions in the cell hall waste air shall not exceed an annual average mass ratio of 1.0 g per Mg of permitted chlorine produced.

If alkali lye and dithionite or alcoholates are produced simultaneously in one facility, mercury emissions in the cell hall waste air shall not exceed an annual average mass ratio of 1.2 g per Mg of permitted chlorine produced.

The best available techniques to further reduce mercury emissions from alkali chloride electrolysis in the amalgam process shall be applied.

5.4.4.1m Facilities for the Production of Acids

5.4.4.1m.1 Facilities for the Production of Nitric Acid

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.20 g/m³, to be indicated as nitrogen dioxide.

Dinitrogen oxide emissions in waste gas shall not exceed a mass concentration of 0.80 g/m³.

EXISTING FACILITIES

NITROGEN OXIDES

Existing facilities shall comply with requirements to restrict emissions of nitrogen monoxide, nitrogen dioxide and dinitrogen oxide no later than eight years after the entry into force of this Administrative Regulation.

5.4.4.1m.2 Facilities for the Production of Sulphur Dioxide, Sulphur Trioxide, Sulphuric Acid and Oleum

SULPHURIC ACID

The formation of sulphuric acid aerosols shall be restricted as much as possible during handling of sulphuric acid or oleum.

SULPHUR DIOXIDE

a) Waste gas feed

In facilities producing pure sulphur dioxide by liquefaction, the waste gas shall be fed into a sulphuric acid production facility or another treatment facility.

b) Conversion factors

aa) When the dual-contact process is used, a conversion factor of at least 99.8 per cent shall be maintained or, if a conversion factor of only 99.6 per cent is maintained, sulphur dioxide and sulphur trioxide

emissions shall be further reduced by using downstream emission reduction technology, a fifth hurdle or equivalent measures.

Divergent to these requirements, when the mean volume content of SO₂ is less than 8 per cent, with varying SO₂ feed concentrations and varying volume flows of the feed gas, a conversion factor of at least 99.5 per cent shall be maintained.

- bb) When the contact process without intermediate absorption is used and
- (i) for a volume content of sulphur dioxide in the feed gas of 6 per cent or more, a conversion factor of at least 98.5 per cent, or
 - (ii) for a volume content of sulphur dioxide of less than 6 per cent in the feed gas, a conversion factor of at least 97.5 per cent
- shall be maintained.

Sulphur dioxide and sulphur trioxide emissions in waste gas shall be further reduced in this type of process using downstream emission reduction technology.

- cc) When wet catalysis is used, a conversion factor of at least 98 per cent shall be maintained.

SULPHUR TRIOXIDE

Sulphur trioxide emissions in waste gas shall not exceed a mass concentration of 60 mg/m³.

5.4.4.1o Facilities for the Production of Salts such as Ammonium Chloride, Potassium Chlorate, Potassium Carbonate, Sodium Carbonate, Perborate and Silver Nitrate

5.4.4.1o.1 Facilities for the Production of Sodium Carbonate

EXISTING FACILITIES

AMMONIA

Ammonia emissions in waste gas shall not exceed a mass concentration of 50 mg/m³.

5.4.4.1p Facilities for the Production of Inorganic Compounds

5.4.4.1p.1 Facilities for the Production of Sulphur

SULPHUR EMISSIONS RATIO

- a) In Claus systems with a sulphur production capacity of up to 20 Mg of sulphur per day, a sulphur emissions factor of 3 per cent shall not be exceeded.
- b) In Claus systems with a sulphur production capacity of between 20 Mg and 50 Mg of sulphur per day, a sulphur emissions factor of 2 per cent shall not be exceeded.
- c) In Claus systems with a sulphur production capacity of over 50 Mg of sulphur per day, a sulphur emissions factor of 0.2 per cent shall not be exceeded.

SULPHUR OXIDES

The requirements under 5.2.4 shall not apply to emissions of sulphur oxides.

CARBON OXYSULPHIDE AND CARBON DISULPHIDE

Waste gases shall be fed into a post-combustion facility; emissions of carbon oxysulphide (COS) and carbon disulphide (CS₂) in waste gas shall not exceed a total mass concentration of 3 mg/m³, to be indicated as sulphur.

The first sentence shall not apply to Claus systems for processing natural gas.

HYDROGEN SULPHIDE

In Claus systems for processing natural gas, divergent to 5.2.4, hydrogen sulphide emissions shall not exceed a mass concentration of 10 mg/m³.

EXISTING FACILITIES

SULPHUR EMISSIONS FACTOR

For existing facilities, the following sulphur emissions factors shall not be exceeded:

- a) for Claus systems with a sulphur production capacity of up to 20 Mg of sulphur per day 3 %,
- b) for Claus systems with a sulphur production capacity of between 20 Mg and 50 Mg of sulphur per day 2 %,

- c) for Claus systems with a sulphur production capacity of over 50 Mg of sulphur per day
 - aa) for Claus systems with an integrated MODOP process, 0.6 %,
 - bb) for Claus systems with an integrated Sulfreen process, 0.5 %,
 - cc) for Claus systems with an integrated Scott process, 0.2 %,

5.4.4.1q Facilities for the Production of Fertilizers Containing Phosphorous, Nitrogen or Potassium (Single-nutrient or Multi-nutrient Fertilizers) including Ammonium Nitrate and Urea

EXISTING FACILITIES

TOTAL DUST

For existing facilities, during prilling, granulation and drying, dust emissions in waste gas shall not exceed a mass concentration of 50 mg/m³.

AMMONIA

For existing facilities, during prilling, ammonia emissions in waste gas shall not exceed a mass concentration of 60 mg/m³.

For existing facilities, during granulation and drying, ammonia emissions in waste gas shall not exceed a mass concentration of 50 mg/m³.

5.4.4.1r Facilities for the Production of Basic Materials for Pesticides and of Biocides

TOTAL DUST, INCLUDING SLOWLY DEGRADABLE, ACCUMULATIVE AND HIGHLY TOXIC ORGANIC SUBSTANCES

Dust emissions in waste gas shall not exceed a maximum mass flow of 5 g/h or a maximum mass concentration of 2 mg/m³.

5.4.4.2 Facilities under 4.2:

Facilities in which Pesticides or their Active Ingredients are Ground or Mechanically Mixed, Packed or Transferred

TOTAL DUST, INCLUDING SLOWLY DEGRADABLE, ACCUMULATIVE AND HIGHLY TOXIC ORGANIC SUBSTANCES

Waste gases containing dust shall be collected at the place of origin and fed into a dedusting system. Dust emissions in waste gas shall not exceed a maximum mass flow of 5 g/h or a maximum mass concentration of 5 mg/m³. Dust emissions with a composition of very toxic substances or preparations of 10 per cent or more shall not exceed a maximum mass concentration in waste gas of 2 mg/m³.

5.4.4.4 Facilities under 4.4:

Mineral Oil Refineries

PRESSURE RELIEF FITTINGS AND BLOW-DOWN SYSTEMS

Gases and vapours of organic substances such as hydrogen and hydrogen sulphide which escape from pressure relief fittings and blow-down systems shall be fed into a gas collecting system. The collected gases shall be combusted in process furnaces if this is feasible. If this is not possible, the gases shall be fed into a torch.

WASTE GAS FEED

Waste gases continually produced by processing systems and waste gases occurring during the regeneration of catalysts, inspections and cleaning operations shall be fed into a post-combustion facility, or equivalent measures to reduce emissions shall be applied.

START-UP AND SHUT-OFF PROCESSES

Gases produced during start up or shut off of the facility, shall, as far as possible, be fed back into the process using a gas collecting system or be combusted in process furnaces. If this is not possible, the gases shall be fed into a torch. The torches shall at least meet the requirements for torches for the combustion of gases due to breakdowns and safety valves.

HYDROGEN SULPHIDE

Gases produced by desulphurisation plants or other sources with a hydrogen sulphide content of over 0.4 per cent and a hydrogen sulphide mass flow of over 2 Mg/d shall be further processed. Gases which are not further processed shall be fed into a post-combustion facility. Water containing hydrogen sulphide shall only be conducted in such a way that gaseous emissions into the atmosphere are prevented.

PROCESS WATER AND BALLAST WATER

Process water and surplus ballast water shall only be passed into an open system after de-aerating; the gases shall be fed into a waste gas purification facility.

CATALYTIC CRACKING

Dust emissions and sulphur oxides emissions in waste gas from facilities for catalytic cracking in the fluidised bed process shall not exceed the following mass concentrations when the catalyst is regenerated:

- a) dust 30 mg/m³,
- b) sulphur dioxide and sulphur trioxide, to be indicated as sulphur dioxide, 1.2 g/m³.

Technical measures to further reduce sulphur oxides emissions shall be applied.

CALCINATION

Dust emissions in waste gas from calcinating facilities shall not exceed a mass concentration of 30 mg/m³.

ORGANIC SUBSTANCES

The requirements for organic substances under 5.4.9.2 shall apply accordingly to the storage of combustible fluids.

GASEOUS EMISSIONS

The requirements for gaseous emissions in 5.4.9.2 shall apply accordingly to new and existing facilities during processing, extraction, transfer or storage.

EXISTING FACILITIES

CATALYTIC CRACKING

Dust emissions in waste gas from existing facilities for catalytic cracking in the fluidised bed process shall not exceed a mass concentration of 40 mg/m^3 when the catalyst is regenerated.

CALCINATION

Dust emissions in waste gas from calcinating facilities shall not exceed a mass concentration of 40 mg/m^3 .

The requirements under 5.2.4, Class IV, first indent, (sulphur oxides) shall be observed by ten years after the entry into force of this Administrative Regulation at the latest.

5.4.4.6 Facilities under 4.6: Facilities for the Production of Soot

5.4.4.6.1 Facilities for the Production of Industrial Soot

BUILDING AND OPERATIONAL REQUIREMENTS

Process gases from facilities producing furnace and flame soot shall be fed into a post-combustion facility and be actively recycled.

REFERENCE VALUES

Emission standards for waste gases or the post-combustion of the steam-generating or electricity-generating systems of facilities producing furnace and flame soot shall refer to a volume content of oxygen in waste gas of 3 per cent.

CARBON MONOXIDE

Carbon monoxide emissions in waste gas from facilities producing gas soot shall not exceed a mass concentration of 0.50 g/m^3 .

NITROGEN OXIDES

For facilities producing furnace and flame soot, divergent to 5.2.4, emissions of nitrogen monoxide and nitrogen dioxide in waste gas from the post-combustion facility shall not exceed a mass concentration of 0.6 g/m³, to be indicated as nitrogen dioxide. Measures to further reduce emissions by using improved combustion techniques shall be applied.

SULPHUR OXIDES

For facilities producing furnace and flame soot, emissions of sulphur dioxide and sulphur trioxide in waste gas from the post-combustion facility shall not exceed a mass concentration of 0.85 g/m³, to be indicated as sulphur dioxide.

ORGANIC SUBSTANCES

For facilities producing gas soot, emissions of organic gaseous substances shall not exceed a mass concentration of 0.10 g/m³, to be indicated as total carbon.

BENZENE

For facilities producing gas soot, benzene emissions shall not exceed a maximum mass concentration of 5 g/m³.

5.4.4.7 Facilities under 4.7: Facilities for the Production of Carbon (Woody Lignite) or Electro graphite by Firing or Graphitisation

EXISTING FACILITIES

FIRING

For existing facilities producing malleable carbon, emissions of organic gaseous substances in waste gas from ring furnaces with electrostatic precipitators, dry sorption facilities, or a combination of both waste gas purification facilities, shall not exceed a mass concentration of 0.15 g/m³, to be indicated as total carbon, and benzene emissions shall not exceed the maximum mass concentration of 3 mg/m³.

5.4.4.10 Facilities under 4.10:

Facilities for the Production of Coating Materials (Varnishes, Veneer, Lacquers, Dispersion Dyes) or Printing Inks

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

5.4.5 Surface Treatment with Organic Substances, Production of Strip-type Plastic Materials, Processing Resins and Plastics

5.4.5.1 Facilities under 5.1:

Facilities for Treating the Surfaces of Materials, Objects or Products including Drying Facilities Using Organic Solvents

TOTAL DUST

Dust emissions in waste gas (particles of lacquer) shall not exceed a mass flow of 15 g/h or a mass concentration of 3 mg/m³.

5.4.5.2 Facilities under 5.2:

Facilities for Coating, Impregnating, Laminating, Lacquering or Saturating Objects, Glass or Mineral Fibres or Strip-type or Plate-type Materials, including Drying Facilities with Synthetic Resins

5.4.5.2.1 Facilities for Coating, Impregnating, Laminating, Lacquering or Saturating Glass or Mineral Fibres

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the place of origin, e.g. at the smelting tanks, cupola furnaces, collection chambers, hardening furnaces, sawing and packaging points, and fed into a waste gas purification plant.

AMMONIA

5.2.4 shall apply to impregnating and drying glass wool or rock wool, provided that ammonia emissions in waste gas do not exceed a mass concentration of 65 g/m³. If

organic emissions are reduced using a thermal post-combustion facility, ammonia emissions in waste gas shall not exceed a mass concentration of 0.10 g/m³.

5.2.4 shall apply to coating glass fibre or mineral fibre fabric, provided that ammonia emissions in waste gas do not exceed a mass concentration of 80 mg/m³.

NITROGEN OXIDES

When a thermal post-combustion facility is used, divergent to 5.2.4, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.35 g/m³, to be indicated as nitrogen dioxide.

EXISTING FACILITIES

TOTAL DUST

For existing facilities, except for packaging and hardening furnaces – insofar as waste gases are collected and treated separately, dust emissions in waste gas shall not exceed a mass concentration of 80 mg/m³; moreover, it is to be examined whether, with the use additional waste gas reduction measures, an emission standard of 50 mg/m³ may be requested.

New facilities shall comply with requirements to restrict dust emissions by eight years after the entry into force of this Administrative Regulation at the latest.

PHENOL AND FORMALDEHYDE

During impregnating and drying of mineral fibres, phenol and formaldehyde emissions in waste gas, to be indicated as sulphur dioxide, shall not exceed a total mass concentration of 30 mg/m³.

5.4.5.4 Facilities under 5.4:

Facilities for Saturating or Covering Materials or Objects with Tar, Tar Oil or Hot Bitumen

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities shall be constructed and operated so that pollutants cannot penetrate into the soil and groundwater. The entry of water shall be minimized (e.g. using covering

or roofing) to prevent the leaching of pollutants or the development of organic emissions through conversion processes.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas shall not exceed a mass concentration of 20 mg/m³, to be indicated as total carbon. The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

5.4.5.5 Facilities under 5.5: Facilities for Insulating Wires Using Wire Enamels Containing Phenol and Cresol

EXISTING FACILITIES

CARBON MONOXIDE

5.2.4 shall apply, provided that emissions of carbon monoxide in waste gas do not exceed a mass concentration of 0.50 g/m³; the best available primary or other techniques to further reduce carbon monoxide emissions shall be applied.

5.4.5.7 Facilities under 5.7: Facilities for Processing Liquid Unsaturated Polyester Resins with Styrene Additive or Liquid Epoxy Resin with Amines

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that emissions of organic substances in waste gas shall not exceed a mass concentration of 85 mg/m³, to be indicated as total carbon. The best available primary techniques to further reduce styrene emissions, e.g. by using low-styrene or styrene-free resins, shall be applied.

5.4.5.8 Facilities under 5.8:

Facilities for the Production of Objects Using Aminoplasts or Phenoplasts such as Furan, Urea, Phenol or Xylene Resins by means of Thermal Treatment

AMMONIA

Ammonia emissions in waste gas shall not exceed a mass concentration of 50 mg/m³.

5.4.5.11 Facilities under 5.11:

Facilities for the Production of Polyurethane Preforms, Prefabricated Parts Using Polyurethane, Box Type Polyurethane Blocks or for Foaming Cavities with Polyurethane

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply to facilities for the production of thermally insulating polyurethane foams powered by pure hydrocarbons (e.g. pentane) as fuel gas.

5.4.6 Timber, Cellulose

5.4.6.1 Facilities under 6.1:

Facilities for the Recovery of Cellulose from Timber, Straw or Similar Fibrous Materials

STOCKYARDS

The requirements under 5.2.3.5 and 5.2.3.6 shall not apply to the storage of undressed timber or lumpy timber.

5.4.6.2 Facilities under 6.2:

5.4.4.11.1/5.4.4.1n.1 Facilities for the Production of Paper, Cardboard or Paper Board

BUILDING AND OPERATIONAL REQUIREMENTS

When dust emissions may occur during the filling process, waste gases from containers and silos shall be collected and fed into a dedusting system.

Waste gases from the production of groundwood pulp and from the TMP (Thermo-Mechanical Pulp) facilities shall be collected and fed into a furnace as combustion air if possible.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas shall be minimized by using low-emission feedstocks, e.g. synthetic resins or elastomeric compounds with low monomeric residue content.

For facilities with directly fired drying aggregates, emissions of organic substances in waste gas shall be minimized, e.g. by optimising combustion in the drying aggregates fired by natural gas with respect to emissions and adapting to changing loads; the requirements under 5.4.1.2.5 with respect to reference values for the volume content of oxygen in waste gas shall not apply.

Start-up and shut-off process shall be optimised with respect to low emissions.

The requirements under 5.2.5 shall not apply to the production of ground wood pulp or TMP facilities.

The best available primary or other techniques to further reduce emissions of organic substances shall be applied, e.g. for TMP facilities using condensation in heat recovery.

ODOUR-INTENSIVE SUBSTANCES

Through good planning and construction, as well as optimisation of process technology and plant management, emissions of odour-intensive substances shall be prevented as far as possible, e.g. from waste paper stock, waste paper treatment, interim storage and transportation of waste from waste paper treatment, process water cycles, the water treatment plant and sludge dewatering. If odour impacts are to be expected in the vicinity of a facility, the best available more extensive

techniques to reduce odours shall be used, e.g. enclosure of the facility components, collection of waste gases and feeding them to a waste gas purification facility.

5.4.6.3 Facilities under 6.3:

Facilities for the Production of Particle Boards, Wood Fibre Slabs or Wood Fibre Mats

STOCKYARDS

The requirements under 5.2.3.5 and 5.2.3.6 shall not apply to the storage of undressed timber or lumpy timber.

When industrial scrap wood may create dust in a dry state (e.g. milling chips, wood shavings, sawdust), or when the separable fraction of timber with a maximum mesh size of 5 mm during sifting exceeds the value of 5.0 g/kg (as related to the dry mass), operational and technical measures shall be used to ensure that unloading takes place exclusively in closed material delivery stations and the silo works; waste gases shall be collected and fed into a dedusting system.

