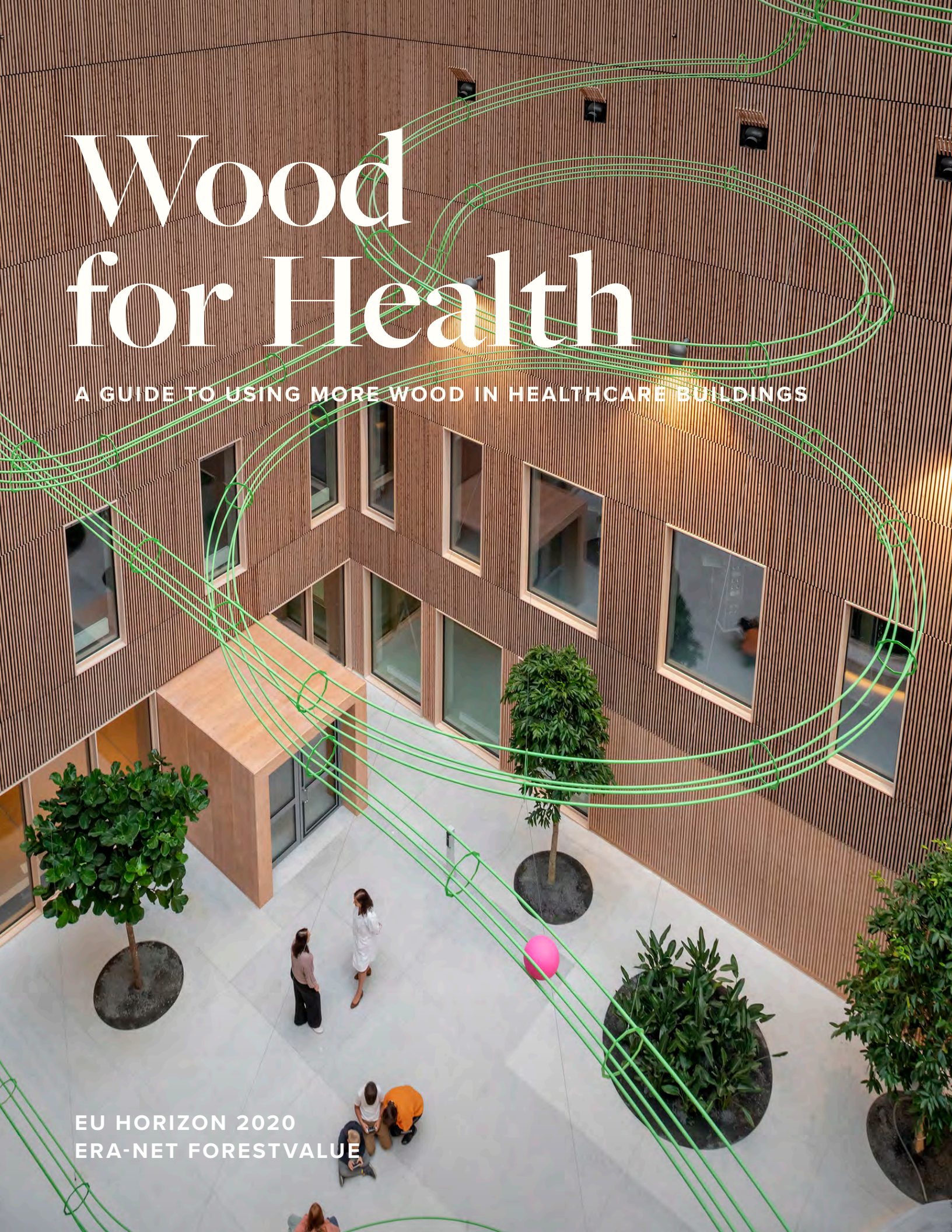

Wood for Health

A GUIDE TO USING MORE WOOD IN HEALTHCARE BUILDINGS

EU HORIZON 2020
ERA-NET FORESTVALUE

A Guide to Using More Wood in Healthcare Buildings

Wood for Health 2025

Editors and graphic design: White Arkitekter AB

Front cover photo: James Silverman
Laboratory photographs: The project´s researchers

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Preface

Dr. Pekka Kilpeläinen
Wood for Health Project Manager
University of Oulu

Timber in buildings is both traditional and modern. It is beautiful, its colour is warm, and it is warm to touch. Wood calms down stress and gives good acoustics to rooms. Timber is also a renewable and sustainable building material – no wonder that the use of wood as a construction material is having a renaissance.

The current tailwind is partly due to public builders. It has resulted in a number of amazingly beautiful and award-winning schools, kindergartens, nurseries, even town halls, highrise hotels and wooden block of flats.

As wooden interiors are reported to support wellbeing, wood should be a perfect match for healthcare buildings. This is also what we see around Europe and the globe today. Yet, there are also challenges. Lack of knowledge and experience of wood in hospitals often restrict its use to general halls and corridors.

This guide is produced as a part of the Wood for Health project, an international research project in the European ForestValue program. The focus of the research in Wood for Health has been to develop and test new sustainable coatings for wood in indoor spaces with high hygiene requirements. In this publication we present a selection of healthcare architecture with wooden interiors – a showcase of good practice in the field. We also briefly share some results and point out need for further research.

I hope that readers will enjoy to see how modern hospital buildings already utilize wood, and that all will share our enthusiasms in the topic. Wood comes from nature, and it takes our thoughts back to nature.

The research project's work packages

2022-25
WP1

Project management

The lead partner, University of Oulu, Finland, has been responsible for project management, including coordination between partners and work packages, reporting to the ERA-Net ForestValue Coordination Office, and general project administration.

2022-23
WP2

Wood surfaces in healthcare buildings – practical experience

With this work package, Wood for Health took its point of departure from the practice of project partner White Arkitekter to ensure the relevance of the research and development. To further broaden the perspectives on wood in healthcare buildings, international examples of architecture and legal requirements have been compiled and are presented in this guide.

2022-24
WP3

Synthesis and formulation of wood coating material

In WP3, new antimicrobial and antiviral coatings for wood surfaces have been developed by project partners from academia and industry: Fraunhofer Institute for Wood Research, Auro Pflanzenchemie AG, Latvian State Institute of Wood Chemistry, and Iecavnieks & Co. The new coatings have been tested in WP4 and WP5.

2022-24
WP4

Antimicrobial, antiviral and hygienic properties of coatings and surfaces

The most promising of the novel coatings from WP3 have been tested by the University of Oulu in WP4. The tests have included coatings on wooden surfaces under various conditions, together with studies of the diversity of microbes on the surfaces and aspects of cleanability.

2023-25
WP5

Technical, environmental and economic product performance

The coating properties (except for the antimicrobial aspects mentioned above) have been assessed in WP5 by the Norwegian Institute of Wood Technology, focusing on surface protection and maintenance, moisture dynamics, and energy impact in buildings. The work has also included preliminary life cycle analysis (LCA) and economic assessment of the coatings.

2022-25
WP6

Transnational dissemination

This publication is part of WP6, which also includes dissemination of project results to the scientific community, policymakers, industry, education, and the public, aligned with Europe's bioeconomy and circular economy strategy for broader outreach. All project partners contribute, led by the Latvian State Institute of Wood Chemistry.

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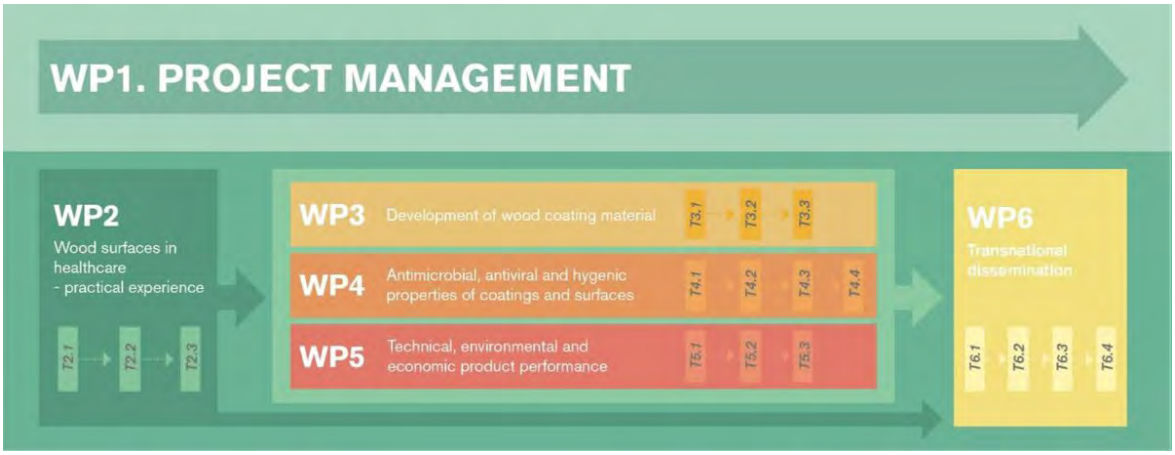


Introduction

Entrance 100, Uppsala, Sweden
White Arkitekter
Photo: Åke E:son Lindman

BACKGROUND

Wood's potential in healthcare buildings

In the last few decades, wood has gained increased interest in the building industry due to its environmental assets. However, because of its reputation for being difficult to clean and prone to contamination, wood has seldom been used in hospitals, healthcare units, and other facilities with high demands for surface hygiene. This is unfortunate, as several studies have shown that wood greatly aids the measured and perceived indoor environment quality (IEQ) and can be utilised to reduce energy use for heating and/or ventilation.

