

Commission Directive (EU) 2015/996 of 19 May 2015 establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council (Text with EEA relevance)

- Article 1 Annex II to Directive 2002/49/EC is replaced by the text...  
Article 2 (1) Member States shall bring into force the laws, regulations...  
Article 3 This Directive shall enter into force on the day following...  
Article 4 This Directive is addressed to the Member States.  
Signature

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ANNEX

ASSESSMENT METHODS FOR THE NOISE DIRECTIVE

1. INTRODUCTION
2. COMMON NOISE ASSESSMENT METHODS
  - 2.1. General provisions — Road traffic, railway and industrial noise
    - 2.1.1. Indicators, frequency range and band definitions
    - 2.1.2. Quality framework
      - Accuracy of input values
      - Use of default values
      - Quality of the software used for the calculations
  - 2.2. Road traffic noise
    - 2.2.1. Source description
      - Classification of vehicles
      - Number and position of equivalent sound sources
      - Sound power emission
        - General considerations
        - Traffic flow
        - Individual vehicle
    - 2.2.2. Reference conditions
    - 2.2.3. Rolling noise
      - General equation
      - Correction for studded tyres
      - Effect of air temperature on rolling noise correction
    - 2.2.4. Propulsion noise
      - General equation
      - Effect of road gradients
    - 2.2.5. Effect of the acceleration and deceleration of vehicles
    - 2.2.6. Effect of the type of road surface
      - General principles
      - Age effect on road surface noise properties
  - 2.3. Railway noise
    - 2.3.1. Source description
      - Classification of vehicles
        - Definition of vehicle and train
      - Classification of tracks and support structure

- Number and position of the equivalent sound sources
  - 2.3.2. Sound power emission
    - General equations
      - Individual vehicle
      - Traffic flow
    - Rolling noise
    - Wheel and rail roughness
      - Definition
    - Vehicle, track and superstructure transfer function
    - Impact noise (crossings, switches and junctions)
    - Squeal
    - Traction noise
    - Aerodynamic noise
    - Source directivity
  - 2.3.3. Additional effects
    - Correction for structural radiation (bridges and viaducts)
    - Correction for other railway-related noise sources
- 2.4. Industrial noise
  - 2.4.1. Source description
    - Classification of source types (point, line, area)
    - Number and position of equivalent sound sources
    - Sound power emission
      - General
      - Source directivity
- 2.5. Calculation of noise propagation for road, railway, industrial sources.
  - 2.5.1. Scope and applicability of the method
  - 2.5.2. Definitions used
  - 2.5.3. Geometrical considerations
    - Source segmentation
    - Propagation paths
    - Significant heights above the ground
    - Calculation of the mean plane
    - Reflections by building façades and other vertical obstacles
  - 2.5.4. Sound propagation model
  - 2.5.5. Calculation process
    - Sound level in favourable conditions (LF) for a path (S,R)...
    - Sound level in homogeneous conditions (LH) for a path (S,R)...
    - Statistical approach inside urban areas for a path (S,R)
    - Long-term sound level for a path (S,R)
    - Long-term sound level at point R for all paths
    - Long-term sound level at point R in decibels A (dBA)...
  - 2.5.6. Calculation of noise propagation for road, railway, industrial sources.
    - Geometrical divergence
    - Atmospheric absorption
    - Ground effect
    - Acoustic characterisation of ground
    - Calculations in homogeneous conditions

- Calculation in favourable conditions
- Diffraction
- General principles
- Pure diffraction
- Calculation of the path difference
- Homogeneous conditions
- Favourable conditions
- Calculation of the attenuation  $A_{dif}$
- Calculation of the term  $\Delta_{ground}(S,O)$
- Calculation of the term  $\Delta_{ground}(O,R)$
- Vertical edge scenarios
- Reflections on vertical obstacles
  - Attenuation through absorption
  - Attenuation through retrodiffraction
- 2.6. General provisions — Aircraft noise
  - 2.6.1. Definitions and symbols
    - Terms
    - Symbols
    - Subscripts
  - 2.6.2. Quality framework
    - Accuracy of input values
    - Use of default values
    - Quality of the software used for the calculations
- 2.7. Aircraft noise
  - 2.7.1. Aim and scope of document
  - 2.7.2. Outline of the document
  - 2.7.3. The concept of segmentation
  - 2.7.4. Flight paths: Tracks and profiles
  - 2.7.5. Aircraft noise and performance
  - 2.7.6. Airport and aircraft operations
    - General airport data
    - Runway data
    - Ground track data
    - Air traffic data
    - Topographical data
    - Reference conditions
      - Reference conditions for NPD data
      - Reference conditions for aeroplane aerodynamic and engine data
  - 2.7.7. Description of the flight path
  - 2.7.8. Relationships between flight path and flight configuration
  - 2.7.9. Sources of flight path data
    - Radar data
    - Procedural steps
  - 2.7.10. Coordinate systems
    - The local coordinate system
    - The ground-track fixed coordinate system
    - The aircraft coordinate system
    - Accounting for topography
  - 2.7.11. Ground Tracks
    - Backbone tracks
    - Track dispersion
  - 2.7.12. Flight profiles

