Sixth General Administrative Provision to the Federal Immission Control Act (Technical Instructions on Noise Abatement - TA Lärm)

of 26 August 1998 (Joint Ministerial Gazette (GMBl) No. 26/1998 p. 503)

Pursuant to Section 48 of the Federal Immission Control Act (BImSchG) of 15 March 1974 (Federal Law Gazette BGBl. I p.721) as amended in the public ation of 14 May 1990 (Federal Law Gazette BGBl. I p.880), the following General Administrative Provision is issued after hearing the parties concerned.

Contents

1. Scope

These Technical Instructions serve the protection of the general public and the neighbourhood against harmful environmental effects caused by noise as well as precautions against harmful environmental effects caused by noise.

They apply to installations, which, as installations subject to licensing or installations not subject to licensing, are subject to the requirements of Part Two of the Federal Immission Control Act (BImSchG), with the exception of the following installations:

a) Sports facilities that are not subject to the Ordinance on Protection against Noise from Sports Facilities (18th BImSchV),

b) other leisure facilities that are not subject to licensing as well open-air restaurants,

c) agricultural installations that are not subject to licensing,

d) shooting ranges at which weapons upwards of 20 mm calibre are fired,

e) open-cast mines and installations required for operation of an open-cast mine,

f) construction sites,

g) seaport transshipment facilities and

h) facilities serving social purposes.

The provisions of these Technical Instructions are to be observed

a) for installations subject to licensing in the case of

   aa) examination of applications for the issuing of a licence for the construction and operation of an installation (Article 6 (1) Federal Immission Control Act, hereafter: BImSchG) as well as for changing the location, nature or operation of an installation (Article 16 (1) in conjunction with (4) BImSchG),

   bb) examination of applications for the issuing of a partial licence or a provisional decision (Articles 8 and 9 BImSchG),

   cc) the decision concerning subsequent orders (Article 17 BImSchG) and

   dd) the decision concerning the order of initial and recurrent measurements (Article 28 BImSchG);

b) for installations not subject to licensing in the case of

   aa) examination of compliance with Article 22 BImSchG within the scope of examination of applications for permits under public law pursuant to other regulations, in particular applications in building permit proceedings,

   bb) decisions concerning orders and prohibitions in individual cases (Articles 24 and 25 BImSchG);

c) for installations subject to licensing and installations not subject to licensing in the case of decisions concerning orders for determination of the type and extent of emissions emanating from an installation as well as of immissions within the area of influence of the installation (Article 26 BImSchG).

If, on account of a statutory ordinance pursuant to Article 23 (1a) BImSchG, proceedings are to be conducted in respect of an application for the issuing of a licence pursuant to Article 4 (1) sentence 1 in conjunction with Article 6 BImSchG for an installation not subject to licensing, the provisions of these Technical Instructions for installations subject to licensing are to be applied.

2. Definitions

2.1 Harmful effects on the environment due to noise

Harmful effects on the environment, in terms of these Technical Instructions, are noise immissions, which, because of their type, extent or duration, are likely to cause risks, considerable disadvantages or considerable annoyance to the general public or the neighbourhood.

2.2 Area of influence of an installation

The area of influence of an installation comprises the areas in which noise emanating from the installation

a) gives rise to a rating level that is less than 10 dB(A) below the relevant binding immission values for a particular area, or

b) where noise peaks equal binding immission values.

2.3 Decisive Immission Point

The decisive immission point is the point in the area of influence of the installation, determined pursuant to Number A.1.3 of the Annex, at which binding immission values are most likely to be exceeded. It is the point in respect of

which noise assessment is conducted according to these Technical Instructions.

If in the area of influence of the installation it is to be expected, due to existing exposure, that binding immission values as defined in Number 6 will be exceeded at another immission point as a result of the additional exposure, the point at which total exposure most exceeds the binding immission value, as defined in Number 6, is to be specified as an additional decisive immission point.

2.4 Existing, additional and total exposure; extraneous noise

Existing exposure is the exposure of an immission point to noise immissions from all installations for which these Technical Instructions apply, excluding immissions emanating from the installation under assessment.

Additional exposure is the immission that is anticipated (with planned installations) or actually caused (by existing installations) by the installation under assessment at an immission point.

Total exposure, in terms of these Technical Instructions, is the exposure at an immission point caused by all installations for which these Technical Instructions apply.

Extraneous noises are all noises that are not caused by the installation under assessment.

2.5 Best available technology for noise reduction

Best available technology for noise reduction, in terms of these Technical Instructions, is best available technology related to noise reduction pursuant to Article 3 (6) BImSchG. It covers not only measures at the noise source but also measures along the propagation path, provided there is a close spatial and operational connection between such measures and the noise source. Its application serves the purpose of reducing noise immissions.

2.6 Sound pressure level $L_{AF(t)}$

The sound pressure level $L_{AF(t)}$ is the momentary sound pressure level formed with frequency assessment A and time assessment F pursuant to DIN EN 60651 of May 1994. It is the main parameter for determination of noise level pursuant to these Technical Instructions.

2.7 Equivalent continuous sound pressure level L_{eq}

Equivalent continuous sound pressure level L_{eq} is the mean temporal value of sound pressure level pursuant to DIN 45641 of June 1990 formed from the temporal progression of sound pressure level or with the use of sound level meters pursuant to DIN EN 60804, of Mai 1994.

2.8 Short-term noise peaks

Short-term noise peaks, in terms of these Technical Instructions, are maximum values of sound pressure level brought about by single events, which occur during the intended operating mode of an installation. Short-term noise peaks are defined by the maximum level L_{AFmax} of sound pressure level $L_{AF(t)}$.

2.9 Cycle time maximum sound pressure level over a given period of time $L_{AFT}(t)$, cycle time maximum equivalent continuous sound pressure level L_{AFTeq}

Cycle time maximum sound pressure level over a given period of time $L_{AFT}(t)$ is the maximum sound pressure value during the associated cycle time T; the cycle time is 5 seconds.

Cycle time maximum equivalent continuous sound pressure level L_{AFTeq} is the equivalent continuous sound pressure level formed from the cycle time maximum sound pressure level pursuant to DIN 45641, Edition June 1990. It is used for assessment of impulse-based noise. For this purpose, the difference $L_{AFTeq} - L_{eq}$ is defined as supplement for impulsiveness.

