Federal Ministry
for Economic Affairs
and Energy

MITTELSTAND
GLOBAL
ENERGY SOLUTIONS
MADE IN GERMANY

Energy Efficiency and Healthy Indoor Climate - Experiences and Trends from Germany

Josef Spritzendorfer

20.11.2018, Vilnius

Introduction

Josef Spritzendorfer

Author of textbooks, journalist and expert for building materials with a focus on residential health, until 2004 more than 10 years active as national product manager and trainer of an international construction materials company (area of responsibility: "sustainable building material assortment").

2006 co-founder of the Sentinel- house Institut Freiburg
(Research project "Building of healthy wooden houses" with the Federal Environmental Foundation)
Co-Managing Director until 2010

Current:
Since July 2017: Online editor of the “European Association for Healthy Construction and Indoor Hygiene EGGBI”
a privately run voluntary information and research platform
to promote “healthy buildings” with a focus on

- health assessment of construction products
- public relations (publications, lectures)
- teaching (guest lectures at universities)
- international project support and research
- consumer advice (free service hotline) for allergy sufferers and
- chemical-sensitive builders, families with increased demands for healthy living
- support for parents, teachers and authorities in the event of pollutant problems in schools and day-care centers

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„The Internet platform for healthy building and indoor air quality"

has given himself the aim

- to „collect“ new insights on the subject of healthy living

- to sensitize and to raise awareness among stakeholders of the construction industry by giving lectures at universities and support of graduate work in the area of training, lectures, guest lectures on healthy living and support (examples: Master's degree transition timber for architects FH Rosenheim, Master Course WINGS , University of Wismar, FNR)

- to offer environmentally sensitive clients a free initial consultation to residential health (free hotline)
- „Protection of consumers in matters of healthy living - providing technical assistance to consumers at "damage cases“
- Support of parents and teachers in pollutant problems in schools

- to discuss open scientific questions by coordinating research projects in cooperation with construction companies, building material manufacturers, planners, medicine and scientific institutions / to clarify if possible, participation in research projects

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Energy state of buildings - fact

We have extremely positive developments in terms of CO_2 savings in the last years through energy-efficient construction and renovation (f.i. „Passive House“, "zero energy- house, energy plus house)

but there are also "health-related risks" by

increased concentrations of pollutants in the buildings

Solution:

- careful planning,
- responsibily product selection and
- professional structural implementation

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Denser building = reduction of indoor air quality?

