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Noise Abatement Ordinance (NAO)

of 15 December 1986 (Status as of 1 November 2023)

The Swiss Federal Council,

on the basis of Articles 5, 12 paragraph 2, 13 paragraph 1, 16 paragraph 2, 19, 21 paragraph 2, 23, 39 paragraph 1, 40 and 45 of the Federal Act of 7 October 1983¹ on the Protection of the Environment (the Act),

ordains:

Chapter 1 General Provisions

Art. 1 Aim and scope

¹ This Ordinance is intended to protect against harmful and disturbing noise.

² It regulates:

- a. the limitation of exterior noise emissions caused by the operation of new and existing installations in accordance with Article 7 of the Act;
- b. the designation and development of building zones in areas exposed to noise;
- c. the issuing of planning permission for buildings with rooms sensitive to noise and lying in areas exposed to noise;
- d. the soundproofing against exterior and interior noise of new buildings with rooms sensitive to noise;
- e. the soundproofing against exterior noise of existing buildings with rooms sensitive to noise;
- f. the determination of the exposure to exterior noise and its rating based on exposure limit values.

³ It does not regulate:

- a. protection against noise originating from an industrial site as long as this only affects industrial buildings and dwellings within the site;
- b. protection against infra- and ultrasound.

⁴ ...²

Art. 2 Definitions

¹ Stationary installations are buildings, transport facilities, building facilities and other immobile equipment that generate exterior noise during operation. These include in particular roads, railway installations, aerodromes, industrial, commercial and agricultural installations, firing ranges and permanent military firing ranges and training grounds.

² New stationary installations also include stationary installations and buildings whose use has been completely altered.

³ Emission limitation measures are technical, structural or functional modifications to installations, or measures to redirect, restrict or calm the flow of traffic, or structural measures along the emission path. The purpose of the measures is to prevent or reduce the generation or propagation of exterior noise.

⁴ Improvements are emission limitation measures for existing stationary installations.

⁵ Exposure limit values include impact thresholds, planning values and alarm values. These are set according to the noise characteristics, the time of day and the sensitivity to noise of the buildings and areas to be protected.

⁶ Rooms sensitive to noise are:

- a. rooms in dwellings with the exception of kitchens without dining facilities, washrooms and storerooms;
- b. rooms in industrial buildings that are regularly occupied by persons for sustained periods of time, with the exception of those for farm animals and those with high levels of industrial noise.

Chapter 2 Vehicles, Mobile Appliances and Machines

Section 1 Emission Limitation Measures from Vehicles

Art. 3

¹ Noise emitted from motorised vehicles, aircraft, water craft and railways must be reduced as far as possible by technical and operational means, and to the extent that this is economically acceptable.

² Emission limitation measures are governed by the legislation on road traffic, civil aviation, inland navigation or the railways, provided the vehicle concerned is covered by one of these categories of legislation.

³ Emission limitation measures for other vehicles is governed by the provisions on mobile appliances and machines.

² Repealed by No I of the O of 12 April 2000, with effect from 1 May 2000 (AS 2000 1388).

Section 2 Emission Limitation Measures for Mobile Appliances and Machines

Art. 4 Principles

¹ The emissions of exterior noise from mobile appliances and machines must be reduced to the extent that:

- a. this is technically and operationally feasible and economically acceptable; and that
- b. the well-being of the affected population is not seriously impaired.

² The enforcement authorities shall order operational and structural measures, or those for proper maintenance.

³ Where it is not possible to avoid exposure to highly disturbing noise due to the operation of military equipment, machines and weapons, the enforcement authorities shall relax the requirements.

⁴ The emissions of appliances and machines that are used to operate a stationary installation are limited according to the provisions on stationary installations.

Art. 5³ Conformity assessment and marking of equipment and machines

¹ Equipment and machines may be placed on the market only following a conformity assessment and the appropriate marking.

² The Federal Department of the Environment, Transport, Energy and Communications (DETEC) shall specify:⁴

- a. the types of equipment and machines subject to the conformity assessment and marking;
- b. the requirements for preventive emission limitation measures and marking, taking into account internationally recognised standards;
- c. the documents to be submitted for the purpose of the conformity assessment;
- d. the test, measurement and calculation procedures;
- e. the subsequent controls;
- f. the recognition of foreign test results and labelling.

Art. 6⁵ Regulations on noise from building sites

The Federal Office for the Environment (FOEN) shall issue regulations covering structural and operational measures to control noise from building sites.

³ Amended by No I of the O of 23 Aug. 2006, in force since 1 Nov. 2006 (AS **2006** 3693).

⁴ Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

⁵ Amended by No I of the O of 29 Sept. 2023, in force since 1 Nov. 2023 (AS **2023** 582).

Chapter 3 New and Modified Stationary Installations

Art. 7 Emission limitation measures for new stationary installations

¹ Noise emissions from new stationary installations shall be limited as directed by the enforcement authorities insofar as:

- a. this is technically and operationally feasible and economically acceptable; and
- b. the noise exposure level resulting from the installation alone does not exceed the planning values.

² The enforcement authorities shall relax the requirements in cases where compliance with the planning values would place a disproportionate burden on the installation and there is an overriding public interest, particularly regarding questions of spatial planning. The impact thresholds must not, however, be exceeded.⁶

³ In the case of new air-to-water heat pumps that are primarily used for space heating or for heating drinking water and whose noise emissions do not exceed the planning values, further emission limitation measures in accordance with paragraph 1 letter a shall only be taken if a limitation of emissions of at least 3 dB can be achieved with no more than one per cent of the investment costs of the system.⁷

Art. 8 Emission limitation measures for modified stationary installations

¹ Where a stationary installation that already exists when this Ordinance comes into force is modified, the noise emissions from the new or modified parts of the installation must be limited as directed by the enforcement authorities as far as this is technically and operationally feasible and economically acceptable.⁸

² If the installation is significantly modified, the noise emissions from the installation as a whole must be limited at least to the extent that the impact thresholds are not exceeded.

³ Conversions, extensions and operational changes carried out by the person responsible for the installation constitute significant modifications to stationary installations if it is anticipated that the noise exposure level will rise perceptibly as a result either of the installation itself or of the increased demand on existing transport facilities. The rebuilding of an installation constitutes a significant modification irrespective of the circumstances.

⁴ If a new stationary installation is modified, Article 7 applies.⁹

Art. 9 Increased demand on transport facilities

The operation of new or significantly modified stationary installations must not lead to a situation in which:

⁶ Amended by No I of the O of 16 June 1997, in force since 1 Aug. 1997 (AS 1997 1588).

⁷ Inserted by No I of the O of 29 Sept. 2023, in force since 1 Nov. 2023 (AS 2023 582).

⁸ Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

⁹ Amended by No I of the O of 16 June 1997, in force since 1 Aug. 1997 (AS 1997 1588).

- a. owing to the increased demand made on a transport facility, the impact thresholds are exceeded; or
- b. owing to the increased demand made on a transport facility in need of remediation, the noise exposure level rises perceptibly.

Art. 10 Soundproofing measures in existing buildings

¹ If the requirements specified in Articles 7 paragraph 2 and 8 paragraph 2 or in Article 9 are not fulfilled by new or significantly modified public or licensed stationary installations, the enforcement authorities shall require the owners of existing buildings exposed to noise to soundproof the windows of rooms sensitive to noise in accordance with Annex 1.

² With the approval of the enforcement authorities, building owners may carry out other structural soundproofing measures provided these reduce the noise within the rooms to the same extent.

³ Soundproofing measures need not be taken if:

- a. no perceptible reduction of the noise level in the building is to be expected;
- b. they conflict with the overriding interest of preserving local character or monuments;
- c. the building is due to be demolished within three years of putting the new or modified installation into service, or the rooms concerned will be converted to purposes not sensitive to noise within this period.

Art. 11 Costs

¹ The person responsible for the new or significantly modified installation bears the costs of limiting the emission it causes.

² If the building owner is required to take soundproofing measures according to Article 10 paragraph 1, the person responsible for the installation also bears the customary local costs proven to be due for:

- a. engineering and supervision of works;
- b. soundproofing of the windows in accordance with Annex 1 and the resulting necessary adaptations;
- c. the financing if the person responsible has failed to contribute despite being requested to do so by the building owner;
- d. any fees due.

