

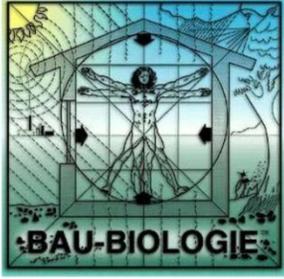
International Institute for
Bau-biologie® & Ecology

IBE 205.3

IBE 205.3 Building Materials



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



Biological Building Materials– IBE 205.3

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Course Navigation

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- 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.
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Structural Materials in Bau-Biologie

The Holistic Viewpoint

As on the subject of Living Climate, it is also possible to develop criteria for the entire subject of Bau-biologie as far as building materials are concerned.

All physical matter, everything material, the so-called animated, as well as the dead world consists of building materials: atoms and molecules; crystalline and amorphous forms; solid, liquid, and gaseous constituents; organically grown, and inorganically formed bodies.

These are the external manifestations only. They do not include the world of light, color, warmth, cold, sound, melodies, taste, and smell.

Finally, all this consists of radiation, waves, quantum¹ energies; of biotrones which represent the basis of the evolution of life on Earth. Seen holistically, everything is linked; interwoven. It is biological integration, or what we call organized, harmonious nature.

Within this pattern, all life, including the human being, the "crown of creation," has developed over millions of years. The human forms a unit with the immediate environment, as well as with the distant environment, but only with integration, and without offending the laws of nature.

The original standard values are described by the labels: good, true (genuine), and beautiful, which represent health, homeland, and the security of one's home, and it is exactly there that we will find the road to the "lost paradise," to real luck that today we seem to be seeking in vain.

A creative unfolding of the human being is possible only in this way. The world is going to continue to degenerate as long as we live outside the evolutionary order in which the human race has lived throughout history—with some notable, unpleasant exceptions.

The need for food, clothing, and shelter was provided by nature. With physical, mental, and social health, people can strive to attain happiness, contentment, affluence, well-being, and culture.

These are the goals of all of us. They are reason enough for being, but in addition, provide the key for the evolution of human consciousness and awareness.

What has this got to do with building materials?

It is necessary now more than ever to subject matters to analysis, to allow thought processes to lead to their logical conclusions, and to see things within a greater context. By approaching it in this way, we can recognize our dilemma and free ourselves gradually from the vicious cycle of a multitude of illnesses, dissatisfactions, restlessness, tension, stress, hurry, fear, neurosis, and environmental chaos.

Building materials, too, are building blocks of life.

The substances we absorb as nutrition for our bodies, the air we breathe, and the materials that surround us cause us to feel either well or unwell, heavy or light, sick or healthy. Everything has an influence, whether we are capable of perceiving it with our senses or not. The nature of building materials, and the buildings that are constructed from them, have an effect on us.

Thus, we are capable of perceiving, among other things, the influence of building materials on:

- the room-climate (air humidity, surface and air temperature, air movement);

¹ Quantum: A definite amount of energy released or absorbed in a process. Energy often behaves as if it were 'quantized' in this way. The quantum of electromagnetic radiation is the photon.

- the so-called electro-climate (electrostatic charge, electromagnetic fields, ionization, DC electric field);
- the permeability of cosmic and terrestrial radiation;
- light and color relationships;
- composition of the air;
- smell;
- levels of toxicity;
- acoustics;
- bacterial flora; and
- radioactivity.

Seen this way, the selection of building materials is no longer a minor matter. A building is a very sensitive organism that could even be described as an extension of a human organism. The influences are many-sided and have a strong impression on our personal and social well-being. If there is only one organ (building material, component) sick in the body (building structure), the entire organism will be sick.

Just as two violins, one formed from a synthetic material, and the other made of hazel spruce, each have a different sound, so too do dwellings differ when one is made of artificial, and the other of natural materials. Just as animals building their nests avoid mistakes by instinctively taking materials offered by their environment, so too did humans—originally.

However, the more we become estranged from nature, and the more we dare to intervene with doubtful, artificial building materials, the more complicated and susceptible to problems become our building "organisms." This applies as much to an individual house as it does to housing and community developments.

Seen rationally, one would expect people to be cautious of using any building materials that are hazardous to their health. One would assume that new materials on the market would, at least, have been subjected to extensive, lengthy, and holistic tests.

But the modern human being disregards this matter carelessly and is even arrogant. He plays with the fire. Stupidity and the blind belief in progress seem to grow without any stops. Even though there is ample evidence of the growing use of materials that have been proven scientifically to be harmful, he will continue to use them. Are we looking at a massive degeneration of our generation in this suicidal society?