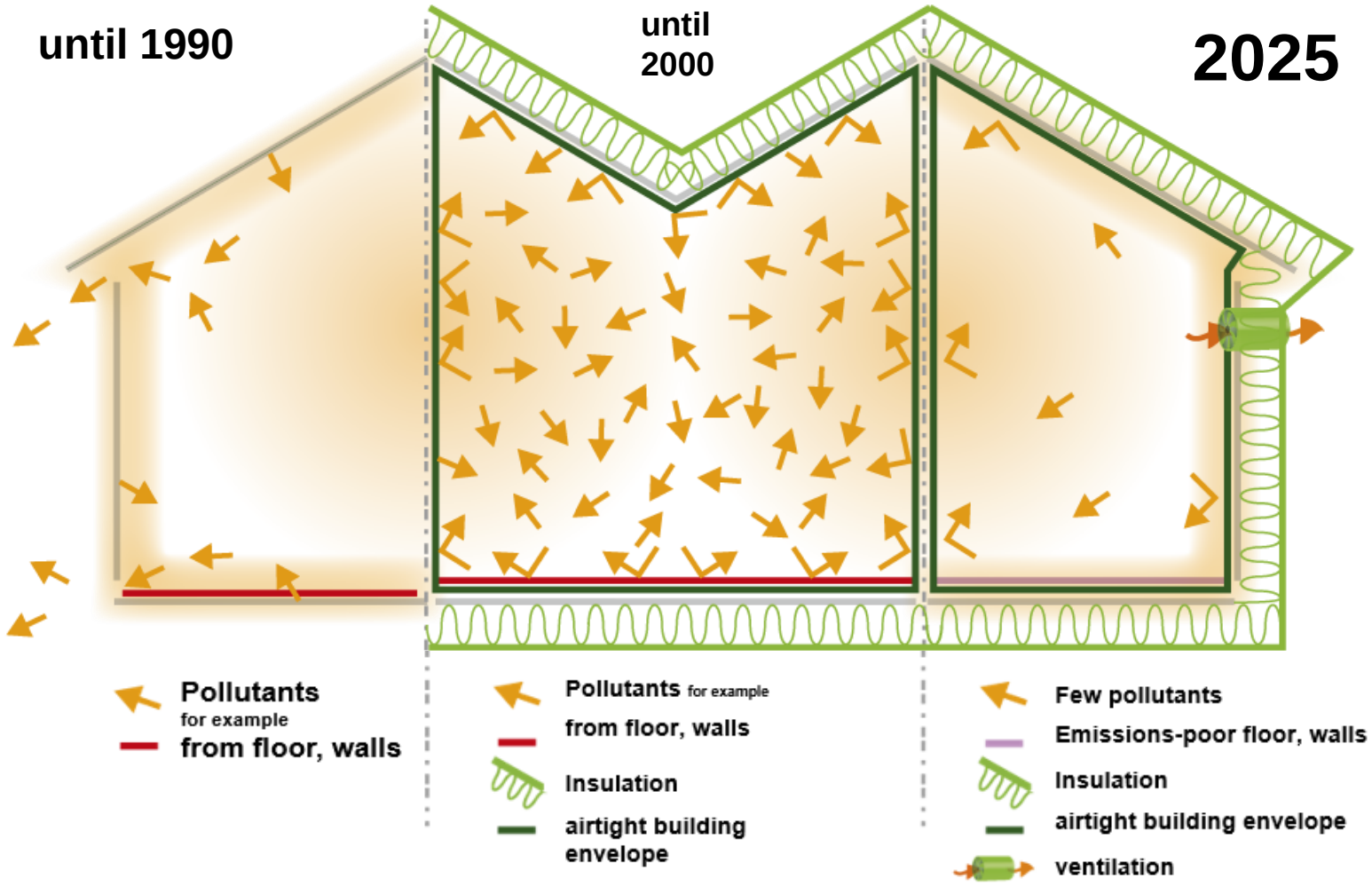
More and more dense buildings cause normally lower air exchange rates. That can only be compensated by appropriate ventilation planning.

So CO_2 concentrations are perfectly balanced by qualitative high-quality ventilation systems (without loss of energy, thanks to special heat recovery).

But not all emissions from building products, furniture, home furnishings, floor coverings, however, can be removed by means of ventilation systems - (Example: Liwotevstudie, Switzerland: increased TVOC loads despite switched comfort ventilation systems in many buildings of a research project)

In energetically optimated quality buildings therefore we need a conscientious selection of building materials with regard to avoidance of harmful solvents, plasticizers, flame retardants, but also non-toxic, but "only" allergy-causing emissions and odors indispensable.