2.10 Rating level L_r

The rating level L_r characterizes average noise exposure during every assessment period, and is formed from the equivalent continuous sound pressure level L_{eq} of the noise to be assessed and, as appropriate, from adjustments for tonality and informational content, impulsiveness and for times of day with increased sensitivity in accordance with the Annex. The rating level L_r is the parameter to which binding emission values as defined in Number 6 relate.

3. General Principles for Installations Subject to Licensing

3.1 Basic obligations of operators

A licence for construction and operation of an installation subject to licensing is only to be issued pursuant to Article 6 (1) No. 1 in

conjunction with Article 5 (1) No. 1 and 2 BImSchG if it is ensured that

a) noise emanating from the installation cannot cause harmful effects on the environment, and

b) precautions against harmful effects on the environment caused by noise are taken; in particular, through measures for emission limitation corresponding to best available technology for noise reduction.

3.2 Inspection of compliance with the protection obligation

3.2.1 Inspection as a general rule

Protection against harmful effects on the environment due to noise (Article 5 (1) No. 1 BImSchG) is ensured, subject to the provisions in paragraphs 2 to 5 below, if the total exposure at the decisive immission point does not exceed the binding immission value as defined in Number 6.

The licence for the installation under assessment may not be denied on the grounds

rule, remediation measures (decommissioning, removal or modification) have been carried out at existing installations of the applicant no later than three years after commissioning of the installation under assessment, which guarantee compliance with binding immission values as defined in Number 6.

The licence may not be denied on account of exceedance of binding immission values when, as a result of constantly prevailing extraneous noise, no additional harmful effects on the environment are to be assumed from the installation under assessment. This is particularly the case when neither supplements for tonality and informational content or impulsiveness, pursuant to the Annex, nor consideration of low-frequency noise, as defined in Number 7.3, are required for assessment of noise immissions of the installation, and the sound pressure level $L_{AF}(t)$ of extraneous noise during more than 95% of the operating time of the installation is higher than the equivalent continuous sound pressure level L_{eq} of the installation in the respective assessment period, as defined in Number 6.4. It has to be ensured, by way of riders to license notification or through subsequent order that the installation under assessment does not make a relevant contribution to harmful effects on the environment in the event of later reduction of extraneous noise.

Examination of the conditions of licensing generally require a forecast of noise immissions of the installation under assessment and – as far as noise from other installations arises in

of noise protection, even when the binding immission value is exceeded due to existing exposure, if, bearing in mind the purpose of the Act, the immissions caused by the installation are to be regarded as not relevant. That is generally the case, when the additional exposure emanating from the installation under assessment falls short of binding immission values, as defined in Number 6, at the decisive immission point by at least 6 dB(A).

Notwithstanding the provision in paragraph 2, the licence for the installation under assessment should also not be denied on account of the binding immission value being exceeded due to existing exposure, if it is ensured on a permanent basis that such exceedance does not amount to more than 1 dB(A). This can also be accomplished by way of an agreement concluded under public law between the installation operator and the supervisory authority.

Notwithstanding the provisions in paragraphs 2 and 3, the licence for the installation under assessment should also not be denied on account of the binding immission value being exceeded due to existing exposure, if it is ensured by means of a licence condition that, as a
the area of influence of the installation under assessment – determination of existing exposure as well as total exposure in accordance with Number A.1.2 of the Annex. Determination of existing exposure can be omitted with reference to paragraph 2, if the noise immissions of the installation under assessment fall short of binding immission values as defined in Number 6 by at least 6 dB(A) .

3.2.2 Supplementary inspection in special cases

Where particular circumstances prevail in individual cases, which are not taken into account in general inspections, yet which, due to their nature and importance can have a significant influence on the assessment of whether the installation makes a relevant contribution to the development of harmful effects on the environment, it has further to be examined whether, taking account of the circumstances of the individual case, an assessment ensues that deviates from the result of general inspection. Circumstances, which can necessitate an inspection in special cases, are, in particular:

a) Noise characteristics of different co-acting installations, as a result of which the establishment of overall sound level for determination of total exposure does not appear to be expedient.

b) Circumstances – for example, operating demands, restrictions on operating time or

particular locational ties of the installation under assessment – that can have an effect on acceptance of noise exposure.

c) Clearly foreseeable improvements in the emission or immission situation as a result of measures other than those cited in Number 3.2.1, paragraph 4.

d) Particular aspects concerning the conventionality and social reasonableness of noise immission.

3.3 Inspection of compliance with the obligation to take precautions

The extent of the obligation to take precautions against harmful effects on the environment caused by noise is determined on an individual basis under consideration of the proportionality of cost and attainable noise reduction according to the immission situation of the area of influence, taking particular account of urban land-use planning. The noise immissions of the installation must be as low as is necessary to satisfy the obligation to take precautions, according to sentence 1, and as low as is possible with best available technology for noise reduction.

4. General Principles for Inspection of Installations not Subject to Licensing

4.1 Basic obligations of operators

Installations not subject to licensing have to be constructed and operated, pursuant to Article 22 (1) No. 1 and 2 BImSchG, in such a manner that

a) harmful effects on the environment caused by noise are precluded, which are avoidable using the best available technology for noise reduction, and

b) harmful effects on the environment, which are unavoidable with the best available technology for noise reduction, are restricted to a minimum.

4.2 Simplified general inspection

With inspection under immission control law within the scope of authorization under public law of an installation not subject to licensing, the following simplified assessment procedure is to be applied:

a) Subject to the requirements in Number 4.3, it has to be ensured that noise emissions of the installation under assessment do not exceed binding immission values as defined in Number 6; where appropriate, corresponding licensing conditions are to be imposed.

b) A forecast of noise immissions of the installation under assessment in accordance with Number A.2 of the Annex is required, insofar as is to be expected that, on account of empirical values at comparable installations, protection is ensured against harmful effects on the environment caused by noise immissions of the installation under assessment. At the same time, the following aspects are to be particularly considered:

- emission-relevant construction features,
- sound power level,
- operating times,
- screening and
- distance to immission point and type of area.

c) Consideration of existing exposure is only required when, on account of specific indications, it is foreseeable that the installation under assessment, in the event of its commissioning, will make a relevant contribution, in terms of Number 3.2.1, paragraph 2, towards exceedance of binding immission values as defined in Section 6, and remedial measures at other installations as defined in Number 5, which contribute to total exposure, clearly do not come into question for reasons of fact or law.

