



International Institute for  
Bau-biologie® & Ecology

IBE 204.2

## IBE 204.2 Indoor Climate Overview



**BRINGING TOGETHER TECHNOLOGY AND DESIGN  
METHODS TO PROVIDE THE INFORMATION  
NEEDED TO CREATE HEALTHY HOMES AND  
WORKPLACES**



# Indoor Climate – IBE 204.2

## Welcome

*Thank you for choosing IBE for your educational needs. Current environmental realities demand a new approach to ensuring that our homes, schools and office buildings support the health and wellness of all who dwell there. We strive to provide the latest information and cutting edge methodology on the vital, complex relationship between the natural and the built environments. May you find your educational experiences enlightening, and take this knowledge out into your community for the benefit of all. **Michael Conn**, Executive Director, Institute for Bau-Biologie & Ecology.*

## Course Navigation

You will find that it is very easy to navigate through this course.

- Progress through the lessons using intuitive navigation tools. When you study, make sure to be aware of and use all supporting materials, such as pdf files, video and audio clips, links to other websites or relevant articles or papers, as well as the online forum.
- The last lesson will give you the option of downloading an electronic version (PDF) of the course. Please be aware that this information is copyright protected.
- When finished, you will be ready for the test. These tests are "open book" and are designed to help you evaluate your understanding of the subject.
- When you have finished the entire Course Pack, a Certificate of Completion is available on-line.

By using the Forum feature, students can share information and solve problems. We would like to see truly interactive discussions take place.

Please be advised that links to third party information may not reflect or support the Building Biology viewpoint. However, it might be of some interest to see how other people, groups, institutions, etc. argue the same subject.

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# Lesson 1 – Basics of Living Climate

## What does "Living Climate" mean?

Climate encompasses the range of weather conditions over long periods of time on a global scale. And within a certain climate region we can distinguish between rural and urban areas. In the past, each region developed a unique building style, which would deal with the prevailing climate conditions most effectively. The selection of building materials, the type of construction and the type of heating system determines the quality of the living climate in a given home.

## Living Climate

- is the atmosphere of a living space.
- captures and displays the essence of a home.
- fills the outer form with life.
- creates either harmony or disharmony.

Mind, body and soul are affected in a myriad of ways by the tangible as well as the intangible aspects of a dwelling. The following wise words by Lao-tzu illustrate this amazing relationship most strikingly:

“Thirty spokes join together in the hub. It is because of what is not there that the cart is useful. Clay is formed into a vessel. It is because of its emptiness that the vessel is useful. Cut doors and windows to make a room. It is because of its emptiness that the room is useful. Therefore, what is present is used for profit. But it is in absence that there is usefulness.”

In this course module, we will focus on the physical factors affecting our living climate and how their natural balance forms one cornerstone of our health and well-being.

In the first part:

We will explore the interrelationship between outdoor climate and indoor climate. The introduction to the optimal balance of fresh air, comfortable temperature, ideal humidity and beneficial electroclimate will guide us through the rest of the course module.

In the second part:

We will zero in on indoor climate and thermal comfort. Human thermal perception and temperature behavior of various construction methods and building materials are discussed.

In the third part:

We will discuss indoor air humidity, heating systems, ventilation types as well as building materials and how they relate to creating a healthy living climate.

## The Exceptional Significance of Indoor Climate

The way we build our homes and the type of building materials we use have a profound impact on the quality of our life. The fundamental connection between our health and the built living spaces and workplaces we occupy is so clear that everybody who makes building decisions has the unique opportunity to create better places (or worse ones). In this course module, the discussion on indoor climate is not limited to indoor air quality (IAQ) but includes many more aspects that can be applied to residential homes as well as schools, hospitals, institutions, office workplaces and workshops.

### Footnotes

Lao-tzu (6th cent. B.C.): Chinese philosopher; considered founder of Taoism and traditionally author of the Tao Te Ching.

Today people talk a lot about creating a “positive work climate” that promotes cooperation and motivates employees to give their best. Often overlooked is the fact that a healthy indoor climate is just as important. An appropriate indoor climate not only contributes to low sick leave rates and high productivity, but above all provides satisfaction, well-being and a pleasant school or work atmosphere. It has often been demonstrated that work performance is directly linked to the quality of indoor climate.

It is no secret anymore that buildings — especially modern housing — can and do make people sick. This phenomenon has been studied for at least 20 years. The list of potential indoor pollutants and effects of low-level electromagnetic fields is growing longer each year. The symptoms caused by “sick homes” are classified as follows:

- Sick Building Syndrome (SBS) refers to a set of symptoms such as headaches and fatigue, which is caused by indoor pollutants and electromagnetic fields. Typically more than 20% of a building’s occupants must experience adverse effects before a building is considered to have an SBS problem. Even though some workers are affected, no clinical disease can be diagnosed.
- Building Related Illness (BRI) is a general term referring to a medically diagnosed illness caused by or related to building occupancy.
- Environmental Illness (EI) is a general term for an abnormal state of health where minute amounts of chemicals or low levels of electromagnetic radiation in the environment (food, water, air, home, workplace) cause severe adverse reactions in susceptible and sensitized individuals. In the case of a specific sensitivity to chemicals, we speak of Multiple Chemical Sensitivity (MCS). In the case of a specific sensitivity to electromagnetic radiation, we speak of Electromagnetic Sensitivity (ES).

Since the economic burden of workplace injury and disease has become enormous, the government has begun to notice. In 1970 the U.S. Congress established the Occupational Safety and Health Act to address this issue. As a result, two agencies were established: the National Institute for Occupational Safety and Health (NIOSH), which is a national research agency with the U.S. Department of Health and Human Services, and the Occupational Safety and Health Administration (OSHA), which creates and enforces occupational health regulations in the U.S. Department of Labor. The current guidelines are a start and form the basis for occupational health community in the United States. Industrial hygienists, safety officers, architects and builders can find important information at these agencies. Among many items, the regulations and standards deal specifically with ventilation, indoor temperature, windows, gas emissions, vapors, dust, electrostatic discharge, odor, air draft, heat, air space, etc.

Last, but not least, energy consumption and environmental pollution is also a major concern. Purchasing and operating costs of heating and air-conditioning systems can be drastically reduced when ecological considerations are taken into account up front.

Due to the increased awareness of indoor air quality and a desire to maximize profits, conscious efforts are being made to reduce toxins in the workplace. Some corporations opt for less toxic building materials, such as low VOC paints. Individual office spaces are now preferred over open-plan offices. Windows that will open are being included again. Sometimes air-conditioning systems are even entirely abandoned. Initiatives for scent-free workplaces are being implemented.

#### Footnotes

Brenda Marsh: No scents is good sense. Canada’s Occupational Health & Safety Magazine January/February 1998

## Lesson 2 – Factors Affecting Indoor Climate

### Definitions and Factors Affecting Indoor Climate

Indoor climate refers to the climate in a home, also called living climate. A multitude of factors interact with each other to form a delicate balance that sustains life. Let's start with some basic definitions:

#### Climate

The average weather conditions in a specific region over a long period of time. A given weather condition is determined by a wide range of meteorological factors, such as solar radiation, albedo or reflectivity of the earth's surface, water vapor content of the air, wind, air pressure, dust, carbon dioxide content of the air, etc.

#### Air-Conditioning

A process in which indoor air is cleaned and its temperature and humidity controlled throughout a building.

#### Bioclimatology

A branch of science concerned with the interaction between climatic factors and living organisms.

In this course module we examine bioclimatology in its broadest sense. The sheer amount of individual climate factors is enormous. Adding to the complexity, the possibilities for interactions and synergistic effects are nearly limitless. Sometimes climatic cause and biological effect are easy to link when, for example, a record heat wave strikes a certain area and people begin to dehydrate rapidly. In the case of weather sensitivities, such links are not that easy to establish, although initial correlations with changes in air pressure, air ionization and air electricity can be found. It is obvious that the intrinsic relationship between specific climatic factors and the well-being of living organisms needs more research.

From the perspective of bioclimatology, it is a dangerous error to reduce indoor climate solely to the temperature and humidity of the air. Modern homes tend to harbor many toxic chemicals, trap enormous amounts of dust in the carpeting, foster rampant mold in the walls and house electric wiring everywhere. It is obvious that a more thorough approach is needed to understand the dynamics of indoor climates.

The Indoor Climate graphic shows the four major spheres of influence that affect indoor climates: air, temperature, humidity and electroclimate. Under each heading you will find the most important keywords. As we proceed through this course module, we will study the interrelationships of most of these factors in more detail.