TOTAL DUST, INCLUDING THE CONTENT OF CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

Dust emissions in waste gas shall not exceed the following maximum mass concentrations:

- | | |
|-------------------------------------|---------------------------|
| a) for grinders | 5 mg/m ³ , |
| b) for indirectly fired chip dryers | 10 mg/m ³ (f), |
| c) for other dryers | 15 mg/m ³ (f). |

FUELS

When liquid or solid fuels are used in chip dryers or fibre dryers, the sulphur mass content in the fuel shall not exceed 1 per cent, as related to a lower calorific value of 29.3 MJ/kg for solid fuels, unless an equivalent emission standard for sulphur oxides is achieved by means of a waste gas purification facility; when coals are used, only coals which do not cause higher sulphur oxides emissions than hard coal with a sulphur mass content of less than 1 per cent, as related to a lower calorific value of 29.3 MJ/kg, shall be used.

ORGANIC SUBSTANCES

For dryers, emissions of organic substances in waste gas, to be indicated as total carbon, shall not exceed a mass concentration of 300 mg/m³ (f). For fibre dryers in air-circulating mode, emissions of Class I organic substances under 5.2.5 shall not exceed a mass concentration defined in 5.2.5 if the mass flow per hour is less than or equal to that which would be reached without circulating air in compliance with a mass concentration defined in 5.2.5.

For presses, emissions of Class I organic substances under 5.2.5 in waste gas shall not exceed a mass concentration of 0.06 kg per cubic metre of slabs produced.

The best available primary techniques to further reduce emissions of organic substances, e.g. by using low-emission binding agents, particularly low-formaldehyde or formaldehyde-free binding agents, or other techniques shall be applied.

5.4.7 Foodstuffs, Luxury Products and Feedingstuffs, Agricultural Products

5.4.7.1 Facilities under 7.1:

Facilities for Farming or Breeding of Livestock

MINIMUM DISTANCE

Facilities shall be constructed at a minimum distance from the nearest residential area, existing or planned, as shown in **Fehler! Verweisquelle konnte nicht gefunden werden.**, taking into consideration the individual animal mass pursuant to Table 10.

The minimum distance may be less if emissions of odorous substances are reduced by means of primary measures, or odorous waste gas is treated in a waste gas purification facility. A possible reduction of the minimum distance by reducing emissions of odorous substances shall be determined using an adequate olfactometric measurement model, and its suitability shall be established by the competent authorities.

The minimum distance for facilities for keeping or breeding species other than those in Table 10, or when they are kept in different conditions, shall be defined on an individual basis.

Figure 1: Minimum Distance Curve

(The top curve shows the minimum distance for poultry and the bottom curve shows the minimum distance for pigs.)

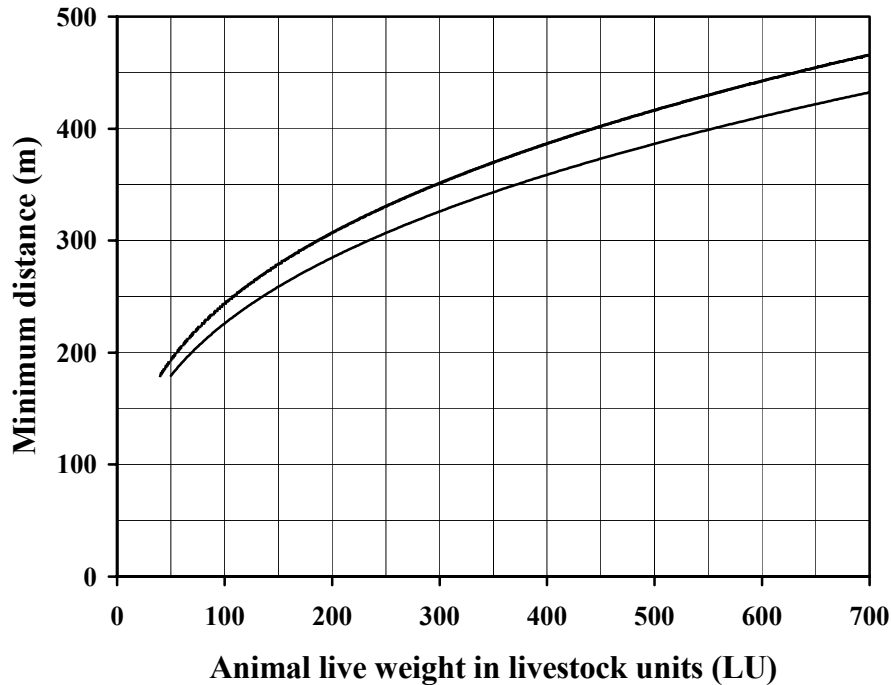


Table 10: Factors for the Conversion of Stocking Density into Animal Live Weight, to be Indicated as Livestock Units*

(1 livestock unit (LU) = 500 kg of animal live weight)

Species	Mean Individual Animal Mass (LU/Animal)
Pigs	
sows during early pregnancy and barren sows, boars	0.30
sows with piglets up to 10 kg	0.40
raising piglet (up to 25 kg)	0.03
gilts (up to 90 kg)	0.12
fattening pigs (up to 110 kg)	0.13
fattening pigs (up to 120 kg)	0.15

* For production processes which vary considerably from those listed in this table, the mean individual animal's mass (in LU/animal) may be determined on an individual basis.

Species	Mean Individual Animal Mass (LU/Animal)
Poultry	
laying hens	0.0034
chickens (up to 18 weeks)	0.0014
fryers up to 35 days	0.0015
fryers up to 49 days	0.0024
breeding Peking ducks (up to 3 weeks)	0.0013
fattening Peking ducks (up to 7 weeks)	0.0038
breeding muscovy ducks (up to 3 weeks)	0.0012
fattening muscovy ducks (up to 10 weeks)	0.0050
breeding muscovy ducks (up to 3 weeks)	0.0022
fattening turkeys, hens (up to 16 weeks)	0.0125
fattening turkeys, roosters (up to 21 weeks)	0.0222

When facilities are erected, a minimum distance of 150 m from plants sensitive to nitrogen (e.g. tree nurseries, cultivated plants) and ecosystems (e.g. heath, moor, forests) shall not normally be exceeded.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall normally be applied:

- a) Highest possible level of cleanliness and dryness in the stall

This includes keeping the feeding racks, areas for droppings, running and lying, the aisles, the installations and the areas around the stall clean and dry. Waste of drinking water shall be avoided by using water-saving technology.
- b) The amount of fodder put down shall be measured so that there is little as possible left over; leftovers shall be removed from the stall regularly. Rotten or inedible fodder or leftovers shall not be stored in the open. If odour-intensive feedstuffs (e.g. waste food, whey) are used as fodder, they shall be stored in closed containers or covered.
- c) Feeding adapted to the nutritional requirements of the animals shall be ensured.
- d) Optimum climate in the stall

For stalls with forced ventilation, DIN 18910 (1992 version) shall be observed.

The type of waste air conduction shall be geared to the conditions of each particular location.

If possible, naturally ventilated stalls shall be aligned with a ridge axis perpendicular to the main wind direction allowing air to flow freely and have additional apertures for ventilation in the gable ends.

- e) When a solid manure system is used, sufficient bedding shall be spread to reduce odorous emissions. The bedding must be dry and clean.

Dung yards for storage of solid manure with a dry mass content of less than 25 per cent shall be erected on an impermeable concrete slab pursuant to DIN 1045 (1988 version) or an equally suitable sealing material. The liquid manure accumulated shall be fed into containers with no drainage pipe. In order to reduce wind-induced emissions, the stockyard shall be walled in on three sides and cover as small a surface as possible.

- f) In order to reduce odorous emissions from the stall, when liquid manure systems are used, droppings and urine accumulated shall be transferred to the storage site for liquid manure continuously or at short intervals. A stench trap shall be installed between the stall and liquid manure channels and containers outside the stall.

- g) Facilities for storing and handling commercial liquid fertilizer shall be erected pursuant to DIN 11622 (1994 version) and DIN 1045 (1988 version).

For interim storage of liquid manure in the stall (in the cellar for liquid manure), the capacity shall be measured so that when under-floor suction is being carried out, the maximum level is 50 cm below the slatted floor; otherwise, 10 cm are sufficient.

When under-floor suction is being carried out, air from the stall shall be sucked out directly under the slatted floor at low speed (maximum 3 m/s).

- h) Liquid manure shall be stored (outside the stall) in closed containers, or equivalent emission reduction measures achieving an emissions reduction ratio, as related to the open uncovered container, of at least 80 per cent of emissions of odour-intensive substances and ammonia shall be applied.

Artificial floating scum shall after being disturbed by stirring or to be applied on land shall subsequently be immediately restored to its functional state.

When liquid cattle manure is stored, no additional cover is required if a natural floating roof is formed.

- i) The storage capacity of commercial liquid fertilizer to use as fertilizer for own purposes shall be measured so that it is sufficient for at least 6 months, plus a supplement for accumulated precipitation water and cleaning water; the supplement for precipitation water may be waived if a suitable cover ensures that no rainwater penetrates the containers. For commercial liquid fertilizer, which is passed on to third parties for further recycling, correct storage and recycling shall be secured by contract.

The following supplementary requirements shall apply to facilities for keeping or breeding poultry:

- j) In cage rearing, drying or ventilation of the dropping belt is obligatory (drying rate at least 60 per cent). Dried poultry droppings shall be stored so that rehumidification (e.g. through rainwater) in the vicinity of the facility shall be excluded.

When the poultry are free-range, the facility and adjacent runs shall be planned and designed so that nutritional depositions in the droppings do not lead to environmental impacts, particularly with respect to soil and water conservation.

The following supplementary requirements shall apply to facilities for breeding fur-bearing animals:

- k) Fresh feed for carnivorous fur-bearing animals shall be delivered daily in the summer months and at least three times a week in winter. The feedingstuffs shall be stored in closed thermos containers (storage temperature of the feedingstuff 4 °C or less). If, notwithstanding, a longer storage period or feedingstuffs deliveries at longer intervals are necessary, the feedingstuffs shall be stored sealed and frozen.
- l) Sufficient bedding shall be spread under the cages in order to reduce emissions of odour-intensive substances.
- m) Manure under the cages shall be removed at least once a week.
- n) Storage of excrements is only permissible in closed rooms or containers.

Building and operational requirements shall be weighed up against the requirements of animal husbandry appropriate to the species, if this form of animal husbandry leads to higher emissions.

BACTERIA

The best available techniques to further reduce organic substances emissions of bacteria and endotoxins shall be applied.

5.4.7.2 Facilities under 7.2: Facilities for Slaughtering Animals

MINIMUM DISTANCE

When facilities are erected, there shall be a minimum distance of 350 m to the next residential area, existing or planned, if possible. The minimum distance may be less if emissions of odorous substances are reduced by means of primary measures, or odorous waste gas is treated in a waste gas purification facility. A potential decrease in the minimum distance by reducing emissions of odorous substances shall be determined with the aid of a suitable model for odour dispersion calculations, the suitability of which shall be established by the competent authorities. The minimum distance may also be decreased if the capacity of the abattoir does not exceed 250 h/a; in this case, a special evaluation shall be required.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall normally be applied:

- a) Unloading shall always be carried out with the site gates closed.
Livestock housing, slaughter and dressing lines, facilities for processing offal and other by-products shall be accommodated in closed rooms. Open interim storage shall be avoided.
- b) Blood leaking from cattle and pigs shall be stored at temperatures of less than 10 °C. Coagulation of blood shall be avoided by regular pumping. The vapour recovery technique shall be applied for emptying the blood tank. The blood tank shall be cleaned regularly.
- c) Slaughtering waste and by-products shall be stored in closed containers or rooms. The temperature of offal and other by-products shall be less than 10 °C or they shall always be kept in rooms with a room temperature of less than 5 °C or be removed daily. Decanting for removal to the facility for the disposal of carcasses must be carried out in covered containers.

- d) Waste gases from production facilities and installations for processing and storing offal and other by-products shall be collected and fed into a waste gas purification facility, or equivalent emissions reduction measures shall be applied.

The following additional requirements shall apply to slaughter of poultry and other animals of more than 10 Mg live weight per day:

- e) As soon as the vehicles have been emptied, straw and droppings from the vehicles shall be stored at the manure dump. The vehicles used shall be cleaned with hydraulic equipment at a washing bay near the manure dump. Boxes shall be cleared out as soon as they have been emptied, and sprayed clean. Equipment shall be provided to spray the pigs with water in the livestock housing.
- f) When the blood tank is filled, the displaced air shall be collected and fed to a waste gas purification facility (e.g. activated carbon filter).
- g) Incinerators used in pig slaughtering shall be designed so that the retention period of the waste gases in the reaction zone is 1 second if possible, or at least 0.5 seconds. The temperature in the reaction zone shall be between 600 °C and 700 °C. Low-emission operation of the incinerators shall be ensured through careful setting of the gas/air mixture. Furnaces shall only be operated on natural gas.
- h) Supplementary to c), the temperature of offal and other by-products shall be less than 10 °C or they shall always be kept in rooms with a room temperature of less than 5 °C or be removed daily. Offal and other by-products shall be transported to the facility for the disposal of carcasses on the day of slaughter, or to another approved facility.

5.4.7.3/4 Facilities under 7.3 and 7.4:

5.4.7.3.1 Facilities for the Production of Edible Fats from Animal Raw Materials or for Melting Animal Fats

5.4.7.4.1 Facilities for the Production of Animal or Vegetable Preservatives of Facilities for the Mass Production of Feedingstuffs by Heating up Animal Ingredients

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) The dry melting process shall be chiefly used as process engineering in Facilities for the production of edible fats from animal raw materials or for melting animal fats.
- b) Unloading shall always be carried out with the warehouse doors closed. Process facilities, including the stockyard, shall be accommodated in closed rooms.
- c) Waste gases from the process facilities as well as the stockyard shall be collected; waste gases with odour-intensive substances shall be fed into a waste gas purification facility, or equivalent emissions reduction measures shall be applied.
- d) Raw and intermediate products shall be stored in closed containers or rooms at temperatures of less than 10 °C. Open interim storage shall be avoided.

**5.4.7.5 Facilities under 7.5:
Facilities for Smoking Meat or Fish Products**

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall be applied:

- a) Smoking installations shall be erected and operated so that
 - the release of smoking gas from the smoking chamber shall only be possible if the waste gas purification facility has effectively complied with emission standards,
 - waste occurring shall be stored in closed containers.

Furthermore, the smoking chambers shall not be opened during the smoking process; this shall not apply to cold-smokers or to facilities with low pressure or where fumes cannot escape when the smoking chamber door is opened.

- b) Waste gases shall be collected at the point of origin (e.g. smoking chambers) and fed into a waste gas purification facility, or equivalent emissions reduction measures shall be applied.
- c) Production waste shall be stored in closed containers at temperatures of less than 10 °C.
- d) Fish products shall be stored in closed, ventilated rooms.

5.4.7.8 – 12 Facilities under 7.8 to 7.12:

5.4.7.8.1 Facilities for the Production of Gelatine, Hide Glue, Leather Glue or Bone Glue

5.4.7.9.1 Facilities for the Production of Feedingstuffs or Fertilizers or Technical Fats from the By-products of Slaughtering, Bones, Animal Hair, Feathers, Horns, Claws or Blood

5.4.7.10.1 Facilities for Storing or Processing Untreated Animal Hair

5.4.7.11.1 Facilities for Storing Untreated Bones

5.4.7.12.1 Animal Carcass Disposal Facilities and Facilities in which Animal Carcasses, Parts of Animal Carcasses, or Animal Waste Products are Collected or Stored for Disposal in the Animal Carcass Disposal Facilities

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall be applied:

- a) Unloading shall always be carried out with the site gates closed.
Process facilities, including the storage facility, shall be accommodated in closed rooms.
- b) Waste gases from the process facilities as well as the storage facility shall be collected; waste gases with odour-intensive substances shall be fed into a waste gas purification facility or equivalent emissions reduction measures shall be applied.
- c) Raw and intermediate products shall be stored in closed containers or rooms and always kept cool. Open interim storage shall be avoided.

- d) Contaminated transport containers shall only be stored and cleaned in closed rooms.

**5.4.7.15 Facilities under 7.15:
Manure Drying Facilities**

MINIMUM DISTANCE

When facilities are erected, there shall be a minimum distance of 500 m to the next residential area, existing or planned, if possible.

BUILDING AND OPERATIONAL REQUIREMENTS

Process facilities, including the storage facility, shall be accommodated in closed rooms. Waste gases containing dust shall be collected at the point of origin and fed into a waste gas purification facility.

BACTERIA

The best available techniques to further reduce organic substances emissions of bacteria and endotoxins shall be examined.

**5.4.7.21 Facilities under 7.21:
Mills for Foodstuffs or Feedingstuffs**

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. at the cereal delivery point and fed into a waste gas purification facility.

**5.4.7.22 Facilities under 7.22:
Facilities for the Production of Yeast or Starch Flour**

5.4.7.22.1 Facilities for the Production of Yeast

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that emissions of organic substances in waste gas shall not exceed a mass concentration of 80 mg/m³, to be indicated as total carbon. The

best available primary and other techniques to further reduce organic substances emissions shall be applied.

5.4.7.23 Facilities under 7.23:

Facilities for the Production of Oils or Fats from Vegetable Products

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the point of origin, e.g. seed silo, seed treatment, toasting, cooling, groats silo, pelletisation, groats loading, and fed into a waste gas purification facility, or equivalent emissions reduction measures shall be applied.

HYDROGEN SULPHIDE

If a biofilter is used to reduce odours, 5.2.4 shall apply, provided that the requirements for hydrogen sulphide emissions do not apply.

EXISTING FACILITIES

TOTAL DUST

If emissions of moist dusts occur, e.g. during seed conditioning, seed treatment, in the dryer sections of toasters and coolers, during groats drying and cooling, during pelletisation, existing facilities shall comply with requirements to restrict dust emissions no later than eight years after the entry into force of this Administrative Regulation.

5.4.7.24 Facilities under 7.24:

Facilities for Producing or Refining Sugar

5.4.7.24.1 Beet-pulp Dryers

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities for drying beet-pulp shall be constructed for indirect drying (steam drying) processes, or equivalent emission reduction measures shall be applied. In the event of a major alteration to the facility in the drying area or the energy centre, it shall be

examined whether indirect drying (steam drying) processes may be requested, taking into consideration the principle of proportionality.

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that emissions of organic substances in waste gas do not exceed a mass flow of 0.65 kg/h, to be indicated as total carbon. The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

The best available primary or other techniques to further reduce emissions of organic substances shall be applied.

EXISTING FACILITIES

The following requirements refer to existing facilities using the direct drying process.

BUILDING AND OPERATIONAL REQUIREMENTS

In order to reduce odour emissions, the drum feed temperature shall not exceed 750 °C.

REFERENCE VALUES

5.4.1.2.5 shall apply, provided that emission standards relate to the volume content of oxygen in waste gas of 12 per cent.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 60 mg/m³ (f).

FUELS

5.4.1.2.5 shall apply, provided that fuels other than those referred to in b) may also be used.