³ If the building owner is required to take soundproofing measures according to Article 10 paragraph 2, the person responsible for the installation bears the customary local costs proven to be due insofar as these do not exceed those under paragraph 2. The building owner bears the remaining costs.

⁴ Where the need for emission limitation measures or soundproofing measures arises as a result of noise from several installations, the costs are divided among the installations in proportion to their contribution to the noise exposure level.

⁵ The building owner bears the costs for maintenance and renewal of the soundproofing measures.

Art. 12 Inspection

The enforcement authorities shall inspect the new or modified installation within one year of its being put into service to check whether the emission limitation and soundproofing measures ordered have been taken. In the event of any doubt, they carry out tests to assess the effectiveness of the measures.

Chapter 4 Existing Stationary Installations

Section 1 Improvements and Soundproofing Measures

Art. 13 Improvements

¹ In the case of stationary installations that contribute significantly to the impact thresholds being exceeded, the enforcement authorities shall order the necessary improvement measures, after hearing the persons responsible for the installations.

² The installations shall be improved to the extent that:

- a. is technically and operationally feasible and economically acceptable; and
- b. the impact thresholds are no longer exceeded.

³ Unless there are overriding interests, the enforcement authorities give priority to measures which prevent or reduce noise generation in preference to those which simply prevent or reduce noise propagation.

⁴ Improvements need not be carried out if:

- a. the impact thresholds are exceeded only in building zones that have not yet been developed;
- b. due to the cantonal building and planning legislation, planning, design or structural measures taken at the site exposed to the noise will satisfy the impact thresholds before the time limit specified in Article 17.

Art. 14 Relaxation of the requirements for improvements

¹ The enforcement authorities shall relax the requirements in cases where:

- a. improvements would result in unreasonable operational limitations or costs;
- b. overriding interests, namely those of the preservation of local character, nature and landscape protection, traffic and operational safety, or national security, conflict with the improvement objective.

² Unlicensed private installations must not, however, exceed the alarm values.

Art. 15 Soundproofing measures for existing buildings

¹ If, as a result of relaxing the requirements, the alarm values for public or licensed stationary installations cannot be complied with, the enforcement authorities shall require the owners of existing buildings exposed to noise to soundproof the windows of rooms sensitive to noise in accordance with Annex 1.

² With the approval of the enforcement authorities, building owners may take other soundproofing measures in the building provided these reduce the noise within the rooms to the same extent.

³ Soundproofing measures need not be taken if:

- a. no perceptible reduction of noise in the building is to be expected;
- b. they conflict with the overriding interest of preserving local character or monuments;
- c. the building is due to be demolished within three years of the soundproofing measures being ordered, or the rooms will be converted to purposes not sensitive to noise within this period.

Art. 16 Costs

¹ The person responsible for the installation bears the costs of its improvement.

² The person responsible for a public or licensed installation also bears the costs of soundproofing measures for existing buildings under Article 11, unless an exemption has been granted under Article 20 paragraph 2 of the Act.

³ Where improvements or soundproofing measures are required as a result of noise from several installations, the costs are divided among the installations in proportion to their contribution to the noise exposure level.

⁴ The building owner bears the costs of maintenance and renewal of the soundproofing measures.

Art. 17 Time limits

¹ The enforcement authorities set the time limits for implementing improvements and soundproofing measures according to their urgency.

² In assessing urgency, the following factors are decisive:

- a. the extent to which the impact thresholds are exceeded;
- b. the number of persons affected by the noise;
- c. the cost-benefit relationship.

³ The improvements and soundproofing measures must be completed within 15 years of this Ordinance coming into force.

⁴ The time limit (para. 3) for improvements and soundproofing measures on roads are extended:

- a. for national roads until 31 March 2015;

- b. for trunk roads according to Article 12 of the Federal Act of 22 March 1985¹⁰ on the Application of the Earmarked Mineral Oil Tax (MinOA), and for other roads until 31 March 2018¹¹.

⁵ The time limits specified in the Federal Act of 24 March 2000¹² on Railways Noise Abatement apply to the completion of improvements and soundproofing measures on railway installations.¹³

⁶ The improvements and soundproofing measures must be completed:

- a. at military aerodromes by 31 July 2020;
- b. at civil aerodromes that are used by heavy aircraft by 31 May 2016;
- c. at civil shooting ranges that require compulsory improvements as a result of the Amendment of 23 August 2006¹⁴ of Annex 7: by 1 November 2016;
- d. at military firing ranges and training grounds: by 31 July 2025.¹⁵

Art. 18 Inspection

Within one year of completion, the enforcement authorities shall inspect the improvements and soundproofing measures to check compliance with the measures ordered. In case of doubt, they carry out tests to assess the effectiveness of the measures.

Art. 19¹⁶

Art. 20¹⁷ Periodical surveys

¹ The FOEN¹⁸ shall enquire regularly of the enforcement authorities as to the status of the improvements and the noise protection measures, in particular concerning roads, railway installations, aerodromes, shooting ranges and military shooting ranges and training areas.

² For roads, the enforcement authorities must provide the following documents in particular by 31 March each year:

- a. a summary of:
 - 1. the roads or sections of road requiring improvements,

¹⁰ SR **725.116.2**

¹¹ Inserted by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS **2004** 4167).

¹² SR **742.144**

¹³ Inserted by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS **2004** 4167).

¹⁴ AS **2006** 3693

¹⁵ Inserted by No I of the O of 23 Aug. 2006 (AS **2006** 3693). Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

¹⁶ Repealed by No I of the O of 1 Sept. 2004, with effect from 1 Oct. 2004 (AS **2004** 4167).

¹⁷ Amended by No I 14 of the O of 7 Nov. 2007 on the New System of Fiscal Equalisation and Division of Tasks between the Confederation and the Cantons, in force since 1 Jan. 2008 (AS **2007** 5823).

¹⁸ Name in accordance with No I of the O of 29 Sept. 2023, in force since 1 Nov. 2023 (AS **2023** 582). This amendment has been made throughout the text.

2. the time frame within which these roads and sections of road will be improved,
 3. the total costs of these improvements and noise protection measures, and
 4. the number of persons exposed to noise levels above the impact thresholds and alarm values;
- b. a report on:
1. the improvements made to roads and sections of road, and the soundproofing measures implemented in the previous year, and
 2. the effectiveness and the costs of these improvements and noise protection measures.

³ For national roads, it shall obtain the information under Paragraph 2 from the Federal Roads Office. For trunk roads and other roads it shall obtain this information from the cantons. The information must be submitted in accordance with the requirements of the FOEN.

⁴ The FOEN shall assess the information in particular in relation to the progress made with improvements and the costs and effectiveness of the measures. It shall inform the enforcement authorities of the results and publishes them.

Section 2¹⁹

Federal Subsidies for Improvements and Soundproofing Measures on Existing Trunk Roads and Other Roads

Art. 21 Eligibility for subsidies

¹ The Confederation shall grant subsidies for improvements and soundproofing measures on existing infrastructure for:²⁰

- a. trunk roads according to Article 12 MinOA²¹;
- b. other roads.

² The subsidies granted under paragraph 1 letter a form part of the global payments according to Article 13 MinOA. The payments under paragraph 1 letter b are granted globally for the road sections defined with the cantons in programme agreements.

³ ...²²

¹⁹ Amended by No I 14 of the O of 7 Nov. 2007 on the New System of Fiscal Equalisation and Division of Tasks between the Confederation and the Cantons, in force since 1 Jan. 2008 (AS **2007** 5823).

²⁰ Amended by No I of the O of 21 Feb. 2018, in force since 1 April 2018 (AS **2018** 965).
²¹ SR **725.116.2**

²² Inserted by No I of the O of 21 Feb. 2018 (AS **2018** 965). Repealed by No I of the O of 12 May 2021, with effect from 1 July 2021 (AS **2021** 293).

Art. 22 Application

¹ The canton submits the application for subsidies for improvements and soundproofing measures for roads according to Article 21 paragraph 1 letter b to the FOEN.