The problem- the solution



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EGGBI MITTELSTAND GLOBAL ENERGY SOLUTIONS MADE IN GERMANY

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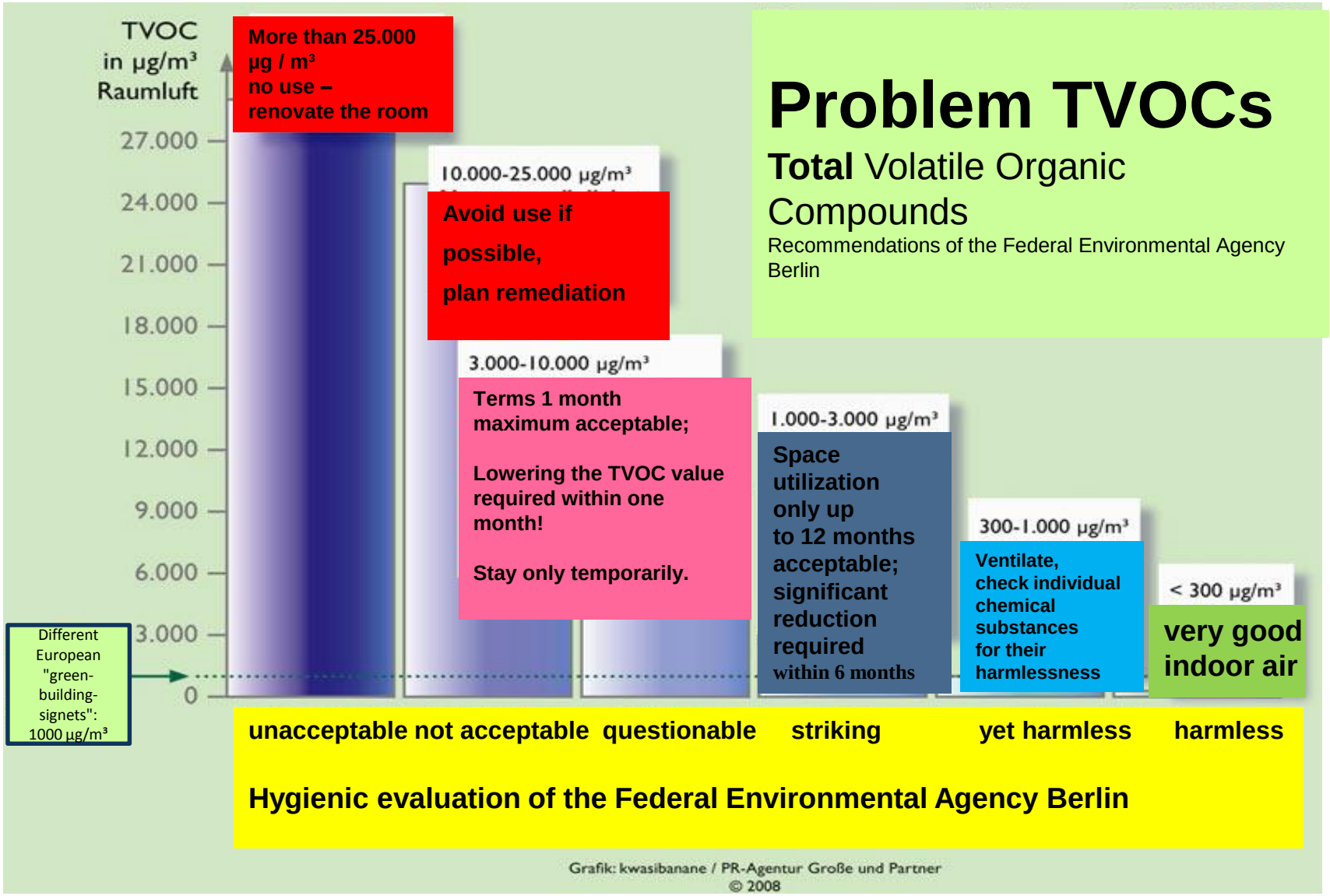


Problem TVOCs

Total Volatile Organic Compounds

Recommendations of the Federal Environmental Agency Berlin

There is also a guideline for formaldehyde in D:

Indoor air maximum
100 µg / m³

Construction products max.
0.1 ppm =
120 µg / m³

health aspects

Increase of the Sick Building syndromes

> 25% of adults in Germany are allergy

> 30% of children

Mold problem in 40%
(also) the (often wrong) modernized buildings

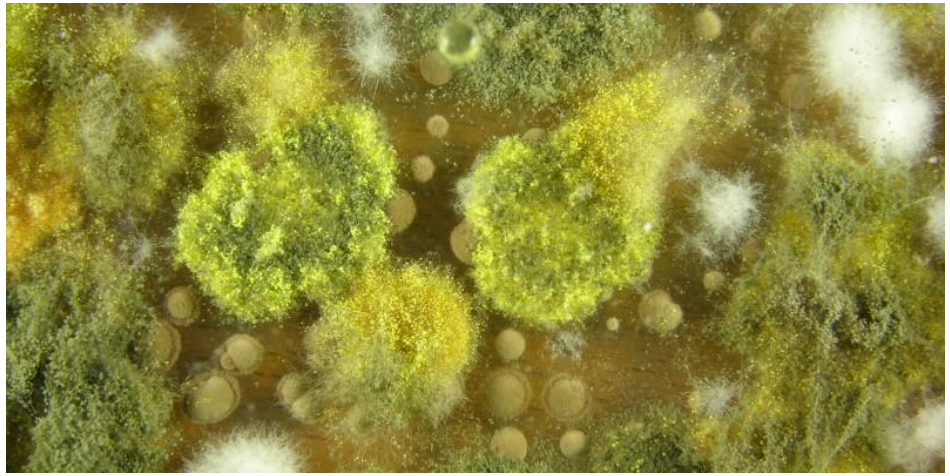
http://www.eggbi.eu/beratung/bauen-fuer-allergiker/

Problem „MOLD“

Especially with energy-saving renovation,

caused by
deficient planning
(for renovations there sholud always be considered all components: walls / roof / windows / doors together)
and / or
unqualified structural implementation

it can come to thermal bridges, which almost always result in the consequence to structural damage with mold.