SULPHUR OXIDES

When liquid fuels other than heating oil with a mass content of sulphur for light heating oil pursuant to the 3. BImSchV, as currently applicable, are used, emissions of sulphur dioxide and trioxide in waste gas shall not exceed a mass concentration of

0.85 g/m³, to be indicated as sulphur dioxide; 5.1.2.8 shall apply, provided that, irrespective of whether or not a downstream exhaust purification facility is used, the calculation only covers periods when the measured oxygen content is above the reference oxygen content.

Divergent to 6.2.3.3, facilities shall comply with requirements to restrict sulphur oxides emissions no later than eight years after the entry into force of this Administrative Regulation.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.40 g/m³, to be indicated as nitrogen dioxide; 5.1.2 para. 8 shall apply, provided the calculation is only for periods when the measured oxygen content is more than the reference oxygen content, irrespective of whether a downstream waste gas facility is used.

ORGANIC SUBSTANCES

Emissions of organic substances, to be indicated as total carbon, shall not exceed the total mass ratio of 0.08 kg per Mg of processed beets. This emission standard refers to organic substances, to be indicated as total carbon, which may be collected by means of adsorption of silica gel; if measurement is carried out using a flame ionisation detector, a corresponding conversion shall be made.

The best available primary or other techniques to further reduce emissions of organic substances shall be applied; as far as is technically possible, existing facilities shall switch to indirect drying methods (steam drying). The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

Facilities shall comply with requirements to restrict sulphur oxide emissions no later than eight years after the entry into force of this Administrative Regulation.

5.4.7.25 Facilities under 7.25: Facilities for Drying Green Fodder

MINIMUM DISTANCE

Facilities shall be constructed at a minimum distance of 500 m from the nearest residential area, existing or planned. The minimum distance may be less if emissions

of odorous substances are reduced using primary measures, or the odorous waste gas is treated in a waste gas purification facility. A possible decrease in the minimum distance by reducing odorous substances may be determined using an appropriate olfactometric measurement model, and its suitability shall be established by the competent authorities.

BUILDING AND OPERATIONAL REQUIREMENTS

The possibility of constructing facilities using indirect drying techniques in at least one stage of the process shall be examined.

The dryer shall be operated, e.g. by adjusting it to the drying feed temperature, so that the reference value for CO is not exceeded.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 75 mg/m³ (f).

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply. Specific emissions of organic substances, to be indicated as total carbon, shall not exceed 0.25 kg per Mg of water vapour and of formaldehyde, acetaldehyde, acrolein and furfural, shall not exceed 0.10 kg per Mg of water vapour in total.

CONTINUOUS MEASURING OF CARBON MONOXIDE

Facilities shall be equipped with a measuring unit that continuously monitors the mass concentration of carbon monoxide emissions.

On the basis of emission measuring, the maximum carbon monoxide concentration in waste gas shall be established so that specific emissions of organic substances and aldehydes in waste gas are not exceeded (reference value for CO).

5.4.7.29/30 Facilities under 7.29 to 7.30:

5.4.7.29.1 Facilities for Roasting and Grinding Coffee or Packaging Ground Coffee

5.4.7.30.1 Facilities for Roasting and Grinding Coffee Substitutes, Grain, Cocoa Beans or Nuts

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational measures shall be applied:

- a) Unloading shall only take place when the warehouse doors are closed.
Processing facilities, including storage, shall be accommodated in closed rooms. Temporary open storage shall be avoided.
- b) Waste gases shall be collected at the place of origin, e.g. roasting facilities including cooling air, the vacuum facility, the central aspiration for ground coffee, the silo facility; waste gases with odour-intensive substances shall be fed into a waste gas purification facility, or equivalent measures for reducing emissions shall be applied.

It shall be endeavoured to recover roasting waste gases in the combustion chamber, insofar as this does not affect safety conditions.

NITROGEN OXIDES

5.2.4 shall apply, provided that nitrogen monoxide and nitrogen dioxide emissions in the waste gas, to be indicated as nitrogen dioxide, do not exceed a mass flow of 1.8 kg/h or a mass concentration of 0.35 g/m³ if possible; the best available techniques to further reduce emissions shall be applied.

EXISTING FACILITIES

NITROGEN OXIDES

Requirements to restrict nitrogen oxides emissions shall not apply to existing facilities with a production capacity of less than 250 kg of roasted coffee per hour.

5.4.8 Facilities for Recycling and Disposing of Waste Products and other Substances

5.4.8.1 Facilities under 8.1:

Facilities for Recycling or Disposing of Solid Wastes, Liquid Wastes or Gaseous Wastes Collected in Containers, or Landfill Gas with Combustible Components, Using Thermal Processes

5.4.8.1a Facilities under 8.1a:

Facilities for Recycling or Disposing of Solid Wastes, Liquid Wastes or Gaseous Wastes Collected in Containers, or Landfill Gas with Combustible Components, Using Thermal Processes or Facilities for the Burn-off of Landfill Gas and Other Combustible Gaseous Substances

5.4.8.1a.1 Facilities for Recycling or Disposing of Landfill Gas with Combustible Components Using Thermal Processes

When landfill gas is used in furnaces, the requirements under 5.4.1.2.3 shall not apply to biogas or sewer gas.

5.4.8.1a.2 Facilities for the Burn-off of Landfill Gas or other Combustible Gaseous Substances

Provisions under 5.4.8.1a.2 shall not apply to burn-off of torch gases due to breakdowns or safety valves; emission-limiting requirements shall be determined on an individual basis.

5.4.8.1a.2.1 Facilities for the Burn-off of Landfill Gas or other Combustible Gaseous Substances from Waste Treatment Facilities

BUILDING AND OPERATIONAL REQUIREMENTS

If collected landfill gases or other combustible gaseous substances (e.g. sewer gas, biogas) are not to be burned by firing or in systems with internal combustion engines with energy utilization, but instead burnt without energy utilization due to poor gas

quality, or due to low quantities of gas or the unavoidable standstill of the energy utilization facility, these gases shall be subject to ground burn-off (isolated high temperature torches or muffle furnaces).

The waste gas temperature from the flame tip shall measure at least 1,000 °C and the retention period of hot waste gases in the combustion chamber shall be a minimum of 0.3 seconds from the flame tip.

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in the waste gas of 3 per cent.

MASS FLOWS

The mass flows established in 5.2 shall not apply.

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply.

MEASURING

In order to monitor combustion, facilities shall be equipped with measuring instruments that continuously determine and register the temperature in the combustion chamber; measuring shall be carried out at the end of the retention period.

5.4.8.1a.2.2 Facilities for the Burn-off of Landfill Gas or other Combustible Gaseous Substances that are not Derived from Waste Treatment Facilities

BUILDING AND OPERATIONAL REQUIREMENTS

Combustible gaseous substances that are not burned in furnaces or internal combustion engines with energy utilization shall instead be burned without energy utilization, either for safety reasons or special operational requirements and shall be fed into a waste gas purification facility with thermal or catalytic post-combustion if possible. If this is not possible (e.g. as a result of discontinuous and irregular quantities of gas occurring only for short periods of time, or if due to the hazardous nature of the gases, a waste gas purification facility cannot be operated efficiently

without great expense, even using a gas buffer), these combustible gaseous substances shall be subjected to a torch. Halogenated combustible gaseous substances shall not be subjected to these torches.

The minimum temperature of the torch flame shall be 850 °C.

SULPHUROUS OXIDES, NITROGEN OXIDES AND CARBON MONOXIDE

The requirements under 5.2.4 shall not apply.

ORGANIC SUBSTANCES

The requirements under 5.2.5 shall not apply. The minimum emission reduction ratio for organic substances is 99.9 per cent, as related to total carbon, and a mass concentration of 20 mg/m³, as related to total carbon, shall not be exceeded; notwithstanding, the minimum emission reduction ratio for the burn-off of torch gases arising from breakdowns and security valves is 99 per cent (as related to total carbon).

MEASURING

In order to monitor the burn-off temperature, facilities shall be equipped with measuring units that shall continuously establish and register the temperature at an appropriate location in the combustion chamber; if this is not possible, appropriate proof of compliance with requirements for burn-off must be provided to the competent authorities.

The observation of reduced emission standards for organic substances shall be demonstrated to the competent authorities; special arrangements shall be drawn up.

5.4.8.1b Facilities under 8.1b:

Internal Combustion Engines Using Waste Oil or Landfill Gas

5.4.8.1b.1 Internal Combustion Engines Using Waste Oil or Landfill Gas

When landfill gas is used, the requirements under 5.4.1.4 for biogas and sewer gas shall apply; notwithstanding, emissions of carbon monoxide in waste gas shall not exceed a mass concentration of 0.65 g/m³, and emissions of nitrogen oxides in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen

dioxide. When landfill gas is used, the best available techniques to further reduce carbon monoxide emissions shall be applied, particularly with respect to engine design.

5.4.8.2 Facilities under 8.2:

Facilities for the Generating Electricity, Steam, Warm Water, Processing Heat or Heated Waste Gas Using

- a) **Painted, Lacquered or Coated Wood, as well as all Resultant Remnants, if no Wood Protecting Agents have been Applied, nor Treatments or Coatings not Consisting of Halogenated Organic Compounds,**
- b) **Plywood, Chipboards, Fibreboard or other Glued Wood and all Resultant Scraps, if no Wood Protecting Agents have been Applied, nor Treatments or Coatings not Consisting of Halogenated Organic Compounds,**

with a Firing Heat Capacity of less than 50 MW

The requirements under 5.4.1.2.1 for the use of natural wood, including requirements for existing facilities, shall apply with the following exceptions:

TOTAL DUST

Dust emissions in waste gas in facilities with a firing heat capacity of less than 2.5 MW shall not exceed a mass concentration of 50 mg/m³.

NITROGEN OXIDES

Emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.40 g/m³, to be indicated as nitrogen dioxide.

EXISTING FACILITIES

NITROGEN OXIDES

In existing facilities, emissions of nitrogen monoxide and nitrogen dioxide in waste gas shall not exceed a mass concentration of 0.50 g/m³, to be indicated as nitrogen dioxide.

5.4.8.4 Facilities under 8.4:
Facilities where Household Substances or Waste Derived from Household Refuse, subject to the Provisions of the Closed Substance Cycle and Waste Management Act, are Sorted and Recovered for the Production Cycle

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities shall be constructed and operated so that for the duration of the treatment process, including delivery and removal, dust emissions shall be prevented as far as possible.

Waste gases shall be collected at the place of origin and fed into a waste gas purification facility.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

5.4.8.5 Facilities under 8.5:
Facilities for the Production of Compost from Organic Waste

MINIMUM DISTANCE

Facilities with an annual throughput of 3 000 Mg or more shall be constructed at a minimum distance

- | | | |
|----|---|--------|
| a) | for closed facilities (bunkers, compost heaps and maturing facilities) of | 300 m, |
| b) | for open facilities (clamp composting) of | 500 m |

from the nearest residential area, existing or planned. The minimum distance may be less if emissions of odorous substances are reduced using primary measures, or if odorous waste gas is treated in a waste gas purification facility. A possible decrease in the minimum distance through reducing odorous substances may be determined using an appropriate olfactometric measurement model, and its suitability shall be established by the competent authorities.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) On the basis of estimated monthly utilization, adequate dimensioning, particularly of storage space, shall be undertaken.
- b) Feed bunkers shall be closed and constructed with a vehicle sluice; in open warehouses and during unloading of waste vehicles, the bunker waste gases shall be removed by suction and fed into a waste gas purification facility.
- c) Facilities shall be closed during processing as far as possible. This shall apply particularly to facilities with odour-intensive moisture or easily biodegradable biowaste (e.g. kitchen or canteen waste) or facilities processing sludge. Facilities (bunkers, compost heaps) with an annual throughput of 10,000 Mg per year or more shall be kept closed during processing.
- d) Condensed water vapours occurring during airing of the silos and accumulated seepage water shall be used in open composting only to moisten the compost, and only if olfactory nuisances may be avoided and the hygienic process is not impaired.
- e) In closed facilities or open facilities with an exhaust system, waste gases containing dust shall be collected at the place of origin, e.g. crushing, straining or transfer point.

Waste gases from reactors and ventilated silos shall be subject to a biofilter or similar waste gas purification facility. The efficiency of biofilters shall be regularly checked in order to guarantee that they comply with purification standards; this may be done by carrying out a compliance audit at least once annually to ensure that the odorous substance concentration of 500 GE/m³ in the waste gas is not exceeded.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

In facilities with an annual throughput of 10,000 Mg or more, emissions of odour-intensive substances in waste gas shall not exceed an odorous substance concentration of 500 GE/m³.

BACTERIA

The best available techniques to further reduce emissions of bacteria and endotoxins shall be examined.

5.4.8.6 Facilities under 8.6: Facilities for the Treatment of Waste Products

5.4.8.6.1 Facilities for the Fermentation of Bio Waste and Facilities Processing Bio Waste in Co-fermentation Facilities

MINIMUM DISTANCE

Facilities with a throughput of 10 Mg of waste per day or more shall be constructed at a minimum distance

- a) for closed facilities (bunkers, fermenting and maturing facilities)
of 300 m,
- b) for open facilities of 500 m

from the nearest residential area, existing or planned. The minimum distance may be less if emissions of odorous substances are reduced using primary measures or the odorous waste gas is treated in a waste gas purification facility. A possible decrease in the minimum distance through reducing odorous substances may be determined using an appropriate olfactometric measurement model, the suitability of which shall be established by the competent authorities.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) On the basis of estimated monthly utilization, adequate dimensioning, particularly of the storage space, shall be undertaken.

Facilities shall be constructed and operated so that the entry of sewage water into the soil is prevented.

- b) Feed bunkers shall be closed and constructed with a vehicle sluice; in open warehouses and during unloading of waste vehicles, the bunker waste gas shall be removed by suction and fed into a waste gas purification facility.
- c) Processing water is to be retained and put to internal use.

- d) The condensed water vapours arising from ventilation of the clamps (maturing process) and the accumulated seepage water shall be used in open composting only to moisten the compost, and only if odour irritations may be avoided.
- e) In closed facilities or open facilities with an exhaust system, waste gases containing dust shall be collected at the place of origin, e.g. during, sifting or transfer.
- f) Waste gases from the maturing process in ventilated clamps shall be fed into a biofilter or equivalent waste gas purification facility. The efficiency of biofilters shall be regularly checked in order to guarantee that they comply with purification standards; this may be done by carrying out a compliance audit at least once annually to ensure that the odorous substance concentration of 500 GE/m³ in the waste gas is not exceeded.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

ODOUR-INTENSIVE SUBSTANCES

For facilities with a daily throughput of 30 Mg or more, emissions of odour-intensive substances in waste gas shall not exceed an odorous substance concentration of 500 GE/m³.

BACTERIA

The best available techniques to reduce emissions of bacteria and endotoxins shall be examined.

5.4.8.10/11 Facilities under 8.10 to 8.11: Waste Treatment Facilities

5.4.8.10 Facilities under 8.10:

Facilities for Physical and Chemical Treatment of Waste

5.4.8.11 Facilities under 8.11:

Facilities for other Treatment of Waste Products

5.4.8.10.1 Facilities for Drying Waste Products

MINIMUM DISTANCE

The facilities shall be constructed at a minimum distance of 300 m from the nearest residential area, existing or planned.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) For dumping sites, feeding and discharge bunkers as well as other installations for delivery, transport and loading of feedstocks, closed rooms with sluice gates shall be constructed, where the air pressure is kept lower than atmospheric pressure by pumping in the sluice area or in the loading and unloading areas. Waste gas shall be fed into a waste gas purification facility.
- b) Waste gases shall be collected at the place of origin, e.g. directly at the dryer or at the point of emission from the hood and fed into a waste gas purification plant.
- c) Waste gases from facilities for drying waste shall be discharged through stacks in such a way that adequate dilution and undisturbed removal with free air flow occurs; this is normally achieved if the requirements under 5.5.2 para. 1 are observed when determining the stack height.
- d) The best available techniques to further reduce organic substances emissions shall be applied, e.g. by minimizing the amount of waste gas and multiple use of the waste gas (if necessary, after reducing the humidity level) as process air for drying, or other best available emission reduction techniques shall be applied.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

AMMONIA

Ammonia emissions in waste gas shall not exceed a mass flow of 0.10 kg/h or a mass concentration of 20 mg/m³.

INORGANIC GASEOUS CHLORINE COMPOUNDS

Emissions of inorganic gaseous chloride compounds under 5.2.4 Class III, to be indicated as hydrogen chloride, shall not exceed a waste gas mass flow of 0.10 kg/h or a mass concentration of 20 mg/m³.

ORGANIC SUBSTANCES

The minimum emissions reduction ratio for emissions of organic substances in the waste gas is 90 per cent, as related to total carbon; if an emission reduction ratio of 90 per cent is observed, emissions of organic substances in waste gas, to be indicated as total carbon, shall still not exceed a mass concentration of 20 mg/m³.

The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

ODOUR-INTENSIVE SUBSTANCES

Emissions of odour-intensive substances in waste gas shall not exceed an odour-intensive concentration of 500 GE/m³.

BACTERIA

The best available techniques to further reduce emissions of bacteria and endotoxins shall be examined.

5.4.8.10.2 Facilities for Drying Sludge

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the place of origin, e.g. directly at the dryer or at the point of emission from the hood and fed into a waste gas purification facility.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

AMMONIA

Dust emissions in waste gas shall not exceed the mass flow of 0,10 kg/h or the mass concentration of 20 mg/m³.

INORGANIC GASEOUS CHLORINE COMPOUNDS

Emissions of inorganic gaseous chloride compounds under 5.2.4 Class III, to be indicated as hydrogen chloride, shall not exceed a waste gas mass flow 0.10 kg/h or a mass concentration of 20 mg/m³.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas shall not exceed a mass concentration of 20 mg/m³, to be indicated as total carbon.

The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

ODOUR-INTENSIVE SUBSTANCES

Emissions of odour-intensive substances in waste gas shall not exceed an odour-intensive concentration of 500 GE/m³.

5.4.8.11.1 Purification Plants for the Mechanical Treatment of Mixed Domestic Refuse and Similar Waste Products

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) For dumping sites, feeding and discharge bunkers as well as other installations for delivery, transport and loading of the feedstocks, closed rooms with sluice gates shall be constructed, where the air pressure is kept lower than atmospheric pressure by pumping in the sluice area or in the loading and unloading areas. Waste gas shall be fed into a waste gas purification facility.
- b) Machines, appliances and other installations necessary for mechanical treatment or physical separation of feedstock or accumulated waste products (e.g. by comminution, grading, sorting, mixing, homogenizing, dehydrating, drying, polarization, pressing) shall be accommodated in closed rooms. The

waste gas flow in these facilities shall be collected and fed into a waste gas purification facility.

- c) Waste gases from facilities for the mechanical treatment of waste products shall be discharged through stacks so that adequate dilution and unhindered transmission with the free air flow may occur; this is normally achieved if the requirements under 5.5.2 para. 1 are observed when determining the stack height.
- d) The best available techniques to further reduce organic substances emissions shall be applied, e.g. by direct access to relevant emission sources, separate treatment of heavily polluted exhaust air flows.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

INORGANIC GASEOUS CHLORINE COMPOUNDS

Emissions of inorganic gaseous chloride compounds under 5.2.4 Class III, to be indicated as hydrogen chloride, shall not exceed a waste gas mass flow 0.10 kg/h or a mass concentration of 20 mg/m³.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas shall not exceed a mass concentration of 20 mg/m³, to be indicated as total carbon.