² The application must in particular contain information on:

- a. the roads or road sections to be improved during the period covered by the programme agreement;
- b. the improvements and soundproofing measures planned and their cost;
- c. the efficiency of the measures.

Art. 23 Programme agreement

¹ The FOEN concludes the programme agreement with the cantonal authorities responsible.

² The programme agreement covers in particular:

- a. the roads or road sections to be improved;
- b. the amount paid by the Confederation;
- c. the control procedures.

³ The programme agreement applies for four years; in justified cases a longer or shorter period may be agreed.²³

⁴ The FOEN issues directives on the procedure followed for programme agreements and on the information and documentation relating to the subjects of the programme agreement.

Art. 24 Determination of the subsidy

¹ The amount of the subsidy for improvements is determined by:

- a. the number of people who are protected by these measures; and
- b. the reduction in noise pollution.

² For soundproofing measures on existing buildings, CHF 400 is allocated per soundproof window or other equally effective structural noise protection measure.

³ The amount of the subsidy is negotiated between the Confederation and the canton.

Art. 24a and 24b

Repealed

Art. 25 Payment

Global subsidies are paid out in instalments.

²³ Amended by No I of the O of 21 Feb. 2018, in force since 1 April 2018 (AS 2018 965).

Art. 26 Reports and controls

¹ The canton shall report annually to the competent Federal Office on the use of the subsidies.

² The FOEN shall verify by random sample:

- a. implementation of individual measures in accordance with the programme goals;
- b. use of the payments made.

Art. 27 Inadequate fulfilment and misuse of subsidies

¹ The FOEN shall withhold all or part of the instalment payments during the programme if the canton:

- a. fails to fulfil its reporting duty (Art. 26 para. 1);
- b. fails to meet its obligations to a substantial extent through its own fault.

² If on conclusion of the programme it emerges that the canton has failed to meet its obligations, the competent Federal Office shall require the canton to rectify the situation; it shall set the Canton an appropriate deadline for doing so.

³ If installations for which subsidies have been made are used for a purpose other than that intended, the FOEN may require the canton to cease or make good the misuse within a reasonable period.

⁴ If the defects are not rectified or the misuse does not stop or is not remedied, the subsidies may be reclaimed in accordance with Articles 28 and 29 of the Subsidies Act of 5 October 1990²⁴.

Art. 28

Repealed

Chapter 5
Requirements for Building Zones and Planning Permission in Areas exposed to Noise**Art. 29** Designation of new building zones and new zones with higher noise abatement requirements

¹ New building zones for buildings with rooms sensitive to noise and new no-build zones with higher noise abatement requirements shall be designated only in areas in which noise exposure does not exceed the planning values or in which these values can be complied with by planning, design or structural measures.

²⁴ SR 616.1

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Art. 30²⁶ Development of building zones

Building zones for buildings with rooms sensitive to noise that have not yet been developed when the Act comes into force may only be developed to the extent that the planning values are complied with or can be complied with by a change in the type of use, or by planning, design or structural measures. The enforcement authorities may grant exceptions for small sections of building zones.

Art. 31 Planning permission in areas subject to noise

¹ If the impact thresholds are exceeded, new buildings and significant modifications to buildings with rooms sensitive to noise may only be authorised if the values can be complied with:

- a. by locating the rooms sensitive to noise on the side of the building away from the source of the noise; or
- b. by structural or design measures which shield the building against noise.²⁷

² If the impact thresholds cannot be complied with by measures under paragraph 1, planning permission may be granted only if there is an overriding interest in constructing the building and the cantonal authorities agree.

³ The landowners bear the costs of the measures.

Art. 31a²⁸ Special provisions for airports used by large aircraft

¹ In the case of airports that are used by large aircraft, the planning values and impact thresholds under Annex 5 number 222 are complied with at night if:

- a. no flight operations are planned between 24 and 06 hours;
- b. rooms sensitive to noise are protected against exterior and interior noise as a minimum in accordance with the increased requirements for soundproofing under SIA Standard 181 of 1 June 2006²⁹ of the Swiss Society of Engineers and Architects; and
- c. the bedrooms:
 1. have a window that closes automatically between 22 and 24 hours and can be opened automatically at other times, and
 2. are designed to guarantee an appropriate indoor climate.

²⁵ Repealed by No I of the O of 16 June 1997, with effect from 1 Aug. 1997 (AS 1997 1588).

²⁶ Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

²⁷ Amended by No I of the O of 16 June 1997, in force since 1 Aug. 1997 (AS 1997 1588).

²⁸ Inserted by No I of the O of 28 Nov. 2014, in force since 2 Feb. 2015 (AS 2014 4501).

²⁹ The said standard may be inspected free of charge at the Swiss Society of Engineers and Architects (SIA), Selnastrasse 16, 8027 Zurich, or obtained for a free from www.sia.ch.

² When designating or developing building zones, the competent authority shall ensure that the requirements set out in paragraph 1 letters b and c are made binding on property owners.

³ The FOEN may issue recommendations on the enforcement of paragraph 1 letter c. In doing so, it shall take account of the relevant technical standards.

Chapter 6 Soundproofing of New Buildings

Art. 32 Requirements

¹ The project owner of a new building shall ensure that the soundproofing of the external building elements and partitions of rooms sensitive to noise, and of the stairs and building facilities complies with recognised codes of building practice. These are in particular, for noise from civil aerodromes that are used by heavy aircraft, the stricter requirements, and for noise from other stationary installations, the minimum requirements, of SIA Standard No 181 of the Swiss Society of Engineers and Architects.³⁰

² If the impact thresholds are exceeded but the requirements of Article 31 paragraph 2 for granting planning permission are fulfilled, the enforcement authorities shall impose stricter requirements for the soundproofing of the external building elements appropriately.

³ The requirements also apply to the external building elements, partitions, stairways and building facilities that are converted, replaced or newly installed. On request, the enforcement authorities grant relief if compliance with the requirements would involve unreasonable cost.

Art. 33 External building elements, partitions and building facilities

¹ External building elements form the external boundary of a room (e.g. windows, external doors, external walls, roofs).

² Partitions (e.g. internal walls, ceilings, doors) serve to separate individual units, such as dwellings, within the building.

³ Building facilities are fixed installations such as heating, ventilation, supply and disposal systems, lifts and washing machines.

Art. 34 Application for planning permission

¹ The project owner must specify in the application:

- a. the exterior noise pollution in the event that the impact thresholds are exceeded;
- b. the use to which the rooms are put;

³⁰ Sentence amended by No I of the O of 12 April 2000, in force since 1 May 2000 (AS 2000 1388).

- c. the external building elements and partitions of rooms sensitive to noise.

² For building projects in areas in which the impact thresholds are exceeded, the enforcement authorities may demand details of the soundproofing of the external building elements.

Art. 35 Inspections

After building works are completed, the enforcement authorities shall make random checks to verify whether the soundproofing measures comply with the requirements. In the event of any doubt, they must carry out a more detailed inspection.

Chapter 7 **Investigation, Assessment and Control of Exposure to Exterior Noise** **due to Stationary Installations**³¹

Section 1 **Investigation**

Art. 36³² Obligation to investigate

¹ The enforcement authorities shall investigate the exposure to exterior noise due to stationary installations, or order its investigation if they have grounds to believe that the relevant exposure limit values are being exceeded or that this is to be expected.

² They shall take account of increases and reductions in noise exposure levels that are to be expected due to:

- a. the construction, alteration or improvement of stationary installations, in particular if the projects in question have already been approved or made available for public inspection at the time of the investigation; and
- b. the construction, alteration or demolition of other structures if the projects have been made available for public inspection at the time of the investigation.

³ ...³³

Art. 37³⁴ Noise pollution register

¹ In the case of roads, railway installations, aerodromes and military firing ranges and training grounds, the enforcement authorities shall record in specific registers (noise pollution registers) the noise exposure levels measured in accordance with Article 36.³⁵

² The noise pollution registers specify:

- a. the noise pollution measured;

³¹ Amended by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS **2004** 4167).

³² Amended by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS **2004** 4167).

