

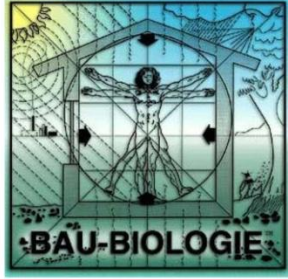
International Institute for
Bau-biologie® & Ecology

IBE 205.4

IBE 205.4 Biological Building



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



Biological Building, Issues & Answers – IBE 205.4

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Timber Treatment Against Fungal and Insect Attack, Impregnation, Prevention and Restoration

The Problem

This section concerns itself with the chemical answer to the protection of wood: timber treatment. Like all organic matter, under certain conditions, timber and timber products can be attacked and weakened by fungal, bacterial, and insect infestations. In order for this to happen, certain pre-conditions are necessary:

- Wood can suffer from fungal attack when moisture content exceeds 18%.
- Wood is vulnerable to such attacks when the drying-out time is delayed by the use of varnishes.
- Checks¹, cracks, and hollows in the wood allow fungal spores² to develop and insect eggs to be deposited.
- When the moisture content of the wood is constantly above 10%, wood-boring insects can develop from deposited eggs.

It is quite rare to find these conditions in a contemporary house. Fifty years ago, the conditions were better for attracting vermin because only organic building materials were used, but still, as a rule, wood was not impregnated. However, about 40 years ago, the war on fungus and insects in houses began, and no house was safe from this questionable practice of impregnating wood.

From both the Bau-biological as well as the legal point of view, it is necessary to ask, "Was it necessary to use toxic wood impregnation in the interiors of houses"

After weighing all the circumstances, we can come up with a definite answer. The treatment of wood in interior spaces, using insecticides and fungicides was, and still is, entirely unnecessary, for the following reasons:

- In earlier times, i.e., before impregnation or surface treatment of wood used in interior spaces became fashionable, neither wood for decoration of walls, ceilings, or floors, nor structural wood for beams, joists, staircases, window and door frames, etc., was treated with toxic substances.

In order to improve beauty and/or increase the resistance to stress, wooden parts were treated with oils, lacquers, or waxes. Up until the end of World War II, there was seldom any destruction of wood, even though the conditions for insects was better (usage of solid wood with cracks and checks, etc.). There are very old wooden houses from the Middle Ages, i.e. log homes or wood frame houses, as well as a Norwegian stave church which is over 800 years old, all of which have their wood, mostly deciduous³, entirely intact, even though it was never impregnated.

- Since 1950, which was the start of a new building phase in Germany, the physiological prerequisites in regard to moisture content and formation of cracks which are conducive for the development of destructive fungi and insects, have been almost non-existent.
- The constructive measures presented in DIN 68800 describe how to dry out wood used in construction which has a too high moisture content, either because of condensation or other structural mistakes, so that, as a rule, insects cannot develop.
- Since 1950 infestation by vermin, fungus, and mold has almost entirely been eliminated because of extensive measures that have been in place with regard to Bauart - the use of concrete floors and stairs, and materials, such as plywood and particle board replacing solid wood, as well as plastic, central heating, tight roofs, vacuum cleaners, and sealed floors.
- As a result of that, such wood-boring and attacking insects have almost been eliminated since 1960. Fungus and mold infestations have always been extremely rare, but if found, were always

¹ Checks: Defects in timber such as splits across or through seasonal rings usually caused by wood drying out.

² Spores: Minute bodies that develop into new individuals.

³ Deciduous: Trees (wood from) that annually lose their leaves: as opposed to evergreen.

because of construction mistakes or damage to a structure, such as a leaking roof. Today, the necessity of continuous impregnation of wood is often justified with statistical data on the widespread occurrence of vermin. Often, data collected in the Thirties, which are now totally obsolete, were used. In addition to that, these data were collected by companies who were involved with wood impregnation and were biased toward impregnation. It was also found that, in collecting these data, whether the infestation was alive or dead was not taken into consideration.