The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

ODOUR-INTENSIVE SUBSTANCES

Emissions of odour-intensive substances in waste gas shall not exceed an odour-intensive concentration of 500 GE/m³.

5.4.8.11.2 Facilities for the Treatment of Waste Products

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities shall be constructed and operated so that for the duration of the treatment process, including delivery and removal, dust emissions are prevented as far as possible.

TOTAL DUST

Dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas shall not exceed a mass concentration of 20 mg/m³, to be indicated as total carbon.

The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply to facilities treating waste not requiring special monitoring.

5.4.8.10.3/5.4.8.11.3 Facilities for the Disposal of Cooling Units or Facilities Containing Chlorofluorocarbons (CFCs)

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational measures shall be applied to facilities where cooling appliances or installations containing CFCs shall be disposed of, pursuant to Annex I of Regulation (EC) No. 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (OJ L 244/1 of 29 September 2000):

- a) Facilities shall be constructed and operated so that entry of sewage water into the soil is prevented as far as possible.
- b) Appliances or installations with coolants containing CFCs or ammonia shall be treated so that coolants and refrigerator lubricant can be removed from the cooling circuit without any loss and completely removed from the closed system and recovered (drainage). CFCs shall be entirely removed from refrigerator lubricant. All the coolants shall be collected and properly disposed of.

- c) When appliances and installations are treated with other coolants, e.g. hydrocarbons such as butane, pentane or carbon-foamed insulation material, e.g. inert gas blanketing of the pulverization level.
- d) The reliability of the drying process shall be tested by a competent agency approved by the *Land* authority; coolants containing CFCs shall be removed and collected from a minimum of 100 appliances with intact cooling systems. The sum of collected CFC coolant amounts shall be less than 90 wt. % of the sum of the amount of CFC coolants as to be indicated on the identification plates of the appliances and installations. The quantity of CFCs in the de-aerated refrigerator lubricants shall not exceed 2 g of the total halogen/kg.
- e) When CFCs are released from insulation materials, CFC emissions shall be prevented as far as possible, e.g. by taking the following measures:
 - The drained appliances or units shall be encapsulated during treatment, which insures against CFC loss e.g. via sluice systems upon entry or removal.
 - The transfer points for insulation material fractions containing CFCs shall be technically impermeable to gas emission.
 - Waste gases containing CFCs shall be collected at the point of origin, (e.g. during pressing of the insulation material) and fed into a waste gas purification facility which shall properly dispose of the recovered CFCs.
- f) By carrying out appropriate monitoring measures, e.g. smoke candles, the appliances or facilities shall be regularly checked to ensure there are no leaks: the result shall be documented. Annual checks to establish whether appliances are leakproof and on internal monitoring documentation proving shall be conducted by an officially recognized state authority.
- g) In areas of the facility releasing CFCs from insulation material, the isolation material substances adhering to the mature fractions (such as metals and plastics) shall be avoided as far as is technically possible; these substances adhering to mature metal and plastic fractions shall not exceed 0.5 wt. %.
The CFCs content of insulation material fractions for material processing shall not exceed 0.2 wt. %. Insulation material fractions with a higher CFCs content shall be subjected to a thermal waste treatment facility (combustion facility for waste) or to another waste treatment facility with an equivalent break-down

efficiency for CFCs; in the latter case, proof of the equivalent break-down efficiency shall be demonstrated to the competent authority.

CHLOROFLUOROCARBONS

CFC emissions in the waste gas from recovered CFCs shall not exceed a mass flow of 10 g/h and a mass concentration of 20 mg/m³; the best available techniques to further reduce emissions shall be applied.

CONTINUOUS MEASURING

The mass concentration of CFC emissions in waste gas shall be continuously determined, or it shall be proven by other continuous tests on the efficiency of the waste gas purification facility that the established emission limit is not exceeded.

EXISTING FACILITIES

FLUOROCHLOROHYDROCARBONS

For existing facilities, CFC emissions in the waste gas from recovered CFC shall not exceed a mass flow of 25 g/h and a mass concentration of 50 mg/m³; the best available techniques to further reduce organic substances emissions shall be applied.

5.4.8.12 – 14 Facilities under 8.12 to 8.14: Waste Storage Plants

5.4.8.12.1 Facilities for the Temporary Storage of Waste Products, to which the Provisions of the Closed Substance Cycle and Waste Management Act shall Apply

5.4.8.13.1 Facilities for the Temporary Storage of Sludge

5.4.8.14.1 Facilities for the Storage of Waste Products, to which the Provisions of the Closed Substance Cycle and Waste Management Act Apply and, in these Facilities, Waste that is Stored for a Period of more than one Year before it is Disposed of or Recycled

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities shall be constructed and operated so that pollutants cannot penetrate into the soil and groundwater. The entry of water shall be minimized (e.g. using covering

or roofing) to prevent the leaching of pollutants or the development of organic emissions through conversion processes.

5.4.9 Storage, Loading and Unloading of Materials and Preparations

5.4.9.2 Facilities under 9.2:

Facilities for Storing Combustible Fluids

ORGANIC SUBSTANCES

For products containing mineral oil with a steam pressure of less than 1.3 kPa at 293.15 K, the mass flow of 3 kg/h applies to organic substances under 5.2.5, first sentence, the mass flow 3kg/h and to continuous measuring pursuant to 5.3.3.2, para. 6, second indent. The requirements under 5.2.5 for Class I organic substances shall not apply to gas oils identified as R 40 and to diesel fuel pursuant to DIN 590 (February 2000 version), heating oils pursuant to DIN 51603 Part 1 (March 1998 version) and homogeneous products.

GASEOUS EMISSIONS

Insofar as safety conditions are not affected and combustible liquids do not demonstrate the characteristics defined in 5.2.6 b) to d) or a boiling point of 150 °C or less, divergent to 5.2.6.3, technically tight soft seals pursuant to Guideline VDI 2440 (November 2000 version) cannot be used for flanges with a gasket up to a maximum nominal pressure of 2.5 MPa.

EXISTING FACILITIES

GASEOUS EMISSIONS

Existing facilities in which gas oils identified as R 40 and as well as diesel fuel pursuant to DIN EN 590 (February 2002 version), heating oils pursuant to DIN 51063 Part 1 (March 1998 version) or similar products are extracted, decanted or stored, which do not comply with the requirements under 5.2.6.1, 5.2.6.3 or 5.2.6.4, may continue operating until they have been replaced by new sealing systems or aggregates. After this Administrative Regulation enters into force, the competent authority shall demand inventory for pumps and shutoff devices and follow up on the

continuous replacement of sealing units or aggregates as well as the completion of maintenance work until their replacement within the framework of plant supervision. 5.2.6.7, first sentence, shall apply to existing facilities storing combustible fluids pursuant to 5.2.6 a), which do not fulfil any of the specifications referred to in b) to d), provided that the fluid organic products may be stored in floating roof tanks with an efficient flange gasket or in stationary roof tanks with an inner floating roof if emission reduction of at least 97 per cent is achieved for fixed roof tanks without an inner floating roof. This shall apply accordingly to the storage of products containing mineral oil, with a benzene content of less than 1 per cent.

Facilities

- a) in which combustible fluids fulfilling one of the specifications under 5.2.6 a) to d) are extracted or decanted,
- b) in which combustible fluids fulfilling one of the specifications under 5.2.6 a) to d) are extracted or decanted,

shall comply with requirements under 5.2.6. no later than twelve years after the entry into force of this Administrative Regulation.

5.4.9.36 Facilities under 9.36:

Facilities for the Storage of Liquid Manure which are Operated Irrespective of 7.1

MINIMUM DISTANCE

Facilities shall be constructed a minimum distance of 300 m from the nearest residential area, existing or planned. The minimum distance may be less if emissions of odorous substances are reduced by means of primary measures, or odorous waste gas is treated in a waste gas purification facility. A possible decrease in the minimum distance by reducing emissions of odorous substances shall be determined with the aid of a suitable model for olfactometric measuring, the suitability of which is to be established by the competent specialist authorities.

BUILDING AND OPERATIONAL REQUIREMENTS

The following building and operational requirements shall apply:

- a) Facilities for storing and handling commercial liquid fertilizer shall be erected pursuant to DIN 11622 (1994 version) and DIN 1045 (1988 version).

- b) Liquid manure shall be stored (outside the stall) in closed containers, or equivalent emission reduction measures achieving an emissions reduction ratio, as related to the open uncovered container, of at least 80 per cent of emissions of odour-intensive substances and ammonia shall be applied.
After being disturbed by stirring or for application on land, artificial floating scum shall subsequently be immediately restored to its functional state.
- c) For commercial liquid fertilizer, which is passed on to third parties for further recycling, proof correct storage and recycling commercial liquid fertilizer shall be furnished.

5.4.10 Other

5.4.10.7 Facilities under 10.7:

Facilities for the Vulcanisation of Natural and Synthetic Rubber

BUILDING AND OPERATIONAL REQUIREMENTS

Waste gases shall be collected at the place of origin and fed into a waste gas purification plant.

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that emissions of organic substances in waste gas do not exceed a mass concentration of 80 mg/m³, to be indicated as total carbon.

5.4.10.8 Facilities under 10.8:

Facilities for the Production of Building Protective Agents, Cleaning Agents or Wood Preservatives and Facilities for the Production of Adhesives

TOTAL DUST

When building protective agents, cleaning agents or wood preservatives are produced, dust emissions in waste gas shall not exceed a mass concentration of 5 mg/m³.

When adhesives are produced, dust emissions in waste gas shall not exceed a mass concentration of 10 mg/m³.

5.4.10.15 Facilities under 10.15: Test Benches

5.4.10.15.1 Test Benches for or with Combustion Engines

TOTAL DUST, INCLUDING THE CONTENT OF CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

For test benches for or with mass-manufactured engines with a firing capacity of less than 2 MW of the individual aggregate operated on diesel fuel, not exceeding the permissible mass content of sulphur pursuant to the 3. BImSchV, as currently applicable, waste gases shall be subject to a soot filter or emissions shall be reduced using an equivalent method.

For test benches for or with other engines operated on diesel fuel, which does not exceed the permissible mass content of sulphur pursuant to the 3. BImSchV, as currently applicable, special regulations to reduce dust emissions shall be established. The best available techniques to further reduce dust emissions, particularly with respect to engine design, shall be applied.

If engines operating in compliance with regulations are operated on residual oils or comparable propellants, special regulations to reduce dust emissions and sulphur dioxide emissions shall be established. The best available techniques to further reduce dust emissions, particularly with respect to engine design, shall be applied.

NITROGEN OXIDES

5.2.4 shall not apply. The best available techniques to further reduce emissions, particularly with respect to engine design shall be applied to test benches with compression ignition engines operated on liquid fuels.

ORGANIC SUBSTANCES

5.2.5 shall not apply. The best available techniques to further reduce emissions of organic substances, particularly with respect to engine design, shall be applied.

5.4.10.20 Facilities under 10.20:

Facilities for Cleaning Tools, Appliances or other Metal Objects Using Thermal Processes

REFERENCE VALUES

Emission standards shall refer to a volume content of oxygen in waste gas of 11 per cent, with the exception of catalytic post-combustion facilities.

ORGANIC SUBSTANCES

5.2.7.1.1 shall apply, provided that emissions of organic substances in waste gas do not exceed a mass flow of 0.10 kg/h or a mass concentration of 20 mg/m³, to be indicated as total carbon. The requirements in 5.2.5 for emissions of Class I and II organic substances shall not apply.

5.4.10.21 Facilities under 10.21:

Facilities for Internal Cleaning of Railway Tank Wagons, Street Tank Vehicles, Tank Ships or Tank Containers and Facilities for Automated Cleaning of Barrels if Containers of Organic Substances are Cleaned

5.4.10.21.1 Facilities for Internal Cleaning of Railway Tank Wagons, Street Tank Vehicles, Tank Ships or Tank Containers

BUILDING AND OPERATIONAL REQUIREMENTS

Facilities shall be constructed and operated with waste gas collection and purification, waste water collection and treatment and sufficient storage areas for waste products. A suitable existing treatment facility may also be used for the treatment of waste water.

Operating instructions for the stages of treatment, e.g. removal of residues, de-aerating, purification, waste gas collection and purification, waste product collection and classification shall be laid down with reference to the groups of substances. The stages of treatment shall be executed so that emissions are minimized. In order to reduce the development of emissions, substances demonstrating a steam pressure of 10 Pa or more at a temperature of 293.15 K shall be rinsed with a cold detergent

solution before washing. Direct treatment of volatile substances with steam or hot water is not permissible.

ORGANIC SUBSTANCES

Emissions of organic substances in waste gas, to be indicated as total carbon, shall not exceed a mass flow of 0.10 kg/h or a mass concentration of 20 mg/m³. The requirements under 5.2.5 for emissions of Class I and II organic substances shall not apply.

CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

Emissions of organic substances under 5.2.7.1 shall not exceed a maximum total mass flow of 2.5 kg/h or a maximum total mass concentration of 5 mg/m³.

5.4.10.21.2 Facilities for Automated Cleaning of Barrels or Comparable Containers (e.g. Tank Pallets) including Reprocessing Facilities

BUILDING AND OPERATIONAL REQUIREMENTS

The washing area shall be contained. Waste gases emitted during opening of containers, removal of residues, scrapping (e.g. pressing), non-recyclable barrels or during transport of open uncleaned barrels and containers shall be collected. Storage containers for residues remaining after containers have been emptied, recycling of wash water, waste water treatment and associated storage containers shall be designed as closed systems as far as possible and operated as such.

Prior to the washing process, containers shall be emptied as much as possible (removal of residues).

While operating the keg or container cleaning facilities, it should be noted that kegs or containers that have been contaminated with substances under 5.2.2 Class I or substances under 5.2.7.1 shall be discarded and exchanged for kegs or containers contaminated with less dangerous substances. Operating instructions to this effect shall be drawn up and an operator's log maintained.

CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

For facilities where kegs or containers contaminated with substances under 5.2.5 Class I or substances under 5.2.7.1 are cleaned emissions of organic substances

under 5.2.5 in waste gas, to be indicated as total carbon, shall not exceed a total mass flow of 0.10 kg/h or a total mass concentration of 20 mg/m³. Further requirements shall be determined on an individual basis for facilities for cleaning mainly kegs or containers which have been contaminated with organic substances under 5.2.7.1.

For facilities where kegs or containers not contaminated with organic substances under 5.2.5 Class I or substances under 5.2.7.1 are cleaned, emissions of organic substances under 5.2.5 in waste gas shall not exceed a total mass flow of 0.10 kg/h or a total mass concentration of 20 mg/m³, to be indicated as total carbon, if possible.

The requirements in 5.2.5 for emissions of Class I and II organic substances shall not apply.

5.4.10.23 Facilities under 10.23: Facilities for Textile Finishing

5.4.10.23.1 Facilities for Textile Finishing by Means of Thermofixing, Thermoinsulating, Coating, Impregnating or Dressing, including Associated Drying Facilities

Insofar as facilities must meet the requirements of to restrict emissions of volatile organic compounds pursuant to the Ordinance on the Curbing of Emissions of Volatile Organic Compounds when using Organic Solvents (31. BImSchV) of 21 August 2001 (BGBl. I, p 2180), as currently applicable, the following requirements for organic substances shall specify and supplement the provisions of Annex IV C No 5 of this Ordinance.

BUILDING AND OPERATIONAL REQUIREMENTS

The content of emissions-relevant substances in or on the goods to be finished (e.g. monomeric residues, preparations such as spinning oils, softeners, slashing products) shall be reduced as far as possible. One or several of the following measures shall be implemented in particular:

- a) use of thermostable preparations
- b) reduction of the order quantity,
- c) preliminary treatment of the goods to be finished e.g. pre-washing,
- d) optimisation of pretreatment (e.g. increasing washing efficiency).

REFERENCE VALUES

The mass concentrations shall refer to an air-goods-ratio of 20 m³/kg; the air-goods-ratio is the quotient of total waste gas volume flow (in m³/h) of a thermal treatment aggregate during a process (finishing stage) and the throughput of the textiles to be finished (in kg/h). Multiplying the permissible mass concentration of established substances by the reference air-goods ratio of 20 m³/kg gives the permissible specific emissions factor (masses of emitted substances (in g) per masses of textiles to finish (in kg)).

ORGANIC SUBSTANCES

5.2.5 shall apply, provided that

- a) emissions of organic substances in waste gas, to be indicated as total carbon, do not exceed a mass flow of 0.80 kg/h or a mass concentration of 40 mg/m³;
- b) an additional mass concentration of no more than 20 mg/m³, to be indicated as total carbon, is emitted from carry-overs and residues of preparations;
- c) if, for processing reasons, one or more of the finishing stages recorded in 10.23 of the Annex of the 4. BImSchV is carried out at in the same treatment aggregate and at the same time as a finishing stage not recorded there, the process shall be optimised so that a total mass concentration of 40 mg/m³ for emissions of organic substances in the waste gas, to be indicated as total carbon, shall not be exceeded if possible. If facilities subject to the requirements of the 31. BImSchV, as currently applicable, coat and print simultaneously, emissions of organic substances in waste gas shall, pursuant to this Ordinance, not exceed a mass concentration of 40 mg/m³, to be indicated as total carbon.

If the requirements under a) to c) are fulfilled, total emissions of organic substances in waste gas shall still not exceed a total mass concentration of 80 mg/m³, to be indicated as total carbon; if facilities subject to the requirements of the 31. BImSchV, as currently applicable, coat and print simultaneously, – divergent to the first part of the sentence and pursuant to this Ordinance – emissions of organic substances in waste gas shall not exceed a mass concentration of 60 mg/m³, to be indicated as total carbon.

The requirements for emissions of Class I and II organic substances shall not apply.

In exceptional cases, e.g. for coatings and technical textiles, these regulations may be waived; in such case 5.2.5 shall apply unamended.

CARCINOGENIC, MUTAGENIC OR REPRODUCTION TOXIC SUBSTANCES

Supplementary to 5.2.7.1, substances and preparations defined in 5.2.7.1 shall immediately be replaced by less harmful substances and preparations.

MEASURING

In order to determine the operating conditions (recipes), which lead to the highest emissions, emission calculations may be made on the basis of substance emission factors insofar as these substance emission factors are established using a scientifically acknowledged method.

Divergent to 5.3.2.2 para. 2, second sentence, up to three individual measurements may be substituted by calculating emissions on the basis of substance emission factors, insofar as, within the framework of initial and repeated emission measuring, substance emission factors for at least three prescription components are technically established by a measurement office recognized pursuant to Article 26.

EVALUATION OF MEASUREMENTS

The actual air-goods-relation shall be determined and documented.