4.3 Requirements concerning unavoidable harmful effects on the environment

Requirements as defined in Number 4.1a exist for installations not subject to licensing only to the extent that they can be complied with through measures based on best available technology for noise reduction. Unavoidable harmful effects on the environment are accordingly to be restricted to a minimum. For this purpose, the following measures come particularly into question:

- organizational measures during operations (for example, no loud work at times of day with increased sensitivity),
- restrictions on time of operation, for instance to safeguard time for recuperation in the evening or at night,
- compliance with adequate separation distance to neighbouring houses or other facilities in need of protection,

- utilization of natural or artificial barriers for noise reduction, and

- selection of sites for machinery or equipment.

Article 25 (2) BImSchG has to be observed.

5. Demands on Existing Installations

5.1 Subsequent orders for installations subject to licensing

During examination of proportionality pursuant to Article 17 BImSchG the competent authority has to select from appropriate measures those that least encumber the operator. Expected positive and negative effects for the operator of the installation, the neighbourhood and the general public as well as public interest in realization of the measure or its omission have to be ascertained and evaluated.

Here, the following factors have, in particular, to be considered:

- extent of emissions and immissions caused by the installation,

- existing extraneous noise,

- extent to which binding immissions values are exceeded by the installation under assessment,

- extent to which binding immission values are exceeded by total exposure,

- principle of mutual consideration,

- number of persons affected,

- distinctiveness of noise,

- best available technology for noise reduction,

- cost in relation to improvement in the immission situation in the area of influence of the installation,

- period of operation since initial or modification licensing of the installation,

- technical characteristics of the installation and

- available space at the site.

A subsequent order may not be made when exceedance of binding immission values as defined in Number 6 results from an increase in or initial consideration of existing exposure, the additional exposure amounts to less than 3 dB(A) and binding immission values are exceeded by not more than 5 dB(A).

5.2 Orders in individual cases of installations not subject to licensing

In the exercise of discretion within the scope of application of Article 24 BImSchG, the principles mentioned in Number 5.1, with the exception of the regulation in the third paragraph thereof, which takes account of consideration of existing exposure in licensing procedures, can be correspondingly applied with respect to differences in basic obligations according to Numbers 3.1 and 4.1.

Examination of an order in individual cases therefore comes particularly into question when

a) assessment according to Numbers 4.2 and 4.3 already reveals that the installation operator does not fulfil his basic obligations under Number 4.1, or

b) specific indications exist that avoidable noise emissions of the installation make a relevant contribution towards a harmful effect on the environment resulting from the noise of several installations.

If remedial measures come into question in the case of b), also with respect to other installation operators, Number 5.3 is to be additionally considered.

5.3 Several installations of different operators that contribute to a harmful effect on the environment

Where several installations of different operators make a relevant contribution to development of harmful effects on the environment, the authority has to decide, after due consideration, on the selection of remedial measures to be taken and on the addressees of corresponding orders in accordance with Numbers 5.1 and 5.2, taking account of the principle of proportionality.

The following aspects come into particular consideration:

a) the content of an existing noise reduction plan, or of one especially prepared to resolve the conflict situation, pursuant to Article 47a BImSchG,

b) the effectiveness of reduction measures,

c) the required cost of the respective reduction measure, the level of individual causal contributions and

d) the existence and degree of possibility culpability.

If completion of a noise reduction plan pursuant to Article 47a BImSchG is expected in the near future, which could be of decisive importance

for the decision according to paragraph 1 above, and should the type and extent of the harmful effects on the environment not require immediate remediation measures, the authority can postpone the decision according to paragraph 1 for a reasonable period with regard to preparation of a noise reduction plan.

6. Binding Immission Values

6.1 Binding immission values for immission points outside buildings

For immission points outside buildings, the binding immission values for the rating level are:

a) in industrial areas 70 dB(A)

b) in commercial zones

during the day	65 dB(A)
at night	50 dB(A)

c) in core areas, village areas and mixed-use zones

during the day	60 dB(A)
at night	45 dB(A)

d) in general residential areas and small residential estate areas

during the day	55 dB(A)
at night	40 dB(A)

e) in purely residential areas

during the day	50 dB(A)
at night	35 dB(A)

f) in spa areas, for hospitals and nursing homes

during the day	45 dB(A)
at night	35 dB(A)

Individual short-term noise peaks may exceed binding immission values during the day by not more than 30 dB(A), and at night by not more than 20 dB(A).

6.2 Binding immission values for immission points inside buildings

For noise transmission inside buildings, or for structure-borne sound transmission inside buildings, the binding immission values for the rating level for rooms with residential or commercial use, according to DIN 4109, Edition November 1989, which are in the same building but are not part of the installation, irrespective of the position of the building in one of the areas mentioned in Number 6.1 a to f, are

during the day	35 db(A)
at night	25 dB(A).

Isolated short-term noise peaks may exceed binding immission values by not more than 10 dB(A).

More far-reaching requirements under building law remain unaffected.

6.3 Binding immission values for rare incidents

In the case of rare incidents, as defined in Number 7.2, binding immission values for the rating level for immission points outside buildings in areas specified in Number 6.1 a to f, are

during the day	70 dB(A)
at night	55 dB(A).

Isolated short-term noise peaks may exceed these values

- in areas specified in Number 6.1 b during the day by not more than 25 dB(A) and at night by not more than 15 dB(A), and
- in areas specified in Number 6.1 c to f during the day by not more than 20 dB(A) and at night by not more than 10 dB(A).

6.4 Assessment periods

Binding immission values as defined in Numbers 6.1 to 6.3 relate to the following periods:

1. day 06.00 - 22.00
2. night 22.00 - 06.00

The night period can be deferred or brought forward by up to one hour, provided this is necessary on account of particular local conditions or constraining operating conditions under consideration of protection against harmful effects on the environment. An eight-hour period of peace at night for the neighbourhood within the area of influence of the installation is to be ensured.