Quote University of Ulm:
Dampness and mold are more
than dust mites, the main triggers of asthmatic diseases.

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Algae and mold problems on facades

solutions

Use of biocides (algicides, fungicides)
Result: environmental pollution by
washing out of the biocides

Alternative:
Environmentally conscious product selection
(**mineral** wall-plasters and facade paints)

Pollution problems caused by the use of "Unsustainable insulation"

Really sustainable, healthy living buildings should be built with sustainable insulation materials:

- sustainable (unlimited available or renewable resources)
- no **harmful** ingredients (**toxic** flame retardants, emissions, respirable fibers ...)
- no extremely toxic gases in case of fire (Dioxine. ..)
- no disposal problems after the later demolition of buildings

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Sheep wool insulation producer "Isolena" built „woolen center“ of excellence in Waizenkirchen

The company Isolena (Natureplus tested sheep wool Insulation) has built a competence center for wool in Waizenkirchen (Austria)

In this center mainly planners, architects, craftsmen and building material suppliers
will be be fully informed about sheep's wool.

The complete former factory building
got a full thermal insulation
with wool and wood fiber.

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Wood fiber insulation of facades

Not only for
private houses, also for
major projects

Residential and commercial building Kalkbreite, Zürich

Fast, economical and also highly environmentally after Swiss Minergie-P-ECO standard build a seven-storey house with jointless facade.

How to do this is, is documented with the new residential and commercial building Kalkbreite in downtown Zurich. The pioneering object was built as a hybrid construction with concrete frame and prefabricated facade modules.

The outer insulation is made of PAVATEX DIFFUTHERM wood fiber insulation boards.
They carrier boards allow not only the seamless facade, but also ensure a high degree of energy efficiency, ecology and comfort.

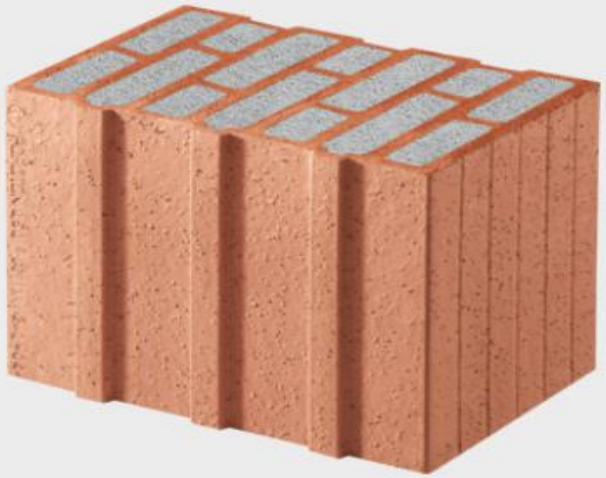
Later insulation - Inside and outside with the perlite-filled brick poroton

2009 POROTON-WDF

Old building renovations with usual heat composite systems often lead to algae growth, mechanical damage (f.i. woodpecker) and elaborate fire protection solutions.

The thermal facade Poroton WDF, is a massive brick wall, filled with the natural insulation perlite (volcanic rock fumed). Environmentally friendly, high fire protection inclusive

2009 POROTON-T7



With the further improvement in thermal conductivity of 0.070 W (mk) Poroton T7 meets the strict requirements of the EnEV (Energy Saving Ordinance)

www.poroton.de

POROTON®-WDF®

Outside

1 Inventory wall
2 Poroton WDF

3 lightweight plaster

POROTON®-WDF®

Inside

1 Inventory wall
2 plaster for interior
3 backfill
4 Poroton WDF
5 plaster for interior
6 bottom panel - celing

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Exampel 1: (pollutant- tested) mineral composite thermal insulation system

Interior Insulation

iPor-Novo-Mineral insulation panel

Capillary-active, permeable, fibre-free, mineral, solid insulation panel made of calcium silicate hydrates,
biologically harmless and fully recyclable. Incombustible A1 as per DIN EN 13501-1, officially approved.