Emission standards shall also be considered to be observed with if specific emission factors established by the air-goods ratio determined and the mass concentrations measured do not exceed the permissible specific emission factors.

EXISTING FACILITIES

ORGANIC SUBSTANCES

A supplementary stipulation shall apply to existing facilities stating that for directly fired treatment aggregates, emissions of organic substances resulting from combustion up to a maximum mass concentration of 20 mg/m³, to be indicated as total carbon, shall be disregarded; the best available techniques to further reduce emissions, particularly with respect to improved combustion, e.g. optimising combustion, carrying out maintenance at least once annually, shall be applied. Insofar as the operator can prove, e.g. with an expert appraisal by the manufacturer of the burner or the stenter frame, that emissions of organic substances from combustion cannot comply with a maximum mass concentration of 20 mg/m³, to be indicated as total carbon and these emissions cannot be further reduced by primary measures, the emission limit shall be determined on an individual basis.

5.5 Waste Gas Disposal

5.5.1 General

Waste gases shall be disposed of in a way by which to facilitate smooth removal together with the free flow of air. As a rule, they shall be disposed of through stacks the height of which shall be determined pursuant to 5.5.2 to 5.5.4, notwithstanding any other information.

5.5.2 Disposal through Stacks

Stacks shall have a minimum height of 10 m above ground level and project 3 m, as a minimum, above the ridge of the roof. In case of a roof with a slope of less than 20°, the height of the ridge shall be calculated on the grounds of a 20° sloop; notwithstanding this, the height of stacks shall not exceed twice the height of the building.

In case of several stacks of approximately equal height with similar emissions, it shall be checked in how far these emissions are to be combined in determining the height of the stacks. This shall apply in particular if the horizontal distance between stacks does not exceed 1.4 times the height of the stacks and insofar as different stack heights are required in order to avoid a superimposition of waste gas plumes.

If the total load indicator to be determined (4.7) by applying the measuring and evaluation procedure (4.6) exceeds the immission value for a calendar year (4.2 to 4.5), emission reduction shall first be attempted. Where this is not possible, the height of the stacks shall be increased to an extent by which to ensure that the immission value for a calendar year cannot be exceeded.

The height of stacks pursuant to 5.5.3 shall, notwithstanding any other provisions, not exceed 250 m; with stacks higher than 200 m, further measures to reduce emissions shall be applied.

Para. 1 shall neither be applied to facilities other than furnaces with low emission mass flows nor in cases in which waste gases are emitted only over few hours of a year for safety reasons; in these cases, the requirements pursuant to VDI Guideline 3781 Part 4 (November 1980 version) or pursuant to VDI Guideline 2280 Section 3 (August 1977 version) shall be applied *mutatis mutandis* in order to ensure sufficient thinning and smooth removal of waste gases together with the free flow of air.

5.5.3 Stack Height Determination Nomogram

The height of stacks shall be determined pursuant to Figure 2.

Explanation:

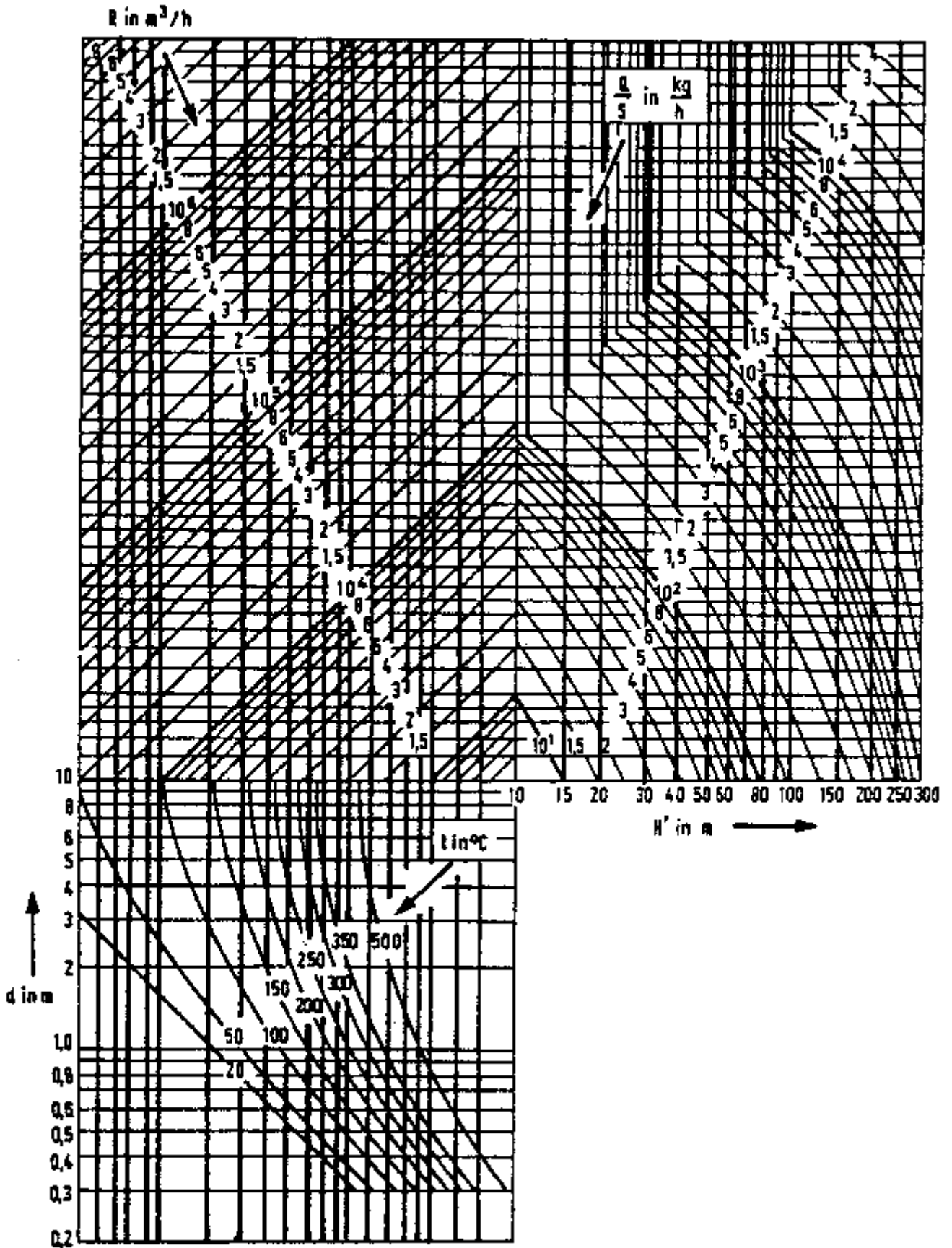
H' in m	stack height as in nomogram;
d in m	inside diameter of the stack or equivalent inside diameter of cross section;
t in °C	temperature of waste gas at stack mouth;
R in m ³ /h	volume flow of waste gas under standard conditions after subtraction of the humidity content of steam;
Q in kg/h	emission mass flow of the air pollutant emitted from the emission source; as to fibres, the quantity of fibres emitted per time unit shall be converted into a mass flow;

S stack height determination factor; as a rule, S shall be defined by the values specified in Annex 7.

As regards t, R and Q, they shall be defined by the values measured during due operation under conditions most unfavourable for clean air maintenance, especially as far as the use of fuels and raw materials is concerned. As regards nitrogen monoxide emissions, a transformation degree of 60 per cent for the transformation into nitrogen dioxide shall be taken as a basis; this implies that the emission mass flow of nitrogen monoxide shall be multiplied by factor 0.92 and used as the emission mass flow of nitrogen dioxide to be indicated as Q in the nomogram.

The competent ruling authority of the respective *Land* may prescribe lower values in areas subject to investigation pursuant to § 44 para. (3) of the Federal Immissions Control Act and in cases pursuant to 4.8. Such values shall not be lower than 75 per cent of the S values specified in Annex 7.

Figure 2: Stack Height Determination Nomogram



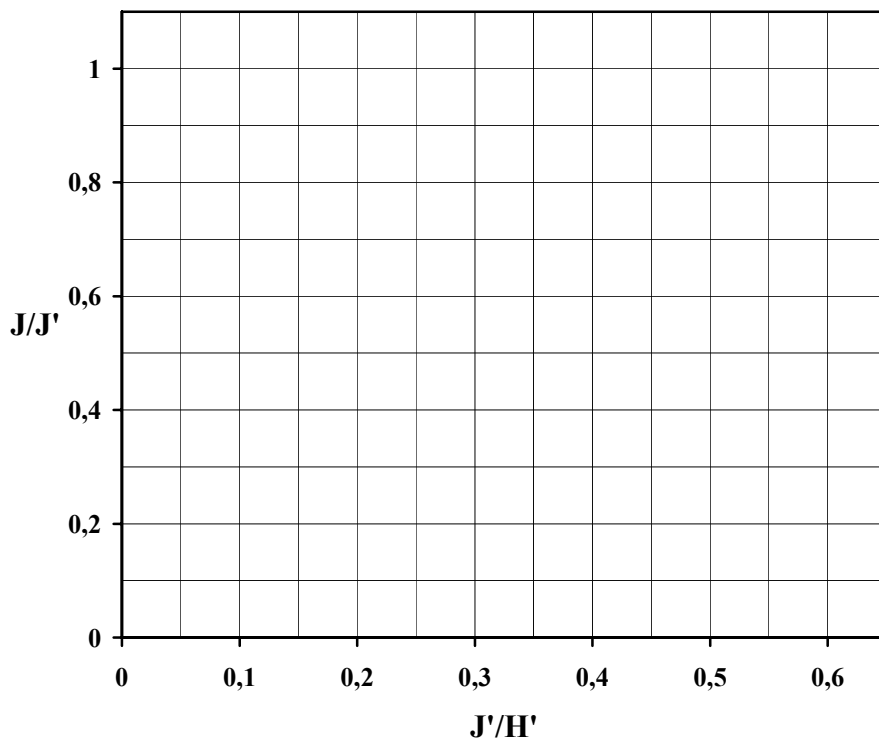
5.5.4 Stack Height Determination while Taking into Account Developed Areas and the Vegetation and in Uneven Terrain

In those cases in which a compact or existing development area or a development permissible in compliance with a development plan or the compact vegetative cover makes up for more than 5 per cent of the surface of the evaluation area, the H' stack height determined pursuant to 5.5.3 shall be increased by the additional amount designated as J. The J value in m shall be determined on the grounds of Figure 3.

Explanation:

H in m	building height of stack ($H = H' + J$);
J' in m	average height of the compact existing built-up area or of the built-up area cover permissible in compliance with a development plan or of the vegetative cover above ground level

Figure 3: Chart for the Determination of J Values



When determining the height of the stacks, unevenness of terrains shall be taken into account if the facility is located in a valley or if emission dispersion is blocked by

elevations prevailing in the respective terrain. In cases in which the prerequisites to apply VDI Guideline 3781 Part 2 (August 1981 version) are met, the height of the stacks determined pursuant to 5.5.3 and 5.5.4 para. 1 shall be adapted accordingly.

5.5.5 Existing Facilities

The requirements under 5.5.2 to 5.5.4 shall not apply to existing facilities which meet the requirements of the Technical Instructions on Air Quality Control (*TA Luft*) of 27 February 1986 (GMBI. p. 95).

6 Subsequent Orders

Insofar as existing facilities do not meet the requirements under 4 and 5, the competent authorities shall issue the necessary orders through which to fulfil the obligations arising from § 5 para. (1) nos. 1 and 2 of the Federal Immissions Control Act while taking into consideration the following provisions. The periods within which to meet the requirements under 5.4 and 6 shall commence as of the effective date of this Administrative Regulation.

6.1 Subsequent Orders for the Protection against Harmful Environmental Effects

6.1.1 Discretion Restriction

Pursuant to the second sentence of § 17 para. (1) of the Federal Immissions Control Act, subsequent orders shall be issued if the protection of the general public or the neighbourhood against harmful effects on the environment or any other hazards, significant disadvantages or significant nuisances turns out to be inadequate. In such cases, subsequent orders may only be waived if special circumstances prevail which justify to evaluate otherwise. In the event of concrete health hazards, the authority shall always intervene.

6.1.2 Intervention Prerequisite

The protection against harmful effects of air pollutants on the environment is not ensured to a sufficient extent if

- a) the immission values in order to ensure the protection of human health pursuant to 4.2.1 are exceeded at a place within the sphere of influence of the facility which is permanently accessible for humans,
- b) the immission values in order to ensure the protection against significant nuisances pursuant to 4.3.1 are exceeded within the sphere of influence of the facility and if it cannot be excluded that intolerable nuisances actually occur in the area affected,
- c) the immission values in order to ensure the protection against significant nuisances, especially the protection of the vegetation and of ecosystems,

pursuant to 4.4.1 or 4.4.2 are exceeded within the sphere of influence of the facility and if ecosystems requiring protection prevail in the area affected,

d) a special-case examination pursuant to 4.8 is to be carried out and shows that air pollutant immissions lead to hazards, significant disadvantages or significant nuisances for the general public or the neighbourhood

and if the operation of the facility contributes to the harmful effects on the environment to a relevant extent.

6.1.3 Measures

If adequate protection against harmful effects on the environment cannot be ensured by applying measures to implement best available techniques, further measures to reduce emissions shall be ordered. If such measures do not suffice either, the conditions of disposal shall be demanded to be improved. In cases pursuant to the second sentence of § 17 para. (1) of the Federal Immissions Control Act, it shall be checked whether the licence is to be completely or partially revoked.

6.1.4 Time Limits

Subsequent orders for the protection against harmful effects on the environment shall be issued immediately after clarification of the prerequisites for intervention. If several polluters contribute to harmful effects on the environment to a relevant extent, the prerequisites for intervention shall be clarified with regard to all polluters concerned and, if necessary, several orders issued. Taking into account the principle of proportionality, a time limit may be allowed for within which measures can be implemented. The third sentence shall only apply if no concrete health hazards may occur during the transitional period and if nuisances or disadvantages of limited duration may be tolerated by those affected.

6.1.5 EC Air Quality Values

If immission values pursuant to 4 are exceeded the observation of which shall only become mandatory as of a certain date in the future in compliance with Daughter Directives of the Council Directive 96/62/EC of 27 September 1996 on ambient air

quality assessment and management (“Air Quality Framework Directive”), the facility may be approved to contribute to excess immission values until expiry of the transitional period. The measures required for future observation of immission values shall be ordered no later than when drawing up a clean air plan.

6.2 Subsequent Orders to Provide Precautions against Harmful Environmental Effects

6.2.1 Principle

If a facility does not meet the requirements to provide precautions against harmful effects on the environment specified in this Administrative Regulation, the competent authority shall issue the necessary orders by which to adapt the facility to the best available techniques pursuant to 5 and to the other requirements to provide precautions specified there under. If the emission standards pursuant to 5 are only exceeded to a low extent, ordering extensive corrective measures may lack proportionality. In all other respects, the principle of proportionality (§ 17 para. (2) of the Federal Immissions Control Act) shall, as a rule, be observed by granting a period of compliance pursuant to 5.4 to 6.

6.2.2 Immediate Rehabilitation

If a facility does not meet the requirements to take precautions against harmful effects on the environment specified in the Technical Instructions on Air Quality Control (*TA Luft*) of 27 February 1986 (GMBI. p. 95), a period of compliance shall only be granted in a subsequent order insofar as this is indispensable to carry out the measures. If such requirements have been specified on a case-to-case basis by imposed condition or by subsequent order, they shall be implemented immediately.

6.2.3 Granting Rehabilitation Periods

Insofar as new requirements are established in this Administrative Regulation, periods of compliance shall be granted with a view to

- the technical efforts required,

- the extent of deviation from such requirements and
- the significance for the general public and the neighbourhood.

6.2.3.1 Rehabilitation Periods for Measures the Implementation of which requires only Administrative Changes or Few Technical Efforts

It shall be determined in subsequent orders the implementation of which requires only administrative changes or few technical efforts, especially when shifting to lower-emission fuels or charge substances and when carrying out simple changes of process management or improvements in the efficiency of existing waste gas purification plants that the implementation of such measures shall be completed within three years after such new requirements have become effective.

6.2.3.2 Rehabilitation Periods for Measures by which to Meet the Existing and New Requirements Simultaneously

As to facilities which meet neither the requirements of the Technical Instructions on Air Quality Control of 1986 nor the new requirements, it shall be attempted to implement measures to meet both the existing and the new requirements simultaneously. The period within which to meet all requirements shall not exceed three years.

All requirements shall be met no later than by 30 October 2007 by facilities pursuant to no. 7.1 letter b) of the Annex of the 4th Ordinance on the Implementation of the Federal Immissions Control Act which require notification as of 3 August 2001 pursuant to § 67 para. (2) of the Federal Immissions Control Act.

6.2.3.3 General Rehabilitation Period

As to facilities which have up to now represented best available techniques all requirements shall be demanded – notwithstanding any other provisions of 6.2.3.1, 6.2.3.4 and 6.2.3.5 – to be met no later than by 30 October 2007.

6.2.3.4 Special Rehabilitation Periods pursuant to 5.4 of this Administrative Regulation

Insofar as special rehabilitation periods are specified for certain facility types in 5.4, these shall take precedence over any other provisions.

6.2.3.5 Rehabilitation Periods in Clean Air Plans pursuant to § 47 of the Federal Immissions Control Act

Insofar as clean air plans pursuant to § 47 of the Federal Immissions Control Act contain rehabilitation periods, these shall take precedence over the periods specified in 5.4 and 6.2.3.1 to 6.2.3.3.

6.2.4 Licence Waiver

Subsequent orders shall not be issued if the operator has expressed a waiver in writing to the licensing authority renouncing to operate the facility over a period exceeding the periods specified in 6.2.3.2 to 6.2.3.4. The first sentence shall not apply to subsequent orders pursuant to 6.2.3.1 and 6.2.3.5.

6.2.5 Compensation

In cases pursuant to § 17 para. (3a) of the Federal Immissions Control Act, the competent authority shall refrain from issuing subsequent orders.

7 Cancellation of Regulations

The Technical Instructions on Air Quality Control (*TA Luft*) of 27 February 1986 (GMBI. p. 95) shall be cancelled as of entry into force of this General Administrative Regulation.

8 Entry into Force

This General Administrative Regulation shall enter into force on the first day of the third calendar month after publication.

Approved by the *Bundesrat*.

Annex 1 Determining the Minimum Distance from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems with Regard to the Requirements under 4.8

Examination pursuant to 4.8 as to whether the protection against significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems is ensured

The provisions under 4.8 stipulate that it is considered evidence for the occurrence of significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems if the minimum distances given in Figure 4: **Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed**

are not observed.

As to facilities for farming or breeding of livestock the emission factors in Fehler! Verweisquelle konnte nicht gefunden werden. shall be used to determine the yearly ammonia emissions expected for the respective facility under conditions most unfavourable according to species, production specialization, livestock housing and commercial fertilizer storage and according to the respective stocking density. In the event of different species and different types of farming and breeding the respective yearly ammonia emissions shall be added up. The yearly ammonia emission can be used to identify the minimum distance in Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

. It is considered evidence for the occurrence of significant disadvantages if such a minimum distance is not observed.