Binding immission values as defined in Numbers 6.1 to 6.3 apply during the day for an assessment period of 16 hours. The full hour (for example, 1.00 to 2.00) with the highest rating level, to which the installation under assessment contributes, provides the basis for night-time assessment.

6.5 Supplement for times of day with increased sensitivity

In determining the rating level, increased noise in areas as defined in Number 6.1 d to f is to be taken into account with a supplement during the following periods:

1.	on weekdays	06.00 - 07.00 20.00 - 22.00
2.	on Sundays and public holidays	06.00 - 09.00 13.00 - 15.00 20.00 - 22.00

The supplement amounts to 6 dB.

Consideration of the supplement can be ignored insofar as this is necessary on account of specific local conditions under consideration of protection against harmful effects on the environment.

6.6 Assignment of immission points

The type of areas and facilities defined in Number 6.1 results from specifications in development plans.

Other areas specified in development plans for areas and facilities, as well as areas and facilities for which no specifications exist, are to be assessed in accordance with Number 6.1 according to the need for protection.

6.7 Diverse land use

Where commercial or industrial zones and residential areas adjoin one another (diverse land use) the binding immission values do not apply. In such cases interim immission values are applied, but only insofar as this is required in accordance with the principle of mutual consideration. Binding immission values for core, village and mixed zones should not, however, be exceeded. It is to be presumed that the best available technology for noise reduction is employed.

The specific protection worthiness of the area concerned is decisive for the level of the interim value in accordance with paragraph 1. The main criteria are the character of the area of influence determined by the extent of residential development on the one hand and commercial and industrial operations on the other hand, the local customary nature of a noise and the question as to which incompatible noise was first actualized. If an area of heightened protection worthiness lies merely in one direction to the installation, this has to be taken into account in the layout of the installation on the land it occupies and the use of screening.

6.8 Determination of noise immissions

Determination of noise immissions takes place in accordance with the provisions in the Annex.

6.9 Reduced rating level for monitoring measurements

If, during monitoring of compliance with binding immission values, the rating level is determined by measurements in accordance with Number A.1.6 or A.3 of the Annex, a rating level reduced by 3 dB(A) is to be applied for the purpose of comparison with binding immission values as defined in Number 6.

7. Special Provisions

7.1 Exceptional regulation for emergency situations

Where necessary to avert hazards for public security and order, or to ward off an operational emergency, binding immission values as defined in Section 6 may be exceeded. An operational emergency is an uncommon and unforeseeable incident, which occurs suddenly and independent of the will of the operator, and which entails the danger of disproportionate damage.

7.2 Provisions for rare incidents

If it is to be expected, on account of foreseeable peculiarities in the operation of an installation, that in rare cases or over a limited period, but on not more than ten days or nights of a calendar year, and not on two successive weekends, binding immission values as defined in Numbers 6.1 and 6.2 cannot be complied with, even with application of best available technology for noise reduction, exceedance can be authorized within the scope of licensing proceedings for installations subject to licensing. In the case of existing installations subject or not subject to licensing, an order can be waived under the above-mentioned conditions.

At the same time, under consideration of the duration and times of such exceedance, the frequency of exceedance by different operators as a whole and reduction potentials by means of organizational and operational measures, it has to be examined whether and to what extent acceptance of higher exposure can be expected of the neighbourhood than is permissible under Numbers 6.1 and 6.2. The values mentioned in Number 6.3 may not be exceeded. As a rule, however, unreasonable noise nuisance is to be accepted, if exceedance of binding immission values, as defined in Numbers 6.1 and 6.2, can be caused

by rare incidents in other installations, and binding immission values, as defined in Sections 6.1 and 6.2, are exceeded at the same immission point on a total of more than 14 days of a calendar year.

Section 4.3 remains unaffected.

7.3 Consideration of low-frequency noise

In the case of noise with a predominant proportion of energy in the frequency range below 90 Hz (low-frequency noise), the issue of whether it gives rise to harmful effects on the environment has to be resolved. Harmful effects on the environment can occur, in particular, when with clearly perceivable low-frequency noise in rooms with closed windows, whose use is vulnerable to noise, the difference $L_{Ceq} - L_{eq}$ determined in accordance with Number A.1.5 of the Annex exceeds 20 dB. Information concerning ascertainment and assessment of low-frequency noise is to be found in Number A.1.5 of the Annex.

If, under consideration of Number A.1.5 of the Annex, harmful effects on the environment are to be expected from low-frequency noise, appropriate reduction measures are to be examined. Their implementation should be suspended if following commissioning of the installation no low-frequency noise occurs, even without implementation of reduction measures.

7.4 Consideration of traffic noise

Vehicle noise on installation grounds as well as on entry and exit, which arises in connection with operation of the installation, is to be attributed to the installation under assessment and recorded and assessed, together with other installation noises under consideration, in determination of additional exposure. Other vehicle noise on installation grounds should be recorded and assessed during determination of existing exposure. As far as traffic noise on public thoroughfares is concerned, the following paragraphs 2 to 4 apply.

Noise deriving from approach and departure on public thoroughfares at a distance of up to 500 metres from installation grounds in areas defined in Number 6.1 c to f should be reduced as far as possible through organizational measures, insofar as

- they increase the rating level of traffic noise during the day and at night by at least 3 dB(A),
- no mixing with general traffic has occurred and
- immission limits in the Traffic Noise Ordinance (16th BImSchV) are exceeded for the first time or also subsequently.

The rating level for road traffic is to be calculated according to the Guidelines for Noise Abatement on Roads (*Richtlinien für den Lärmschutz an Straßen*) - 1990 Edition - RLS-90, published in the Traffic Gazette, Official Gazette of the Federal Ministry of Transport of the Federal Republic of Germany (VkBl.) No. 7 of 14 April 1990, sequence no. 79. The Guidelines can be obtained from the *Forschungsgesellschaft für Straßen- und Verkehrswesen*, Alfred-Schütte-Allee 10, 50679 Cologne.