The field of research on the influence of wooden interior materials on IEQ was extensively reviewed by Alapieti et al. in 2020[1] , a study that underlined wood's great potential as a building material also in healthcare facilities. A review of the scientific work in this field also discloses the knowledge gaps that must be filled to safely use wood products to a greater extent than today in buildings with high demands for surface hygiene.

The scarce use of wood in healthcare buildings today depends on specific challenges concerning hygiene, chemical and mechanical resistance, and fire safety, and due to the lack of updated guidelines leading actors, such as healthcare organisations, planners, architects, and builders often stick to traditional solutions with less sustainable materials. Still, the industry has moved forward thanks to stakeholders who take interest in both environmental issues and health-promoting design.

Across Europe, healthcare providers are planning for new big hospital investments in the near future. The aspiration of Wood for Health is to meet the growing interest from the construction industry, investors, developers and owners of healthcare buildings who wish to extend their use of interior wood but are unsettled regarding the feasibility and safety. The Wood for Health consortium consists of seven partners: one university, three sector research institutes focused exclusively on various aspects of wood research, an architect company, and two coating manufacturers. Together we represent expertise in architecture, wood construction technology, wood and coating chemistry, health effects of natural compounds, microbiology, environmental and economic product assessment.

[1]Alapieti, T., Mikkola, R., Pasanen, P., & Salonen, H. (2020). The influence of wooden interior materials on indoor environment: a review. European Journal of Wood and Wood Products, 78(4), 617-634.

OBJECTIVES

Safe use of wood in healthcare buildings

The project's hypothesis is that wood is an environmentally friendly, cost-effective, technically versatile, and health-promoting material that can be used to a much greater extent than today in interior architecture of buildings with high demands towards surface hygiene. However, this requires a knowledge-based use, protection, and maintenance of wood products that takes heed of wood's complexity as a natural material in these environments.

The project has aimed both to develop antimicrobial surfaces and safe hygiene concepts with low environmental impact and to promote the use of interior wood in healthcare buildings by examples of good practice.

This guide presents new European healthcare architecture with interior wood, together with reflections on rules and regulations that differ between countries and even regions. The collected examples are meant to inspire property developers to use wood in the interior to enhance the indoor environment for both staff and patients.

The New Medical Clinic in Tübingen, Germany
Visualisation: White Arkitekter

Good practice

Built examples around Europe that use wood in healthcare buildings

Hälsocentrum Lindesberg, Sweden
White Arkitekter
Photo: Åke E:son Lindman

Queen Silvia Children's Hospital

SWEDEN

Care for the patient, family and relatives was the guiding principle in the design of the Queen Silvia Children's Hospital at Sahlgrenska University Hospital in Gothenburg, Sweden.

HEALTHCARE TYPE
Children's hospital

CITY
Gothenburg, Sweden

CLIENT
Västfastigheter

COMPLETION DATE
2021

AREA
35 000 sqm

ARCHITECT
White Arkitekter

Characterised by the typical homogeneous suburban healthcare architecture from the 70s, the greater Östra Hospital campus of Sahlgrenska University Hospital is a mixture of high-rise and low-rise buildings. Queen Silvia Children's Hospital is a first step in the transformation into a more urban-like hospital campus with improved workflows that respond to the collaborative needs of modern healthcare.

The 35,000 sqm state-of-the-art extension of the existing children's hospital houses a new operation unit, an intensive care expansion, and single-patient rooms to reduce the spread of infections.

Creating a sense of home

Although the average time of treatment at the hospital is shorter than a few days, some children will spend up to half a year or longer. The challenge was to meet the high demands on equipment, hygiene, and efficiency in a way that does not "look and feel" like a hospital. The architects spent a lot of time with the children and their families to unfold their ideas through dialogue, drawings, and play. The results revealed a care environment resembling home: calming materials, soft lighting, access to outdoor play, and for teenagers places to hang out with friends as well as space for privacy. Wood played a very important role in creating this type of environment.

Designing to maximise daylight

At Queen Silvia Children's Hospital, daylight is captured through expansive exterior views and patient rooms with low window sill heights. For children who are not well enough to venture outdoors, a temperature-controlled winter garden provides direct access to daylight and lends a feeling of being in the fresh outdoors. Wood panels add warmth and tranquility to the winter garden and are a common design feature throughout the interior.

Case-study for wood in healthcare buildings

The Queen Silvia Children's Hospital has been used as a case study in this research, with principles for zoning and how wood accordingly has been used in a hospital environment. It connects the design of different zones within the building with policies and requirements for wood from the perspectives of microbiological properties, cleanability, hardness, resistance, fire safety, etc.

The Wood for Health research team has explored the limits and potentials of wood products in healthcare buildings with an emphasis on surface aspects.

> "Our intention has been to bring the hospital as close to every day life as possible

WOOD IN THE PROJECT

ZONES
Waiting rooms, Day rooms, Corridors, Staff rooms

PRODUCTS
Walls, doors, windows, furniture, flooring, loadbearing elements

TYPES OF WOOD
Birch plywood panels, solid timber ribs and panels, glulam beams

TREATMENTS
Factory-treated lacquer for fire and hygiene, hard wax oil, two-component topcoat paint

Photos: James Silverman

Kainuu New Hospital

FINLAND

The requirements set for Kainuu New Hospital were clear: the hospital must support the patients' recovery, operate flexibly and efficiently, and adapt to changes if needed.

HEALTHCARE TYPE
Hospital

CITY
Kajaani, Finland

CLIENT
Kainuu Regional Healthcare District

COMPLETION DATE
2021

AREA
New building 44 265 sqm
Renovation 4 255 sqm

ARCHITECT
Sweco

The Kainuu New Hospital project is formed by a new building and a totally renovated existing building. The project was realized in an alliance-based collaboration including the Regional Healthcare District, Skanska, Caverion, and Sweco. The project includes the functions of an acute care hospital, polyclinic, and outpatient wards. Psychiatric functions, that were scattered in the city, have been now rearranged in the new hospital. Additionally, the hospital will feature a day hospital, imaging, and laboratory facilities.

Wood is a central element in the hospital, used in facades, as a finishing material in lobbies and public spaces, on furniture and as wall finishing in patient rooms. The hospital has an art program, in which artists were asked to use wood and themes related to nature. Artworks are present in all the departments of the hospital. Laminate wood was also used in furniture and doors.

Wood as a positive impact on the patient experience

Wood is mostly visible and often placed where it can be touched and felt. The hospital is on a hill, surrounded by trees. The project alliance agreed that the views of the parks and trees from patient rooms are also part of the use of wood in the hospital and could have a positive impact on the patients' experience. When possible, patients have access to places where they can enjoy these views.

Connection to the landscape

The landscaping of the hospital yard focused on ensuring that nature and greenery, because of their calming effect, can be sensed through the windows. The handsome pines in the area were also preserved. The functional hospital yard areas benefit patients, hospital staff, and family members alike. The yard includes a rehabilitation park for physical rehabilitation. Patients can also take part in maintaining the flowers and plants in the park. Using green areas for rehabilitation purposes is still a new concept in Finland, but there is evidence of its benefits.

Common goal to use wood

The client's main goal for the realization of the hospital was the wide use of wood – in fact, as much as possible. The alliance partners agreed that wood would not be used for structures but in all other places as much as regulations, function, hygiene, and so on would allow. After a few years of operation in the hospital, the feedback has been very positive from the client and from users such as nurses, doctors, patients, and others.