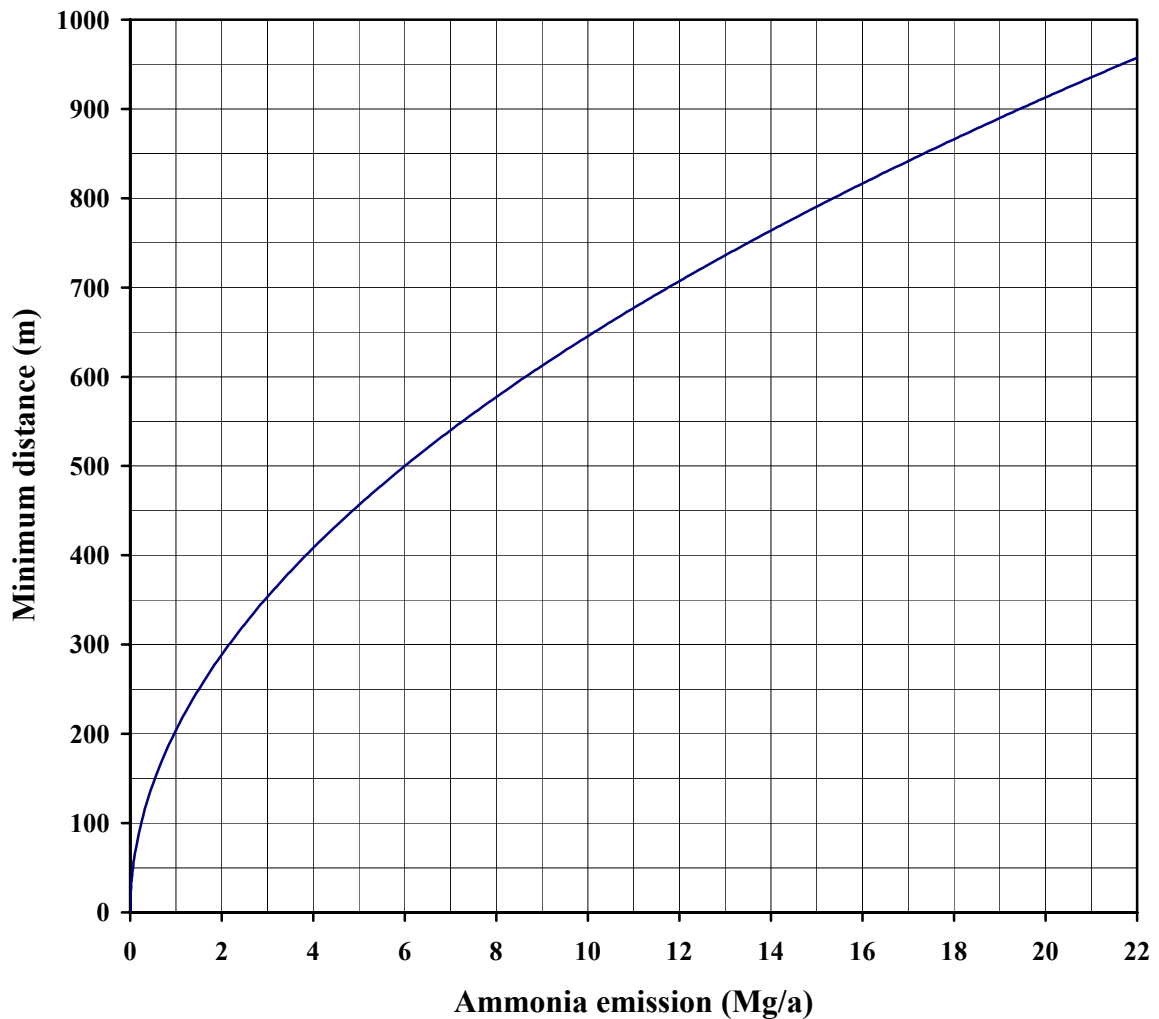
Table 11: Ammonia Emission Factors for Facilities for Farming or Breeding of Livestock*

Species, Production Specialization, Livestock Housing, Commercial Fertilizer Storing	Ammonia Emission Factor (kg/(Stocking Rate· a))
Fattening pigs	
Compulsory ventilation, liquid manure system (partially or fully slated floors)	3.64
Compulsory ventilation, solid manure system	4.86
Naturally ventilated housing, kennel housing (liquid or solid manure system)	2.43

* If facilities for farming or breeding of livestock significantly diverge from the procedures listed in **Fehler! Verweisquelle konnte nicht gefunden werden.** in relation to species, production specialization, livestock housing, feeding or commercial fertilizer storage, diverging emission factors for calculation may be drawn upon on the basis of plausible reasoning (e.g. measuring reports, practical examinations).

Species, Production Specialization, Livestock Housing, Commercial Fertilizer Storing	Ammonia Emission Factor (kg/(Stocking Rate· a))
Naturally ventilated housing, deep litter or composting system	4.86
Swine nursery (breeding sow management)	
All areas and types of livestock housing (breeding sows incl. piglets up to 25 kg)	7.29
Laying hens	
Cage rearing using ventilated dropping belts	0.0389
Aviary housing using ventilated dropping belts	0.0911
Floor management/free-range (manure removal 1 time per turn)	0.3157
Feeding poultry	
Fryers, floor management	0.0486
Ducks	0.1457
Turkeys	0.7286
Dairy cattle	
Tied housing, liquid or solid manure system	4.86
Cubicle housing, liquid or solid manure system	14.57
Free stall, deep litter system	14.57
Free stall, sloping floor straw yard system	15.79
Fattening bullock, young cattle incl. breeding (6 months up to 2 years)	
Tied housing, liquid or solid manure system	2.43
Free stall, liquid manure system	3.04
Free stall, sloping floor straw yard system	3.64

Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed



For calculating the minimum distance according to Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

the following equation shall apply:

$$X_{\min} = \sqrt{F \cdot Q}$$

F shall be $41668 \text{ m}^2 \cdot \text{a/Mg}$ and Q the yearly ammonia emission in Mg/a. This equation may also be used in the event of yearly ammonia emissions being higher than the value of 22 Mg/a depicted Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

If it is proved by applying a dispersion calculation pursuant to Annex 3 and taking into consideration the conditions in which the animals are kept that in cases where the distance to be determined falls below the value given in Figure 4: Minimum Distance of Facilities from Sensitive Plants (e.g. Tree Nurseries, Cultivated Plants) and Ecosystems for which Significant Disadvantages due to Damage or Harm Caused by the Effects of Ammonia on these Protected Resources will Occur if the Minimum Distances are not Observed

, the additional load for ammonia of $3 \mu\text{g}/\text{m}^3$ is not exceeded in any significant evaluation parcel, it is considered evidence for the occurrence of significant disadvantages due to damage or harm caused by the effects of ammonia on sensitive plants (e.g. tree nurseries, cultivated plants) and ecosystems if such newly determined distances fall below the given values.

It is not considered evidence for the occurrence of significant disadvantages if the total load of ammonia does not exceed $10 \mu\text{g}/\text{m}^3$ in any evaluation parcel.

The minimum distance curve has been derived for sources close to the ground and does not take into consideration that the immission concentration may be reduced due to the discharge of waste gases through stacks pursuant to 5.5. A dispersion calculation pursuant to Annex 3 may be carried out to take into consideration such discharge conditions.

Annex 2 Curves for Deriving Mass Flows on the Basis of Immission Projections

Figure 5: Arsenic and Inorganic Arsenic Compounds

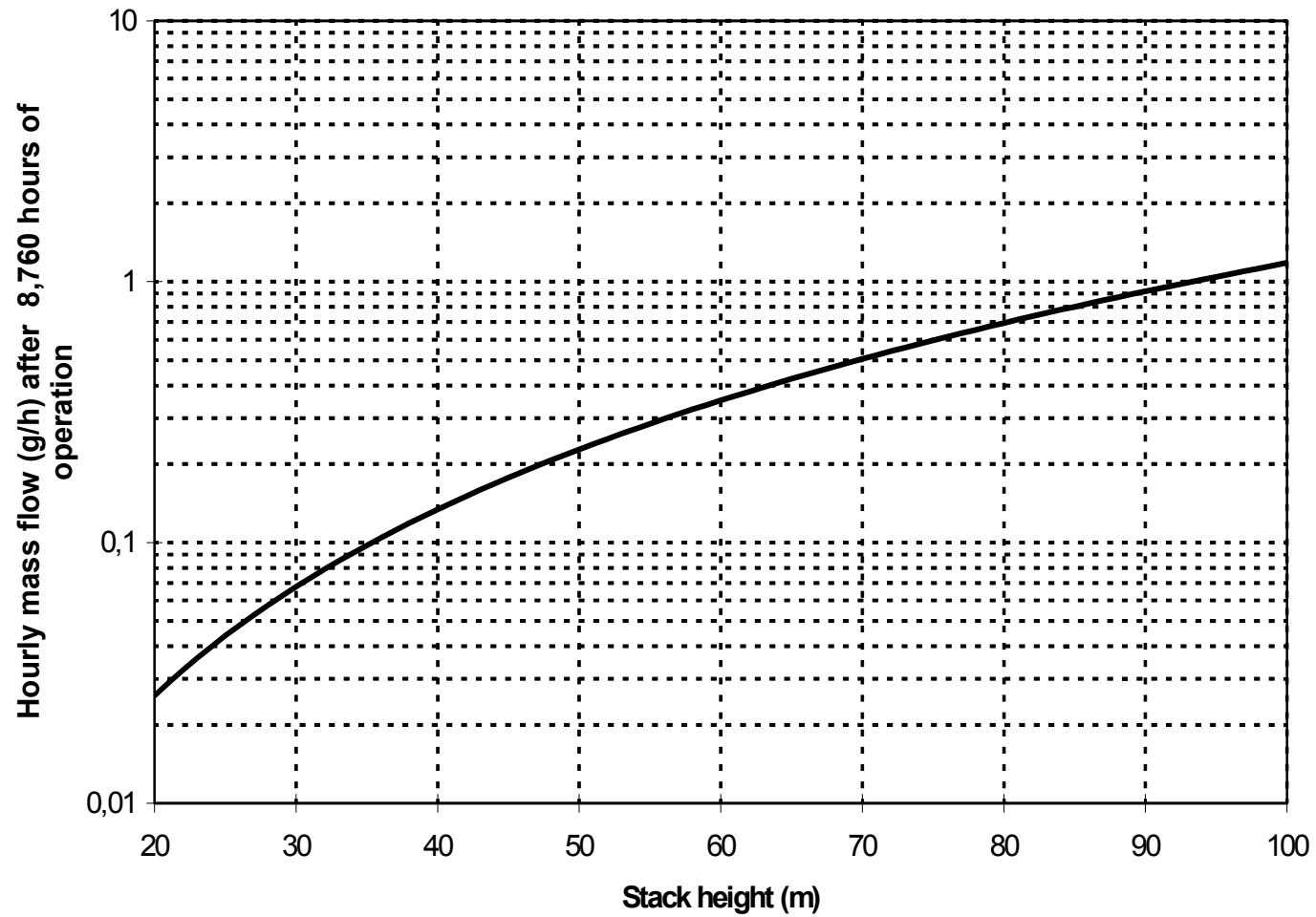


Figure 6: Lead and Inorganic Lead Compounds

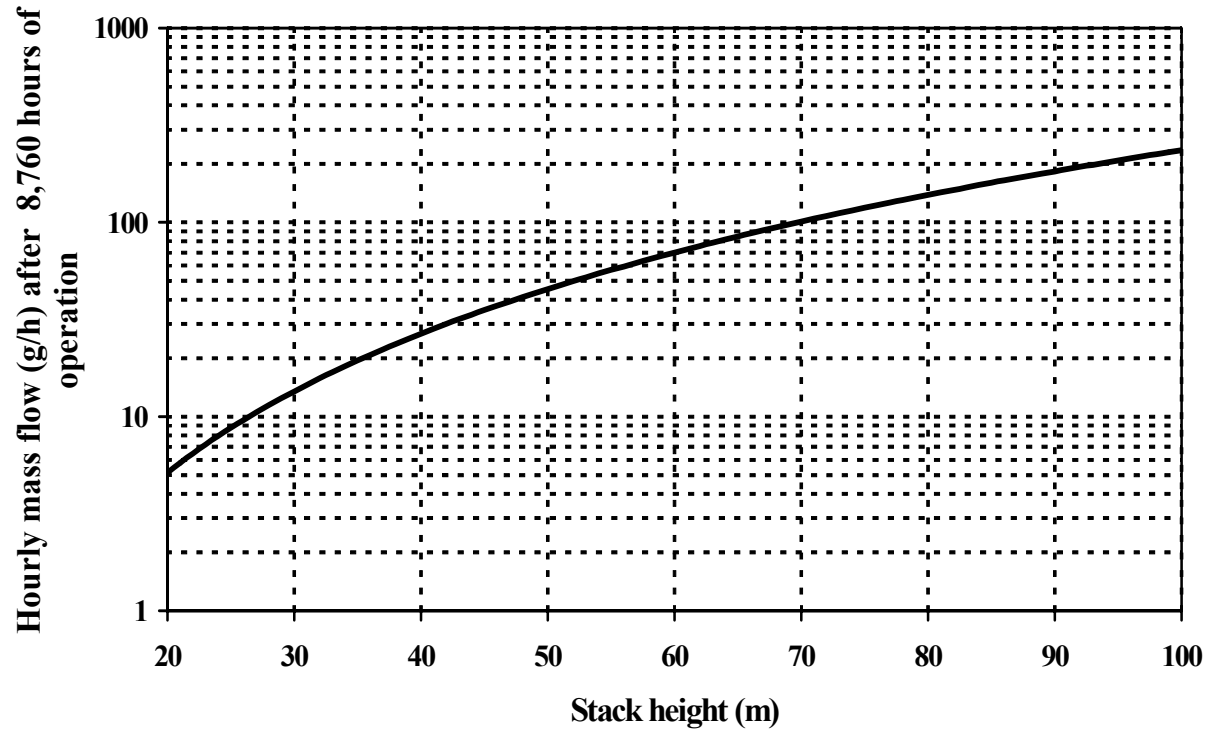


Figure 7: Cadmium and Inorganic Cadmium Compounds and Thallium and Inorganic Thallium Compounds