Panel size: 600 x 390 mm
Panel thickness: 60/80/100/120/140/160/180/
200 mm (220-300 mm on request)
Rated value of thermal conductivity: 0.042 W/mK
Compressive strength on average: at least 200 kPa
Density range from 85 to 95 kg/m^3

Panel thickness: 50 mm
Rated value of thermal conductivity: 0.045 W/mK
Compressive strength on average: at least 300 kPa
Density range from 110 to 115 kg/m^3

Exterior Insulation with KEIM Multipor

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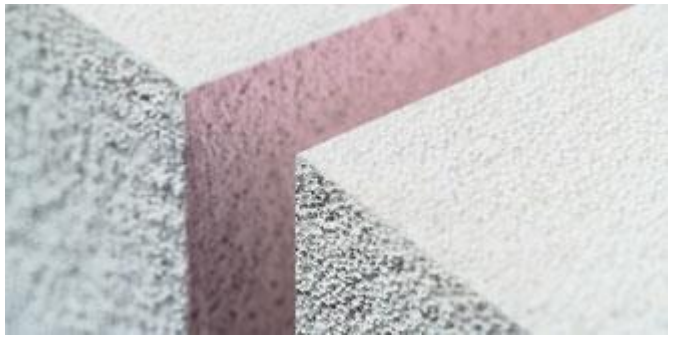
Exampel 2: (pollutant- tested) mineral composite thermal insulation system

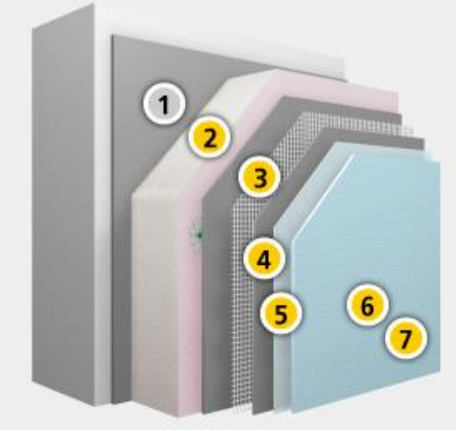
External Thermal Insulation Composite System with

Mineral foam insulation board
StoTherm Cell



Mineral, non-combustible cladding system with mineral foam insulation

1 bonding
2 insulation
3 flush
4 Reinforcement
5 intermediate coating
6 final coat
7 Accessories, Supplements



natureplus®
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Economic aspect of the theme "healthy living"

High costs always arise in subsequent renovations by

mold problems

as well as by Indoor air pollution

Negative marketing for architects and builders

After renovation in old buildings:
mold - **what happened**?

Actually, everything was supposed to be better, if the building envelope would be provided with a reasonable thermal insulation.

Lower heating costs, better living climate plus a real increase in property value. Well actually.

Often promised in the most dazzling colors in brochures, this can do not match with the reality in some cases.

Mold on interior walls,
wet house corners, hardly an insulating effect
are the fatal and costly consequences **of a faulty house insulation**

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Economic aspect of the theme "healthy living"

High costs always arise in subsequent renovations by mold problems

as well as by Indoor air pollution

Formaldehyde after a energy refurbishment

"In a school in the 70s, the windows are in the context of energy Restoration renewed. Above the false ceiling there is a permanent formwork chipboard. The new window of the natural air exchange falls into the Spaces, so that the formaldehyde content, thanks to the leaky window before still had not become noticeable, rises above the limit value and a reorganization of the school again begins, this time a contaminant remediation."

Negative marketing for architects and builders

In addition, there is always a huge damage to the image of the planning and exporting companies, especially when the problems arise in public buildings (schools, kindergartens) with appropriate media interest.

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“Hammer of the week” ZDF TV Report 09.07.2016

Ecological newly built Kindergarten - energetically optimized - has far excessive pollution levels

WALLERFANGEN
Newly built crib is not usable

After 13 months of ventilation and heating is certain: The replacement of the walls and ceilings is inevitable!

