

REHVA

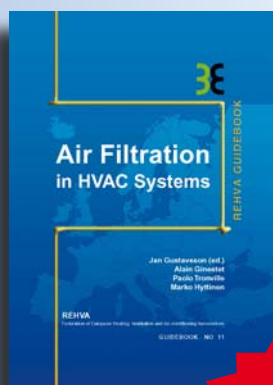
GUIDEBOOKS

...for Healthy Technology

REHVA, now almost 50 years old, is an organization of European professionals in the field of building services (heating, ventilation and air-conditioning). REHVA represents more than 100 000 experts from 29 European countries. REHVA's main activity is to develop and disseminate economical, energy efficient and healthy technology for the mechanical services of buildings.

NO: 11 Air Filtration in HVAC Systems

Jan Gustavsson (ed.), Alain Ginestet,
Paolo Tronville and Marko Hyttinen



NEW!

This Guidebook will increase the awareness of the role of air filtration to improve indoor air quality and to design energy efficient air filtration systems. It will help the designer and user to understand the background and criteria for air filtration, how to select air filters and avoid problems associated with hygienic and other conditions at operation of air filters. The selection of air filters requires a number of considerations from the air intake to the disposal of soiled air filters. The criteria for selecting an air filtration system are based on external conditions such as levels of existing pollutants, indoor air quality and energy efficiency requirements.



Air filter in air handling unit.

NO: 12 Solar Shading How to integrate solar shading in sustainable buildings

Wouter Beck (ed.), Dick Dolmans,
Gonzague Dutoo, Anders Hall and
Olli Seppänen

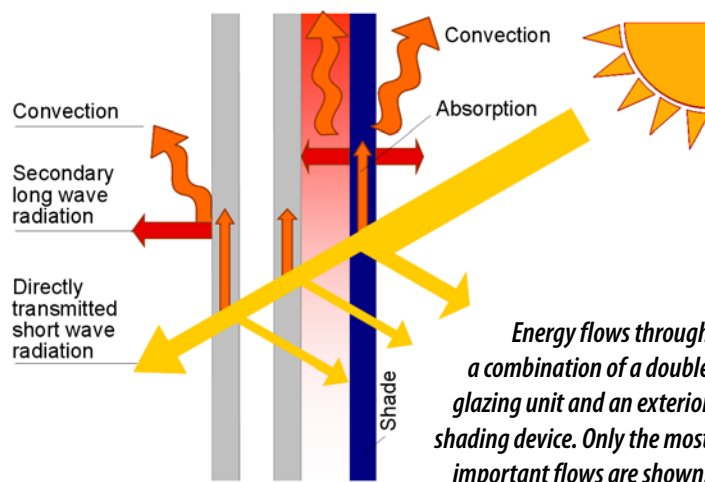


NEW!

Selection of solar shading should always be one of the first steps in the design of HVAC systems as the demand of power and use of energy is greatly influenced by solar shading. It is always more feasible to prevent extra heat entering to the building than use energy for cooling to remove the heat in summer, and in winter take maximum benefit of free solar heating. The integration of solar shading with building HVAC-systems is more and more important in the future to optimise the investment and operation costs of buildings.

This guidebook gives a solid background on the physics of solar radiation and its behaviour in window with solar shading

systems. Major focus of the guidebook is on the effect of solar shading in the use of energy for cooling, heating and lighting. The book gives also practical guidance for selection, installation and operation of solar shading as well as future trends in integration of HVAC-systems with solar control.

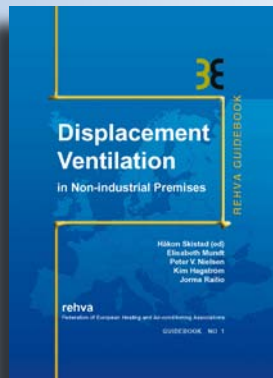


NO: 1

Displacement Ventilation

in Non-Industrial Premises

Håkon Skistad (ed), Elisabeth Mundt, Peter V. Nielsen, Kim Hagström and Jorma Railio

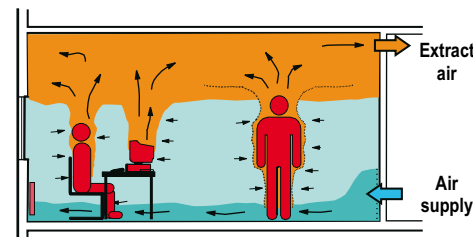


Research, development and use of displacement ventilation, mainly confined to Scandinavian countries, is now gaining popularity in other countries as well.

The guidebook serves as a comprehensive and easy-to-understand design manual. The book explains the benefits and limitations of displacement in commercial ventilation and outlines where ventilation should be applied. Case studies for a restaurant, office cubicle, auditorium, meeting room and classroom are included. With displacement ventilation, warm contaminants rise to the ceiling, the contaminated air is extracted and fresh, cool air is supplied at floor level. Displacement ventilation has two main advantages over traditional mixing systems. First, it ensures improved indoor air quality throughout occupied spaces and removes more contaminants at high level than conventional mixing air distribution systems. Second, as an efficient use of energy due to its capability to remove exhaust air from

the room at a higher temperature than that in the occupied zone, this strategy allows a higher inlet temperature for the same internal heat gain/load. Benefits are that less cooling is needed for a given temperature in the occupied spaces, longer periods with free cooling and better air quality in the occupied spaces.

The book also points out the limitations of displacement ventilation. The technique is no marvel that can solve all ventilation problems, but a principle that has definite advantages when applied correctly.

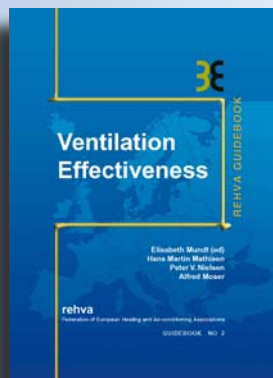


Principle of displacement ventilation.

NO: 2

Ventilation Effectiveness

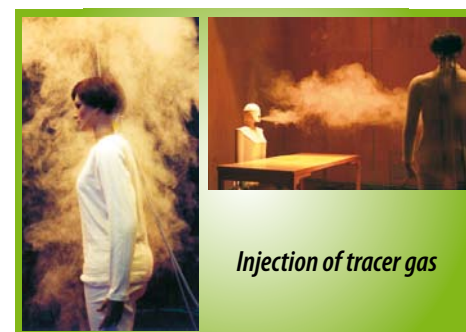
Elisabeth Mundt (ed), Hans Martin Mathisen, Peter V. Nielsen and Alfred Moser



Ventilation effectiveness is the common notion for the indices used to characterize the ability of a ventilation system to exchange the air in the room and the ability of a ventilation system to remove air-borne contaminants. Improving the ventilation effectiveness allows the indoor air quality to be significantly enhanced without the need for higher air changes in the building, thereby avoiding the higher capital costs and energy consumption associated with increasing the ventilation rates. This guidebook does not only present the practical research on ventilation effectiveness, but also illustrates its application with case studies.

This guidebook is aimed at practising, consulting and contracting engineers. It provides easy-to-understand descriptions of the indices used to measure the performance of a ventilation

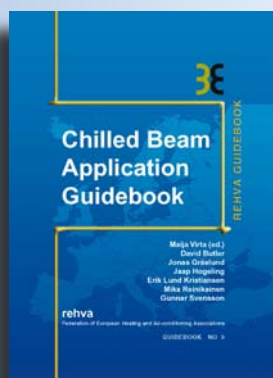
system and which indices to use in different cases. It also demonstrates how to measure ventilation effectiveness in practice. Use of tracer gases, measurement equipment and how to perform measurement and calculations are introduced. Eight practical case studies are also presented and discussed.



NO: 5

Chilled Beam Application Guidebook

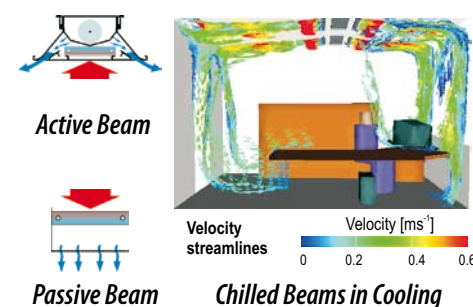
Maija Virta (ed), David Butler, Jonas Gräslund, Jaap Hogeling, Erik Lund Kristiansen, Mika Reinikainen and Gunnar Svensson



Chilled beam cooling is relatively new technology that has rapidly spread all over the Europe. Its advantages are in low noise generation, low room velocities and flexibility. High temperature level of cooling media also improves the energy efficiency of the mechanical cooling and allows longer periods of free cooling. The guidebook presents theory on the principles of chilled beam cooling and illustrates its practical applications. The chilled beam systems are primarily used for cooling and ventilation in spaces, where good indoor environmental quality and individual space control are appreciated and where the internal moisture loads are moderate. Chilled beam systems are dedicated outdoor air systems. They can also be used for heating. Active chilled beams are connected to the ventilation ductwork, high temperature cold water and when desired low temperature hot water system. The main air-handling unit supplies

primary air into the various rooms through the chilled beam. Primary air supply induces room air to be recirculated through the heat exchanger of the chilled beam. In order to cool or heat the room either cold (14–17 °C) or warm (30–50 °C) water is cycled through the heat exchanger. Recirculated room air and primary air mix prior to diffusion in the space.