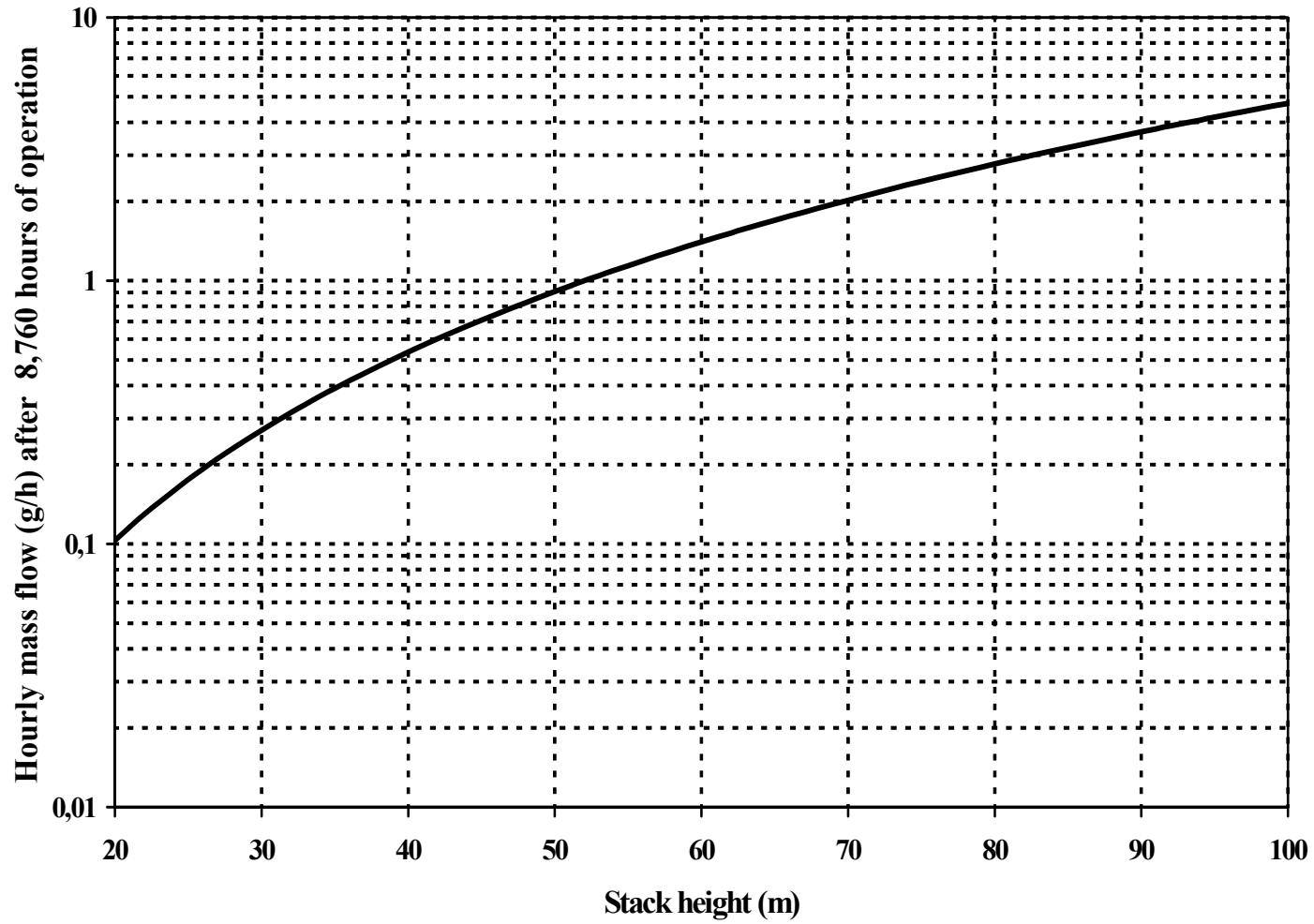


Figure 8: Nickel and Inorganic Nickel Compounds

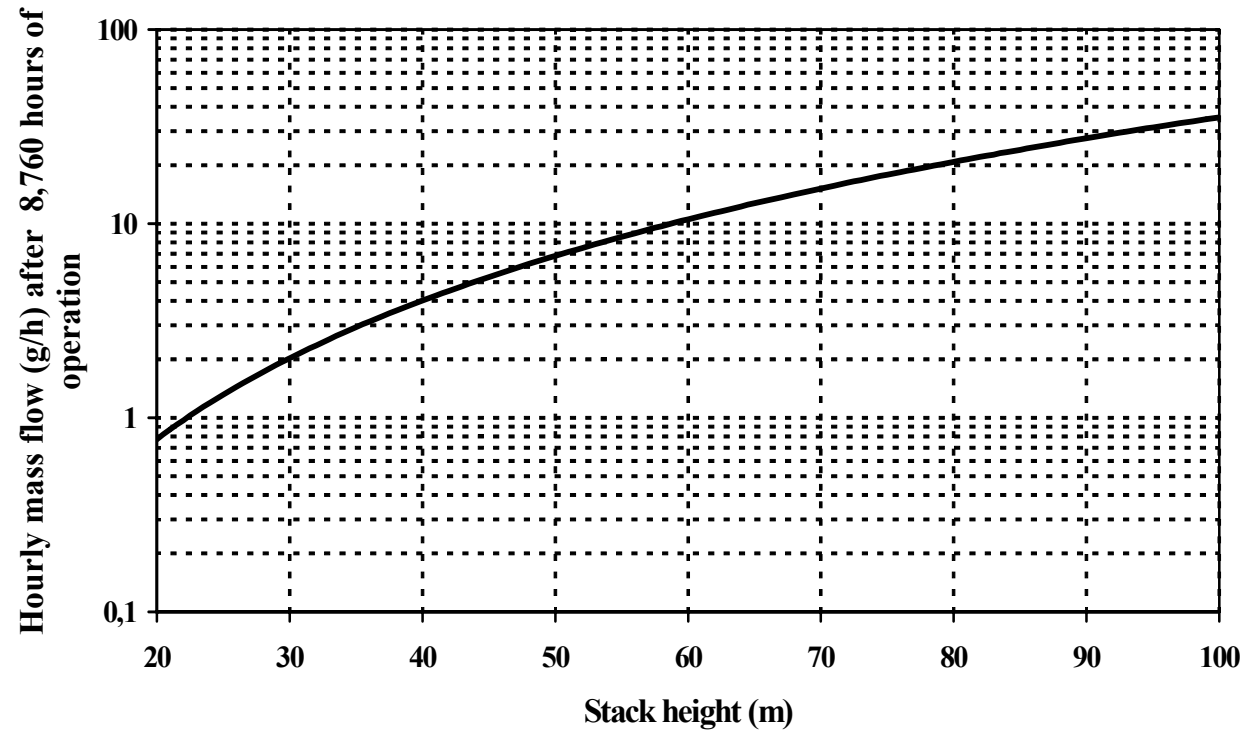
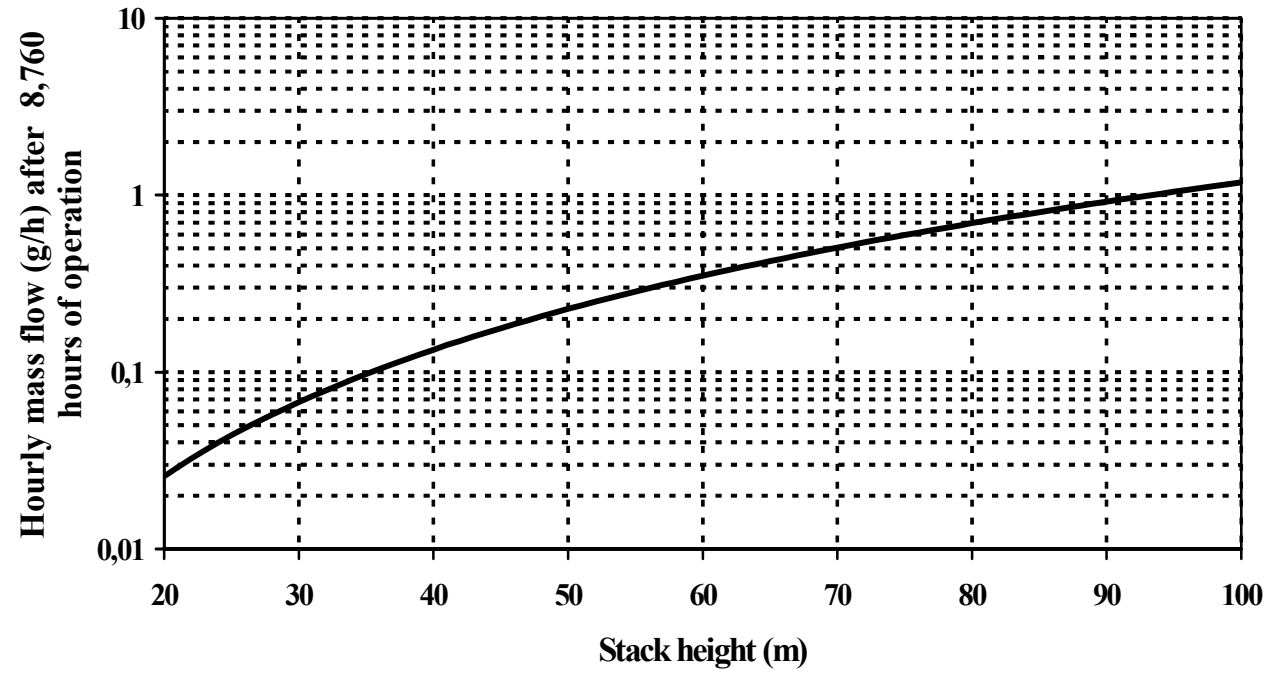


Figure 9: Mercury and Inorganic Mercury Compounds



Annex 3 Dispersion Calculations

1 General

The dispersion calculation for gases and dusts shall be carried out as a time series calculation over a period of one year respectively or on the basis of a frequency distribution of dispersion situations over a period of several years according to the procedure described herein using the particle models of the VDI Guideline 3945 Part 3 (September 2000 version) and under consideration of other Guidelines quoted further below.

When using a time series calculation the dispersion model will furnish the concentration of a substance (as mass/volume) and the deposition (as mass/(surface · time)) for each hour of the year for the given model parcels. When using a frequency distribution according to chapter 12 in this Annex the dispersion model will furnish the relevant annual mean values.

The results of a calculation for a raster of model parcels shall serve to select the evaluation parcels pursuant to 4.6.2.5.

The results at the evaluation parcels represent the additional load and shall serve, together with the time series of the existing load values measured, to determine the total load.

2 Determination of Emissions

Emission sources shall be determined as such points where air pollutants are let out of the facility into the atmosphere. The release conditions prevailing in the event of emissions being disposed of shall be taken account of.

The emission parameters of the emission source (emission mass flow, waste gas temperature, waste gas volume flow) shall be indicated as hourly mean values. If the emission parameters vary in time, e.g. batch operation, they are to be indicated as time series. If such a time series is not available or cannot be used, the most

unfavourable conditions for clean air maintenance during due operation shall be assumed. If the emission rate is dependent on the wind velocity (wind-induced sources), this shall be taken account of correspondingly.

3 Dispersion Calculation for Gases

As to gases for which no immission values have been established for deposition, the dispersion calculation shall be carried out without taking account of the deposition. For ammonia and gaseous mercury the deposition velocity values v_d as stipulated in Table 12 shall be used:

Table 12: Deposition Velocity for Gases

Substance	v_d in m/s
Ammonia	0.010
Mercury	0.005

The conversion times indicated in VDI Guideline 3782 Part 1 (December 2001 version) shall be used to calculate the conversion of NO to NO₂.

4 Dispersion Calculation for Dusts

The dispersion calculation for dusts shall take account of dry deposition and sedimentation. The calculation shall be carried out for the following classes of particle size distribution, indicated as aerodynamic diameter d_a , of the emission mass flow, at the same time using the respective given deposition velocity values v_d and sedimentation velocity v_s :

Table 13: Deposition and Sedimentation Velocity for Dusts

Class	d_a in μm	v_d in m/s	v_s in m/s
1	less than 2.5	0.001	0.00
2	2.5 to 10	0.01	0.00
3	10 to 50	0.05	0.04
4	more than 50	0.20	0.15

The dispersion calculation for one particle size class shall be carried out using the emission mass flow of the relevant particle size class. To calculate the deposition of the dust in total the deposition values of the particle size classes shall be added up. The individual measurements of the concentration for PM-10 (aerodynamic diameter less than 10 μm) are made up of the sum of the individual measurements of the concentration of the particle size classes 1 and 2.

In cases where the particle size distribution is not known, PM-10 shall be considered as Class 2 dust. For dusts having an aerodynamic diameter larger than 10 μm the value 0.07 m/s shall be used for v_d and 0.06 m/s for v_s .

5 Soil Roughness

The soil roughness of the area shall be described by a mean roughness length z_0 . Such soil roughness shall be determined according to Table 14 on the basis of the land cover classes of the CORINE Land Cover Inventory * (the indicated numbers correspond to the CORINE land cover nomenclature):

* Data on ground cover in the Federal Republic of Germany (“*Daten zur Bodenbedeckung der Bundesrepublik Deutschland*”) provided by the Federal Statistical Office, Wiesbaden

Table 14: Mean Roughness Length Subject to the Land Cover Classes Indicated in the CORINE Land Cover Inventory

z_0 in m	CORINE Classes
0.01	Beaches, dunes and sand plains (331); Water bodies (512)
0.02	Dumpsites (132); Pastures (231); Natural Grassland (321); Sparsely vegetated areas (333); Salt marshes (421); Intertidal flats (423); Water courses (511); Estuaries (522)
0.05	Mineral extraction sites (131); Sport and leisure facilities (142); Non irrigated arable land (211); Glaciers and perpetual snow (335); Coastal lagoons (521)
0.10	Airports (124); Inland marshes (411); Peat pogs (412); Sea and ocean (523)
0.20	Road and rail networks and associated land (122); Green urban areas (141); Vineyards (221); Complex cultivation patterns (242); Land principally occupied by agriculture with significant areas of natural vegetation (243); Moors and heathland (322); Bare rock (332)
0.50	Port areas (123); Fruit tree and berry plantations (222); Transitional woodland scrub; (324)
1.00	Discontinuous urban fabric (112); Industrial or commercial units (121); construction sites (133); coniferous forest (312)
1.50	Broad-leaved forest (311); Mixed forest (313)
2.00	Continuous urban fabric (111)

The roughness length shall be determined for an area that is located within a circle around the stack, drawn by a radius equal to 10 times the actual stack height. If such area is composed of units having different soil roughness, a mean roughness length shall be determined by calculating the arithmetic mean by weighting the respective proportion of the overall area and subsequently be rounded to the next higher value in the table. It shall be examined whether the use of land has changed considerably, since the inventory was drawn up, or whether it can be expected that the immission projection will be significantly different.

If the soil roughness varies strongly within the area under consideration, it shall be examined how the roughness length value effects the immission values calculated.

6 Effective Emission Height

The effective emission height shall be determined pursuant to VDI Guideline 3782 Part 3 (June 1985 version). The emitted heat flow M in MW shall be calculated using the following formula:

$$M = 1.36 \cdot 10^{-3} \cdot R' \cdot (T - 283.15 \text{ K}) \quad (1)$$

M being the heat flow in MW, R' the volume flow of the waste gas (f) in normal condition in m^3/s and T the waste gas temperature in K.

If waste gases are disposed of via cooling towers, VDI Guideline 3784 Part 2 (March 1990 version) shall be applied accordingly.

7 Calculation Area and Model Parcels

The calculation area applied to a single emission source shall be the area which is perfectly located within a circle around the centre of emission drawn by a radius equal to 50 times the actual stack height. If several sources contribute to the additional load, the calculation area shall be composed of the total calculation areas of the individual sources. In cases where the terrain shows a special nature it may be necessary to select a larger calculation area.

The raster for calculating concentration and deposition shall be selected in such a way, that it will be possible to determine location and amount of the maximum immission values in a sufficiently reliable way. As a rule this is the case when the horizontal mesh does not exceed the stack height. If sources are located in a distance that exceeds a radius of 10 times the stack height, it is possible to select a proportionally larger horizontal mesh.

The concentration at the model parcels shall be calculated as a mean value using a vertical interval from the ground up to 3 m height above ground and shall thus be representative for a model parcel height of 1.5 m above ground. The mean values

thus calculated for a volume or a surface of the calculation grid shall be considered as point values for the model parcels contained therein.

8 Meteorological Data

8.1 General

Meteorological data shall be indicated as hourly mean values, with the mean wind velocity to be determined by a vector. The values used should be characteristic for the location of the facility. If no measurements are available at the location of the facility, data shall be used which come from a suitable station of the German Meteorological Services (*Deutscher Wetterdienst*) or from another accordingly equipped station. It shall be examined whether these data can be transferred to the location of the facility; such examination can be carried out e.g. by comparing the data to data determined in a location study. Measurement gaps that do not exceed more than 2 hourly values may be bridged by interpolation. Data availability shall be at least 90 per cent of the hours per year.

The meteorological boundary-layer profiles required for the particle model shall be determined pursuant to VDI Guideline 3783 Part 8.* In this context, the following values will be required:

* The profiles indicated in the following publications shall be used until VDI Guideline 3783 Part 8 will have been introduced: L. Janicke, U. Janicke: “*Vorschlag eines meteorologischen Grenzschichtmodells für Lagrangesche Ausbreitungsmodelle*“. *Berichte zur Umweltphysik 2*, Ingenieurbüro Janicke, ISSN 1439-8222, September 2000 (“Proposal for a meteorological boundary-layer model for Lagrangian dispersion models“).

Table 15: Values for Meteorological Boundary-layer Profiles

r_a	Wind direction in anemometer height h_a
u_a	Wind velocity in anemometer height h_a
L_M	Monin–Obukhov Length
h_m	Boundary layer height
Z_0	Roughness length
D_0	Displacement height

8.2 Wind Direction

The wind direction shall be the direction from which wind blows and shall be indicated in anemometer height as an angle exactly in degree clockwise against northerly direction. If the meteorological time series used for calculating the dispersion only contains rounded values for wind direction (sector data), an equally distributed random wind direction of the respective sector shall be used for calculating the dispersion.

For circulating winds an equally distributed random wind direction shall be selected from the sector 1° to 360° . For intervals with low winds up to duration of 2 hours the wind direction shall be determined by linear interpolation between the last value prior to the start of the low wind and the first value after the end of the low wind. For intervals longer than two hours the wind direction shall be selected randomly according to the wind direction distribution for wind velocities up to 1.2 m/s.

The rotation D of the wind direction r in the boundary layer shall be taken into consideration as a function of the height z above ground according to the formulas 2 and 3:

$$r(z) = r_a + D(z) - D(h_a) \quad (2)$$

$$D(z) = 1.23 D_h [1 - \exp(-1.75 z/h_m)] \quad (3)$$

The value for D_h shall be derived as function of the Monin–Obukhov Length L_M (chapter 8.4 of this Annex) and the boundary layer height h_m (chapter 8.5 of this Annex) of Table 16:

Table 16: Determination of D_h

D_h in degree	Stability
0	$h_m/L_M < -10$
$45 + 4.5 h_m/L_M$	$-10 \leq h_m/L_M < 0$
45	$L_M > 0$

For heights above the boundary layer height the wind direction in the boundary layer height shall be used.

8.3 Wind Velocity

The wind velocity in anemometer height shall be indicated in m/s, including the first digit to the right of the decimal point. If the wind velocity is indicated in steps larger than 0.1 m/s in the meteorological time series, an equally distributed random velocity shall be selected from the steps selection for calculating the dispersion, if necessary.

In the event of low wind and of wind velocities below 0.8 m/s in anemometer height an arithmetic value of 0.7 m/s shall be used for the wind velocity in anemometer height.

8.4 Monin–Obukhov Length

The stability of atmospheric layers shall be determined by indicating the Monin–Obukhov Length L_M . If the value of the Monin–Obukhov Length is not known, a dispersion class shall be determined according to Klug/Manier pursuant to VDI Guideline 3782 Part 1 (December 2001 version) and the Monin–Obukhov Length shall be determined in metre pursuant to Table 17:

Table 17: Determining the Monin–Obukhov Length L_M

Dispersion Class according to Klug/Manier	Roughness Length z_0 in m								
	0.01	0.02	0.05	0.10	0.20	0.50	1.00	1.50	2.00
I (very stable)	7	9	13	17	24	40	65	90	118
II (stable)	25	31	44	60	83	139	223	310	406
III/1 (indifferent)	99999	99999	99999	99999	99999	99999	99999	99999	99999
III/2 (indifferent)	-25	-32	-45	-60	-81	-130	-196	-260	-326
IV (unstable)	-10	-13	-19	-25	-34	-55	-83	-110	-137
V (very unstable)	-4	-5	-7	-10	-14	-22	-34	-45	-56

The value of the Monin–Obukhov Length between two dispersion classes is the harmonic mean value of the values in the neighbouring dispersion classes, e.g. the reciprocal value shall be determined by calculating the arithmetic mean of the reciprocal values. Such limits between classes shall be used if reference is explicitly made to dispersion classes according to Klug/Manier.

8.5 Boundary Layer Height

If the boundary layer height is unknown, such boundary layer height shall be determined using the following method. As to values of the Monin–Obukhov Length from the area of the dispersion classes IV and V, a boundary layer height h_m of 1,100 m shall be used for calculation. Otherwise a value of 800 m shall be used for calculation, unless Formula 4 results in a lower value:

$$h_m = \begin{cases} \alpha \frac{u_*}{f_c} & \text{for } L_M \geq \frac{u_*}{f_c} \\ \alpha \frac{u_*}{f_c} \left(\frac{f_c L_M}{u_*} \right)^{1/2} & \text{for } 0 < L_M < \frac{u_*}{f_c} \end{cases} \quad (4)$$

α equals 0.3 and the Coriolis parameter f_c equals 10^{-4} s^{-1} . The friction velocity u_* shall be determined on the basis of the wind profile of the meteorological boundary layer model.

8.6 Displacement Height

The displacement height d_0 indicates, how far the theoretical meteorological profiles shall be shifted in the vertical due to vegetation or developed areas. The displacement height shall be assumed 6 times the roughness length z_0 (chapter 5 of this Annex), for densely developed areas as 0.8 times the mean height of developed areas. Below the height of $6 z_0 + d_0$ the wind velocity shall be interpolated in a linear way up to a value of zero if z equals zero; all other meteorological parameters shall be kept constant.

9 Taking into Consideration Statistical Uncertainties

The immission values calculated by using the method described herein show statistical uncertainties due to the statistical nature of the method indicated in VDI Guideline 3945 Part 3 (September 2000 version). It shall be observed that the model-related statistical uncertainty, which is calculated as a statistical dispersion of the calculated values, may not exceed 3 per cent of the yearly immission value as to the yearly immission value and 30 per cent of the daily immission value as to the daily immission value. The statistical uncertainty may be reduced by increasing the particle number.

If the evaluation parcels are located at points of maximum additional load, it shall not be necessary to take the statistical uncertainty separately into consideration. Otherwise the yearly, daily and hourly immission values calculated shall be increased by the respective statistical uncertainty. In this context the relative

statistical uncertainty of the hourly immission value shall equal the relative statistical uncertainty of the daily immission value.