The rating level for railway lines is to be determined in accordance with the Guideline on Noise Immissions from Railway Lines (*Richtlinie zur Berechnung der Schallimmissionen von Schienenwegen*) – 1990 Edition - Schall 03, published in the Official Gazette of the Deutsche Bundesbahn No. 14 of 4 April 1990, serial no. 133. The Guideline can be obtained from Deutsche Bahn AG, Drucksachenzentrale, Stuttgarter Straße 61a, 76137 Karlsruhe.

8. Accessibility of Standards and Guidelines

The DIN Standard Specification Sheets, ISO Standards and VDI Guidelines mentioned in these Technical Instructions can be obtained from Beuth Verlag GmbH, 10772 Berlin. The standards and guidelines mentioned are archived at the German Patent and Trade Mark Office.

9. Abrogation of Provisions

The Technical Instructions on Noise Abatement of 16 July 1968 (Supplement to Federal Gazette (*BAnz.*) No. 137 of 26 July 1968) will be abrogated with the entry into force of this General Administrative Provision.

10. Entry into Force

This General Administrative Provision enters into force on the first day of the third calendar month following publication.

Annex

Determination of Noise Immissions

Contents

A.1 General Provisions for Determination of Noise Immissions

A.1.1 Definitions and explanations

A.1.1.1 Average sound power level

Average sound power level L_{Weq} is the level of sound power averaged over exposure time. The frequency weighting or frequency band, to which average sound power level applies, is denoted by way of indices; for example, L_{WA} and L_{WOkt}.

A.1.1.2 Immission-related sound power level

The immission-related sound power level of an installation is the sound power level, which arises from the sum of sound power of all sound sources of the installation less losses on the propagation path within the installation and under consideration of the directivity index of sound sources. It can be determined, for example, by omnidirectional measurement pursuant to ISO 8297, Edition December 1994.

A.1.1.3 Exposure time T_E

The exposure time T_E of a noise source of an installation is the time within the assessment period during which the noise source or installation is in operation.

A.1.1.4 Structure-borne sound transmission

With structure-borne sound transmission sound is transmitted from the source via the floor and / or parts of the building to the boundary surfaces of rooms whose use is vulnerable to noise.

A.1.2 Determination of existing, additional and total exposure

Noise immissions are to be determined at the immission points specified by the competent authority in accordance with Number A.1.3.

If additional exposure is determined,

a) the operating mode of the installation – split, if necessary, according to operating phase with varied emissions – that produces the highest rating level in its area of influence is taken as a basis, and

b) different weather conditions pursuant to DIN ISO 9613-2, Draft Edition September 1997, Equation (6) are to be considered.

The rating level L_G of total exposure that is to be expected after commissioning of an installation subject to licensing is determined according to Equation (G1) from existing exposure L_V as determined according Number A.3 and from additional exposure L_Z as determined according to Number A.2.

$$L_G = 10\,\lg(10^{0.1L_V} + 10^{0.1L_Z}) \qquad \text{(G1)}$$

A.1.3 Decisive immission point

Decisive immission points are to be found in accordance with Number 2.3

a) in buildings, 0.5 m outside the middle of the open window of the room whose use is vulnerable to noise pursuant to DIN 4109, Edition November 1989, which is worst affected by noise;

b) in undeveloped areas or built-up areas that contain no buildings with rooms whose use is vulnerable to noise, at the edge of the area where, pursuant to building and planning law, buildings with rooms whose use is vulnerable to noise may be built;

c) in rooms whose use is vulnerable to noise, which are connected structurally with the installation under assessment, and in the case of structure-borne sound transmission and exposure to low-frequency noise in the room whose use is vulnerable to noise, which is worst affected.

In addition, the provisions of DIN 45645-1, Edition July 1996, Section 6.1 on surrogate measurement points as well as on microphone placement and actual measurement apply.

A.1.4 Rating level L_r

The rating level is established on the basis of DIN 45645-1, Edition July 1996, Equation (1). The supplement or deduction for particular noise and situations is no longer required. The meteorological correction pursuant to ISO 9613-2, Draft Edition September 1997, Equation (6) has to be additionally considered.

If different emissions occur during an assessment period, or if different supplements for tonality and informational content, impulsiveness or times of day with increased sensibility are required for the purpose of determination of noise immission during the entire assessment period, this has to be divided in an appropriate manner into subperiods T_j, in which emissions are largely similar and the supplements constant. Such subdivision is required, for example, in the case of temporally definable, varied operation of the installation. The rating level is then calculated according to Equation (G2).

$$L_r = 10lg\left[\frac{1}{T_r}\sum_{j=1}^{N} T_j \cdot 10^{0.1\left(L_{Aeq,j}-C_{met}+K_{T,j}+K_{I,j}+K_{R,j}\right)}\right]$$ (G2)

with

$T_r = \sum_{j=1}^{N} T_j$ = 16 h during the day

= 1 h or 8 h at night in accordance with Section 6.4

T_j	Subperiod j
N	Number of selected subperiods
$L_{eq,j}$	Equivalent continuous sound pressure level during subperiod T_j
C_{met}	Meteorological correction pursuant to DIN ISO 9613-2, Draft Edition September 1997, Equation (6)
$K_{T,j}$	Supplement for tonality and informational content in accordance with Number A.2.5.2 (forecasting) or A.3.3.5 (measurement) in subperiod T_j
$K_{I,j}$	Supplement for impulsiveness in accordance with Number A.2.5.3 (forecasting) or A.3.3.6 (measurement) in subperiod T_j
$K_{R,j}$	Supplement for times of day with increased sensitivity in accordance with Number 6.5 in subperiod T_j

The rating level is calculated separately for the assessment periods of day and night.

A.1.5 Information on consideration of low-frequency noise

Low-frequency noise can be caused, for example, by the following sound sources:

- slow-running ventilators (for example, in cooling towers),
- exhaust systems of slow-running combustion engines,
- burners in conjunction with combustion plants,
- engine test benches,
- vacuum pumps,
- roots blowers,
- slow-running sieves, mills and launders,
- reciprocating compressors and
- separator drums.

Certain installations also conduct low-frequency alternating forces into the subsoil. The vibration thus produced can be transmitted as structure-borne sound into rooms requiring sound insulation and there give rise to low-frequency noise.