³³ Repealed by Art. 15 of the O of 4 Dec. 2015 on Railway Noise Abatement Measures, with effect from 1 Jan. 2016 (AS **2015** 5691).

³⁴ Amended by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS **2004** 4167).

³⁵ Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

- b. the calculation procedure used;
- c. the input data for the calculation;
- d. the classification of the areas exposed to noise in the land use plan;
- e. the sensitivity levels applicable;
- f. the installations and their owners;
- g. the number of persons who are affected by noise exposure levels above the applicable exposure limit values.

³ The enforcement authorities are responsible for the supervision and revision of the registers.

⁴ On request, they submit the noise pollution registers to the FOEN. The Office may issue recommendations on the standardised recording and presentation of the data.

⁵ The Federal Office for Civil Aviation is responsible for measurement of noise exposure levels produced by Basel Mulhouse Airport on Swiss territory.

⁶ Any person may have access to the noise pollution register provided that confidentiality with respect to manufacturing and business secrets is ensured, and no conflict with other interests that override exists.

Art. 37a³⁶ Determination and control of noise exposure levels

¹ The enforcement authorities state the permitted noise exposure level in their decision on the construction, alteration or improvement of an installation.

² If it is established or anticipated that the noise exposure levels due to an installation will deviate significantly and permanently from those quoted in the decision, the enforcement authorities shall take the necessary measures.

³ The FOEN may issue recommendations on the standardised recording and presentation of the noise exposure levels in these decisions.

Art. 38 Method of determination

¹ Noise exposure levels are determined in the form of a rating sound level, L_r , or a maximum sound level, L_{max} , on the basis of calculations or measurements.³⁷

² Noise exposure levels due to aircraft shall principally be determined by calculation. The calculations are carried out using recognised state-of-the-art methods. The FOEN shall recommend suitable calculation procedures.³⁸

³ The requirements for calculation procedures and measuring instruments are given in Annex 2.³⁹

³⁶ Inserted by No I of the O of 12 April 2000 (AS 2000 1388). Amended by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS 2004 4167).

³⁷ Amended by No I of the O of 1 Sept. 2004, in force since 1 Oct. 2004 (AS 2004 4167 4313).

³⁸ Inserted by No I of the O of 12 April 2000, in force since 1 May 2000 (AS 2000 1388).

³⁹ Originally para. 2.

Art. 39 Point of determination

¹ For buildings, noise exposure levels shall be determined at the centre of open windows in rooms sensitive to noise. Noise exposure levels due to aircraft may also be determined in the vicinity of the building.⁴⁰

² In the non-developed sector of zones with higher noise abatement requirements, noise exposure levels shall be measured 1.5 m above the ground.

³ In building zones that have not yet been developed, noise exposure levels shall be measured at points where the building and planning legislation allows the building of rooms sensitive to noise.

Section 2 Rating**Art. 40** Exposure limit values

¹ The enforcement authorities shall rate the exposure to exterior noise due to stationary installations on the basis of the exposure limit values specified in Annexes 3 ff.

² The exposure limit value, it is also considered exceeded if it is less than the sum of the levels of exposure to similar types of noise generated by several installations. This does not apply to the planning values for new stationary installations (Art. 7 para. 1).

³ In the absence of exposure limit values, the enforcement authorities shall rate the noise exposure levels in accordance with Article 15 of the Act. They shall also take account of Articles 19 and 23 of the Act.

Art. 41 Validity of the exposure limit values

¹ The exposure limit values apply to buildings with rooms sensitive to noise.

² They also apply:

- a. in yet undeveloped building zones in areas where the construction of buildings with rooms sensitive to noise is allowed under the building and planning legislation;
- b. in the non-developed areas of zones with higher noise abatement requirements.

³ For areas and buildings in which, as a rule, people are present either only during the day or only at night, no exposure limit values apply at night or during the day.

Art. 42 Special exposure limit values for rooms in industrial buildings

¹ For rooms in industrial buildings (Art. 2 para. 6 let. b) lying in areas of sensitivity levels I, II or III, the planning and impact thresholds shall be increased by 5 dB(A).

⁴⁰ The correction of 7 May 2019 concerns the French text only (AS 2019 1337).

² Paragraph 1 does not apply to rooms in schools, institutions and homes. It applies to hotels and guesthouses only if these can be adequately ventilated when the windows are closed.

Art. 43 Sensitivity levels

¹ In land use zones according to Articles 14 ff. of the Spatial Planning Act of 22 June 1979⁴¹, the following sensitivity levels apply:

- a. sensitivity level I in zones with higher noise abatement requirements, notably in leisure zones;
- b. sensitivity level II in zones in which operations that emit noise are not permitted, notably in residential zones and zones for public buildings and installations;
- c. sensitivity level III in zones in which operations emitting a certain level of noise are permitted, notably in residential and industrial zones (mixed zones) and agricultural zones;
- d. sensitivity level IV in zones in which operations emitting a high level of noise are permitted, notably in industrial zones.

² Parts of land use zones rated as sensitivity levels I or II may be assigned the next higher level if they are already exposed to noise.

Art. 44 Procedures

¹ The cantons shall ensure that sensitivity levels are assigned to the land use zones in the building regulations or land use plans of the communes.

² The sensitivity levels are assigned at the time of designation or modification of the land use zones, or at the time of modification of the building regulations.⁴²

³ Prior to assignment, the cantons shall determine the sensitivity levels on a case by case basis in accordance with Article 43.

⁴ ...⁴³

⁴¹ SR 700

⁴² Amended by No IV 31 of the O of 22 Aug. 2007 on the Formal Revision of Federal Legislation, in force since 1 Jan. 2008 (AS 2007 4477).

⁴³ Repealed by No 1 of the O of 27 June 1995, with effect from 1 Aug. 1995 (AS 1995 3694).

Chapter 8 Final Provisions

Section 1 Enforcement

Art. 45⁴⁴ Responsibilities of the Confederation and the cantons⁴⁵

¹ The cantons shall enforce this Ordinance unless it delegates enforcement to the Confederation.

² If the federal authorities apply other federal laws or international treaties or decisions that relate to the subject matter of this Ordinance, they shall also enforce this Ordinance. The cooperation of the FOEN and the cantons is governed by Article 41 paragraphs 2 and 4 of the Act; statutory duties of secrecy are reserved.

³ The following authorities are responsible for enforcing the provisions governing emission limitation measures (Art. 4, 7–9 and 12), improvements (Art. 13, 14, 16–18 and 20) and the determination and control of noise exposure levels (Art. 36, 37, 37a and 40):

- a. for railway installations:
 1. DETEC, where the provisions relate to major railway projects under the Annex to the Railways Act of 20 December 1957⁴⁶ and are implemented by means of a planning approval procedure,
 2. in other cases, the Federal Office of Transport;
- b. for civil aerodromes:
 1. DETEC, where the provisions relate to buildings and installations under Article 37 of the Air Navigation Act of 21 December 1948⁴⁷ that are used for operation of an aerodrome and are implemented by means of a planning approval procedure,
 2. in other cases, the Federal Office of Civil Aviation;
- c. for national roads:
 1. DETEC, where the provisions are implemented by means of a planning approval procedure,
 2. in other cases the Federal Roads Office;
- d. for national defence installations: the Federal Department of Defence, Civil Protection and Sport;
- e. for electrical installations:
 1. the Swiss Federal Office of Energy in cases where the Federal Inspectorate for Heavy Current Installations (ESTI) has been unable to deal with objections from or resolve disputes with the Federal authorities

⁴⁴ Amended by No II 14 of the O of 2 Feb. 2000 to the Federal Act on the Coordination and Simplification of Decision-making Procedures, in force since 1 March 2000 (AS **2000** 703).

⁴⁵ Inserted by Annex 2 No 9 of the O of 21 May 2008 on Geoinformation, in force since 1 July 2008 (AS **2008** 2809).

⁴⁶ SR **742.101**

⁴⁷ SR **748.0**

concerned, in accordance with Article 16 paragraph 2 letter b of the Electricity Act of 24 June 1902⁴⁸,

2. in other cases the ESTI;

f. for cable railway installations according to Article 2 of the Cable Railways Act of 23 June 2006⁴⁹: the Federal Office of Transport⁵⁰.

