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Prezraļevanje stavb - Difuzija zraka - Meritvev lastni coni klimatizacijske/ventilacijske sobe termiļnega vrednotenja in akustiļnih razmer

Ventilation for buildings - Air Diffusion - Measurements in the occupied zone of airconditioned/ventilated rooms to evaluate thermal and acoustic conditions

Lüftung von Gebäuden — Luftverteilung — Messungen im Aufenthaltsbereich von klimatisierten/belüfteten Räumen zur Bewertung der thermischen und akustischen Bedingungen

Systemes de ventilation pour les bâtiments - Diffusion d'air - Mesurages dans la zone d'occupation des pieces avec conditionnement d'air ou ventilées afin d'évaluer les conditions thermiques et acoustiques

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Ventilation for buildings - Air Diffusion - Measurements in the occupied zone of airconditioned/ventilated rooms to evaluate thermal and acoustic conditions

Systèmes de ventilation pour les bâtiments - Diffusion d'air - Mesurages dans la zone d'occupation des pièces avec conditionnement d'air ou ventilées afin d'évaluer les conditions thermiques et acoustiques

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Foreword

This document (prEN 15726:2007) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

Annex A is normative and others are informative.

1 Scope

This European Standard is applicable to measure some parameters of thermal and acoustic comfort (i.e. temperatures, air velocities…) in a room with an air diffusion system.

This European Standard can be used on site or in a lab for full-scale measurements.

This European Standard applies to ventilation or air conditioning systems designed to maintain the comfort conditions in buildings. It is not applicable in the case of systems for the control of industrial or other special process environments.

NOTE In the latter case however, it may be referred to if the system technology is similar to that of the above mentioned ventilation and air conditioning systems.

2 Normative references

This European Standard document incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard document only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 12792, *Ventilation for buildings — symbols and terminology*

CR XXXX, *Ventilation for buildings — method for measuring airflow rates in ventilation systems*

ISO 5167, *Measurements of fluid flow by means of pressure differential devices*

ISO 7726, *Ergonomics of the thermal environment — Instruments and methods for measuring physical quantities*

EN 12599, *Test procedures and measuring methods for handing over installed ventilation and air conditioning systems*

EN 13779, *Ventilation for non residential buildings — Performance requirements for ventilation and room-conditioning systems*

EN 13182 *Instrumentation requirements for air velocity measurements in ventilated spaces*

EN 15251, *Ventilation for buildings- Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and a*coustics

ISO 7730, *Ergonomics of the thermal environment-Analytical determination* and interpretation of thermal comfort using calculation of the PMV and PPD indices and the local comfort criteria

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

3.1
reference point
the point where the measurements are taken

3.2
mean velocity
at a point, mean velocity is the time average velocity over the measuring period

3.3
spatial Average (or residual) velocity
it is the average value of mean velocities taken in several points in the occupied zone

3.4
spatial Maximum velocity
it is the maximum value of mean velocities taken in several points in the occupied zone

3.5
test area
is equal to the occupied zone according EN 13779

4 Test set up and conditions

Before any test, the air diffusion system shall be checked accordance with EN 12599 so that its performance may be recorded.

If the system performance does not meet the design criteria correction shall be considered prior the continuation of the test. If this is not possible this shall be made clear in the report along with the assumptions made.

4.1 Thermal loads

The room should be occupied according to its expected use or thermal loads have to be simulated. This should include all internal and external loads (occupants, lights, equipment…). For on site measurements internal and external loads should be reported. (actual or simulated).

4.2 Furniture

Furniture, curtains, absorbent surfaces, etc. can influence thermal or acoustic characteristics and should therefore be as representative as possible.

4.3 Other conditions

Operational conditions of system running (VAV, fan speed, variable geometry…) and environmental conditions do have influence on results and have to be reported according to Annex A.

Conditions must be stabilised as much as possible during the test. For instance, supply temperature and reference point temperature should be checked regularly and should not vary during the test by more than +/- 1 K If this is not possible then the variation shall be recorded.

5 Methodology

5.1 Sampling

5.1.1 Sampling in a room

The reference point will be situated in the centre of the test area at a height of 1.1 m. Large areas may be divided in smaller parts, usually recommended to be less than 20 m^2 (EN 12599). In this case, each smaller part shall be treated as a test area

There should be enough area to ensure a correct representation of the overall and local air diffusion. It is recommended that the test area takes into account several diffusers jets in order to cover the effect of jet interaction.

5.2 Measurements

Different levels of measurements can be used:

— Level 1: easy and quick check at the reference point(s).

— Level 2: more detailed check. Level 1 tests have to be performed first.

For each level, required measurements are indicated in Table 1.