- Fungus and insects can appear in impregnated and not impregnated wood. The chemicals used are not 100% effective, which has something to do with the depth they can penetrate wood, their general evaporation, and their aging process. In most cases, the targeted holes and checks are not impregnated at all because, at the time of treatment, they do not even exist - and won't, until about two years after construction. This is exactly the situation addressed in DIN 68800, where impregnation should be done after any checks and cracks develop. That, of course, is rather unrealistic, because such treatment in an existing house is impractical.
- Wood-boring insects ready to lay their eggs are more attracted by freshly cut wood than to old wood. There is statistical evidence that in buildings more than 40 years old, the insects are all dead. Only evidence of old infestation can be seen. Yet treatment of these buildings was recommended and often conducted.
- Construction timber can also be subject to attack by insects such as the death watch beetle and the wood wasp, etc. These insects lay their eggs only into freshly cut timber. Larvae develop in one to two years, as a rule, so that when the beetles emerge from the timber in the house, they leave boring channels and flight holes, some of which are very similar to those of the death watch beetle or furniture beetle and, hence, give rise to totally unnecessary timber treatment. The death watch beetle is introduced to a building at the time of construction, and most infestations originated when over-mature timber was used in the initial construction. Since the beetle doesn't fly indoors, this species is becoming rarer in buildings. However, it is still common in dead wood outdoors.
- There is no unbiased, official control, or even guidance as to either the necessity or the efficacy of timber treatment. This means that fraud is common with people whose sole intention is to treat houses and other structures chemically regardless of whether it is proper or necessary.
- The whole subject of timber treatment is largely influenced by publications, training, publicity, and regulations put out by the chemical firms producing such treatments. A very successful publicity campaign during the last decades has resulted in a new and misleading understanding of the term "timber treatment" by architects, builders, and homeowners. Whereas in the past, traditional construction would have protected timber by paint and appropriate detailing, today even professionals have come to understand the term to mean the application of poisonous chemicals.
- In spite of all this, chemical wood treatment has been laid down in norms and standards for public buildings and housing projects that receive public funding. Such treatments are obligatory. Only chemical substances that have been officially approved are to be used for these treatments and they are, nevertheless, strong, toxic substances. Usually in advertisements and product literature, the restricted impregnation rules are not mentioned, so that professionals as well as homeowners believe they have to be used in every instance. In Germany, these regulations have been lifted by a few states.
- According to regulations enacted by law in Germany, wood impregnation has to be tested and approved by the State Testing Laboratory for Materials in Berlin. The norms and regulations do not touch the question of toxicity or the health problems in this context. For instance, preparations based on borax and boric acid, which are known to be safe for human health, have been, and still are approved in such regulations. In advertising and product literature, the differing levels of toxicity of various substances used for wood impregnation are not sufficiently explained. For example some are not recommended for use in vegetable planter applications because of the high toxicity.
- Furthermore, the use of toxic preparations is highly questionable and unnecessary because their ability to prevent fungus and insect infestation is no better than that of the non-toxic substances which are not dangerous for human beings. We know from experience that in most cases, the usual toxic substances are used. But we also know that in circumstances where the physiological conditions are favorable for the growth of insects, surface treatment does little or nothing to prevent it.

When selling products in a free market society, virtually all possibilities are utilized to make a profit, often disregarding health and ethics, etc., and absolutely without regard for necessity and need. Success and profit are the goals of the free enterprise system, and this applies as well to the selling of chemicals used for wood impregnation.

But, after learning about the extreme toxicity of these wood impregnations, wouldn't it have been proper to withdraw such substances from the market? We feel that even a "free" economy should abide by legal constraints.

Somebody who intentionally or negligently poisons other people is in effect breaking the law, must be held accountable, and must make reparations. Then, it really doesn't matter whether somebody poisons a well, or applies poison to the wood in an apartment.

These are the problems that occupy the Courts and the Attorneys General, because hardly anybody these days, is not affected by these impregnation substances and lacquers and glazes.

Some people have even had to move away from, or even demolish their homes. Uncounted damage to health and wealth has been done. The people who are actually responsible for this manage to hide, because legally there must be proof of a connection between an illness and any specific substance said to have caused it. But considering the number of toxic substances in our environment today, this is nearly impossible, for one thing, because many illnesses are asymptomatic for long periods of time, so that tracing an illness back to its source may not be possible, and for another, because a combination of substances (in synergism⁴) may play an important role. On the question of motive for this unlimited marketing of hazardous substances for wood impregnation and wood treatment, we can conclude:

- that the market for these products, which may have taken years to develop, for financial reasons, will not easily be given up;
- that, because of massive advertising, consumers have believed that the toxic substances are superior to the harmless ones, and even that they are something special, so misinformed buyers have been convinced that they really do need to protect their homes against vermin;
- that since non-toxic substances haven't needed to be officially guaranteed, they've been considered less effective by the consumer which, in turn, has reduced their marketability;
- that sales would increase because of the suggestion in professional literature and advertising that the proper way of treating wood was to impregnate it at the factory or sawmill and then glaze or lacquer it on site.;
- that the manufacturers of the toxic wood impregnation substances have had an advantage over their competition because their products received the attribute of being effective because they were officially approved. To obtain the Seal of Approval was relatively expensive, so the small firms in competition could not easily obtain it. In other words, it was possible to buy an advantage in the market;
- that because their products were officially approved and described in professional literature, the manufacturers of these substances didn't feel they had any further responsibility to the consumer, especially since the health implications of the products were not considered when the Seal of Approval and the right to use the substances were granted;
- that over the decades, the awful consequences of vermin infestation were impressed so strongly in people's minds by various means, it would have meant a loss in prestige to suddenly admit that that was not the case.
- that manufacturers, fearing legal consequences, flatly rejected responsibility for any damages that might be incurred.

⁴ Synergism: The simultaneous action of separate agencies which, together, have greater total effect than the sum of their individual effects: said esp. of drugs.

Wood Impregnation Substances for Prevention and for Immediate Effect.

No MAK-values have been established for toxic substances mixed into wood impregnating substances. The effects regarding fungus and insects have been tested, but toxicological aspects regarding health are almost entirely overlooked. Following are a brief explanation and comments on some of the more frequently used salt and oil compounds:

- Fluoride (hF- cF- and sF- salts). This poisonous matter can occur in the form of dust or gas and can present severe health risks. Acute symptoms can include breathlessness, cough, bronchitis, nausea, sickness, headaches, cramps, paralysis, and ulcers. If a person recovers from the acute symptoms, there may still be other consequences to be considered, such as metabolic disturbances which can result in liver and kidney troubles, loss of weight, anemia, various arthritic conditions, etc. The recently favored combinations of fluorides and hydrocarbons have particularly toxic effects. Vapors emanating from timbers treated with these chemicals can, among other things, cause edema of the lungs.
- Zinc chloride. Although this salt is somewhat less poisonous than the fluorides, after extended exposure, a person is still liable to develop disorders of the liver and kidneys. The vapor and dust cause irritation of the respiratory tract, fevers, sickness, weakness, muscle ache, feverish tremors, and edema of the lungs.
- Arsenic Salts. (CFA Salts). Arsenic is one of the most potent poisons. When ingested, just 0.1 gram is a lethal dose, and 0.005 gram leads to acute and chronic poisoning. Hydrogen arsenide must not exceed a concentration of 0.05 ppm (MAK-value) according to the German Safety at Work regulations. Symptoms of arsenic poisoning include digestive disorders, hypotonia⁵ metabolic collapse, heart and lung paralysis, edema of the lungs, joint pains, general paralysis, and kidney and liver disorders. Several compounds containing arsenic result in cancer. (In Germany, the use of compounds containing arsenic has not been permitted in rooms for people, animals, or for the storage of foodstuffs. However, imported timber is not covered by this regulation, and neither is timber used in children's playgrounds or outdoor decks, for example.
- The prohibition of these and other highly poisonous substances is dependent on the number of proven cases of poisoning.) In practice, of course, the great number of toxic substances now in use make it difficult to substantiate that one particular substance is the culprit in a case of poisoning.
- Borax⁶ and Borax salts. These will only lead to health disorders if taken orally or absorbed by the skin in relatively large doses. (The German MAK-value for Boroxide is 15 mg/m³.) In practice, there have been no reports of cases of poisoning from this substance in the field of timber protection.
- Mercury-containing substances These substances have poisonous effects similar in strength to those of arsenic, especially the organic type used for treatment of blue stain. (MAK-value: 0.01 ppm)
- Phenolic and chlorinous substances. These are contained in timber treatments based on oil and are to be found in most of the solvent-based products which, today, account for more than half of the 250 timber treatment preparations on the market in Germany. Evaporation (out-gassing) of these substances and their absorption by the skin can cause the following symptoms: breathlessness, dizziness, eczema, liver and kidney disorders, cramps, paralysis, anemia, general weakness and debility and even coma. Statistics on the frequency of these conditions are not easily available, but one physician in Germany reported 30 cases of poisoning during the period from 1965 to 1975 as a result of just one popular timber treatment containing PCP⁷. Particularly dominant were severe metabolic disorders and cases of colic.