⁴ In cases where the responsibility for ordering emission limitation measures and improvements lies with the federal authorities, but that for noise protection lies with the cantonal authorities, the two authorities shall coordinate the necessary measures.

⁵ For national roads, DETEC is also responsible for enforcing the provisions governing soundproofing measures (Art. 10 and 15). It coordinates the enforcement of these provisions with the soundproofing measures that are arranged by the cantons.⁵¹

Art. 45^{a52} National noise pollution survey

The FOEN shall conduct a national survey of noise pollution. It shall publish a geo-referenced presentation of the noise pollution in particular for road, railway and aircraft noise and for noise from military firing ranges and training grounds. It shall update this presentation at least every five years.

Art. 46⁵³ Geoinformation

The FOEN shall provide specifications for the minimal geodata models and presentation models for official geodata under this Ordinance, for which it is designated as the federal specialist authority in Annex 1 to the Geoinformation Ordinance of 21 May 2008⁵⁴.

Section 2 Transitional Provisions

Art. 47⁵⁵ Stationary installations and buildings

¹ Stationary installations are deemed to be new stationary installations if the decision authorising the start of building work has not yet taken full legal effect when this Ordinance comes into force.

² For stationary installations that are to be modified, Articles 8-12 apply only if the decision authorising the modification has not yet taken full legal effect when this Ordinance comes into force.

⁴⁸ SR 734.0

⁴⁹ SR 743.01

⁵⁰ Amended by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

⁵¹ Inserted by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

⁵² Inserted by No I of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

⁵³ Amended by Annex 2 No 9 of the O of 21 May 2008 on Geoinformation, in force since 1 July 2008 (AS 2008 2809).

⁵⁴ SR 510.620

⁵⁵ Amended by No I of the O of 23 Aug. 2006, in force since 1 Nov. 2006 (AS 2006 3693).

³ Buildings are deemed to be new buildings if planning permission has not yet taken full legal effect when this Ordinance comes into force.

⁴ For buildings that must be modified, Articles 31 and 32 paragraph 3 apply only if planning permission has not yet taken full legal effect when this Ordinance comes into force.

Art. 48⁵⁶

Art. 48a⁵⁷

Art. 49⁵⁸

Section 3 Commencement

Art. 50

This Ordinance comes into force on 1 April 1987.

⁵⁶ Repealed by No I of the O of 30 June 2010, with effect from 1 Aug. 2010 (AS **2010** 3223).

⁵⁷ Inserted by No I of the O of 1 Sept. 2004 (AS **2004** 4167). Repealed by No I of the O of 21 Feb. 2018, with effect from 1 April 2018 (AS **2018** 965).

⁵⁸ Repealed by No IV 31 of the O of 22 August 2007 on the Formal Revision of Federal Legislation, with effect from 1 Jan. 2008 (AS **2007** 4477).

*Annex 1*⁵⁹
(Art. 10 para. 1 and 15 para. 1)

Requirements for Soundproofing of Windows

¹ The weighted sound reduction index for the building, including the spectrum-adjustment factor, $R'w + (C \text{ or } C_{tr})$, measured on site of the windows and related elements such as roller-shutter boxes and quiet ventilators must be at least equal to the following minimum values, depending on the relevant rating sound level L_r :

L _r in dB(A)		R'w + (C or C _{tr}) in dB
Day	Night	
up to 75	up to 70	32
over 75	over 70	38

² $R'w$ is equal to at least 35 dB and at most 41 dB.

³ For particularly large windows, the enforcement authorities shall impose appropriate requirements that are stricter than paragraphs 1 and 2.

⁴ The weighted sound reduction index for buildings, $R'w$, and the spectrum-adjustment factor, C or C_{tr}, are determined according to the recognised rules, in particular the ISO 140 and ISO 717 standards of the International Standards Organisation.

⁵ The spectrum-adjustment factor C_{tr} applies to predominantly low frequency noise, in particular from roads with a maximum speed of up to 80 km/h and from airfields. The spectrum-adjustment factor C applies to predominantly high frequency noise, in particular from roads with a maximum speed above 80 km/h and from railways.

⁶ The enforcement authorities may order the installation of quiet ventilators in bedrooms.

⁵⁹ Amended by No II of the O of 23 Aug. 2006, in force since 1 Nov. 2006 (AS 2006 3693)

*Annex 2*⁶⁰
(Art. 38 para. 3)

Requirements for the Calculation Procedures and Measuring Instruments

1 Calculation Procedures

- ¹ The procedures used to calculate noise exposure levels must take account of:
- a. the emissions from the noise source of the installation;
 - b. the distance between the exposure point and the noise source of the installation or the flight paths (attenuation due to propagation and dissipation);
 - c. the influence of the ground on the propagation of the noise (ground effects);
 - d. the influence of buildings and natural obstacles on the propagation of the noise (attenuation due to obstacles and reflection).
- ² The FOEN (FOEN) recommends suitable state-of-the-art calculation procedures to the enforcement authorities.

2 Measuring Instruments

The requirements of the Measuring Instruments Ordinance of 15 February 2006⁶¹ and the corresponding implementing provisions of the Federal Justice and Police Department apply to the instruments used to measure noise exposure levels.

⁶⁰ Amended by No II para. 1 of the O of 23 Aug. 2006 (AS **2006** 3693). Revised in accordance with No II para. 1 of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

⁶¹ SR **941.210**

Annex 3
(Art. 40 para. 1)

Exposure Limit Values for Road Traffic Noise

1 Scope

The exposure limit values specified in Number 2 apply to road traffic noise. This includes noise on roads from motor vehicles (motor vehicle noise) and railways (railway noise).

2 Exposure limit values

Sensitivity level (Art. 43)	Planning value		Impact threshold		Alarm value	
	Lr in dB(A)		Lr in dB(A)		Lr in dB(A)	
	Day	Night	Day	Night	Day	Night
I	50	40	55	45	65	60
II	55	45	60	50	70	65
III	60	50	65	55	70	65
IV	65	55	70	60	75	70

3 Determination of the Rating Sound Level

31 Principles

¹ The rating sound level Lr for road traffic noise is determined from the partial rating sound levels for motor vehicle noise (Lr1) and railway noise (Lr2) as follows:

$$Lr = 10 \times \log (10^{0,1 \times Lr1} + 10^{0,1 \times Lr2})$$

² The partial rating sound level Lr1 is the sum of the equivalent continuous A-weighted sound level Leq,m resulting from motor vehicles, and the level correction K1:

$$Lr1 = Leq,m + K1$$

³ The partial rating sound level Lr2 is the sum of the equivalent continuous A-weighted sound level Leq,b resulting from the railways, and the level correction K2:

$$Lr2 = Leq,b + K2$$

⁴ The partial rating sound levels Lr1 and Lr2 are determined for average day and night traffic flows assuming a dry road surface.

32 Average Day and Night Traffic

¹ The average day and night traffic is defined as the annual average of the hourly traffic between 06 and 22 hours and between 22 and 06 hours.

² The hourly motor vehicle traffic during the day (N_t) and at night (N_n) are each divided into two partial traffic flows, N_{t1} and N_{t2} , and N_{n1} and N_{n2} , respectively.

³ The partial traffic flows N_{t1} and N_{n1} for motor vehicle traffic include private cars, delivery vehicles, minibuses, motorcycles and trolley buses.

⁴ The partial traffic flows N_{t2} and N_{n2} for motor vehicle traffic comprise lorries, articulated lorries, coaches, motorcycles and tractors.

⁵ Railway traffic comprises all scheduled and non-scheduled trains, including service journeys.

33 Determination of Average Day and Night Motor Vehicle Traffic

¹ The average day and night traffic (N_t , N_n) and the partial traffic flows (N_{t1} , N_{t2} , N_{n1} , N_{n2}) are determined:

- a. from traffic surveys for existing roads;
- b. from forecasts of traffic volume for roads which are to be built or modified.