> “We have not built a hospital for yesterday or today, but a hospital for the future

WOOD IN THE PROJECT

ZONES
Facade, lobbies, public spaces, patient rooms, artwork, furniture

PRODUCTS
Walls, doors, furniture

TREATMENTS
Painting, transparent fire lacquer, hard wax oil

Photos: Tuomas Uusheimo

Waldkliniken Eisenberg

GERMANY

The concept of the orthopaedic centre and teaching hospital is described as 'state of the art medical care and quality of staying in a star-rated hotel' where the patient is the guest. The large building for inpatient care, circular in plan, employs the power of healing architecture.

HEALTHCARE TYPE
Orthopedic Center

CITY
Eisenberg, Germany

CLIENT
The Ministry of Thuringia

COMPLETION DATE
2020

AREA
16 500 sqm

ARCHITECT
Matteo Thun & Partners

Waldkliniken Eisenberg is the largest orthopaedic center in Germany. The managing director of Waldkliniken wanted to create a clinic that combines cutting-edge medicine, innovation, and 'healing architecture'. The project team aimed to create a hospital with hotel standards for a municipal hospital, and this vision was very clear throughout the planning and construction process.

The circular building, with its facade made of local wood and featuring 128 patient rooms and 246 beds, will accommodate orthopaedic patients after their operations in a building that consciously puts its temporary residents at the center. The architecture for hospitals corresponds to the concept of 'Hospitecture': the design language combines the aesthetics of hospitality projects with those of the healthcare sector. The focus is the guest (lat: hospes). Architecture and interior are intended to promote healing.

A '3 Zeros' project

The new building was planned according to the 3 Zeros concept: Zero kilometers stands for immediate proximity to building materials and use of local skills. Zero CO_2 means energy management and lower emissions. Zero waste includes life cycle management in the construction process and reuse of construction materials.

Healthy living

Surrounded by forest and with 55 newly planted trees in the immediate outdoor area, the wooden circular structure of the building puts the material wood at the center. Lots of green for the interior and exterior, natural materials, an interplay of inside and outside, a well-considered use of artificial light and daylight, and color compositions from flora and fauna. Rooms, boarding areas, a unit care concept: the interior design ensures transparency – not only to nature outside but also to the staff inside.

Holistic design

The result of this holistic design has nothing in common with usual hospitals. The patient rooms offer views of the surrounding forest of the Saale-Holzland district. Nature itself takes part in the healing process. The carefully designed floor plans of the multiple-bed rooms, with patios between them serving as connectors and climate buffers, provide a degree of privacy that patients and their visitors will hardly find in usual hospitals.

> **The design language combines the aestetics of hospitality with the requirements in healthcare**

WOOD IN THE PROJECT

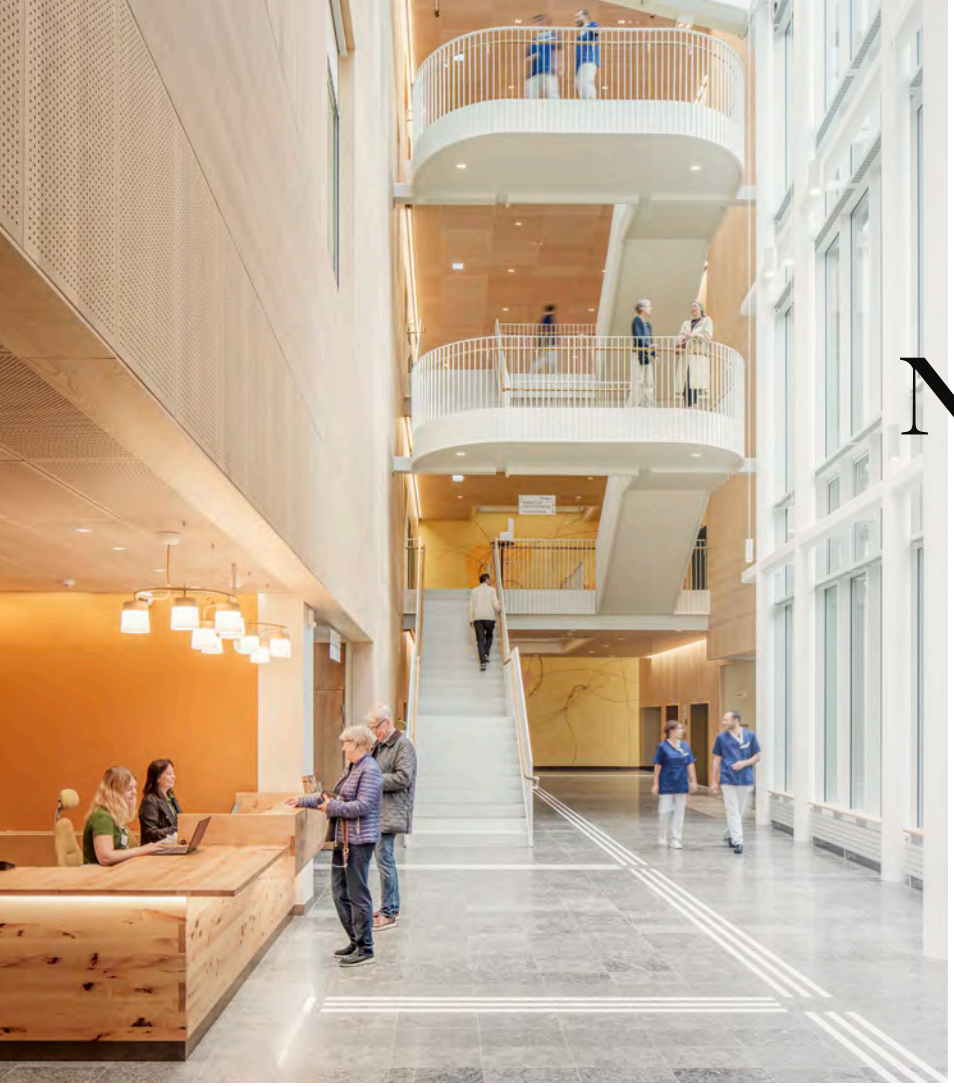
ZONES

Facade, lobbies, public spaces, patient rooms, furniture

PRODUCTS

Walls, doors, furniture, floor, ceiling

Photos: Gionata Xerra



Ersta Nya Sjukhus

SWEDEN

Ersta Diakoni developed Ersta New Hospital together with the architect offices Nyréns, Ratio and Tengbom in different stages of design. With an evidence-based approach and in close partnership with healthcare providers, the organization, patients and family members, they created an industry-leading healthcare environment where people will feel (almost) like home.

HEALTHCARE TYPE
Hospital

CITY
Stockholm, Sweden

CLIENT
Ersta Diakoni

COMPLETION DATE
2023

AREA
24 000 sqm

ARCHITECT
Tengbom, Emma Olbers Design, Nyréns arkitektkontor, Ratio

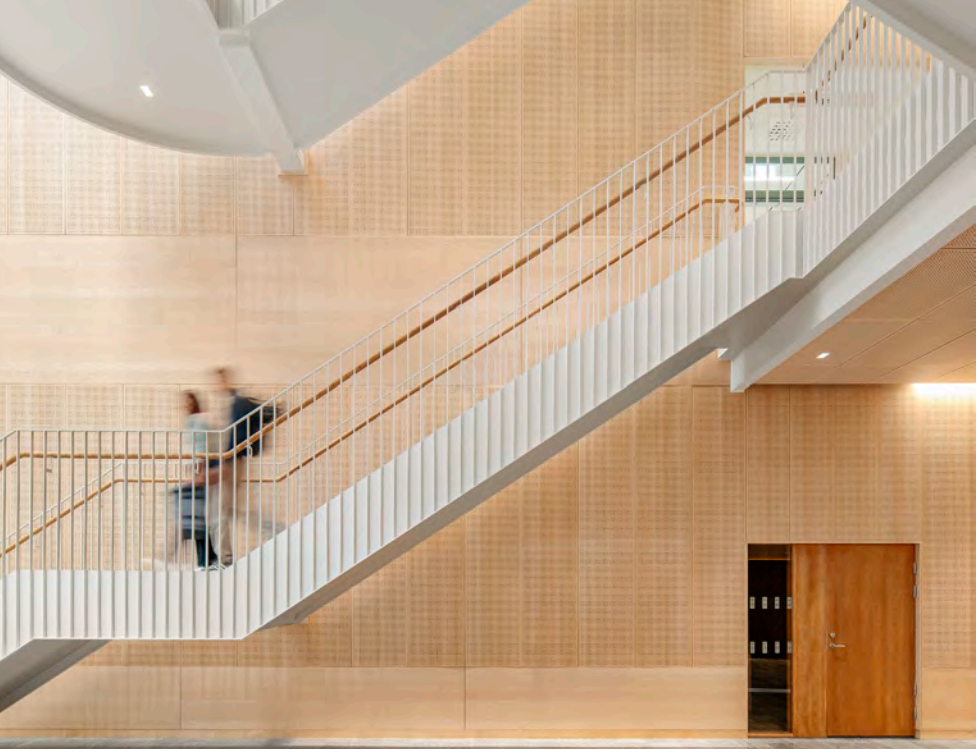
Ersta Hospital opened on the heights of Södermalm island in 1864. In 1907, it was relocated nearby. Fifty years later, major additions and extensions were added to the block, designed by Tengbom. In 2014, an architectural design competition was held for Ersta Nya Sjukhus – the New Ersta Hospital – for a design that would capture the historic identity of the surroundings and the hospital's main fields of expertise. The winner was Nyréns Arkitektkontor who, together with Ratio, developed a concept that elegantly followed the topography and reflected the scale and classical look of the area. They worked on the project until it was time to apply for the building permit.