Information on determination and assessment of low-frequency noise is contained in DIN 45680, Edition March 1997, and in the accompanying Supplement 1. Harmful effects on the environment are not to be expected if the reference values in Supplement 1 are not exceeded.

A.1.6 Determination of noise immissions from shooting ranges

Noise immissions from shooting ranges are determined pursuant to Guideline VDI 3745 Sheet 1, Edition May 1993. Here, as a rule, the provisions for controlled measurements are to be applied. It has further to be observed that

a) deviating from VDI 3745 Sheet 1, binding immission values, assessment periods and the supplement for times of day with increased sensitivity apply in accordance with Number 6,

b) supplementary to VDI 3745 Sheet 1, the criteria for isolated short-term noise peaks in accordance with Number 6 are to be applied to single shot levels in accordance with Section 4.4 of the VDI Guideline,

c) furthermore, the meteorological correction pursuant to DIN ISO 9613-2, Draft Edition September 1997, Equation (6) is to be considered NS

d) regarding the number of random measurements, Number A.3.3.7 is to be applied under consideration of Section 4.3 of the VDI Guideline.

A.2 Determination of Noise Immissions by Forecasting

A.2.1 Forecasting method

Two methods are specified for the forecasting of noise immissions:

a) the detailed forecast and

b) the estimated forecast. The estimated forecast is sufficient for preliminary planning and in cases in which the rating level thus calculated does not lead to binding immission values being exceeded. In all other cases a detailed forecast is to be conducted.

No provisions are specified for the calculation of structure-borne sound transmissions within buildings.

A.2.2 Principles

With immission forecasting, all noise sources of an installation, including transport and traffic proceedings on installation grounds mentioned in Number 7.4, paragraph 1, sentence 1 are to be considered.

If it is to be expected that short-term noise peaks from the installation could exceed permissible maximum values as defined in Number 6, their levels are also to be calculated.

The accuracy of immission forecasting is largely dependent on the reliability of input data. Such data has therefore always to be critically examined. Sound power levels should, where possible, have been determined on the basis of a measurement procedure of accuracy class 2 or 1, as defined in DIN 45635-1, series of standards ISO 3740 to ISO 3747 (for machinery) or in ISO 8297 (for industrial installations). Should conversion into sound power level be possible, sound pressure level can also be used at defined intervals, particularly data determined pursuant to the series of standards DIN EN ISO 11200.

For determination of sound power radiated off partial areas of a building shell, reference is made to Guideline VDI 2571.

For traffic proceedings on installation grounds in accordance with Number 7.4, paragraph 1, sentence 1, use can be made of provisions mentioned in Number 7.4, paragraphs 3 and 4, as well as calculation methods pursuant to DIN 18005 Part 1, Edition May 1987.

For calculation of sound propagation, reference is made to the provisions in DIN ISO 9613-2, Draft Edition September 1997, and in the case of sound radiation to VDI 2714, Edition January 1988, Section 5.

A.2.3 Detailed forecast

A.2.3.1 General remarks

The forecast is based on the average sound power level of the noise sources under consideration in accordance with Number A.2.2, separated, where required, according to subperiods (cf. Number A.1.4).

Immission levels should be calculated in octaves, as a rule for the medium frequencies 63 to 4000 Hz. Sound power is to be determined explicitly in octave bands. With this spectral value the propagation path is then calculated. Influences on sound propagation have effects of varied magnitude in the octaves. Shares of the spectrum in the octave 8000 Hz are only to be considered in exceptional cases (for example, in the case of a short distance of an immission point or surrogate immission point from an open-air gas reducing station.

If emission data is only available as A-weighted sound level, the forecast can be carried out with these values pursuant to DIN ISO 9613-2, Draft Edition September 1997, Section 1.

A.2.3.2 Input data for calculation purposes

For every noise source under consideration, average sound power level, exposure time T_E (where required, separated according to subperiods), directivity correction as well as data on tonality, informational content and impulsiveness of noise, and also on the position and height of the noise source are required for calculation purposes.

Measurements, empirical values and data from manufacturers can be used as input data, provided they correspond with the demands of Number A.2.2, paragraph 3. If, on account of particular precautionary measures, a permanent noise reduction is verified compared to empirical values, correction values corresponding to the noise reduction can be taken into account with input data.

The following data is also required:

- position and dimensions of relevant barriers (buildings, vegetation and sound barriers) and
- position and height of decisive immission points.

Calculation of the equivalent continuous sound pressure level of noise emanating from vehicle traffic on parking areas attributable to the installation in accordance with Section 7.4 paragraph 1 sentence 1 is to be based, in determining the number of vehicle movements per parking place and hour, insofar as precise figures are not available, on empirical values obtained at comparable installations.

A.2.3.3 Sound power radiated off partial areas of a building shell

Sound power radiated off partial areas of a building shell is to be calculated, pursuant to Guideline VDI 2571, Section 3, as far as possible in octave bands. The equation given in the VDI Guideline for calculation of the internal sound level presupposes a diffuse sound field, and generally results, in factory buildings, in values that are too high or, in the case of loud sound sources close to building shell elements, too low. If more precise calculation bases are available – for instance, pursuant to VDI 3760, Edition February 1996 – the internal sound level calculated therewith can be taken.

A.2.3.4 Calculation of sound propagation

The calculation is to be made for every noise source and every octave pursuant to DIN ISO 9613-2, Draft Edition September 1997, Section 6. In the process, sound attenuation due to sound propagation through vegetation, industrial sites and built-up areas should be considered pursuant to Annex A, and screenings and reflections pursuant to Sections 7.4 and 7.5 of DIN ISO 9613-2, Draft Edition September 1997.

Equivalent continuous sound pressure level L_{eq} at the decisive immission point results for every noise source according to Equation (5) of DIN ISO 9613-2, Draft Edition September 1997.