² Where insufficient data is available from traffic surveys, or no detailed forecasts exist, the traffic flows N_t , N_n , N_{t1} , N_{t2} , N_{n1} and N_{n2} are calculated from the average daily traffic (ADT; vehicles per 24 h) as follows:

$$\begin{array}{ll} N_t & = 0.058 \cdot \text{ADT} & N_n & = 0.009 \cdot \text{ADT} \\ N_{t1} & = 0.90 \cdot N_t & N_{n1} & = 0.95 \cdot N_n \\ N_{t2} & = 0.10 \cdot N_t & N_{n2} & = 0.05 \cdot N_n \end{array}$$

³ The ADT is determined according to the recognised principles of traffic planning and traffic technology.

34 Determination of the Average Day and Night Traffic for Railways

The average day and night traffic for railways is determined:

- a. from the timetable and traffic data for existing railway installations;
- b. from traffic volume forecasts for railway installations which are to be built or modified.

35 Level Corrections

¹ The level correction K1 for motor vehicle noise is calculated as follows from the average day and night traffic:

$$\begin{array}{lll} K1 = -5 & \text{for} & N < 31.6 \\ K1 = 10 \cdot \log(N/100) & \text{for} & 31.6 \leq N \leq 100 \\ K1 = 0 & \text{for} & N > 100 \end{array}$$

Here, N stands for the hourly motor vehicle traffic Nt or Nn.

² The K2 level correction for railway noise is equal to -5. For screeching railway noise that occurs frequently and is clearly audible, the K2 level correction is equal to 0.

Annex 4
(Art. 40 para. 1)

Exposure Limit Values for Railway Noise

1 Scope

¹ The exposure limit values specified in Number 2 apply to the noise from standard and narrow gauge railways.

² Noise on roads arising from railways is considered equivalent to road traffic noise (Annex 3 Number 1).

³ The noise from cable railways and railway workshops, energy installations and similar railway works, is considered equivalent to noise from industrial and commercial installations (Annex 6 Number 1).

2 Exposure Limit Values

Sensitivity level (Art. 43)	Planning value		Impact threshold		Alarm value	
	Lr in dB(A)		Lr in dB(A)		Lr in dB(A)	
	Day	Night	Day	Night	Day	Night
I	50	40	55	45	65	60
II	55	45	60	50	70	65
III	60	50	65	55	70	65
IV	65	55	70	60	75	70

3 Determination of the Rating Sound Level

31 Principles

¹ The rating sound level Lr for railway noise is determined from the partial rating sound levels for vehicle noise (Lr1) and shunting noise (Lr2) as follows:

$$Lr = 10 \times \log (10^{0,1 \times Lr1} + 10^{0,1 \times Lr2})$$

² The partial rating sound level Lr1 is the sum of the equivalent continuous A-weighted sound level Leq,f resulting from vehicle operation, and the level correction K1:

$$Lr1 = Leq,f + K1$$

³ The partial rating sound level Lr2 is the sum of the equivalent continuous A-weighted sound level Leq,r resulting from shunting, and the level correction K2:

$$Lr2 = Leq,r + K2$$

⁴ The partial rating sound levels Lr1 and Lr2 are determined for average day and night traffic flows.

32 Average Day and Night Operations

¹ Average day and night operations are hauling and shunting operations from 06 to 22 hours and from 22 to 06 hours respectively, averaged over the year.

² Vehicle operations comprise all scheduled and non-scheduled trains, including service journeys.

³ Shunting comprises all shunting movements and operations intended for the purpose of connecting and disconnecting trains.

⁴ Vehicle operations and shunting are determined:

- a. from the timetable and operating data for existing railway installations;
- b. from operational forecasts for railway installations which are to be built or modified.

33 Level Corrections

¹ The level correction K1 for transport noise is calculated as follows:

$$\begin{array}{lll} K1 = -15 & \text{for} & N < 7.9 \\ K1 = 10 \cdot \log(N/250) & \text{for} & 7.9 \leq N \leq 79 \\ K1 = -5 & \text{for} & N > 79 \end{array}$$

Here, N stands for the number of train journeys per day or night.

² The level correction K2 for shunting noise is based on the frequency and audibility of all pulsating, tonal and screeching types of noise, and is equal to:

Audibility of all types of noise	Frequency of all types of noise		
	Seldom	Occasional	Frequent
Weak	0	2	4
Clear	2	4	6
Strong	4	6	8

*Annex 5*⁶²
(Art. 40 para. 1)

Exposure Limit Values for Noise from Civil Aerodromes

1 Scope and Definitions

¹ The exposure limit values specified in Number 2 apply to the noise from civil air transport at civil aerodromes.

² Civil aerodromes means the national airports in Basel, Geneva and Zurich, the other licensed aerodromes and the airfields.

³ Light aircraft means an aircraft having a maximum permissible take-off weight of 8618 kg or less.

⁴ Heavy aircraft means an aircraft having a maximum permissible take-off weight of over 8618 kg.

⁵ The noise from repair workshops, maintenance works and similar operations at civil aerodromes is considered equivalent to the noise from industrial and commercial installations (Annex 6 Sec. 1).

2 Exposure Limit Values

21 Exposure Limit Values for Light Aircraft Traffic Noise, expressed as L_{rk}

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	L_{rk} in dB(A)	L_{rk} in dB(A)	L_{rk} in dB(A)
I	50	55	65
II	55	60	70
III	60	65	70
IV	65	70	75

22 Exposure Limit Values for Total Traffic Noise from Light and Heavy Aircraft, expressed as L_r

For the total traffic noise from civil aerodromes used by heavy aircraft, the following exposure limit values apply in addition to the exposure limits expressed as L_{rk} :

⁶² Amended by No I of the O of 30 May 2001 (AS **2001** 1610). Revised in accordance with No II para. 1 of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

221 Daytime Exposure Limit Values (06-22 hours), expressed as L_{r_t}

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	L_{r_t} in dB(A)	L_{r_t} in dB(A)	L_{r_t} in dB(A)
I	53	55	60
II	57	60	65
III	60	65	70
IV	65	70	75

222 Night Time Exposure Limit Values for the first (22-23 hours), the second (23-24 hours) and the last night hour (05-06 hours), expressed as L_{r_n}

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	L_{r_n} in dB(A)	L_{r_n} in dB(A)	L_{r_n} in dB(A)
I	43	45	55
II	47/50 ¹	50/55 ¹	60/65 ¹
III	50	55	65
IV	55	60	70

¹ The higher value applies for the first night hour (22-23 hours)

23 Exposure Limit Values expressed as \bar{L}_{max}

For civil aerodromes used exclusively by helicopters (heliports), the following exposure limit values, expressed as \bar{L}_{max} , apply in addition to the exposure limits expressed as L_{r_k} :

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	\bar{L}_{max} in dB(A)	\bar{L}_{max} in dB(A)	\bar{L}_{max} in dB(A)
I	70	75	85
II	75	80	90
III	80	85	90
IV	85	90	95

3 Determination of the Rating Sound Level L_{rk} for Light Aircraft Noise

31 Principles

¹ The rating sound level L_{rk} for light aircraft noise is the sum of the equivalent continuous A-weighted sound level Leq_k and the level correction K:

$$L_{rk} = Leq_k + K$$

² The equivalent continuous sound level Leq_k is determined for the average number of hourly aircraft movements (number of movements n) for a day with average peak operations.

³ Aircraft movements are all landings and takeoffs of light aircraft. Go-arounds count as two flight movements.

32 Number of Aircraft Movements n for existing Civil Aerodromes

For existing civil aerodromes, the number of aircraft movements n is determined as follows:

- a. the six months with the greatest amount of traffic during the operating year are identified;
- b. for these six months, the average daily number of flight movements is determined separately for each of the seven days of the week. The average daily values for the two days of the week with the most traffic are designated as N1 and N2;
- c. n is determined by averaging N1 and N2 over the twelve daytime hours as follows:

$$n = (N1 + N2)/24$$

33 Number of Aircraft Movements n for new Civil Aerodromes

¹ For civil aerodromes which are to be built or modified, the number of flight movements n is determined from forecasts of traffic volume.