Table 1 — Measurements required

	Level 1	Level 2
Airflow rate	Smoke test or any other jet visualisation (§ 5.2.1.1)	Measurement (§ 5.2.1.2)
Velocities		Measurement (§ 5.2.2.2)
Temperatures	At reference point (§ 5.2.3.1)	Measurement (§ 5.2.3.2)
Sound pressure level	Overall dBA level at the reference point, or any other point where the highest sound level can be expected. (§ 5.2.4.1)	Octave band in order to recalculate any criteria (dB(A), dB(C), NR…) asked (§ 5.2.4.2)

If required

Ventilation Efficiency		see Annex E

5.2.1 Airflow rate

5.2.1.1 Level 1: Jet visualisation

Jet shall be visualised either by smoke test or by any other means

The objective of the visualisation is:

— to determine the air flow pattern in the occupied zone;

— to detect possible high velocity areas;

— to detect possible dead zones;

— Examples of common flow patterns are given in Annex B.

5.2.1.2 Level 2: Airflow rate measurements

Any method described either in CR XXXX,EN 12599 , or ISO 5167 (lab measurements) shall be used for the determination of airflow rates. Both supply and extract airflow rates shall be determined if applicable.

Results have to be compared to designed values and, if not appropriate, ventilation system shall be adjusted before continuing measurements.

5.2.2 Velocities in the occupied zone

5.2.2.1 Level 1

No measurements are required. Flow visualisation as in § 5.2.1.

5.2.2.2 Level 2: measurements

The measurements of low velocities within treated spaces shall be made with a measuring device in accordance with EN 13182.

Air velocities should be measured in enough points in the occupied zone to determine the velocity field in the occupied zone. To this end, two or more planes of measurements shall be chosen according to Figures 1 to 5. One plane has to be perpendicular to the diffuser and centered on it. Test planes must be evenly distributed in the occupied zone and spaced with a distance between 0,6 and 4 m. They are limited by the occupied zone and shall be representative of standard occupation of the room.

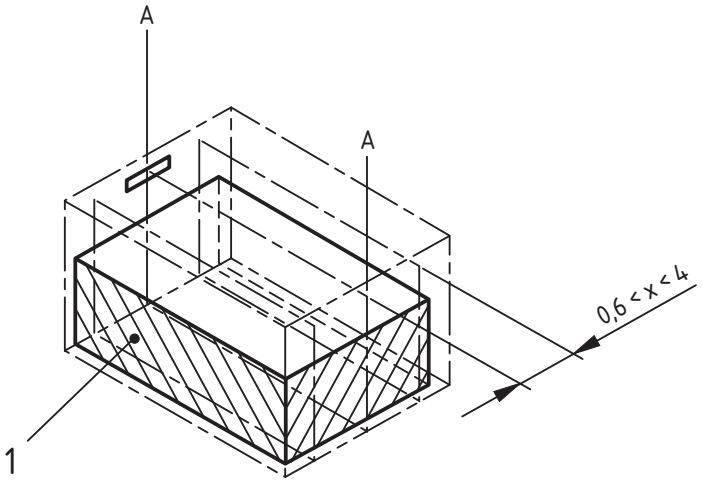

Figure 1 — Diffuser on the wall – example of test planes

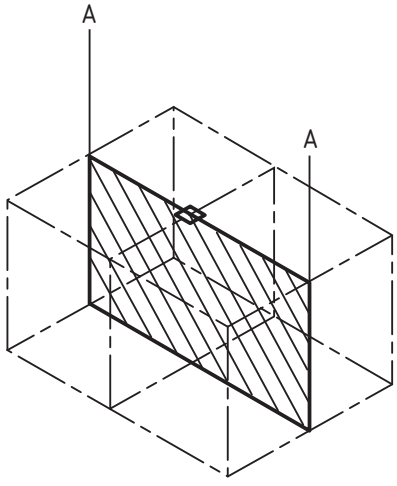

Figure 2 — Diffuser on the ceiling – example of test planes

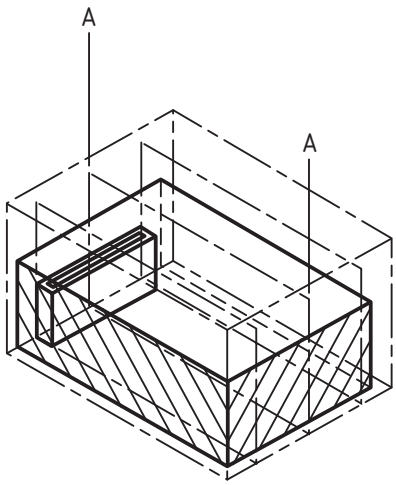

Figure 3 — Diffuser (or fan coil) in window or floor position – example of test planes