A.2.3.5 Calculation of the level of short-term noise peaks

Under the conditions specified in Number A.2.2, paragraph 2, calculation in accordance with Number A.2.3.4 is to be repeated with the maximum sound power levels of noise sources with short-term noise peaks instead of with the average sound power levels of all noise sources. If, in the case of several noise sources in the installation, such noise peaks occur simultaneously, the level of short-term noise peaks at the immission point is to be added up from the contributions $L_{AFmax,i}$ of individual noise sources (Index i) determined in accordance with Number A.2.3.4, according to Equation (G3), for the installation as a whole.

$$L_{AFmax} = 10lg \sum_i 10^{0.1 L_{AFmax,i}} \qquad \text{(G3)}$$

A.2.4 Estimated forecast

A.2.4.1 General remarks

With the estimated forecast, the equivalent continuous sound pressure level at the decisive immission point is determined with the aid of average A-weighted sound power level, exposure times and the directivity correction of noise sources as well as simplified calculation of sound propagation, presupposing weather conditions that favour sound propagation, and with only geometrical sound propagation attenuation being considered.

Specifications concerning input data and incorporation of noises emanating from parking areas in accordance with Number A.2.3.2 apply accordingly.

A.2.4.2 Sound power radiated off partial areas of a building shell

Sound power radiated off partial areas of a building shell is to be determined pursuant to Guideline VDI 2571, Section 3, Equation (9 b).

In rooms in which the internal level is determined by sound with strong low-frequency components, the equation mentioned above produces sound power levels that are too low. In such cases, a safety supplement of 5 dB(A) must be added for sound power emitted into the atmosphere, or else a detailed forecast carried out.

A.2.4.3 Estimated sound propagation

Time of exposure T_E to the equivalent continuous sound pressure level $L_{eq}(s_m)$ at the immission point is to be calculated for every noise source according to Equation (G4).

$$L_{Aeq(s_m)} = L_{WAeq} + DI + K_0 - 20\lg(s_m) - 11\text{dB} \qquad \text{(G4)}$$

with

L_{WAeq}	Mean A-weighted sound power level of the noise source
DI	Directivity index pursuant to VDI 2714, Section 5.1, Figure 2 (only with screening by the building itself
K_0	Solid angle connection pursuant to VDI 2714, Section 5.2, Table 2
s_m	Distance of the immission point in m from the centre of the source. If the distance of the immission point from the centre of the installation is more than double its greatest extension, the distance of the immission point from the centre of the installation can be applied instead of s_m.

Besides screening of sound-emitting buildings by the buildings themselves, no screening is to be considered. Calculation with DI ≤ -10 dB for the side of the building facing the immission point may only be made if there is no reflecting surface (for example, the wall of a building) opposite the building under consideration.

Reflections, which are not contained in the solid angle correction, are to be taken into consideration pursuant to VDI 2714, Section 7.1 through assumption of mirror sound sources.

A.2.4.4 Calculation of the level of short-term noise peaks

Insofar as is necessary according to Number A.2.2 paragraph 2, calculation according to Number A.2.4.3 is to be repeated in accordance with Section A.2.3.5 with the

maximum A-weighted sound power levels of noise sources with short-term noise peaks.

A.2.5 Calculation of rating level

A.2.5.1 Calculation of the equivalent continuous sound pressure level of the installation in subperiods

The rating level is to be calculated for every immission point and every surrogate immission point according to Equation (G2). The equivalent continuous sound pressure level $L_{eq,j}$ of the installation for subperiod T_j is calculated from equivalent continuous sound pressure level $L_{eq,k,j}$ and exposure times $T_{E,k,j}$ of all noise sources k according to Equation (G5).

$$L_{Aeq,j} = 10lg\left(\frac{1}{T_j}\sum_k T_{E,k,j} \cdot 10^{0.1L_{Aeq,k,j}}\right) \text{ (G5)}$$

A.2.5.2 Supplement for tonality and informational content K_T

For subperiods in which one or more tones are present in the noise immissions under assessment, or in which the noise contains information, either 3 or 6 dB is to be applied for the supplement K_T depending on distinctiveness.

In the case of installations whose noises do not contain tonal sound or information, K_T = 0 dB.

Where empirical values are available from comparable installations and parts of such installations, these are to be used as calculation bases.

A.2.5.3 Supplement for impulsiveness K_I

For subperiods in which the noise under assessment contains impulses, either 3 or 6 dB is to be applied for the supplement K_I depending on exposure.

In the case of installations whose noises do not contain impulses, K_I = 0 dB.

Where empirical values are available from comparable installations and parts of such installations, these are to be used as calculation basis.

A.2.6 Presentation of results

The noise immission forecast is to be presented in a report, which contains the data required to be able to assess databases, comprehend the forecasting method and estimate the quality of the results. As a rule, the following have to be stated:

- designation of the installation,
- applicant,
- contracting authority,
- name of the institution and the responsible person,
- terms of reference,
- method applied,
- description of the operating procedure of the installation, insofar as this is of acoustic relevance,
- map of the area, from which the layout of the installation (where appropriate, co-ordinates with acoustic reference values), relevant noise sources, decisive immission points and, where applicable, surrogate immission points are to be seen,
- list of relevant noise sources with technical data and operating times, as well as the calculation bases of sound power level in the case of buildings as noise sources,
- data on planned noise abatement measures,
- in the case of detailed forecasts, data on relevant barriers (sound barriers, buildings and vegetation),
- data for every decisive immission point:
    - position and height,
    - individual noises considered, including propagation attenuation (with detailed forecasts),
    - A-weighted equivalent continuous sound pressure values of such noise sources for every subperiod,
    - supplement for tonality and informational content,
    - supplement for impulsiveness,
    - rating level and,
    - where applicable, level of short-term noise peaks.
- Quality of the forecast.

A.3 Determination of Noise Immissions by Measurement

A.3.1 Principles

Noise immissions are to be determined at decisive immission points, depending on terms of reference, for existing exposure, additional

exposure and total exposure as well as for exposure to extraneous noises.

If measurements at decisive immission points in accordance with Number A.1.3 are not possible – for example, in the case of extraneous noise influence or the rarity of downwind weather conditions (see references in Number A.3.3.3) – the competent authority can stipulate that noise immissions at decisive immission points be determined from surrogate measurements according to one of the procedures described in Number A.3.4. In this connection, measurements (noise immissions at surrogate immission points or sound power levels) are linked with sound propagation calculations.

DIN 45645-1, Edition July 1996 applies for measuring devices to be used, measuring methods and determination of the definitive rating level, provided that this Annex does not apply deviating, limiting or supplementary regulations.