Sensory and humane spaces

Nyréns & Ratio developed the design together in line with Ersta Diakoni's basic values and overarching goals. Ersta wanted sensory and humane spaces where the color palette, daylight, and presence of views interact to create a sense of security and safety in an otherwise high-tech, modern hospital environment.

Somewhere between a hospital and a home

If you imagine a scale ranging from the public, often impersonal spaces of large hospitals to a private, home-like setting, the aim for the new Ersta Hospital is to find a balance between both worlds. It should be infused with personality and a sense of caregiving, paired with professionalism and trust. In 2017, Tengbom was given the task to manage and carry out the project – and to develop the function and design of the new hospital.



Categorization of rooms

Already from the competition proposal, wood and other natural materials were part of the core. In the architects' work, a concept connected to room categories was developed. The highest class in terms of design and material selection included areas such as the entrance hall, main staircase, and meditation room. This made it easier to decide which areas could include wooden elements. Tengbom worked in collaboration with Emma Olbers, who was in charge of the interior color and material concept and furnishing. The project never uses wood laminate on surfaces with a wood-look – there is actual wood. Emma and Ersta Diakoni performed numerous tests with disinfection on surfaces in order to confirm the decision to use hard wax oil on wooden finishes where hygiene requirements allowed wood. Oil and wax instead of lacquer make maintenance easier over time.

Connection to the city

The hospital rises six stories up the hill from a very busy street. At eight stories, the building's highest section runs from east to west along the crest of the hill, in harmony with the characteristic buildings nearby. Two projecting buildings – one facing south toward the street and one facing the old hospital building to the north – form two lush courtyards. Even inside the new hospital, the connection to the city is the primary theme. From the wards and rooms to the hallways and large rooftop terraces, the surrounding city and vegetation have a constant presence. The cityscape is part of the healing environment. The glass-enclosed hospital lobby is a large, bright, and welcoming room rising three stories, with views of the surroundings.

WOOD IN THE PROJECT

ZONES
Facade, lobbies, public spaces, patient rooms, furniture

PRODUCTS
Walls, doors, furniture, floor, ceiling. No 'wood' laminate products.

TREATMENTS
Osmo hard wax oil

Photos: Felix Gerlach

LHL Hospital

NORWAY

In the LHL Hospital material choices reflect the optimal balance between qualities that are comforting and pleasant for the users and the necessary requirements for medical treatment and efficiency.

HEALTHCARE TYPE
Hospital

CITY
Gardemoen, Norway

CLIENT
LHL Helse / Aspelin Ramm

COMPLETION DATE
2017

AREA
30 000 sqm

ARCHITECT
Nordic Office of Architecture

Nordic Office of Architecture was commissioned by LHL, the Norwegian association for people with heart and lung diseases, to develop their new hospital at Gardermoen. Their ambition was to further establish LHL as a leading authority in its field, offering their members both cure and treatment.

Light and relaxing

The hospital includes wards, outpatient clinics, and surgical departments and strives to provide the best possible patient experience. The atmosphere is light and relaxing, and the building is easily navigable, with short walking distances. Abundant natural light and spatial connections provide transparency and clear lines of sight across the building and the surrounding green outdoor spaces.

User-focused design

The project was brought to life by a large multidisciplinary team, with a singular focus on the hospital's users. Based on LEAN principles, the end-user has always been at the center of the development – from selecting the right plot, through focus groups, workflow analysis, programming, and early-stage design development, to detailing. The result is that both patients and staff feel a strong sense of ownership and pride in the building, thanks to the extensive user engagement throughout the design process.

Healing qualities

The idea of providing the best possible patient experience has permeated the architectural and interior design of the hospital. Large windows offer an important visual connection to nature. Paired with extensive use of timber and glass, simple, precise forms, and well-considered detailing, the building feels less like a traditional hospital and more like a retreat.

Few wood limitations

According to one of the lead architects of the project, Alexander Wærsten, it was no challenge to use wood in this healthcare facility. Everybody was on board, and hygiene aspects were easy to fulfill. The two aspects that affected the amount of wood in the building were fire regulations and budget factors.

> “it was no challenge to use wood in this healthcare facility. Everybody was on board

WOOD IN THE PROJECT

ZONES

Facade, lobbies, public spaces, patient rooms, furniture

PRODUCTS

Walls, doors, furniture, floor, ceiling

Photos: Knut Ramstad / Nordic Office of Architecture

Red Cross Hospital, Riga

LATVIA

The welcoming character of the building facilitates the mental well-being of patients and thus accelerate their recovery.

HEALTHCARE TYPE
Hospital

CITY
Riga, Latvia

CLIENT
Medical Company ARS, Ltd.

COMPLETION DATE
2024

AREA
2 200 sqm

ARCHITECT
Architectural bureau Jaunromans un Abele

Riga Red Cross Hospital is restored sustainably, thoroughly taking one step at a time. Historical details are meticulously preserved against the backdrop of a symbiotic relationship between a compassionate environment and modern medical and engineering systems.

It is energy efficient, with hot/cold air being dispensed from the ceiling without obstructing the view of the architectural design. It now has a surgical block, a state-of-the-art operating theatre, an outpatient department, and a façade with an entry portico and a curved ramp – a historical landmark anchor of Grīziņkalns.

The major focus was on preserving the original architectural glory while simultaneously equipping the hospital with state-of-the-art medical technology. The end result is a wonderful blend of past and present, serving as a beacon of healthcare innovation and historical preservation.

Wood is a recurring element in the hospital. Much of it is restored oak, originally from 1912, like the entrance door and its handle, but it has been complemented with details made in wood veneer. Solid wood is used in places prone to crash damage such as door frames and the upper ends of the wall panelling.

WOOD IN THE PROJECT

ZONES
Facade, entrance hall, corridors, wards

PRODUCTS
Wall panels, windows, doors, fixed furniture

TREATMENTS
Acrylic varnish, matte with 3% shine

Photos: Iļja Ševcovs, Jānis Salmanis, Māra Ābele

Universitäts Kinderspital Zürich

SWITZERLAND

The hospital is located next to the historic University Psychiatric Clinic, known as the Burghwölzli, and the entrance gate stands directly opposite the entrance to the historic building. The concave gesture of the façade creates a shared forecourt for both institutions.

HEALTHCARE TYPE
Hospital

CITY
Zürich, Switzerland

CLIENT
Kinderspital Zürich – Eleonorenstiftung, Zurich, Switzerland

COMPLETION DATE
2024

AREA
Acute Hospital 79 215 sqm
Research & Teaching 16 100 sqm

ARCHITECT
Herzog & de Meuron

The new University Children's Hospital lies in Zürich-Lengg, at the foot of a hill known as Burghölzli. It is adjacent to other hospital buildings from several eras and is the largest facility for children and adolescents in Switzerland. It consists of two buildings: the acute-care hospital and the research and teaching facility.