How far the estrangement from a natural and harmonious life has progressed in the field of building and construction is indicated by the increasing levels of toxicity in our living environment. An alarming number of apartments and houses in Germany and the US, for example, are contaminated with dangerous toxic substances such as PCP (pentachlorophenol)², which reduces to half-life only after six to seven years, and formaldehyde, both of which are constituents in surface treatment substances, adhesives, and synthetic materials.

Since numerous cases of poisonings have become known and many court cases have been heard, some manufacturers of timber treatments and preservatives containing PCP recommend using such substances only on the exterior surfaces of houses.

For interior purposes, other insecticides and fungicides have been developed recently, which are not supposed to be toxic in the concentration applied. However, some are known to contain the highly poisonous "Lindane," and others have been tested for only a short time.

Up to now, the producers assert only that they are not supposed to be toxic, and the public relies on this. It is no consolation that when the German Federal Health Authority licenses new timber preservatives, their approval is based, to a large extent, upon statements provided by the manufacturers.

² PCP: Pentachlorophenol; has a half-life of 6-7 years. Carcinogenic, causes depression of central nervous system, dizziness, sleepiness, nausea, tremor, loss of appetite, disorientation and liver damage.

Characteristic of the thoughtlessness of consumers on one hand, and the high dependence on short-sighted economic pressures on the other, is the fact that the healthiest building material, timber, is frequently the cause of illness, because it has been treated with these preparations. Building regulations and codes in several countries now stipulate the use of preservatives in various timber components. This means, in fact, that the use of toxic building materials is being promoted.

The same applies to vapor barriers. It has already become a general habit to incorporate them in the structure of ceilings, floors, walls, and roofs. No one seems to consider whether they are necessary at all, or whether they may have any significance in relation to health.

Radioactive building materials present similar problems. Quite a few materials are in use with a dosage close to the "permitted" limit. This limit, however, was arrived at as a compromise between commercial pressures and biological/ medical criteria, and hence is not adequate from the biological point of view.

Although health and safety ought to be the primary criteria for approval of building materials, to date, too few questions about these criteria have been raised by the approving bodies. It is no surprise, therefore, that building materials presenting health hazards have flooded the market.

It is only since the law on chemicals was introduced in West Germany at the beginning of 1982 that there has been an improvement in the situation. Now it is mandatory to test new building materials for biological/medical factors if they raise doubts on health grounds. However, a great number of those products already in use are not required to be tested. The reason given is that there are not enough toxicologists, test institutes, or financial resources available for this purpose. It is due to this regrettable situation that many building materials of questionable value with regard to health can be sold without restrictions. The tragedy is that millions of people have unknowingly served as guinea pigs.

Prof. Dr. U. Wolke of the Federal Institute for the Testing of Materials in Dortmund, West Germany (Bundesanstalt für Materialprüfung) commented: "In most instances, up to now, we have discovered the dangerous effects of the substances on people afterwards." The "up to now," however, sounds very optimistic.

There is much talk about preventive health policies. Many illnesses and complaints could be prevented or healed by preventive health measures in the building and construction industry if the relevant scientific realizations were to be followed—that is, if people would build and renovate biologically.

As long as neither the public nor the commerce has taken action—or even opposed the actions of responsible people who still feel a natural way, and who have left the wrong track, any of such actions becomes a sort of self-defense. It is not easy to swim against the current. A person needs some guidelines, some real help, and clear information to cut through the maze of confusion and start on the proper self-help path.

This, in fact, is the basic purpose of this course in Bau-biologie. The following may help to achieve this.

Historic Development



Figure 1: Building with Nature and in Nature - 1 chaffinch, 2 wren, 3 woodpecker, 4 seagull, 5 house swallow

In the very beginning of such activities, the important features of early building forms were very much like those of the animals: simplistic and useful, with solid ties to nature. The house was meant to satisfy such basic needs as shelter against harsh weather conditions, wild animals, and human enemies.

The types of buildings that emerged were determined by locally available building materials and by the climate of the region. In the same way that animals created their nests, the so-called primitive humans created their resting/sleeping places (buildings) of wood, brushwood, bark, peat, clay, soil, stones, sand, reeds, straw, moss, leaves, grass, sedge, wool, and fur. While the soft building materials were used mostly to create the inner living area, the hard, or inorganic, building materials such as rocks, bricks, concrete, and metals were utilized as structural materials. The common idea that our ancestors lived in caves is true to a limited degree. Caves were used only in areas where climatic, geological, and topographical circumstances permitted. When ideal surroundings were available, as in subtropical regions, houses were not necessary at all.

As the cultural development unfolded and grew, beauty and solidity entered the building scene, with regards to single buildings as well as villages and towns.