⁵ Hypotonia: a deficiency on body tone.

⁶ Borax: A white crystalline compound, with a sweetish alkaline taste, found native as tincal, and used as an antiseptic, in preserving food, in medicine, and as a flux; also of value in glass manufacture and certain smelting operations.

⁷ PCP: (pentachlorophenol), it reduces to half-life only after six to seven years

Medical investigations in a single detached house where timber paneling and beams had been treated with a preparation containing PCP six years earlier showed that the inhabitants were suffering from chronic poisoning, which was clearly caused by the PCP. Six years after application, measurements showed that approximately 50% of the effective substance had disappeared, assuming that about 5,000 mg of PCP per kg of timber had been applied. (In accordance with the manufacturer's recommendations, the depth of penetration, as a rule, does not exceed 1.5 mm. It was also found to be absorbed in other materials such as carpet, upholstery, and books in the same home.) PCP values during winter months, when the internal air was heated and the ventilation was poor, amounted to 0.1 mg per m³. The report continues, "under certain adverse conditions, it is quite possible that the PCP concentration in closed rooms may exceed 0.2 mg per m³." (The German MAK-value today is 0.5 mg per m³.)

A report from the State of Michigan in the USA stated that several cattle died after coming in contact with wood containing PCP. Meat from the poisoned animals had to be destroyed because it was contaminated by the chemical TCDD (dioxin)⁸, which was the poison that led to the massive catastrophe at Seveso in northern Italy. That dioxin caused the fetal abnormalities there, is now certain. Following the poisoning case in Michigan mentioned above, authorities prohibited the sale of the timber treatment product concerned. In Germany, these products are still widely used in outside applications in the form of timber preservation and timber treatment.

- Tar Oil Products (Creosote). A distillation of coal tar oil which can cause acute and chronic poisoning. Tar vapors are carcinogenic⁹. Many products based on tar oil and solvents, including bitumen and creosote, have, as fungicides and insecticides, highly poisonous additives such as phosphoric compounds¹⁰, lindane¹¹, and propoxur.

It is common knowledge that these substances cause health problems, and because they were publicly renounced in recent years, these chlorinated hydrocarbons such as PCP and lindane, were more or less replaced by:

Xyligen, Xylasan AL, Tributylzinn-Verbindungen, Carbendazin, Dichlorfluanid, and Athylparathion.

(Editor/Translator's Note: These names are written in German, and may differ in other areas of the world. However, replacing toxic substances with other, unknown substances, is common practice.)

These replacements, from the toxicological point of view, are far from harmless. Sometimes they are even more toxic than the original substances. Unfortunately, this fact has not become common knowledge—at least not yet. And as long as there are no legal constraints, and there is a demand for them, officially legalized products will continue to be sold, even though they are known to be hazardous to human health.

In addition to their other consequences, several oily products give off noxious smells which can last for several years. This is caused by vapors and by evaporation that considerably reduces the long-term effectiveness of the timber treatment. Approximately 100 liters [26.4 gal] of timber preservation solution, either in the form of 100 kg [220 lb] of oily product or 10 kg [22 lb] of dissolved salts, is required to treat the roof of an average detached house. Thus, timber, one of the healthiest building materials known, is transformed into one of the most hazardous.

⁸ Dioxin: TCDD (Tetrachloro-Dibenzodioxin) are created in the production of chlorinated hydrocarbons. They are admixtures of PCP which is used in wood impregnations. It was part of Agent Orange which was used in the Vietnam War for defoliation of the jungle. There are more than 80 different types of Dioxin with a variety of toxicity. TCDD is toxic, carcinogenic and mutagenic.

⁹ Carcinogenic: causing cancer

¹⁰ Phosphoric compound: A chlorinated hydrocarbon used as an insecticide; may cause toxic effects in persons exposed unduly to its action. Poisonous for cattle and sheep. Must be used on animals in low concentration.

¹¹ Lindane: Benzene hydrochloride; BHC; a chlorinated hydrocarbon insecticide. In low concentrations, used on cattle for treating scabies.