The acute-care hospital to the south consists of a three-story concrete frame with intricate wooden infills that blend into the landscape. The interior functions like a town: the medical specialties are neighbourhoods with squares and connecting streets. On each of the three floors, a central main street runs past various green courtyards that provide orientation and bring daylight into the building. The patients' rooms on the roof are like individual cottages. Teaching and research are housed in a white cylindrical building to the north, with an open, five-story atrium in the center.

The curved, three-story main façade, with its endearing small-scale wooden houses and variously sloped roofs, offers a friendly and warm welcome to young patients and their families. The thoughtful use of wood and carefully placed art installations provide clear and memorable orientation, plenty of daylight, and a connection to nature. The spatial diversity, with views both inside and out, also offers spaces for children, teenagers, and their families to stay and play, as well as restful break areas for hospital staff.

Different and complementary

The two facilities of the Children's Hospital, though different and distinct, are clearly complementary. Situated on the hill, the circular building for research and teaching guides the gaze towards the lake. The elongated, horizontal shape of the acute-care hospital blends into the flat landscape and provides a view of the mountain range behind it. The hospital focuses on each patient as an individual, and that means not only the healing process but also the well-being of relatives and staff. The building for research and teaching highlights exchange and collaboration among scientists and students, which is a prerequisite for forward-looking research.

A healing environment

People in hospitals are often in life-threatening situations. That is an exceptional challenge not only for patients but also for relatives, carers, and physicians. Ironically, hospitals all over the world, and even in Switzerland, are often the ugliest places. For the past 20 years, we have zeroed in on this issue because we are convinced that architecture can contribute to the healing process; it can make a substantial difference. Here at the Children's Hospital, people can see for themselves how daylight coming in from outside and variations in proportion can animate and change a room, how plants and vegetation can blur the distinction between inside and outside, and how materials are not just beautiful to look at but also pleasing to the touch. We designed all these things with conscious intent so that people can perceive them, sense them, and ultimately feel better.

> **Architecture *can* contribute to healing**

WOOD IN THE PROJECT

ZONES

Facade, lobbies, public spaces, patient rooms, furniture

PRODUCTS

Walls, doors, furniture, floor, ceiling

Photos: Maris Mezulis

Landesklinikum Thermenregion Mödling

AUSTRIA

The project subtly integrates the large volume of a polyclinic into a suburban neighborhood. It complements the latest medical technology with the consideration of emotional demands through the offer of light-flooded rooms, clear internal routing and a harmonious material and color concept.

HEALTHCARE TYPE
Hospital

CITY
Mödling, Austria

CLIENT
HYPO NOE Leasing Company

COMPLETION DATE
2019

AREA
54 800 sqm

ARCHITECT
Habeler & Kirchweger Architekten ZT GmbH

The basic architectural concept is dominated by clarity and simplicity of the path network, short distances, and a light-flooded, friendly, ergonomically sensible basic structure. The use of natural materials such as wood, natural stone, and the polychromatic use of colours creates an ambience that supports the efforts of the doctors and nurses in the best possible way.

In addition to the functional aspects, particular attention was paid to a good spatial structure of the common areas and the spatial relationships in the arrangement of the rooms, so that the necessary and desired interaction of the users as well as a corresponding possibility of retreat for patients and staff are given.

Recognisable spaces

The central approach of the design concept is that a building of this size is only perceived as pleasant and appropriate in terms of scale if there is a clearly recognisable sequence of manageable areas in its structure and spatial zones. These must be easily recognisable, support orientation, and above all, have a pleasantly stimulating effect in keeping with their purpose.

Warm and welcoming entrance

At the centre of the building is the two-storey entrance hall with plenty of natural light, divided into a hall section, primarily for information and waiting, and a supplementary section containing services for patients, from a prayer room to a café. The lighting, greenery, and a small drinking fountain create a recreational architecture that contrasts with the highly functional parts.

The important green space

A beautiful and generous greening of the outdoor space is characteristic of the clinic area. An attempt was therefore also made to shape the building in such a way as to maximise the relationships within the interior of the building. Viewed from the upper floors, the building is strongly integrated into the green spaces thanks to the green roofs.

Wood improves the emotional atmosphere

Apart from the sustainable quality as a renewable building material, the material presence of wooden surfaces makes a significant contribution to improving the emotional atmosphere in the interior spaces. The functional and technical necessities that otherwise so strongly characterise the interior design of a hospital must be balanced with emotionally perceived materials.

> **The buildings were designed to maximize connections, both internally within the complex and externally with the surroundings.**

WOOD IN THE PROJECT

ZONES
Facade, lobbies, public spaces, patient rooms, furniture

PRODUCTS
Wall panels, windows, door frames and leaves, furniture.

TREATMENTS
Clear varnish

Photos: Bruno Klomfar

Alta omsorgssenter

NORWAY

HEALTHCARE TYPE
Nursing home

CITY
Alta, Norway

CLIENT
Alta kommune

COMPLETION DATE
2021

AREA
25 000 sqm

ARCHITECT
Stein Halvorsen Arkitekter

This award-winning nursing home, recipient of Norway's 'Årets helsebygg' in 2021, is located in Alta. It houses 60 care homes and 108 nursing home places distributed across five buildings.

With 4,000 cubic meters of solid wood used in its construction, it is northern Norway's largest solid wood project. The architect stated that the goal was to use wooden materials as much as possible. The massive wooden structure, wood panels inside, and wooden cladding outside contribute to making the buildings feel homely and provide the residents with peace and security.

WOOD IN THE PROJECT

ZONES	PRODUCTS	TYPES
Kitchen	Walls	CLT
Offices	Ceilings	Solid wood panelling (wall + ceiling)
Recreational room		Panel/Board
Foyer		
Ward		
Corridor		

Photos: Ørjan Marakatt Bertelsen

Entrance 100

SWEDEN

HEALTHCARE TYPE
Hospital

CITY
Uppsala, Sweden

CLIENT
Landstingsservice

COMPLETION DATE
2019

AREA
60 000 sqm

ARCHITECT
White Arkitekter

Photos: Åke E:son Lindman

Entrance 100 is a state-of-the-art facility at Uppsala University Hospital dedicated to advanced treatment, care, and research. Although built to rigorous technical specifications, the flexible floor plan allows the hospital trust to adapt facilities to future demands and emerging technologies.

Evidence-based research guided the building's design, maximizing daylight and greenery to support patient recovery. The facility is divided into two parts that surround a large, light-filled green garden. Treatment rooms are housed in brick volumes, while public areas and an educational gallery showcase ongoing activities and research.

WOOD IN THE PROJECT

ZONES	PRODUCTS	TYPES
Offices	Walls	CLT
Recreational room	Ceilings	Solid wood panelling (wall + ceiling)
Foyer		Panel/Board
Ward		
Corridor		

More wood in progress

Examples of European hospitals in planning or under construction

ANBAU FRAUENKLINIK UNIVERSITÄTSKLINIKUM
TÜBINGEN, GERMANY
TPK ARCHITEKTEN

11 555 M²
TO BE FINISHED 2025

NEW MEDICAL CLINIC
TÜBINGEN, GERMANY
WHITE ARKITEKTER,
HPP ARCHITEKTEN

53 400 M²
TO BE FINISHED 2032

CENTRALSJUKHUSET KARLSTAD

KARLSTAD, SWEDEN
WHITE ARKITEKTER

NEW CONSTRUCTION 107 000 M²
RECONSTRUCTION 29 000 M²
PHASE 1 TO BE FINISHED 2033

COPENHAGEN CHILDREN'S HOSPITAL
COPENHAGEN, DENMARK
3XN ARCHITECTS

58 000 M²
TO BE FINISHED 2026

VÄSTERÅS NYA SJUKHUS
VÄSTERÅS, SWEDEN
CARLSTEDT ARKITEKTER,
LINK ARKITEKTUR

75 000 M²
TO BE FINISHED 2030

VELINDRE CANCER CENTER
CARDIFF, WALES, UK
WHITE ARKITEKTER

36 000 M²
TO BE FINISHED 2027

Centralsjukhuset Karlstad, Karlstad, Sweden
Visualisation: White Arkitekter

Velindre Cancer Center, Cardiff, Wales
Visualisation: White Arkitekter

Reflecting on good practice

WHITE ARKITEKTER

This collection of projects from across Europe offers inspiration to promote the use of wood in healthcare buildings. The images and case reviews presented here can provide insterested stakeholders insights regarding the performance of wood in modern healthcare environments. Across these projects, common themes emerge, highlighting a genuine concern for all building users: patients, their families, and healthcare staff alike.