It is interesting in this context that nearly every home owner-to-be was planning and building his or her own house, in much the same way that an animal was doing it. In less civilized cultures, or those which are more attuned to nature and in which people exercise less division of labor (less enslavement), this is still common practice. The result is a feeling of native safeness. Although similar, regionally available building materials are used, rather than monotony, a diversity of building forms and settlements appeared. Every family was building its own house, because the building materials were often available for free and could be utilized by the family and its friends.

Health, in relation to a house, was hardly a problem. The utilization of natural materials could only result in biological homes. Structural mistakes with regard to climatic conditions were avoided as a result of long experience. A house grew in surroundings that were alive, and it remained a part of nature. For example, 30 to 40% of the materials used in a house in Central Europe was organic (derived from plants) and 60 to 70% was inorganic.

Originally, the basic "building blocks" of a house and a human body were one and the same. Buildings became a biological and ecological problem only when a few man-made materials began to be used in the building process about 100 years ago. Today, however, 90 to 100% of building materials are man-made, and the problems they cause are being recognized much too late. Many are still not known at all.

Starting some decades ago, we began to surround ourselves with materials in our clothing, our dwellings, our workplaces, and our urban settlements that are unnatural, synthetic, and inharmonious to our bodies, all of which have a negative impact. Since this change has taken place, people have become poorer, more dependent, less contented, and more ill. Life, in order to unfold in a healthy way, needs a life environment that interrelates with the body, mind, and spirit. In a dead building, however, the inhabitants tend to degenerate.

"All manufactured products that are mass-produced (in great quantities by machines) artificially are alien elements." (Prof. Thiirkauf)

For the modern person, nature is not good enough anymore. With great expenditure of energy, machines, capital, rationalization measures, research, administration, promotion, and people, artificial mass-products are being manufactured. In actual fact, we are talking about total loss of individuality, and alienation of the human being from natural building materials, natural houses, and natural urban developments. This situation extends to food, in terms of good nutrition, and even clothing. Simple, natural building materials which are cheap and available everywhere – clay, straw, and natural stone – have been totally forgotten. Even wood, with its individual properties which require skill, intuitional grasp, experience, and workmanship to fashion into useful forms and products, has been reduced into small particles, glued (often with toxic substances), and pressed together to produce building materials. In many respects, the process of building, just as life itself, has become rather complicated. Having failed with our structural "masterpieces" made of plastics, concrete, and aluminum, etc., and having depleted our raw material re-

sources, it may be that we have passed a turning point, and that in spite of all we may do, the shortage of those materials may establish limits for us.

It does seem that after having been manipulated, the human being becomes more and more aware, and demonstrates that awareness by becoming very suspicious of each new and more modern product of the test tube, and of their advertising campaigns. All too often, people have been disappointed. The building process has become more expensive, has deviated more from nature, and has become more unhealthy. The restless activities of people ultimately end in nostalgia, a longing for independence, silence, and harmony in the security of one's own healthy home. The more people recognize the problem and start to help in the solution by creating a more human environment, the better is our chance of success.

Urban development and town planning efforts should not be influenced by nostalgia or by trying to copy earlier epochs. Rather, they should be up-to-date and modern in the sense of being ecological, bau-biological, social, and healthful. The material prerequisites for a review of our activities that can lead us out of the cul-de-sac are already available. However, most people are still unaware of the necessity for taking action.

Building Materials and Their Biological Valuation

Although in the judgment of building materials health aspects should come first, common handbooks contain almost nothing of this matter. One will find described almost entirely only physical, chemical, technical and technological problems.

Such properties of building materials do not need to be repeated here, unless they are biologically of relevance. We assume that they are known.

It is quite a risky undertaking to develop a biological handbook for building materials because the necessary knowledge is rather fragmentary. On the other hand, there is much material available which hasn't been publicized even though that the subject is very important. The knowledge about building materials is an important part of a bau-biological curriculum. The existing shortcomings may trigger the willingness for cooperation and research.

We have deviated from the common structuring of the subject. It seemed to be more practical in going through the material following biological guidelines. Hence, we are considering more the holistic principle when discussing building materials and their characteristics. The entire problematic nature of the dwelling and the environment - foremost the human being - have to come first when investigating a building material.

Thermal Insulation, Heat Storage, and Surface Temperature

A material close to the skin, such as clothing, ought to possess balanced thermal properties. If a material normally has the properties of thermal insulation, has formed no condensation in its pores, and does not allow heat to be conducted away quickly (also an economic factor), the surface will remain warm. Building materials ought to have optimum heat storage properties in order to ensure that the climate in rooms will be influenced favorably during all seasons by means of internal and/or external heat sources.

In previous courses, this relationship has been explained in detail. That is why attention is drawn only to some of the peculiarities of a few building materials.

The following comparison between a house built exclusively of timber and a house built of concrete without any additional, special thermal insulation materials, may provide a good example of the extreme contrasts that are possible in the construction industry: