

Use of guideline and guidance values in the evaluation of indoor air problems

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Aim of the study

- Propose the procedure for evaluation of indoor air problems and the use of guideline and guidance (P90, P100) values (=reference values) in indoor air investigations in office environments with suspected indoor air problems
- Propose reference values for fungi and bacteria, volatile organic compounds (VOC), formaldehyde, and man-made vitreous fibres (MMVF).



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Introduction

- Good indoor air quality is important to human health because people spend a significant fraction of their time indoors (Bernstein et al. 2008).
- Problems with indoor air quality can be caused by several factors. Problems in air conditioning, moisture damage, material emissions, or dust and dirt problems may occur simultaneously at one workplace (Wolkoff, 1995)
- The guideline and guidance values for contaminants in the indoor air of office environments are valuable tools for assessing occupants exposure to these compounds.



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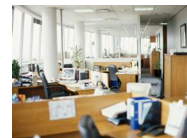
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Material and methods

- Reference values for fungi and bacteria, volatile organic compounds, formaldehyde, and man-made vitreous fibres were presented on the basis of a wide study conducted in office buildings (Salonen, 2009).



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- These values, guideline (P50) and guidance (P90, P100) values, can be used to assess the quality of indoor air in office environments with suspected indoor air problems.



- The procedure follows the basic assessment criteria proposed by ACGI H (American Conference of Governmental Industrial Hygienists).



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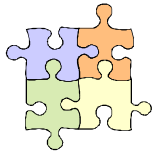
Results



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- The first step in the assessment is to collect and summarize the information gathered by previous surveys and from the environment.
- If an indoor air problem seems to be complicated and challenging, a multiprofessional approach is useful at the very beginning. Otherwise, the need for additional expertise is assessed during the evaluation.
- The first part of the evaluation ends with a preliminary hypothesis.



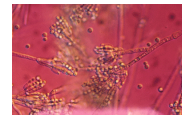
- In order to test the hypothesis, environmental samples are collected to determine suspected sources of agents, the quality and quantity of agents, and to demonstrate the release of contaminants from sources.
- The quality and function of building maintenance technology is studied simultaneously.



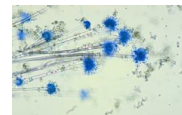
Based on our earlier study. (Salonen et al. 2007, 2008, 2009a, 2009b)

GUIDELINES FOR FUNGI AND BACTERIA

- 50 cfu/m³ for fungi
- 600 cfu/m³ for bacteria



If these guidelines are exceeded, additional investigations are needed.



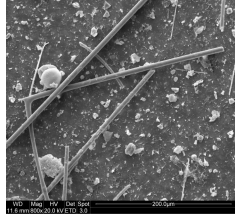
GUIDELINES FOR VOLATILE ORGANIC COMPOUNDS AND FORMALDEHYDE

Compound/compound group	Guideline value (P50) [$\mu\text{g}/\text{m}^3$]	Guidance value (P90) [$\mu\text{g}/\text{m}^3$]
Aromatic hydrocarbons	NE* <small>* Not estimated because the 50th percentile was below the detection limit (0.4$\mu\text{g}/\text{m}^3$)</small>	5
Alcohols	NE	5
Aliphatic hydrocarbons	NE	5
Aldehydes	NE	5
Glycol/glycoether	NE	10
Terpenes	NE	5
Si-compounds	NE	10
Organic acids	NE	10
Esters	NE	5
Ketones	NE	5
TVOC	70	250
Formaldehyde	10	15

- The guideline value (P50) can be regarded as a usual level in an office building with suspected indoor air problems.
- Concentrations exceeding the guidance values (P90) may indicate the presence of abnormal sources of chemical pollutants in indoor environments and a need for additional environmental investigations.
- The values (P50, P90) should not be used in the evaluation of health risks!!

GUIDELINES FOR MAN-MADE VITREOUS FIBRES

- The suggested guideline value of 0.2 MMVF/cm², as proposed by Schneider (2000) and Finnish investigators (Kovanen et al. 2006), is suitable for the deposition rate of MMVF longer than 20 µm over a period of 2 weeks.



- If the guideline value is exceeded, increasing the cleaning frequencies and improving the cleaning methods should be considered.

- If there are doubts concerning, for example, broken or uncoated insulation, the insulation should be removed or repaired.

Conclusions

- Guideline and guidance values can be used simultaneously with other indoor environment factors for testing the hypothesis.
- The guideline (P50) and guidance (P90, P100) values help investigators to draw conclusions about the quality of indoor air and the exposure of occupants in office environments.
- However, conclusions usually have to be drawn multiprofessionally.



- Finally, it is important to note that the comprehensive procedure for solving indoor environment problems should always include the following three parts:

- (1) an evaluation of the perceived indoor environment and the health state of occupants;
- (2) measurement and analysis of indoor air quality; and
- (3) good practice in solving indoor air problems.