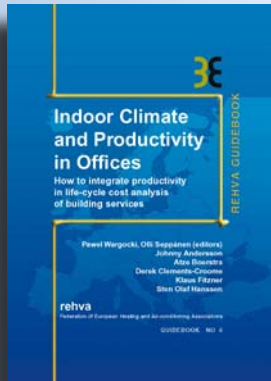
Room temperature is controlled by regulating the water flow rate of the heat exchanger.



NO: 6 Indoor Climate and Productivity in Offices

How to integrate productivity
in life-cycle cost analysis
of building services

Pawel Wargocki and Olli Seppänen (editors),
Johnny Andersson, Atze Boerstra, Derek
Clements-Croome, Klaus Fitzner and
Sten Olaf Hanssen

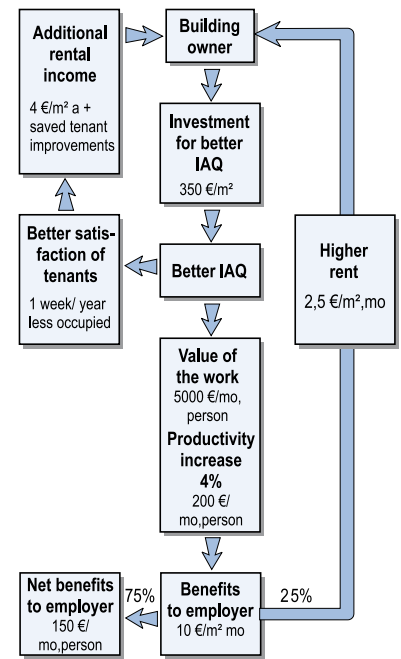


This REHVA guidebook shows for the first time how to quantify the effects of indoor environment on office work, and also how to include these effects in the calculation of building costs. This is a concerted effort of researchers, engineers and practitioners. Such calculations have not been performed previously, as very little data was available on this issue. In recent years more and more information has become available on this topic. This information has been reviewed during the present work to find out whether there is solid scientific evidence that the indoor environmental quality affects office work.

The quantitative relationships presented in this guidebook can be used to calculate the costs and benefits of running and operating the building, as illustrated by several examples. One of the aims of these examples is to emphasize that the costs of running the building are much lower than the benefits from improved office work obtained by reducing temperatures or improving of indoor air quality. This is further presented in the guidebook by comparing the typical costs of wages, and typical energy and operation costs.

The main purpose of the guidebook is to increase the awareness of building owners and practitioners to indoor environmental quality and its importance for office work. This is attempted

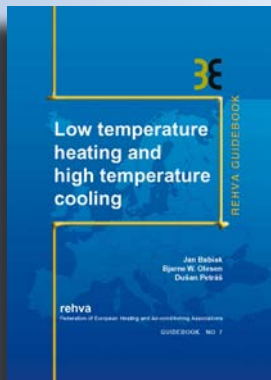
by showing how large profits can be obtained from fairly small investments. Examples on how to convince the client in practice are given.



Profit sharing of the improved productivity.

NO: 7 Low temperature heating and high temperature cooling

Jan Babiak, Bjarne W. Olesen
and Dušan Petráš



The guidebook describes the systems that use water as the heat-carrier and where the heat exchange within the conditioned space is more than 50% radiant.

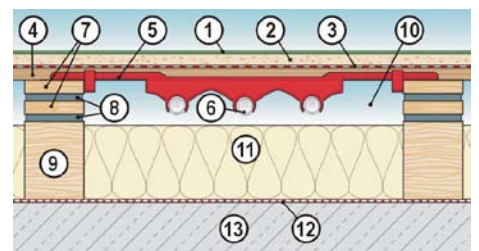
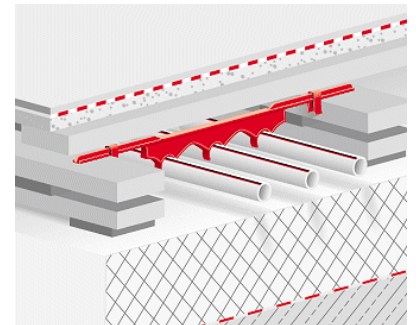
Radiant ceiling panels are suspended under the ceiling with heat carrier temperature relatively close to room temperature. Embedded systems insulated from the main building structure (floor, wall and ceiling) are used in all types of buildings and work with heat carriers at low temperatures for heating and relatively high temperature for cooling. Finally systems with pipes embedded in the building structure (slabs, walls), which are operated at heat carrier temperatures very close to room temperature and take advantage of the thermal storage capacity of the building structure.