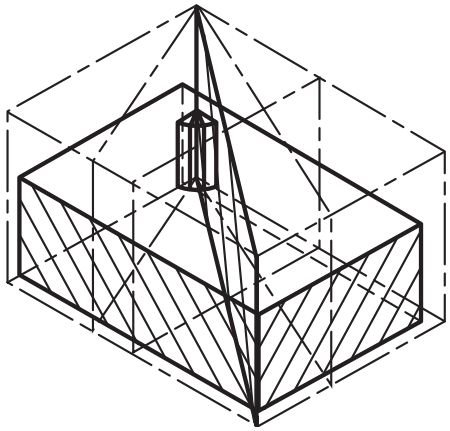

Figure 4 — Diffuser in a corner – example of test planes

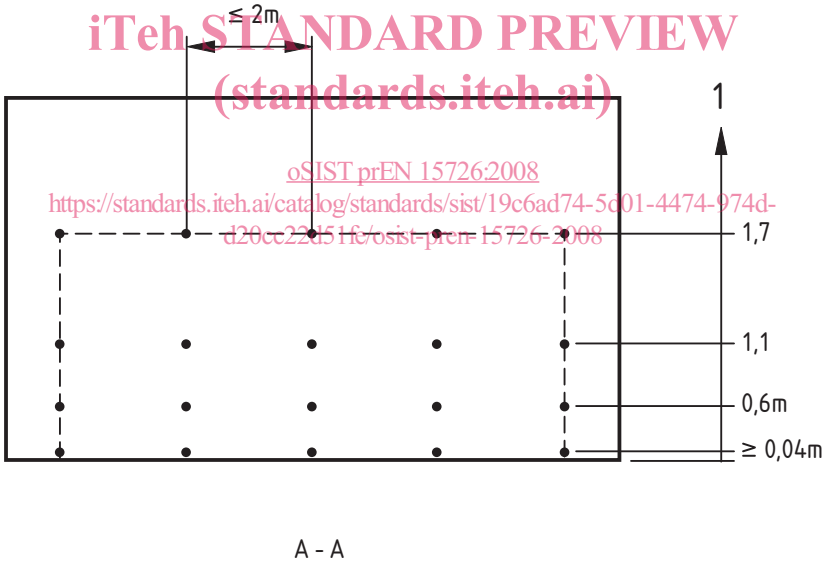

Figure 5 — Distribution of points in one vertical plane

In each plane, horizontal test positions shall be evenly spaced resulting in a minimum of five positions per plane, with a maximum spacing of 2m between them. It is recommended to have positions at the limit of the occupied zone.

In each horizontal position, velocities shall be measured at three heights from the floor. The lower and upper boundaries shall be specified in accordance with EN 13779 and additionally at 1.1 m (optional 0.6 m for seated persons). However the lower measurement point shall not be lower than 0.04 m, If average velocity in the occupied zone is to be determined, a minimum of 15 measurement points shall be used to average the values in the occupied zone. In each points, velocity measurements shall be done according to EN 13182.

Where jet visualisation has shown highest velocities, the number of points might be increased in this zone in order to determine better the maximum air velocity in the occupied zone. These additional points should not be used for average velocity calculations.

If some positions of the described grid can't be measured due to furniture, obstacles etc., these points should be excluded from the measurements. In this case, the position of the test planes can be slightly adapted to fit better to the occupation.

For diffusers situated in a corner, velocities should be measured as in Figure 4 in a 45º plane and, if necessary, also in the plane of maximum velocity (determined by visualisation)

Annex C gives further details on comfort analysis with regard to intermittence and draughts.

5.2.3 Temperature measurements

Measurements of temperatures in room shall be made by means of resistance thermometers, thermocouples or other suitable instruments as long as they are calibrated with an accuracy better than ± 0,25 K. The global accuracy shall be better or equal to ± 0,5 K.

5.2.3.1 Level 1: at reference point

The air temperature at the reference point shall be determined.

Air temperatures shall be measured by radiant shielded sensors with an accuracy better than or equal ± 0,1 K.

Globe temperature may be measured with a sensor with accuracy better than or equal ± 0,1 K, according to ISO 7726

If necessary, mean radiant temperature may be determined at the boundary of the occupied zone closest to the center of the radiating surfaces (windows, ceiling…).

5.2.3.2 Level 2: temperature distribution

Air Temperatures shall be measured at the same points as velocities as described in § 5.2.2.2 and according to ISO 7726.

If necessary, mean radiant temperature and radiant temperature asymmetry according to ISO 7726 may be determined in chosen points where occupants might be seated (1.1 m above the floor) or standing (1.7 m above the floor).

5.2.4 Sound pressure level

NOTE The following procedure is meant to be used in situ, laboratory conditions usually differ from those found in practice.

5.2.4.1 Level 1:Overall value in a few points

One point of measurement in every zone of the room lower than 20 m^2 can be enough. The measurement shall be done at the reference point. In addition other measurements should be taken to determine where the highest sound level is to be found and this reading should be recorded.

If the measurement is in the air stream, microphone must be shielded (for instance foam ball).

In this position, the sound pressure levels in dB(A) shall be measured with the system operating normally. Additionally, the sound pressure level in dB(A) with the system switched off shall be measured if possible. If the difference between system on and off is greater than 10 dB, no correction for background is required. If this is not the case, repeat measurement when ambient noise is lower