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Ventilation for buildings - Design criteria for the indoor environment

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Foreword

This Technical Report has been prepared by Technical Committee CEN/TC 156, Ventilation for buildings. It received approval from the CEN Technical Board on 199X.

Annexes A to H are all informative. Annexes A to G cover the details of development and determination of design criteria, practical examples, data, WHO guidelines, ventilation effectiveness, guidelines for low-polluting buildings. Annex H is a bibliography.

Introduction

This Technical Report is intended to assist in providing an acceptable indoor environment for people in ventilated buildings. The indoor environment comprises the thermal environment, the air quality and the acoustic environment. Good ventilation provides a comfortable indoor environment with a low health risk for the occupants and uses a small amount of energy. Reducing the indoor sources of pollution and preferably adapting the ventilation rate to the actual demand are more important than increasing the outside airflow rate.

The quality of the indoor environment may be expressed as the extent to which human requirements are met. Requirements vary, however, for different individuals. Some people are rather sensitive to an environmental parameter and are difficult to satisfy, whereas others are less sensitive and are easier to satisfy. To cope with these individual differences the environmental quality can be expressed by the percentage of persons who find an environmental parameter unacceptable (= % dissatisfied). If there are few dissatisfied, the quality of the environment is high. If there are many dissatisfied, the quality is low. Prediction of the percentage of dissatisfied is used to establish requirements for the thermal environment and for ventilation. A predicted value may not be equal to the actual percentage of dissatisfied in practice, where other factors such as stress can have an influence. This Technical Report is intended to specify the requirements whilst also indicating methods currently in use and those under development.

Although aspects of the indoor environment (thermal, air quality and acoustic) are dealt with separately, the indoor environment is considered as a whole. Conflict can arise between the different environmental requirements and designers may therefore be required to find a compromise.

A ventilation or air-conditioning system is usually designed to operate under certain assumptions concerning the application of the building, internal loads, meteorological conditions etc. The desired indoor environment will therefore only be provided when these assumptions are valid.

NOTE A rationale which specifies how the quality of the indoor environment can be expressed is provided in annex A. Annex B gives a step-by-step method for determining the criteria. The application of annex A is illustrated in annex C by a number of practical examples. The examples cover spaces in different types of buildings under conditions frequently occurring in practice.

1 Scope

This Technical Report specifies the requirements for, and methods of expressing the quality of the indoor environment for the design, commissioning, operation and control of ventilation and air-conditioning systems.

This Technical Report covers indoor environments where the major concern is the human occupation but excludes dwellings. This Technical Report does not cover buildings where industrial processes or similar operations requiring special conditions are undertaken.

The practical procedures, including selection of parameters to be measured during commissioning, control and operation, are not covered.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Technical Report. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

EN ISO 7730, *Moderate thermal environments — Determination of the PMV and PPD indices and specification of the conditions for thermal comfort.*

ISO 9920, *Ergonomics of the thermal environment — Estimation of the thermal insulation and evaporative resistance of a clothing ensemble.*

ISO 8996, *Ergonomics — Determination of metabolic heat production.*

EN ISO 11201, *Acoustics — Noise emitted by machinery and equipment. Guideline for the preparation of test code of engineering grade requiring noise measurements at the operator's or bystander's position.*

EN ISO 3744, *Acoustics — Determinators of sound power levels of noise sources — Engineering methods for free field conditions over a reflecting plane.*

3 Definitions

For the purposes of this Technical Report, the following definitions apply:

3.1

draught

unwanted local cooling of the body caused by air movement and temperature

3.2

draught rating (DR)

percentage of people predicted to be dissatisfied due to draught

3.3

external work

energy spent in overcoming external mechanical forces on the body; also expressed as a fraction of metabolic energy production, where the fraction value defines the mechanical efficiency.

NOTE For most activities external work may be disregarded.

3.4

humidity, absolute

absolute amount of water vapour in the ambient air expressed in g/kg or m³ dry air. It can also be expressed by the partial water vapour pressure (p_v) in Pa or by the dewpoint (t_d) in °C