1. HUMAN-CENTERED ARCHITECTURE

All projects share a vision of creating spaces for patients and their families that feel more like a home or a welcoming hotel than a traditional hospital. All emphasize aspects of healing architecture. They build on evidence that patients recover more quickly in environments that feature wood. For patients with longer stays, it is especially important that the atmosphere feels less institutional. These projects also consider the working environment for staff, finding that wood contributes positively to their wellbeing and experience.

2. CONNECTION WITH THE WORLD OUTSIDE

In relation to the first finding, all the projects strive for a good connection to the outside and, where possible, to nature. Some emphasise the visual connection from the patient's bed, some provide easy access to the outdoors, and some have created indoor spaces that resemble outdoor environments. Measures like these have been shown to improve patients' health. And because many patients have to spend most of their time indoors, all projects aim to provide plenty of daylight in patients' rooms.

3. COMMON GOAL

In all projects, there was a common goal set between architect and client to use as much wood as possible. Having such an agreement from the start seems to have made the process run smoother and decision-making easier along the way.

4. ZONING

In most healthcare buildings, it is quite easy to divide different rooms into zones regarding the use of wood. Introducing wood into an operating theatre is (still) out of the question. We find it in foyers and other public spaces, while the use of wood in patients' rooms varies. It seems useful to define categories of rooms at an early stage and specify where and how wood can be used and treated.

5. REAL WOOD AND IMITATIONS

Although it is not possible to expose wood surfaces in all zones or rooms in a hospital, there is a common ambition to take advantage of wood's qualities in as many areas as possible. Where wood surfaces are not allowed, wood laminate or other wood imitations seem to be preferred over plain colour in patient rooms.

Requirements revisited

NORWEGIAN INSTITUTE OF WOOD TECHNOLOGY

This chapter gives examples of key aspects and requirements that need to be addressed concerning the use of wood in healthcare facilities in a European context. Chemical resistance, mechanical resistance, and fire safety are just a few of them. There are different requirements for materials and surface treatments across both countries and regions, and these requirements evolve as products, research, and best practices develop. Naturally, the requirements for specific elements in a building depend on both location and function.

Mary Elizabeth´s Hospital, Copenhagen, Denmark
Visualisation: 3XN Architects

HYGIENE REQUIREMENTS

In European healthcare buildings, interior spaces are often categorised based on the hygiene standards required to prevent hospital-acquired infections. While specific classifications may vary between countries, a four-category system is commonly used in architectural and design practice. These categories dictate the intensity and frequency of cleaning, which chemicals are used, how often cleaning occurs, and how aggressive the cleaning methods are.

Wood has traditionally been viewed as an unsuitable material for healthcare environments due to perceptions of poor hygiene and difficulty in maintenance. Being a porous material, wood can potentially harbor bacteria, viruses, and fungi within its microstructure. Its vulnerability to moisture also raises concerns, as damp conditions can promote microbial growth. Furthermore, many of the disinfectants used in healthcare settings are aggressive and may damage untreated or unprotected wood surfaces.

However, research findings challenge some of these concerns. Studies have shown that some wood species naturally exhibit antimicrobial properties. This antimicrobial activity is believed to result from a combination of factors, including wood's ability to dry quickly and its chemical composition. Specific compounds found in wood - such as abietic acids, stilbenes, pinenes, and various natural resins - possess antimicrobial effects. Many of these substances have been used in traditional medicine, and their efficacy has since been confirmed through laboratory research.

It has also been suggested that the porous structure of wood may physically trap micro-organisms, preventing them from spreading or reproducing. For instance, a study from the University of Eastern Finland found that coronaviruses lose their infectiousness more rapidly on wooden surfaces compared to non-porous materials like plastic.

Coatings play a critical role in enabling the use of wood in healthcare environments with stricter hygiene requirements. By addressing wood's natural porosity, moisture sensitivity, and limited chemical resistance, coatings can make wood surfaces more suitable for clinical environments.

Coatings form a barrier on the wood surface, making it easier to clean and disinfect while reducing the risk of microbial colonisation. They also enhance durability and resistance to harsh cleaning agents and ultraviolet (UV) radiation commonly used in sterilisation. Some coatings are specifically designed with antimicrobial agents that actively inhibit the growth of microbes on the surface.


Photo: Åke E:son Lindman

1. GOOD LEVEL OF HYGIENE

For example waiting rooms, office areas, cafeterias, meeting rooms, pharmacies, and technical rooms.


Photo: Ilja Ševcovs, Jānis Salmanis, Māra Ābele

2. ADVANCED LEVEL OF HYGIENE

For example patient rooms, examination rooms, and laboratories.


Photo: Åke E:son Lindman

3. HIGHLY ADVANCED LEVEL OF HYGIENE

For example intensive care unit, surgery rooms, wards for patients sensitive to infections and sterile supply units.

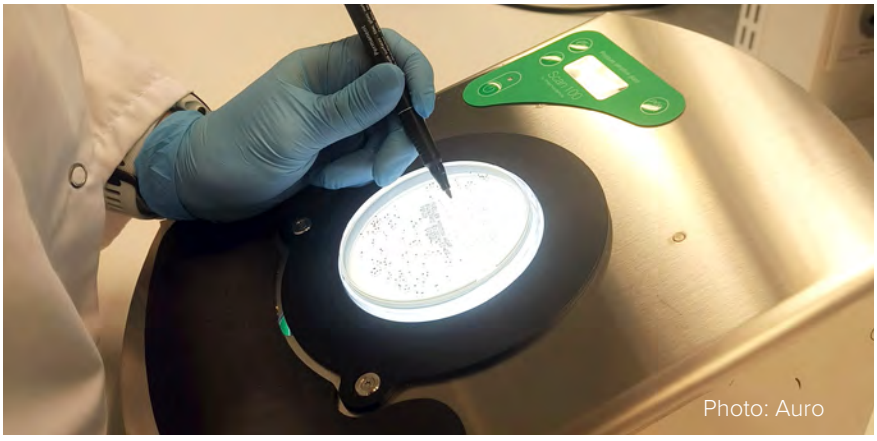


Photo: Auro

4. STRICTLY REGULATED CLEAN ROOMS

For example stem cell laboratories and pharmaceutical manufacturing rooms.

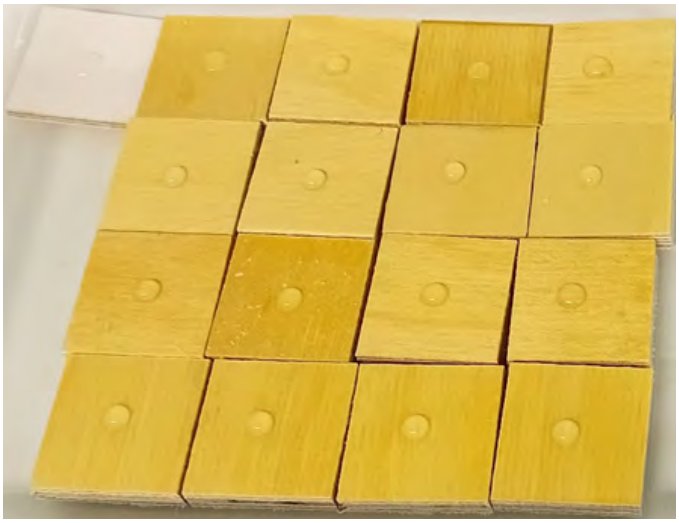
CHEMICAL RESISTANCE

In healthcare environments, coatings for wood and wood-based products must withstand frequent exposure to disinfectants, cleaning agents, and alcohol. This became particularly critical during the COVID-19 pandemic, when disinfection protocols intensified. Without adequate chemical resistance, coatings can discolor or even degrade, thereby losing their protective function for the underlying wood.

In healthcare buildings, the hygiene category determines the cleaning routines and, consequently, the requirements for the chemical resistance of surface coatings. In zones where hygiene demands are high, it is essential to use coatings with excellent chemical resistance. Coatings known for their high chemical resistance include two-component polyurethane coatings, UV-cured coatings, and epoxy coatings.

Additionally, waterborne polyurethane-acrylic hybrid coatings are commonly used in healthcare environments. These hybrids combine the strengths of both polyurethane and acrylic polymers, offering enhanced durability, chemical resistance, and flexibility - making them well-suited for demanding applications where both hygiene and performance are critical.