2018 the building must be demolished - the architect is sued for damages

What is measured, is the concentration of pollutants (aldehydes) from the exhalations of the built-up (OSB) timber. At the time of closing, the figures were around 13 000 µg/m³.

The new building costed around 1.5 million euros.
The costs for the measurements and appraisals now amount to a further 19,000 euros.

main cause:
OSB (oriented strand board or oriented structural board)

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https://www.sr.de/sr/home/nachrichten/politik_wirtschaft/wallerfangen_kita_zuschuss_rueckzahlung100.html

Positive economic aspect of the theme "healthy living"

Example:
LOHAS = Lifestyles of Health and Sustainability

More than a third of the population of western countries is counted among the LOHAS.

It it is a new target group that will have a significant impact on trade, marketing and product design in the coming years.

LOHAS want the 'AND':

- **health AND pleasure, comfort**
- **lifestyle AND environmental**
- **individual welfare AND the fate of humanity**
- **family AND career**

Positive marketing with residential health

LOHA is a rapidly growing market, which is estimated at an annual turnover of around $ 500 billion worldwide.
Source: Future Institute

Laws for „healthy“ buildings - example Germany

civil Code

criminal code

products Safety Act

EU Construction Products Regulation

sample management regulation MVV TB

country building regulations

liability of the architect

In all these national and European regulations there are demands for protection of the health in terms of

building products

and buildings

Legal regulation for buildings:

Pursuant to § 3 and § 13 MBO1, physical structures must be arranged, constructed, modified and maintained in such a way that public safety and order, in particular life, health and natural resources are not endangered, and by plant and animal pests and others chemical, physical or biological influences do not cause any danger or unreasonable nuisance.

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Add to that in Germany: “architects liability”

Quote:
"Contractual agreements

When determining the basics, the architect has to research the interests of the client. He must therefore find out ***even without a special order:***

- *whether special energy-saving measures are desired,*
- *whether the client wants to avoid certain allergenic substances,*
- *whether he is particularly interested in a good indoor air quality and*
- *whether it is due to the special nature of the use of certain ventilation systems - beyond the accepted rules of technology - and similar needs.*

What the client is not already pretends himself, the architect must ask.

He is the administrator of the client interests."

Source: “Deutsches Architektenblatt”, September 2015

Careful product selection

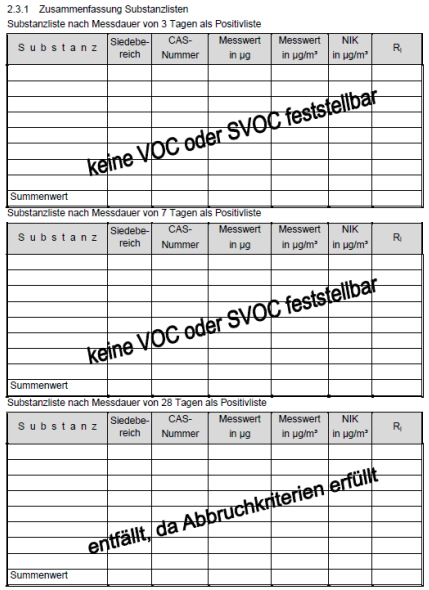
evaluated as helpful by "Ökotest"

Only products should be used in new buildings, but especially also in energy renovations,
for which
credible, comprehensive emission reports are present.

Do not orient yourself to questionable quality labels,

who often give "complacency reports":

Example - Test reports for wood-based materials with "zero" emissions!



2.3.1 Zusammenfassung Substanzlisten

Substanzliste nach Messdauer von 3 Tagen als Positivliste

Substanz	Siedebereich	CAS-Nummer	Messwert in µg	Messwert in µg/m³	NIK in µg/m³	R_i
Summenwert						

keine VOC oder SVOC feststellbar

Substanzliste nach Messdauer von 7 Tagen als Positivliste

Substanz	Siedebereich	CAS-Nummer	Messwert in µg	Messwert in µg/m³	NIK in µg/m³	R_i
Summenwert						

keine VOC oder SVOC feststellbar

Substanzliste nach Messdauer von 28 Tagen als Positivliste

Substanz	Siedebereich	CAS-Nummer	Messwert in µg	Messwert in µg/m³	NIK in µg/m³	R_i
Summenwert						

entfällt, da Abbruchkriterien erfüllt

important:

- Credibility of the audited institution
- the samples must be taken from the Institute or his agent from current production **(not sent by the manufacturer)**
- Circumference of the inspection order must be correct
- standard test conditions
- the values must be credible!