10 Taking into Consideration the Development of Areas

Impacts of area development on the immission in the calculation area shall be taken into consideration. If the stack height is 1.2 times higher than the height of the buildings or if buildings, for which this requirement is not met, are located in a distance of more than 6 times of their respective height from the emission source, as a rule the following can be applied:

- a) If the building height of stack is higher than 1.7 time of the height of the building, it suffices to take into consideration the development by roughness length (chapter 5 of this Annex) and displacement height (chapter 8.6 of this Annex).
- b) If the building height of stack is lower than 1.7 time of the height of the building and if a free flow can be ensured, the impact can be taken into consideration by using a diagnostic wind field model for airflow around buildings. Until a suitable VDI Guideline has been introduced, such wind field models shall be used whose suitability has been proved to the competent upper *Land* authority.

All buildings that are located in a distance from the emission source of less than 6 times of the stack height shall be significant for evaluating the building heights pursuant to paras. a) or b).

11 Taking into Consideration the Unevenness of Terrain

As a rule uneven terrain shall only be taken into consideration, if within the calculation areas differences in level occur in relation to the emission location of more than 0.7 times of the building height of stack and gradients of more than 1:20. In this context the gradient shall be determined on the basis of the difference in level over a certain distance that corresponds to twice the building height of stack.

As a rule uneven terrain can be taken into consideration using a meso-scale diagnostic wind field model if the gradient of the terrain does not exceed the value of 1:5 and if considerable impact of local wind systems or other meteorological particularities can be ruled out.

Until a suitable VDI Guideline has been introduced, such wind field model be used whose suitability has been proved to the competent upper *Land* authority.

12 Using a Frequency Distribution for the Hourly Dispersion Situation

It is possible to use a frequency distribution for the hourly dispersion situations, if the hourly mean value of mean wind velocities is lower than 1 m/s at the facility's location occur for less than 20 per cent of the yearly hours. A dispersion situation shall be determined by wind velocity class, wind direction sector and dispersion class.

The wind velocities u_a in anemometer height h_a shall be classified as follows:

Table 18: Classification of Wind Velocities

Wind Velocity Class	Wind Velocity u_a in ms^{-1}	Operand u_R in ms^{-1}
1	< 1.4	1
2	1.4 to 1.8	1.5
3	1.9 to 2.3	2
4	2.4 to 3.8	3
5	3.9 to 5.4	4.5
6	5.5 to 6.9	6
7	7.0 to 8.4	7.5
8	8.5 to 10.0	9
9	> 10.0	12

The wind direction shall be classified in 36 sectors of 10° respectively. The first sector shall comprise the wind directions 6° to 15°, the other sectors follow clockwise. As to the wind velocity class 1 the same distribution to the wind direction sectors shall prevail as for velocity class 2.

Cases of circulating winds shall be allocated to the corresponding dispersion and wind velocity classes; the distribution to the wind direction sectors shall be carried out according to the wind direction distribution in the respective wind velocity class.

The dispersion class shall be determined according to VDI Guideline 3782 Part 1 Annex A (December 2001 version).

For each dispersion situation quoted in the frequency distribution as having a probability of larger than zero a dispersion calculation not related to time shall be carried out according to the method indicated for the time series. In this context the arithmetic value u_R shall be used as wind velocity u_a . The dispersion calculation for a wind direction sector of 10° shall be carried out in the form of calculations for 5 wind directions, with a distance of 2° respectively by calculating the arithmetic mean of the results. For the first sector these are the wind directions 6°, 8°, 10°, 12°, 14° and for the following sectors correspondingly.

The yearly mean value calculated for concentration or deposition shall be the mean value averaged by the probabilities of the concentration and/or deposition values to be calculated for the individual dispersion situations.

Annex 4 Organic Substances of Class I pursuant to 5.2.5

Table 19: Organic Substances of Class I pursuant to 5.2.5

Substance	CAS-Number
1,1,2,2-Tetrabromoethane	79-27-6
1,2,3-Propanetriol, trinitrate	55-63-0
1,2,4-Benzenetricarboxylic acid	528-44-9
1,2-Benzenediol (Pyrocatechin)	120-80-9
1,2-Ethanediamine, N-(2-aminoethyl)-	111-40-0
1,2-Ethandiol, dinitrate	628-96-6
1,2-Propanediol, dinitrate	6423-43-4
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87-68-3
1,3-Propanediamine	105-83-9
1,4-Dioxane	123-91-1
1,5-Naphthalenediamine	2243-62-1
1,6-Hexamethylene diisocyanate	822-06-0
1,6-Hexanediamine	124-09-4
1-Butanamine,	109-73-9
1-Butanethiol	109-79-5
1-Naphthalenamine	134-32-7
1-Propene, 3-chloro-2-methyl-	563-47-3
2,4,7-Trinitrofluorenone	129-79-3
2,5-Furandione	108-31-6
2-Butenal (Crotonaldehyde)	123-73-9
2-Butyne-1,4-diol	110-65-6
2-Chloro-1,3-butadiene (Chloroprene)	126-99-8
2-Cyclohexen-1-one, 3,5,5-trimethyl-	78-59-1
2-Ethoxyethyl acetate	111-15-9
2-Furancarboxaldehyde (Furfural)	98-01-1
2-Furanmethanamine	617-89-0
2-Hexanone	591-78-6
2-Imidazolidinethione	96-45-7
2-Methyl-m-phenylenediamine	823-40-5

Substance	CAS-Number
2-Naphthyl phenyl amine	135-88-6
2-Nitro-p-phenylenediamine,2	5307-14-2
2-Propanamine, 2-methyl-	75-64-9
2-Propenal (Acrolein, Acrylaldehyde)	107-02-8
2-Propenoic acid, butyl ester	141-32-2
2-Propenoic acid, ethyl ester (Ethyl acrylate)	140-88-5
2-Propenoic acid, methyl ester	96-33-3
2-Propyn-1-ol	107-19-7
3,3'-Diamino-benzidine	91-95-2
4,4'-Methylenebis(2-methylcyclohexylamine)	6864-37-5
4-Amino-2-nitrophenol	119-34-6
4-Methyl-3-oxa-1-pentanol	109-59-1
4-Tert-butyltoluene	98-51-1
Acetaldehyde	75-07-0
Acetamide	60-35-5
Acetamide, N-phenyl-	103-84-4
Acetic acid anhydride	108-24-7
Acetic acid ethenyl ester	108-05-4
Acetic acid, chloro-	79-11-8
Acetic acid, chloro-, methyl ester	96-34-4
Acetic acid, methoxy-	625-45-6
Acetic acid, trichloro-	76-03-9
Acrylic acid	79-10-7
Alkyl-lead compounds	
Aniline	62-53-3
Aniline, N-methyl-	100-61-8
Benzenamine, 2,4-dimethyl-	95-68-1
Benzenamine, 2-methyl-5-nitro-	99-55-8
Benzenamine, 4-methoxy-	104-94-9
Benzenamine, 5-chloro-2-methyl-	95-79-4
Benzenamine, N,N-dimethyl-	121-69-7
Benzene, (dichloromethyl)-	98-87-3
Benzene, 1,1'-methylenebis[4-isocyanato-	101-68-8

Substance	CAS-Number
Benzene, 1,2,4,5-tetrachloro-	95-94-3
Benzene, 1-chloro-2-nitro	88-73-3
Benzene, 1-chloro-4-nitro-	100-00-5
Benzene, 1-methyl-3-nitro-	99-08-1
Benzene, 1-methyl-4-nitro-	99-99-0
Benzene, 2,4-dichloro-1-methyl-	95-73-8
Benzene, nitro-	98-95-3
Benzenesulfonyl chloride	98-09-9
Benzoyl chloride	98-88-4
Benzoyl peroxide	94-36-0
Biphenyl (Diphenyl)	92-52-4
Bis(2-ethylhexyl)phthalate	117-81-7
Butylamine, iso-	78-81-9
Camphor	76-22-2
Caprolactam	105-60-2
Carbamic chloride, diethyl-	88-10-8
Carbon tetrachloride	56-23-5
Carbonyl sulfide	463-58-1
Chloroacetic acid isopropyl ester	105-48-6
Chloroform (Trichloromethane)	67-66-3
Chloromethane	74-87-3
Chloropicrin (Trichloronitromethane)	76-06-2
Diaminoethane (Ethylenediamine)	107-15-3
Dichlorophenols	
Diglycidyl ether	2238-07-5
Diisocyanatoluol,2,6-	91-08-7
Di-n-butyltindichloride	683-18-1
Dinitronaphthalene (all isomers)	27478-34-8
Diphenyl ether	101-84-8
Diphenylamine	122-39-4
Diphenylmethane-2,4'-Diisocyanate	5873-54-1
Ethanamine, N-ethyl-	109-89-7
Ethane, 1,1,2,2-tetrachloro-	79-34-5

Substance	CAS-Number
Ethane, 1,1,2-trichloro-	79-00-5
Ethane, 1,1-dichloro-1-nitro-	594-72-9
Ethane, hexachloro-	67-72-1
Ethane, pentachloro-	76-01-7
Ethanedial (Glyoxal)	107-22-2
Ethanethiol (Ethyl mercaptan)	75-08-1
Ethanol, 2-chloro-	107-07-3
Ethanolamine	141-43-5
Ethene, 1,1-dichloro-	75-35-4
Ethene, 1,1-difluoro- (Genetron 1132a)	75-38-7
Ethyl chloride	75-00-3
Ethyl chloroacetate	105-39-5
Ethylamine	75-04-7
Ethylene	74-85-1
Formaldehyde	50-00-0
Formamide	75-12-7
Formic acid	64-18-6
Glutaral	111-30-8
Hexahydrophthalic Anhydride	85-42-7
Hexanoic acid, 2-ethyl-	149-57-5
Hydrazine, phenyl-	100-63-0
Hydroquinone (1,4-Benzenediol)	123-31-9
Isophorone diisocyanate	4098-71-9
Ketene	463-51-4
Kresole	1319-77-3
Lead acetate (monobasic)	1335-32-6
Mecrylate	137-05-3
Methanamine, N-methyl-	124-40-3
Methane, isocyanato-	624-83-9
Methane, tribromo-	75-25-2
Methanethiol (Methyl mercaptan)	74-93-1
Methyl bromide	74-83-9
Methyl chloride	107-05-1

Substance	CAS-Number
Methyl iodide	74-88-4
Methylamine	74-89-5
Methylene chloride	75-09-2
m-Nitroaniline	99-09-2
Montanic acid waxes, Zn-salts	73138-49-5
Morpholine	110-91-8
N,N,N',N'',N'''- Pentamethyldiethylenetriamine	3030-47-5
Naphthalene, 1,5-diisocyanato-	3173-72-6
Nitrocresols	
Nitrophenols	
Nitropyrenes	5522-43-0
Nitrotoluene (all isomers)	1321-12-6
N-Methyl-N,2,4,6-tetranitroaniline (tetryl)	479-45-8
N-Vinylpyrrolidone	88-12-0
o-Nitroaniline	88-74-4
Oxalic acid	144-62-7
p-Benzoquinone	106-51-4
Pentachloronaphthalene	1321-64-8
Phenol	108-95-2
Phenol, 2,4,5-trichloro-	95-95-4
Phenol, p-tert-butyl	98-54-4
Phenyl-1-(p-tolyl)-3-dimethylaminopropane,1-	5632-44-0
Phthalic anhydride	85-44-9
Phthalonitrile	91-15-6
Piperazine	110-85-0
p-Nitroaniline	100-01-6
Propane, 1,2-dichloro-	78-87-5
Propane, 1-bromo-	106-94-5
Propanoic acid, 2,2-dichloro-	75-99-0
p-Toluidine	106-49-0
Pyridine	110-86-1
Sodium chloroacetate, Sodium salts	3926-62-3
Sodium Trichloroacetate	650-51-1

Substance	CAS-Number
Tetrachloroethylene	127-18-4
Thioalcohols	
Thioethers	
Thiourea	62-56-6
Toluene-2,6-diisocyanate-	584-84-9
Trichloroaphtalene	1321-65-9
Trichlorobenzenes (all isomers)	12002-48-1
Trichloroethylene	79-01-6
Trichlorophenols	
Tricresyl phosphate (ooo,oom,oop,omm,omp,opp)	78-30-8
Triethylamine	121-44-8
Trimellitic anhydride	552-30-7
Tri-n-butylphosphate	126-73-8
Trinitrotoluene (TNT)	118-96-7
Xylenols (except for 2,4-Xylenol)	1300-71-6

Annex 5 Equivalence Factors for Dioxins and Furans

The concentrations of the following dioxins and furans determined in the waste gas shall be multiplied and totalled by the given equivalence factors in order to receive the totals required under 5.2.7.2 or the relevant requirements pursuant to 5.3 or 5.4.

Table 20: Equivalence Factors for Dioxins and Furans

Substance	Equivalence Factors
2,3,7,8 – Tetrachlorodibenzodioxin (TCDD)	1
1,2,3,7,8 – Pentachlorodibenzodioxin (PeCDD)	0.5
1,2,3,4,7,8 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,7,8,9 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,6,7,8 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,4,6,7,8 – Heptachlorodibenzodioxin (HpCDD)	0.01
Octachlorodibenzodioxin (OCDD)	0.001
2,3,7,8 – Tetrachlorodibenzofuran (TCDF)	0.1
2,3,4,7,8 – Pentachlorodibenzofuran (PeCDF)	0.5
1,2,3,7,8 – Pentachlorodibenzofuran (PeCDF)	0.05
1,2,3,4,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,7,8,9 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,6,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
2,3,4,6,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,4,6,7,8 – Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8,9 – Heptachlorodibenzofuran (HpCDF)	0.01
Octachlorodibenzofuran (OCDF)	0.001

Annex 6 VDI Guidelines and Standards in Relation to Emission Measuring

Table 21: VDI Guidelines and Standards in Relation to Emission Measuring

Test Object	Method		VDI Guideline		DIN/EN Standards	
	Continuous	Intermittent	Guideline/Standard	Version	Guideline/Standard	Version
General Guidelines						
Calibration			3950 P. 1	Jul. 94		
Measuring plans			2448 P. 1	Apr. 92		
Emission measuring			4200	Dec. 00		
Requirements for testing bodies			4220	Sep. 99		
Dust						
Dust (general)		X	2066 P. 1	Oct. 75		
Dust	X		2066 P. 4	Jan. 89		
	X		2066 P. 6	Jan. 89		
Dust (lower concentrations)		X	2066 P. 7	Aug. 93	EN 13284-1	Nov. 01
Dust (higher concentrations)		X	2066 P. 2	Aug. 93		
Fractionating dust measuring		X	2066 P. 5	Nov. 94		
Soot level		X	2066 P. 8	Sep. 95		
Dust Components						
Heavy metals (sampling)		X	3868 P. 1	Dec. 94		
Heavy metals (analysis)		X	2268 P. 1	Apr. 87		
		X	2268 P. 2	Feb. 90		
		X	2268 P. 3	Dec. 88		
		X	2268 P. 4	May 90		
Mercury		X			13211	Jun. 01
Asbestos		X	3861 P. 2	Sep. 96		

Test Object	Method		VDI Guideline		DIN/EN Standards	
	Continuous	Intermittent	Guideline/Standard	Version	Guideline/Standard	Version
Sulphur Compounds						
Sulphur dioxide		X	2462 P. 8	Mar. 85		
Sulphur trioxide		X	2462 P. 7	Mar. 85		
Hydrogen sulphide		X	3486 P. 1	Apr. 79		
		X	3486 P. 2	Apr. 79		
Carbon disulphide		X	3487 P. 1	Nov. 78		
Nitrogen Compounds						
Nitrogen monoxide/-dioxide		X	2456 P. 8	Jan. 86		
Basic nitrogen compounds		X	3496 P. 1	Apr. 82		
Carbon Monoxide						
		X	2459 P. 1	Dec. 00		
		X	2459 P. 7	Feb. 94		
Chlorine Compounds						
Hydrogen chloride		X			1911-1 1911-2 1911-3	Jul. 98
Chlorine		X	3488 P. 1	Dec. 79		
		X	3488 P. 2	Nov. 80		
Fluoride Compounds						
Hydrogen fluoride		X	2470 P. 1	Oct. 75		
Organic Substances						
Hydrocarbons (general)			3481 P. 6	Dec. 94		
Hydrocarbons		X	3481 P. 2	Sep. 98		
Hydrocarbons (FID)	X		3481 P. 1	Aug. 75	12619	Sept. 99
	X		3481 P. 3	Oct. 95		
Hydrocarbons (IR)			2460 P. 1	Jul. 96		
		X	2460 P. 2	Jul. 74		
		X	2460 P. 3	Jun. 81		

Test Object	Method		VDI Guideline		DIN/EN Standards	
	Continuous	Inter-mittent	Guideline/Standard	Version	Guideline/Standard	Version
Determination of organic compounds by gas chromatography		X	2457 P. 1	Nov. 97	13649 (prEN)	
		X	2457 P. 2	Dec. 96		
		X	2457 P. 3	Dec. 96		
		X	2457 P. 4	Dec. 00		
		X	2457 P. 6	Jun. 81		
		X	2457 P. 7	Jun. 81		
Aliphatic aldehydes (C ₁ to C ₃)		X	3862 P. 1	Dec. 90		
		X	3862 P. 2	Dec. 00		
		X	3862 P. 3	Dec. 00		
		X	3862 P. 4	May 01		
Acrylonitrile		X	3863 P. 1	Apr. 87		
		X	3863 P. 2	Febr. 91		
PAH (general)		X	3873 P. 1	Nov. 92		
PAH in relation to facilities in carbon industry		X	3467	Mar. 98		
Vinyl chloride		X	3493 P. 1	Nov. 82		
Dioxins and furans		X			1948-1 1948-2 1948-3	May 97
Odorous substances		X	3881 P. 1	May 86		
		X	3881 P. 2	Jun. 87		
		X	3881 P. 3	Nov. 86		

Annex 7 S-Values

Table 22: S-Values

Substance	S-Value
Suspended particulate matter	0.08
Lead and its inorganic compounds, indicated as Pb	0.0025
Cadmium and its inorganic compounds, indicated as Cd	0.00013
Mercury and its inorganic compounds, indicated as Hg	0.00013
Chlorine	0.09
Inorganic gaseous chlorine compounds, indicated as hydrogen chlorine	0.1
Fluoride and its inorganic gaseous compounds, indicated as hydrogen fluoride	0.0018
Carbon monoxide	7.5
Sulphur oxides (sulphur dioxide and sulphur trioxide), indicated as sulphur dioxide	0.14
Hydrogen sulphide	0.003
Nitrogen oxides, indicated as nitrogen dioxides	0.1
For substances pursuant to 5.2.2	
• Class I	0.005
• Class II	0.05
• Class III	0.1
For substances pursuant to 5.2.5	
• Carbon	0.1
• Class I	0.05
• Class II	0.1
For substances pursuant to 5.2.7	
• 5.2.7.1.1 Class I	0.00005
• 5.2.7.1.1 Class II	0.0005
• 5.2.7.1.1 Class III	0.005