However, it should be emphasized that, depending on the hygiene zoning, the use of less chemically resistant coatings - such as oils, waxes, or alkyd- and acrylic-based coatings - may still be sufficient in many areas of a healthcare building.



Testing of antimicrobial activity on coated birch plywood

Testing of chemical resistance of coatings to different liquids

MECHANICAL RESISTANCE

Wood is susceptible to damage from mechanical wear. Daily use, movement of medical equipment, beds, frequent cleaning, and foot traffic place high demands on surface properties such as hardness, abrasion resistance, and scratch resistance.

Coatings can offer high mechanical resistance to protect the wood substrate and help maintain a clean and intact surface over time. The mechanical requirements vary greatly depending on the type of component. Floors, for instance, must withstand significantly more abrasion and impact than walls or ceilings. For this reason, wood flooring and parquet are generally not recommended in patient rooms in e.g. Norwegian hospitals.

In contrast, laminates can meet the mechanical performance requirements. Although it features a photographic surface layer that imitates wood, or other materials, and is often perceived as a non-wood product, laminate flooring consists of approximately 85–90% wood-based materials

In areas exposed to less wear, wood flooring may be used. However, it is important to note that softer coatings' oil and wax basis are more prone to wear than harder coatings and therefore require more frequent maintenance. In contrast, harder coatings like lacquers offer better durability but are more challenging to maintain locally. Spot repairs are often difficult, and maintenance may require closing off large areas.

Wooden floor with marks and scratches

Staircase in treated wood material, Entrance 100

COLOR STABILITY

Wood is a photosensitive material and changes its colour when exposed to light. In interior applications, both artificial lighting and sunlight - whether direct or filtered through glass - can cause wood discolouration. Some wood species darken, while others may bleach, yellow, or develop reddish tones. The type and extent of discolouration depend on the wood species, the type of coating used, and the characteristics of the light source.

Results of different coatings on the same type of wood

The visible portion of sunlight is composed of various colours, ranging from violet and blue to green, yellow, orange, and red. Beyond the visible spectrum, ultraviolet (UV) radiation lies on the shorter wavelength side, while infrared (IR) radiation lies on the longer side. Each wood species has a specific sensitivity to certain light wavelengths, meaning oak, for example, reacts differently to light than maple or pine.

Coatings can help protect wood from discolouration by blocking specific wavelengths of light, especially in wood species that are susceptible to UV light. However, some species are also - or even primarily - sensitive to visible light, particularly violet and blue wavelengths. Protecting wood from visible light is more challenging than from UV light, as it requires coatings with coloured pigments in complementary shades, but this approach can significantly alter the wood's natural appearance.

This is especially important considering that LED lighting has largely eliminated UV radiation from indoor light sources but typically emits significant amounts of short-wavelength visible light. Softwoods tend to be more sensitive to discolouration under LED lighting compared to hardwoods.

In summary, uncoated wood experiences significant colour changes under light exposure. While coatings can reduce discolouration for many wood species, they cannot completely prevent it. The composition of the coating - including its base formulation and additives - determines both the initial colour and how it changes over time. To achieve long-term colour stability, it is essential to consider the specific combination of wood species, coating formulation, and the intended lighting conditions. Understanding these factors allows for better decision-making when designing with wood in interior spaces.

FIRE SAFETY

Fire safety requirements in healthcare buildings are generally very strict due to the need to protect vulnerable occupants and ensure safe evacuation.

When using visible wood and wood-based surfaces, particular attention must be paid to reaction to fire, which describes how a material contributes to fire development and spread. This is distinct from resistance to fire, which refers to structural fire performance. The term Euroclass is commonly used to describe the reaction to fire classification of building materials, as defined in the European standard EN 13501-1.

In buildings, the required Euroclass for interior surfaces is influenced by several factors, such as the building's function and size, the number of storeys, evacuation time, and the occupants' ability to self-rescue. These parameters define the fire risk class, which in turn sets the minimum Euroclass performance required for materials used on walls, ceilings, and floors.

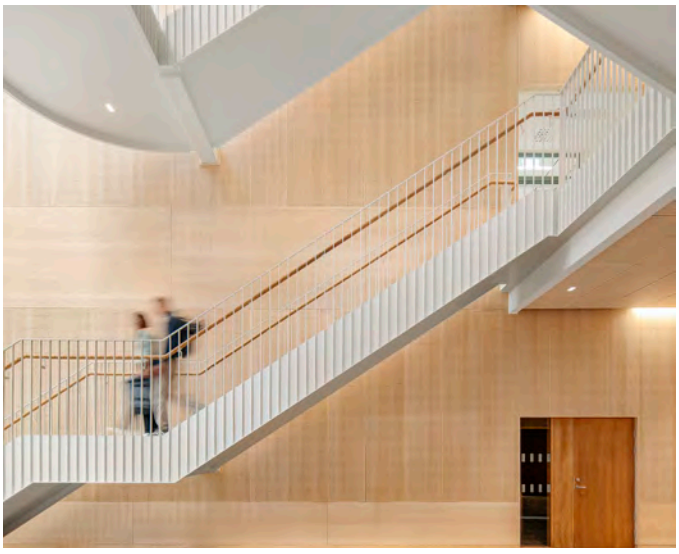
The European Euroclass system (EN 13501-1) rates materials from A1 (non-combustible) to F (no performance determined). Wood and wood-based materials typically fall into Class D or lower. However, higher performance can be achieved through fire-retardant treatments, particularly Euroclass B, which is often required for visible surfaces in healthcare environments.

There are two main ways to achieve Euroclass B:
- Surface treatment with tested fire-retardant coatings
- Industrial impregnation with fire-retardant chemicals

Conventional coatings such as lacquers, oils, or paints do not improve the fire classification and may even reduce it. Therefore, the reaction-to-fire classification must be documented for the specific wood product with the intended coating system applied.

It is not technically feasible to achieve Euroclass A with wood-based materials. Where Class A is mandatory - such as in certain escape routes - non-combustible materials like gypsum boards must be used instead of wood.

Although fire safety requirements are often perceived as a barrier to the use of wood in healthcare buildings, this is not necessarily the case. With the correct choice of products and proper documentation, wood can be safely used for visible surfaces.



Stairwell, Ersta New Hospital, Stockholm, Sweden

INDOOR CLIMATE

Indoor air quality (IAQ) is a key factor in human health and comfort, and it is subject to strict regulatory requirements in healthcare buildings. This is not primarily for comfort, but to prevent airborne transmission of infections and to protect vulnerable patient groups.

IAQ is typically assessed based on parameters such as temperature, relative humidity (RH), CO_2 concentration, and levels of airborne pollutants like volatile organic compounds (VOCs). Among these, humidity plays a central role in both microbial control and comfort.

Moisture buffering refers to a material's ability to absorb and release water vapour in response to fluctuations in indoor humidity. Wood and other hygroscopic materials can moderate changes in relative humidity, thus helping to stabilise the indoor climate. This material property, referred to as Moisture Buffering Capacity (MBC), supports thermal comfort, passive humidity regulation, and perceived indoor air quality.