Architects, contractors and consumers are confused by a myriad of quality labels and certificates

Already in 2014 we published with the magazine
Ökotest a comparison of numerous
“quality labels for construction products."

“rarely light in the jungle”

Currently we have listed over 45 quality labels for construction products,

of which
only very few are a serious basis for a "health assessment“ –rating.

Free download in the EGGBI publication series:


Europäische Gesellschaft für gesundes Bauen und Innenraumhygiene
Internet- Informationsplattform zum Thema Wohngesundheit und Umwelterkrankungen

EGGBI Bewertungen von über 45 Gütezeichen und "Kennzeichnungen" für Bauprodukte

für Verbraucher

mit erhöhten Anforderungen an die „Wohngesundheit“

(Risikogruppen: Allergiker, Umwelterkrankte, Chemikaliensensitive[1]
Schwangere, chronisch Kranke, Kleinkinder...)
Informationsstand: 18.10.2018

Auflistung von Gütezeichen mit teils hohen Anforderungen an die Nachhaltigkeit, Ökologie, aber nur mit wenigen Ausnahmen mit aussagekräftigen Anforderungen bezüglich gesundheitlicher Unbedenklichkeit .

1 Informationen bzgl. eines Bevölkerungsanteils „Allergiker“ von bereits 30 % ergibt die Notwendigkeit, auch bei öffentlichen Gebäuden, vor allem Schulen, Kindergärten, Sportstätten nicht nur Fragen von „toxischen“, sondern auch „sensibilisierenden“ Stoffen zu berücksichtigen. Link

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Most important: Education“

The topic of " sustainability - healthy living " is also increasingly part of the university and post-university education (architects, planners) in Germany

example:

DISTANCE EDUCATION Course
MASTER ARCHITECTURE AND ENVIRONMENT

The „Master distance course“ architecture and environment is a range of courses at „Hochschule Wismar“– university of Applied Sciences: Technology, Business and Design.

The aim of the inter-university „distance learning architecture and the environment“ is to convey the complexity and the necessary knowledge of the "ecological building". http://www.wings.hs-wismar.de/de/fernstudium_master/architektur_und_umwelt

The course includes 3 lessons of healthy living „construction and use of practical examples" occupied by EGGBI

We also support Training courses for architects planners and craftsmen on issues of low-emission construction methods, materials and workmanship.

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Urgently required:
„Research projects“

Especially up to date:
Issues of health relevance of natural emissions from wood-based materials (terpenes, carboxylic acids…)

Research results in Germany and Austria lead to new "product reviews“.

2018

- **carboxylic acids:**

New guideline for the detection of vinegar and formic acid
VDI guideline 4301 sheet 7 (issue 10/2018)
Here it is pointed out expressly, that it comes to under-detection with the previously practiced Tenax method! (Own experiences up to a factor of 2.5)

- **Formaldehyd:**

Even a new test standard - the **DIN EN 16516 (1/2018)** currently worries mainly wood-based panel manufacturers, since this results in completely new bases for the determination of formaldehyde emissions. Previous measurement results (formaldehyde values) according to EN 717-1 are therefore to be multiplied by a factor of 2 in the future.

http://www.eggbi.eu/beratung/produktinformationen-guetezeichen/#c1567

Current example:
research project
(with EGGBI participation)

"gut dank Holz"
"good because of using wood"

Toxicological evaluation:
natural emissions
made of wood and wood-based materials

Health:
Positive and negative effects

Institut für Umweltmedizin und Krankenhaushygiene

UNIVERSITÄTS KLINIKUM FREIBURG

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Final resume:
Main condition for "healthy living" energetic renovations of buildings

- **Careful diagnosis of the actual technical and energetic building state**
- **Expertly competent overall renovation concept, taking questions of the future air exchange (ventilation planning) into account**
- **Use of only pollutant-tested products**
- **Careful execution of the construction work**

Thank you for your attention

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contact data

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https://www.facebook.com/wohngesundheit/

Publications: (free downloads) http://www.eggbi.eu/gesundes-bauen-eggbi/eggbi-schriftenreihe/

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