- 2.7.13. Construction of flight path segments
  - Ground track
  - Flight profile
  - Segmentation of the takeoff ground roll
    - Example:
  - Segmentation of the initial climb segment
    - Example:
  - Segmentation of airborne segments
  - The landing ground roll
- 2.7.14. Noise calculation for a single event
- 2.7.15. Single event metrics
- 2.7.16. Determination of event levels from NPD-data
  - Impedance adjustment of standard NPD data
- 2.7.17. General expressions
  - Segment event level  $L_{seg}$
  - Event noise level  $L$  of an aircraft movement
- 2.7.18. Flight path segment parameters
  - Geometric parameters
  - Segment power  $P$
- 2.7.19. Segment Event level correction terms
  - The duration correction  $DV$  (Exposure levels  $LE$  only)
  - Sound propagation geometry
  - Engine installation correction  $\Delta I$
  - Lateral attenuation  $\Lambda(\beta, \ell)$  (infinite flight path)
  - Finite segment lateral attenuation
  - The finite segment correction  $\Delta F$  (Exposure levels  $LE$  only)
  - Specific Treatments of Ground-roll Segments, including the start-of-roll directivity function...
  - The start-of-roll directivity function  $\Delta SOR$
  - Treatment of receivers located behind each takeoff and landing ground-roll...
- 2.7.20. Event noise level  $L$  of a general-aviation aircraft movement
- 2.7.21. Method for the Calculation of Helicopter Noise
- 2.7.22. Noise associated with Engine Testing (Run-Up) Operations, taxiing and auxiliary...
- 2.7.23. Calculation of cumulative levels
- 2.7.24. Weighted equivalent sound levels
- 2.7.25. The weighted number of operations
- 2.7.26. Standard grid calculation and refinement
- 2.7.27. Use of rotated grids
- 2.7.28. Tracing of contours
- 2.8. Assigning noise levels and population to buildings
  - Determination of the number of inhabitants of a building
    - CASE 1: the data on the number of inhabitants is...
    - CASE 2: no data on the number of inhabitants is...
  - Assigning receiver points to the façades of buildings
    - CASE 1
    - CASE 2
- 3. INPUT DATA
- 4. MEASUREMENT METHODS

## Appendix A Data requirements

Section 2.7.6 of the main text describes in general terms...

Note:

- A1 GENERAL AIRPORT DATA
- A2 RUNWAY DESCRIPTION
- A3 GROUND TRACK DESCRIPTION
- A4 AIR TRAFFIC DESCRIPTION
- A5 FLIGHT PROCEDURE DATA SHEET

## Appendix B Flight performance calculations

Terms and symbols

Terms

Symbols

- B1 INTRODUCTION
  - Flight path synthesis
  - Flight path analysis
- B2 ENGINE THRUST
  - Guidance on operation with reduced takeoff thrust
  - Reduced Climb Thrust
- B3 VERTICAL PROFILES OF AIR TEMPERATURE, PRESSURE, DENSITY AND WINDSPEED
- B4 THE EFFECTS OF TURNS
  - Approximate method
- B5 TAKEOFF GROUND ROLL
  - Note:
- B6 CLIMB AT CONSTANT SPEED
- B7 POWER CUTBACK (TRANSITION SEGMENT)
  - Amount of thrust reduction
  - Constant speed climb segment with cutback
- B8 ACCELERATING CLIMB AND FLAP RETRACTION
  - Note:

## Accelerating segment with cutback

- B9 ADDITIONAL CLIMB AND ACCELERATION SEGMENTS AFTER FLAP RETRACTION
- B10 DESCENT AND DECELERATION
- B11 LANDING APPROACH

## Appendix C

## Modelling of lateral ground track spreading

It is recommended that, in the absence of radar data,...  
Assuming a Gaussian distribution with a standard deviation  $S$ ,  
illustrated...  
Figure C-1 Subdivision of a ground track into 7 subtracks...  
A Gaussian distribution can normally be modelled adequately  
using 7...  
However, the adequacy of the approximation depends on the  
relationship...

## Appendix D

## Recalculation of NPD-data for non-reference conditions

The noise level contributions from each segment of the flight...  
Figure D-1 Meteorological conditions recorded during noise  
certification tests  
The curves overlaid on Figure D-1, calculated using an industry...  
Because the attenuation rates, given in Table D-1, are arithmetic...  
The attenuation coefficients in Table D-1 may be assumed valid...  
The ANP database provides the following NPD data for each...  
maximum sound level versus slant distance,  $L_{max}(d)$  time  
integrated level...  
all data being normalised to the AIR-1845 atmosphere.  
Adjustment of the NPD curves to user-specified conditions  $T$   
and...  
First the reference spectrum is corrected to remove the SAE...  
The increment  $\Delta L$  is the difference between the NPDs in...  
Applying  $\Delta L$  to adjust both  $L_{max}$  and LE NPDs effectively...

## Appendix E

## The finite segment correction

This appendix outlines the derivation of the finite segment  
correction...

- E1 GEOMETRY

- E2 ESTIMATION OF THE ENERGY FRACTION
- E3 CONSISTENCY OF MAXIMUM AND TIME INTEGRATED METRICS — THE SCALED...

#### Appendix F

##### Database for road traffic source

This appendix presents the database for most of the existing...

#### Appendix G

##### Database for railway source

This appendix presents the database for most of the existing...

#### Appendix H

##### Database for industrial source

This appendix presents a few examples for input values for...

#### Appendix I

##### Database for aircraft source — NPD data

This appendix presents the database for most of the existing...  
This section introduces complementary data for general aviation aircraft.

GASEPF and GASEPV data

Aircraft classes data

Aircraft Noise and Performance data for the four classes are...

Helicopter Noise and Performance Data Set 1

Helicopter Noise and Performance Data Set 2

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*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

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- (1) [OJ L 189, 18.7.2002, p. 12.](#)
- (2) Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors ([OJ L 162, 3.7.2000, p. 1](#)).
- (3) Common Noise Assessment Methods in Europe (CNOSSOS-EU) — JRC Reference Report, EUR 25379 EN. Luxembourg: Publications Office of the European Union, 2012, — ISBN 978-92-79-25281-5