² If no detailed forecasts can be made, n is calculated from the forecasted annual number of aircraft movements N as follows:

$$n = (N \times 2,4)/(365 \times 12)$$

34 Level Corrections

The level correction K is calculated from the annual number of aircraft movements N as follows:

$$K = 0 \text{ for } N < 15\,000$$

$$K = 10 \times \log (N/15\,000) \text{ for } N \geq 15\,000$$

4 Determination of the Rating Sound Level L_r for Traffic at Civil Aerodromes used by Heavy Aircraft

41 Principles

¹ At civil aerodromes used by heavy aircraft, the rating sound level L_r of total traffic is determined based on the relevant aircraft traffic, whereby separate calculations are made for daytime (06-22 hours), and for the first (22-23 hours), second (23-24 hours) and last (05-06 hours) night hours.

² At civil aerodromes used by heavy aircraft, the daytime rating sound level for total traffic L_{r_d} is calculated from the rating sound levels for light aircraft L_{r_k} and heavy aircraft L_{r_g} as follows:

$$L_{r_d} = 10 \times \log (10^{0,1 \times L_{r_k}} + 10^{0,1 \times L_{r_g}})$$

³ For heavy aircraft noise, the daytime rating sound level is the sum of the equivalent continuous A-weighted sound level Leq_g arising from aircraft operations between 06 and 22 hours, averaged over one year:

$$L_{r_d} = Leq_g$$

⁴ For heavy aircraft noise, the rating sound level L_{r_n} for the first, the second and the last night hour is the equivalent continuous A-weighted sound level Leq_n , each averaged over one hour, arising from aircraft operations during the periods 22-23, 23-24 hours and 05-06 hours, averaged over one year:

$$L_{r_n} = Leq_n$$

42 Relevant Aircraft Traffic

¹ The equivalent continuous sound levels Leq_g and Leq_n are determined from the operational data.

² For civil aerodromes that are to be built or modified, the relevant aircraft traffic is determined from forecasts of traffic volume.

³ Flights taking place after the second night hour (23-24 hours) and before the last night hour (05-06) are assigned to the second night hour (23-24 hours).

5 Determination of the Average Maximum Noise Level \bar{L}_{\max} for Heliports

¹ The average maximum noise level \bar{L}_{\max} for heliports is the energetic average of the maximum noise level of a representative number of passing flights or overflights.

² Measurements of \bar{L}_{\max} are carried out with the instruments set on SLOW.

Annex 6
(Art. 40 para. 1)

Exposure Limit Values for Industrial and Commercial Noise

1 Scope

¹ The exposure limit values specified in Number 2 apply to noise:

- a. from industrial, commercial and agricultural installations;
- b. from goods handling in industrial, commercial and agricultural installations and at railway stations, aerodromes, etc.;
- c. from traffic within the perimeter of industrial and commercial installations and farmyards;
- d. from multi-storey car parks and from larger off-road car parks;
- e. from heating, ventilation and air-conditioning installations.

² Energy, waste processing and transport installations, aerial cableways and cable railways, ski lifts and racing tracks that are used regularly for sustained periods of time are considered equivalent to industrial and commercial installations.

2 Exposure Limit Values

Sensitivity level (Art. 43)	Planning value		Impact threshold		Alarm value	
	Lr in dB(A)		Lr in dB(A)		Lr in dB(A)	
	Day	Night	Day	Night	Day	Night
I	50	40	55	45	65	60
II	55	45	60	50	70	65
III	60	50	65	55	70	65
IV	65	55	70	60	75	70

3 Determination of the Rating Sound Level

31 Principles

¹ The rating sound level Lr for industrial, commercial and similar types of noise is determined from the partial rating sound levels Lr,i for each noise phase as follows, whereby separate calculations are made for daytime (07 to 19 hours) and night-time (19 to 07 hours):

$$L_r = 10 \cdot \log \sum_i 10^{0,1 \cdot L_{r,i}}$$

² The partial rating sound level Lr,i is determined for the average daily duration of the noise phase i as follows:

$$L_{r,i} = L_{eq,i} + K_{1,i} + K_{2,i} + K_{3,i} + 10 \times \log (t_i/t_0)$$

where:

- Leq,i is the equivalent continuous A-weighted sound level during the noise phase i;
 K1,i is the level correction for the noise phase i;
 K2,i is the level correction for the noise phase i;
 K3,i is the level correction for the noise phase i;
 ti is the average daily duration of the noise phase i in minutes;
 to = 720 minutes.

³ Noise phases are time periods in which the exposure point is subject to uniform noise with respect to sound level, frequency and pulse content.

32 Average Daily Duration of Noise Phases

¹ The average daily duration (ti) of the noise phase i is calculated from its annual duration (Ti) and the annual number of working days (B) as follows:

$$t_i = T_i/B$$

² For new or modified installations, the average daily duration of the noise phase i is determined from operational forecasts.

33 Level Corrections

¹ Value of the level correction K1:

- | | | |
|----|---|--------------------------|
| a. | for noise according to Number 1 paragraph 1 letters a and b | 5 |
| b. | for noise according to Number 1 paragraph 1 letter c | 0 |
| c. | for noise according to with Number 1 paragraph 1 letter d | 0 by day
5 at night |
| d. | for noise according to Number 1 paragraph 1 letter e | 5 by day
10 at night. |

² The level correction K2 takes account of the audibility of the tonality content of the noise at the point of exposure and is equal to:

- | | | |
|----|---------------------------------------|----|
| a. | for non-audible tonality content | 0 |
| b. | for weakly audible tonality content | 2 |
| c. | for clearly audible tonality content | 4 |
| d. | for strongly audible tonality content | 6. |

³ The level correction K3 takes account of the audibility of the pulse content of the noise at the point of exposure and is equal to:

- a. for non-audible pulse content 0
- b. for weakly audible pulse content 2
- c. for clearly audible pulse content 4
- d. for strongly audible pulse content 6.

*Annex 7*⁶³
(Art. 40 para. 1)

Exposure Limit Values for Noise from Civil Firing Range Installations

1 Scope

¹ The exposure limit values specified in Number 2 apply to the noise from civil firing range installations at which only hand guns or small arms are used to fire at stationary or moving targets.

² The hand guns or small arms used at the firing range installations are allocated to the following weapons categories:

- a. assault rifles and portable firearms of comparable calibre;
- b. small arms with centre fire cartridges, in particular ordnance pistols;
- c. small arms with rim fire cartridges;
- d. portable firearms with rim fire cartridges;
- e. sporting guns with ball cartridges;
- f. shotguns;
- g. other firearms.

³ Firing range installations are public if they are used for shooting practice in accordance with Articles 62 and 63 of the Armed Forces Act of 3 February 1995⁶⁴.

2 Exposure Limit Values

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	Lr in dB(A)	Lr in dB(A)	Lr in dB(A)
I	50	55	65
II	55	60	75
III	60	65	75
IV	65	70	80

For noise from public installations according to Number 1 paragraph 3⁶⁵, at which, for weapons in categories a or b, the level correction $K_i < -15$, no alarm values apply. For such installations, no soundproofing measures under Article 15 are required. The level correction K_i is calculated as specified in Number 321.

⁶³ Amended by No I of the O of 23 Aug. 2006 (AS **2006** 3693.). Revised in accordance with No II para. 1 of the O of 30 June 2010, in force since 1 Aug. 2010 (AS **2010** 3223).

⁶⁴ SR **510.10**

⁶⁵ The reference was amended on 1 Aug. 2010 pursuant to Art. 12 para. 2 of the Publications Act of 18 June 2004 (SR **170.512**).

3 Determination of rating sound level

31 Principles

¹ The rating sound level L_r for the noise from firing range installations is the energetic sum of the partial rating sound level L_{ri} for the weapons categories:

$$L_r = 10 \cdot \log \sum_i 10^{0.1 \cdot L_{ri}}$$

² The partial rating sound level L_{ri} is the sum of the average single shot sound level L_i of a weapons category and the level correction K_i :

$$L_{ri} = L_i + K_i$$

³ The average single shot sound level L_i is the energetic average weighted according to the number of shots of the energetically averaged single shot sound level L_j of a type of weapon or type of ammunition:

$$L_i = 10 \cdot \log \sum_j \frac{M_j}{M_i} \cdot 10^{0.1 \cdot L_j}$$

⁴ The energetically averaged single shot sound level L_j must be determined using the measurements of the A-weighted maximum sound level with the FAST time constants.