Information on determination of low-frequency noise is to be found in Number A.1.5.

A.3.2 Measuring devices

The requirements of DIN 45645-1, Edition July 1996 apply for devices used for the measurement of sound. The following has additionally to be observed:

The following may be used as sound level measuring devices:

a) calibrated sound level meters of class 1 pursuant to DIN EN 60651, Edition May 1994, or DIN EN 60804, Edition May 1994, and

b) calibrated sound level measuring devices as defined in Section 3 of Annex 21 of Calibration Regulations.

If measurements cannot be carried out with calibrated measuring devices due to difficulties related to the immission situation (for example, with the use of directional microphones due to heavy interference from extraneous noise), non-calibrated measuring devices may be used in justified isolated cases, provided that any deviations that arise are comprehensibly quantified and taken into consideration in the assessment.

A.3.3 Measuring methods and evaluation

A.3.3.1 Types of measurement value

Frequency weighting A and time weighting F are generally used pursuant to DIN EN 60651, Edition May 1994 with sound measurements in accordance with these Technical Instructions.

For the assessment of noise immissions in these Technical Instructions the measurement values displayed in Table 1 are applied. The particular measurement value to be obtained in addition to equivalent continuous sound pressure level L_{eq} depends on the individual case.

Table 1: Types of measurement value and their application

Measurement value	Application	Source
L_{Aeq}	Assessment of noise immissions	Number 2.7 Number A.1.4
L_{AFmax}	Assessment of noise peaks	Number 2.8
L_{AFTeq}	Supplement for impulsiveness	Number A.3.3.6
L_{AF95}	Inspection of constantly prevailing extraneous noise	Number 3.2.1

A.3.3.2 Measuring points

Measurements are generally carried out at decisive immission points in accordance with Number A.1.3. Concerning measuring points for surrogate measurements in accordance with Number A.3.1, paragraph 2, reference is made to Section A.3.4.

A.3.3.3 Execution of measurements

The provisions of DIN 45645-1, Edition July 1996, Sections 6.2 to 6.5 concerning the execution of measurements are to be observed. It is further specified as follows:

Where existing or total exposure (Number 2.4) is to be determined, in setting the time and duration of measurement the focus has to be on those installations that make substantial noise contributions. Measurements are generally to be executed downwind at a distance of at least 200 m between decisive immission points and such installations. Sentence two applies correspondingly to determination of additional exposure. The meteorological correction pursuant to DIN ISO 9613-2, Draft Edition September 1997, Equation (6) is to be considered when determining the rating level.

A.3.3.4 Determination of rating level

The rating level is to be determined according to Equation (G2).

$$K_{I,j} = L_{AFTeq,j} - L_{Aeq,j} \qquad \text{(G6)}$$

A.3.3.5 Supplement for tonality and informational content

If one or more tonal sounds are audibly present in a noise during certain subperiods T_j, or if the noise contains information, the supplement for tonality or informational content $K_{T,j}$ amounts to either 3 or 6 dB depending on distinctiveness.

The tonality of a noise can also be determined metrologically (DIN 45681, Draft Edition May 1992).

A.3.3.6 Supplement for impulsiveness

If the noise under assessment contains impulses during particular subperiods T_j the supplement $K_{I,j}$ for impulsiveness amounts to:

$L_{AFTeq,j}$ is the cycle time maximum equivalent continuous sound pressure level over a period of time according to Section 2.9.

A.3.3.7 Relevant rating level

The relevant rating level is determined pursuant to DIN 45645-1, Edition July 1996, Section 7.2. In setting the number and extent of measurements, simplifications pursuant to DIN 45645-1, Edition July 1996, Section 6.5.1 are to be considered.

A.3.4 Surrogate measurements

A.3.4.1 General Remarks

Noise immissions at decisive immission points can be determined from surrogate measurements according to one of the following procedures:

a) measurements at surrogate immission points,

b) omnidirectional measurement and

c) sound power measurements of individual installations or installation groups.

The procedures according to b or c should only be employed when, due to local circumstances, the procedure according to c cannot be applied.

A.3.4.2 Procedure for measurements at surrogate immission points

One or more immission points are specified, generally in the vicinity of the installation, at which the noise situation that is characteristic for the decisive immission point can be determined, and at which the noise level of the installation is sufficiently above the level of extraneous noise.

The rating level for every surrogate immission point for the forecast in accordance with Number A.2 is to be calculated using the same installation data as for decisive immission points. The highest rating level has to be stated in the licensing notification in respect of all specified surrogate immission points at which compliance with binding immission values is assured at decisive immission points.

A.3.4.3 Procedure for omnidirectional measurement

An omnidirectional measurement is specified, for example pursuant to ISO 8297, Edition December 1994. The measurement result determines the immission-related sound power level of the installation. From this, the rating level for the decisive immission points is to be calculated according to the forecasting methods described in Number A.2, whereby the installation is to be regarded as a noise source.

A.3.4.4 Procedure for sound power measurement

It is specified that the sound power level of the installation is to be measured in respect of individual sources or groups of sources. The sound power levels of all relevant installation sources are generally to be determined according to one of the methods mentioned in Number A.2.2. Otherwise, measurement is to be carried out as far as possible on the basis of the standards cited. Rating levels at decisive immission points are to be calculated from the sound power levels of all relevant installation sources.

A.3.5 Measurement report

Noise immissions are to be presented in a report, which contains the data required to be able to comprehend the conduct of investigations and the presentation of results as well as to assess the quality of the results. The report has to contain, in particular the following information:

- designation of the installation,
- applicant,
- contracting authority,

- name of the Institution and the responsible person,

- terms of reference,

- method applied,

- map of the area, from which the layout of the installation (where appropriate, co-ordinates with acoustic reference values), relevant noise sources, decisive immission points and, where applicable, surrogate immission points are to be seen,

- locus and time of measurements,

- sound propagation conditions,

- measuring devices as well as measures to ensure adequate measuring accuracy,

- operating mode and utilization of installation capacity during measurements,

- extraneous noise during measurements and, where necessary, sound level corrections,

- rating level, maximum level and accompanying parameters,

- quality of results and,

- where applicable, requisite data on surrogate measurements in accordance with Number A.3.4.