Using a low water supply temperature (of 25 – 40°C) in heating conditions and high water temperature (16 – 20°C) in cooling, allows the possible use of renewable energy sources. In cooling conditions it is also possible to

use renewable energy sources, for example ground heat exchangers or rain water ground accumulators.

The guidebook describes the following systems:

- Radiant heating and cooling panels
- Pipes isolated from main building structure
- Thermo Active Building Systems (TABS)



Sprung floor construction.

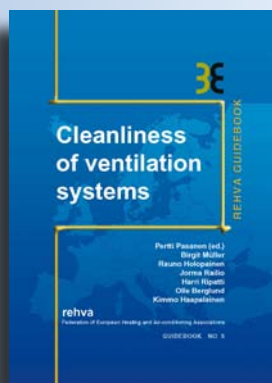
1 = PVC- or linoleum covering, 2 = wood plates,
3 = PE foil, 4 = blind floor, 5 = pipe keeper,...



Construction of a cooling panel.

NO: 8 Cleanliness of ventilation systems

Pertti Pasanen (ed.), Birgit Müller,
Rauno Holopainen, Jorma Riiho, Harri Ripatti,
Olle Berglund and Kimmo Haapalainen

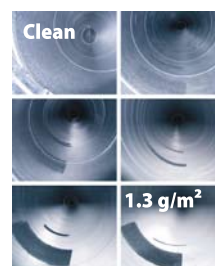


A growing body of evidence shows that indoor environmental conditions substantially influence health and productivity. Ventilation is an important contribution to air quality. Its purpose is to maintain good indoor air quality. But air handling systems may also be a source of pollution if not properly constructed and maintained. This guidebook presents criteria and methods on how to design, install and maintain clean air handling systems for better indoor air quality.

The ventilation system should be cleaned according to a cleaning plan. The plan consists of a selection of methods suitable for the different components and surface materials. The methods should be selected so as to avoid damage to surfaces and components being cleaned.

The guidebook is useful for practitioners who like to follow the recent international practices. With its illustrations and examples it is also an

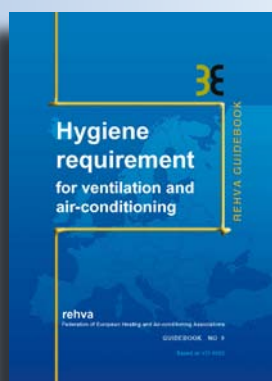
excellent text book for the vocational training of various building professionals.



Visual scales for both new
and existing air ducts.

The guidebook offers a wide approach to the factors affecting indoor air quality and is aiming to conform to the European standards of HVAC system maintenance.

NO: 9 Hygiene requirement for ventilation and air-conditioning



This Guidebook is intended to provide a holistic formulation of hygiene-related constructional, technical and organisational requirements to be observed in the planning, manufacture, execution, operation and maintenance of ventilating and air-conditioning systems. These requirements for ventilating and air-conditioning systems primarily serve to protect human health; they may, however, also be the consequence of technical conditions.

The guidebook complements the REHVA guidebook no 8 Cleanliness of ventilation systems, published at the same time. The guidebook is based on VDI Guideline 6022, one of the most popular Guidelines published by VDI. Since 1998, more than 10.000 copies of VDI Guidebooks have been printed and thousands of people went to the training described in the guidebook. As the result the

hygiene standard in air-conditioning systems today is much better than 10 years ago. REHVA's Swiss member SWKI accepted the VDI 6022 Guideline as SWKI-2003-5, in 2003. The REHVA working group revised and updated the German Guidebook with some new ideas and procedures.



NO: 10 Computational Fluid Dynamics in Ventilation Design

Peter V. Nielsen (ed.), Francis Allard,
Hazim B. Awbi, Lars Davidson and Alois Schälin



Both the development of CFD models for room air movement and progress in the general fluid dynamics research are strongly influenced by the increased computer power that has been available for the past few decades. This guidebook is written by a working group of highly qualified international experts representing research, consulting and design. CFD-calculations have rapidly been developed a powerful tool for the analysis of air and pollution distribution in various spaces. However, the user of CFD-calculation should be aware the basic principles of calculations, and specifically the boundary conditions. The reliability of the results depend very much on the skills of the person who performs the calculations. Guidebook is intended for users of CFD-programs, designers, manufactures

and building owners. It gives also guidelines for those who order CFD-calculations from the experts. With its illustrations and examples it is also an excellent text book for universities and also the vocational training of various building professionals.



Temperature distribution in the symmetry plane
of a room with displacement ventilation.