Where:

M_j is the number of shots fired annually using a single type of weapon or a single type of ammunition of a weapons category, averaged over three years;

M_i is the number of shots fired annually using weapons of a single category, averaged over three years.

32 Level Correction

321 Calculation

¹ The level correction K_i is calculated as follows:

$$K_i = 10 \times \log (D_{wi} + 3 \times D_{si}) + 3 \times \log M_i - 44$$

Where:

D_{wi} is the number of annual firing half-days falling on a weekday, averaged over three years, for each weapons category;

D_{si} is the number of annual firing half-days falling on a Sunday or a general public holiday, averaged over three years, for each weapons category.

² When determining the number of firing half-days and the number of shots, all exercises that take place regularly over a period of three years must be taken into account.

322 Determination of the number of firing half-days

¹ Any firing exercise taking place in the morning or in the afternoon and lasting more than two hours counts as a firing half-day. Exercises lasting two hours or less count as half a firing half-day.

² For new or modified firing range installations, the number of firing half-days is determined on the basis of operational forecasts. For existing firing range installations, the number of firing half-days is determined by counting.

323 Determination of the number of shots

¹ For existing firing range installations, the number of shots M_i per weapons category is determined from the operational logs.

² If the operational logs of existing firing range installations are incomplete or if the firing range installations are new or have been modified, the number of shots M is determined from forecasts of future use.

Annex 8⁶⁶
(Art. 40 para. 1)

Exposure Limit Values for Noise at Military Aerodromes

1 Scope

¹ The exposure limit values specified in Number 2 apply to traffic noise from military aerodromes.

² Civil regional airports and airfields used for military purposes also count as military aerodromes.

³ Helicopters are considered equivalent to propeller aircraft.

⁴ Noise from repair workshops, maintenance workshops and similar operations at military aerodromes is considered equivalent to the noise from industrial and commercial installations (Annex 6 Number 1).

2 Exposure Limit Values

21 Exposure Limit Values expressed as L_r

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	L _r in dB (A)	L _r in dB (A)	L _r in dB (A)
I	50	55	65
II	60	65	70
III	60	65	70
IV	65	70	75

22 Exposure Limit Values expressed as L_{r,z}

In addition to the exposure limit values expressed as L_r, the exposure limit values specified in Annex 5 and expressed as L_r, referred to below as L_{r,z}, also apply to the noise from civilian traffic at military airfields.

⁶⁶ Inserted by No II of the O of 27 June 1995 (AS **1995** 3694). Revised in accordance with No II para. 2 of the O of 12 April 2000 (AS **2000** 1388) and of the O of 23 Aug. 2006, in force since 1 Nov. 2006 (AS **2006** 3693).

3 Determination of the Rating Sound Level

31 Principles

¹ The rating sound level L_r for noise from military aerodromes is calculated from the rating sound levels L_{r_m} for military aircraft noise and L_{r_z} for civil aircraft noise, as follows:

$$L_r = 10 \times \log (10^{0,1 \times L_{r_m}} + 10^{0,1 \times L_{r_z}})$$

² The rating sound level L_{r_z} is determined in the same way as the corresponding L_r for civil aerodromes specified in Annex 5 Numbers 3 and 4.

³ The rating sound level L_{r_m} is determined from the partial rating sound levels L_{r_j} , for noise from jet aircraft, and L_{r_p} , for noise from propeller aircraft, as follows:

$$L_{r_m} = 10 \times \log (10^{0,1 \times L_{r_j}} + 10^{0,1 \times L_{r_p}})$$

⁴ The partial rating sound level L_{r_j} is the sum of the equivalent continuous A-weighted sound level Leq_j arising from the operation of jet aircraft, and the level corrections K_0 and K_1 :

$$L_{r_j} = Leq_j + K_0 + K_1$$

⁵ The partial rating sound level L_{r_p} is the sum of the equivalent continuous A-weighted sound level Leq_p arising from the operation of propeller aircraft, and the level corrections K_0 and K_2 :

$$L_{r_p} = Leq_p + K_0 + K_2$$

⁶ The equivalent continuous sound levels Leq_j and Leq_p are calculated for the average number of hourly flight movements for a day with an average level of traffic, whereby flight movements of jet aircraft and propeller aircraft are counted separately (number of flight movements n_j and n_p).

⁷ Flight movements are all takeoffs and landings of jet and propeller aircraft. Go-arounds count as two flight movements.

32 Numbers of Flight Movements n_j and n_p for Military Aerodromes

¹ For existing military aerodromes, the number of flight movements n_j and n_p are determined as follows:

- a. the six months of the operating year with the greatest amount of traffic are identified, whereby flight movements of jet aircraft and propeller aircraft are counted separately;
- b. for these six months, the number of flight movements of jet aircraft M_j and propeller aircraft M_p are determined;

- c. the numbers of flight movements n_j and n_p are calculated from M_j and M_p by averaging them over 130 days and twelve daytime hours:

$$n_j = M_j / (12 \times 130)$$

$$n_p = M_p / (12 \times 130)$$

² For military aerodromes that are to be built or modified, the numbers of flight movements n_j and n_p are determined from forecasts of traffic volume.

33 Level Corrections

¹ The level correction K_0 is equal to -8.

² The level correction K_1 is calculated from the annual number of flight movements of jet aircraft N_j as follows:

$$K_1 = 0 \text{ for } N_j < 15\,000$$

$$K_1 = 10 \times \log(N_j / 15\,000) \text{ for } N_j \geq 15\,000$$

³ The level correction K_2 is calculated from the annual number of flight movements of propeller aircraft N_p as follows:

$$K_2 = 0 \text{ for } N_p < 15\,000$$

$$K_2 = 10 \times \log(N_p / 15\,000) \text{ for } N_p \geq 15\,000$$

Annex 967
(Art. 40 para. 1)

Exposure Limit Values for Noise from Military Firing Ranges and Training Grounds

1 Scope

¹ The exposure limit values specified in Number 2 apply to the firing noise on military firing ranges and training grounds.

² In addition to the exposure limit values specified in Number 2, the exposure limit values specified in Annex 7 apply to the noise from civil firing on military firing ranges and training grounds, with the exception of firing by the police and border guards.

³ Noise from repair workshops, maintenance workshops and similar operations and noise from traffic on military firing ranges and training grounds is considered equivalent to the noise from industrial and commercial installations (Annex 6 Number 1).

⁴ Noise from helicopters on military firing ranges and training grounds is considered equivalent to the noise from heliports (Annex 5 Numbers 23 and 5).

2 Exposure Limit Values

Sensitivity level (Art. 43)	Planning value	Impact threshold	Alarm value
	L _r in dB(A)	L _r in dB(A)	L _r in dB(A)
I	50	55	65
II	55	60	70
III	60	65	70
IV	65	70	75

3 Determination of the Rating Sound Level

31 Principles

The rating sound level L_r for the firing noise from military firing ranges and training grounds is calculated as follows from the sound levels L_{AE1} and L_{AE2} and the level corrections K1 and K2:

$$L_r = 10 \cdot \log(10^{0.1 L_{AE1}} + 10^{0.1(L_{AE2} + K1)}) - 10 \cdot \log(T) + K2$$

⁶⁷ Inserted by No II para. 2 of the O of 30 June 2010, in force since 1 Aug. 2010 (AS 2010 3223).

Where:

L_r	Rating sound level for noise from military firing ranges and training grounds;
T	Rating time in seconds = 52 weeks · 5 days · 12 hours · 60 minutes · 60 seconds;
L_{AE1}	Sound exposure level of all the shooting events of a year which have taken place Mondays to Fridays between 07 and 19 hours;
L_{AE2}	Sound exposure level of all the shooting events of a year which have taken place outside of the L_{AE1} timeframe;
K1	5
K2	15

32 Determination of Shooting Operations

¹ For existing military firing ranges and training grounds, the number of shots is determined from surveys carried out over three years.

² If, for existing military firing ranges and training grounds, no data on the number of shots is available or if the installations are new or have been modified, the number of shots is determined from forecasts of future use.

