All you need to know about indoor air

A simple guide for educating yourself
to improve your indoor environment

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COLOPHON

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THANKS

At first this guide was introduced to first year students of the faculty of Architecture and the Built Environment at the Delft University of Technology in Delft, The Netherlands. However, because of the interest in this guide outside the university, I decided to make the guide more widely accessible and to give it the shape it has now: a small booklet which you can easily bring along.

I would like to specially thank Stanley Kurvers and Celine Roda, for their inspiration and critical input. Next to that, thanks to Freek van Zeist and Andreja Andrejevic, my respectively first and second student assistant, for their help with the layout of the guide.

Enjoy reading!

Philo Bluyssen

PREFACE

While most people are aware of the importance of the outdoor environment, especially in relation to climate change but also to problems more directly related to our health, the effects of indoor environmental quality are not that common knowledge. Who doesn't know by now that air pollution such as fine dust and noise pollution from aeroplanes are important issues, or that too much sunlight can be very unhealthy. Most of us don't realize that people in the Western world in general spend 80-90% of their time indoors (e.g. at home, at school and at the office). Exposure indoors is thus much longer than outdoors. Chapter 1 'Indoor air & Health' therefore presents facts of indoor air and health.

From the middle ages people realise that air in a building should be good and if not, could result in diseases or at least extreme discomfort (bad smells). Until the beginning of the 19th century, the miasmatic theory of disease, was used to explain the spread of disease such as cholera and yellow fever. Miasma (Greek for pollution) was considered to be a poisonous smelly vapour or mist that is filled with particles from decomposed matter (miasmata) that could cause illnesses. Ventilation already then became an important part of the indoor environment. The discussions on how much ventilation is sufficient to prevent spread of disease and to provide adequate comfort (no noxious odours), were born and are still taking place. It is not an easy problem to solve. Especially not in relation to required fossil energy-use reduction in the built environment. Chapter 2 'Pollutants and Sources' presents the pollutants that can be present in the indoor environment and the sources that produce them.

Indoor air quality is an important part of indoor environment. The other factors, thermal quality, acoustical or sound quality and visual or lighting quality, can also play an important role in how you experience the indoor environment as a whole. Therefore, Chapter 3 'Other factors' briefly describes those factors and their possible interactions.

This guide provides you with information on what indoor air quality is and what it can do, in order to make you aware of your own home indoor environment. In Chapter 4 ‘Tips and Tricks’, the focus is on clear recommendations to improve your indoor enivironment. If you have, after reading this guide, still some questions, then Chapter 5 provides a number of possibilities to get answers.

CONTENTS

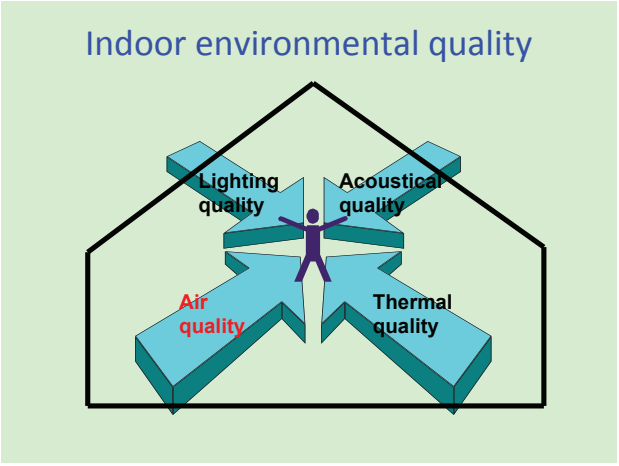
01 INDOOR AIR & HEALTH

1.1 Introduction

The indoor environment can be described by the so-called indoor environmental factors:

- *Indoor air quality*: with parameters such as smell, outdoor air and ventilation rate.
- *Thermal comfort or thermal quality*: with for example humidity, air velocity and temperature.
- *Acoustical or sound quality*: such as sound (noise) from outdoors and indoors, but also vibrations and reverberation.
- *Visual or lighting quality:* comprising view, illuminance, brightness and reflection.

The focus of this guide is on indoor air because indoor air is an important but often underexposed part of the indoor environment.



1.2 Indoor air

What is indoor air?

Indoor air is the air inside your house, your school, your workplace and even inside your car. Approximately 80-90% of the air you inhale is indoor air, because most of your time is spent indoors.

But what is 'Normal' air?
'Normal' air comprises of dry air plus a variable amount of water vapour, on average around 1%. Dry air comprises roughly of 78 % nitrogen and 21 % oxygen (in volume) plus small amounts of other compounds: noble gases such as argon and neon, but also other greenhouse gases such as methane, nitrous oxide and ozone (O_3).