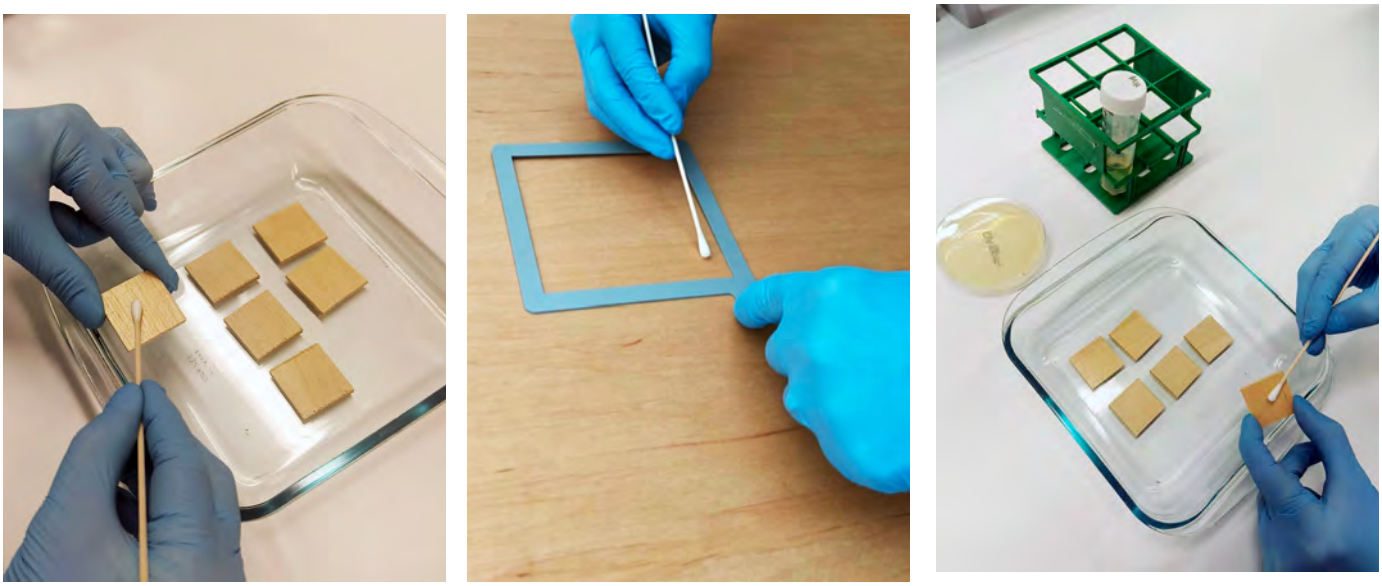
Wood surfaces, especially those with vapour-permeable coatings, can act as passive regulators of indoor humidity. However, the real-world impact of moisture buffering in hospital rooms is limited by several factors. A major limitation is the type of coating applied to wood, especially when it must provide high resistance to wear, cleaning agents, or disinfectants. Film-forming coatings, such as lacquers or certain paints, significantly reduce vapour permeability and thus diminish wood's buffering effect. In contrast, more open treatments like oil-based finishes allow partial buffering but still reduce the potential compared to untreated wood. In other words, high mechanical and chemical resistance often comes at the cost of vapour permeability.

Another limiting factor is the moisture load itself. In patient rooms, the generation of indoor humidity tends to be low and relatively constant. Without significant daily RH fluctuations, the buffering mechanism remains underutilised. Research studies show that even with large areas of exposed wood, the effect on indoor RH is marginal under such steady-state conditions.

The design of Heating, Ventilation, and Air Conditioning (HVAC) systems further constrains the moisture buffering potential. In modern hospitals, ventilation systems have high air change rates compared to, for instance, residential buildings. These systems dominate the indoor humidity balance, thereby limiting the role of passive materials like wood.

Industrial development

REPORTS FROM AURO AND IECAVNIEKS



Surface sampling to study the bacterial communities found in the different materials used in a healthcare building

Auro Pflanzenchemie AG, Germany

The coating industry is currently undergoing significant advancements driven by technological innovations, market developments, and regulatory decisions. One of the most prominent trends is the increasing focus on sustainability. Companies are developing environmentally friendly coatings with lower volatile organic compound (VOC) content and eco-friendly formulations, for example by incorporating biogenic raw materials or using a mass-balanced approach derived from animal and plant sources. This shift is propelled by growing consumer demand and regulatory pressure for greener products.

Another key trend is the development of smart coatings. These coatings offer functionalities beyond traditional protective and decorative purposes, such as self-healing properties, enhanced durability, and antimicrobial features – the latter being a key research focus of the "Wood for Health" project concerning healthcare applications.

We are working on functionalized binders (the main ingredient in every lacquer or stain) with inherent antimicrobial properties. Eliminating the need for biocides is also a major concern and driving force for AURO.

Despite these advancements, the coatings industry faces several challenges. Increasing regulations and restrictions on VOC emissions push companies to innovate and develop new technologies to meet these standards. Additionally, global supply chain issues, material shortages, and rising raw material costs create obstacles for manufacturers. Particularly demanding is the availability and quality of biobased raw materials, as well as balancing their performance against cost.

The industry must navigate these challenges while continuing to innovate and enhance both the performance and sustainability of its products. Looking ahead, the future of the coatings industry is promising.

> **Looking ahead, the future of the coatings industry is promising. Ongoing research and development in advanced materials and technologies will lead to even more efficient and environmentally friendly coatings.**

Ongoing research and development in advanced materials and technologies will lead to even more efficient and environmentally friendly coatings. The industry is also expected to see the development of multipurpose paints that not only protect surfaces but also provide additional functionalities, such as energy generation or interactive surfaces. The use of drones and autonomous robots for coating application and maintenance is another area of potential growth, offering more efficient and cost-effective solutions.

Iecavnieks & Co. Ltd, Latvia

Linseed oil paint is an environmentally friendly, sustainable product made from renewable raw materials, with a relatively wide range of applications for wood in both interior and exterior conditions. With the growing demand for natural and environmentally friendly products, the popularity of linseed oil paint is increasing. Manufacturers are seizing this opportunity to diversify their product range and offer customers high-quality, sustainable products.

There are challenges concerning both production and market in this field. The main component of linseed oil paints is linseed oil, whose quality can vary depending on the flax variety, growing and weather conditions, and seed processing methods. The manufacturer must be able to ensure a stable and high-quality raw material supply, which is not easy under fluctuating market conditions. The natural consistency and odour of linseed oil paints can vary depending on raw materials and production conditions, so careful quality control is a must to ensure each batch meets standards and suits its intended use.

The production of linseed oil paints is a time-consuming process that requires specialized knowledge and equipment. The quality and

durability of linseed oil paints are ensured by strict adherence to traditional recipes and technologies.

The linseed oil paint market is highly competitive, both between linseed oil products and in comparison with other paint types, such as acrylic or latex paints.

To attract customers, producers must offer high-quality products at competitive prices. At the same time, linseed oil prices can fluctuate significantly depending on yields and other factors, so maintaining profitability requires flexibility to adapt to these changes.

Linseed oil paints are a niche product, not as widely popular as synthetic paints. Manufacturers invest significant resources in marketing and sales to educate customers about the benefits of linseed oil paints and to promote their use.

Linseed oil paints are environmentally friendly, but lecavnieks continuously work to implement sustainable production methods and reduce waste, and also to keep up with the latest trends and innovations in the paint industry to improve the products and offer new options to customers. Despite the challenges, manufacturers remain confident in the potential for further development of linseed oil paints.

Redcross Hospital, Riga, Latvia
Architectural bureau
Jaunromansun Abel

The project's coating research

Wood is a building material with environmental benefits. However, concerns about contamination and cleaning challenges have limited its use in hygiene-critical environments such as healthcare facilities. To address these challenges, the consortium has developed and tested new solutions with the aim to increase the safe and effective use of wood in healthcare buildings.

As a starting point, the consortium identified healthcare buildings in different countries that successfully integrate wood into clinical environments. The partners mapped design and performance requirements to surfaces in various types of healthcare buildings across the participating countries. The results indicated that wood was primarily used in areas with low contamination risks, while architects expressed significant interest in expanding its use. Their primary concerns, however, were durability, fire safety, and resistance to bacteria.

Recognising these challenges, the project focused on developing sustainable antimicrobial and antiviral coatings that meet strict requirements. The University of Oulu screened plant oils and metal compounds for antimicrobial activity and identified carvacrol, chitosan, and nano zinc oxide as promising antimicrobial agents for wood coatings. For incorporating these compounds into wood coatings, two main approaches were followed: (1) incorporating the compounds into existing binder systems (linseed oil, acrylate, polyurethane), and (2) synthesising new binder systems by integrating suitable compounds directly into the chemical structure of acrylate- and polyurethane-based systems.

In Germany, the Fraunhofer Institute for Wood Research (WKI) integrated carvacrol into acrylic binders, but its antimicrobial efficacy was lost when chemically bound. However, adding unmodified carvacrol to an acrylic formulation developed by the German manufacturer AURO demonstrated antimicrobial properties. Chitosan also showed promising results.

The Latvian State Institute of Wood Chemistry, in collaboration with the coating manufacturer Iecavnieks, developed a solvent-free linseed oil coating including nano zinc oxide. When tested on plywood, these coatings outperformed commercial antimicrobial benchmarks (a polyurethane lacquer with an antimicrobial additive and a hardwax oil).

Initially, the performance was attributed to the coating's stickiness or permeability hindering bacterial removal during testing, but microscopic analyses by NTI (Norwegian Institute of Wood Technology) did not support this hypothesis.

Beyond antimicrobial performance, coatings were tested for key properties relevant to healthcare settings, such as resistance to chemicals and liquids. Due to the stringent

cleaning regulations in such environments, the coatings must withstand aggressive cleaning agents. All coatings performed well against commercial hospital disinfectants commonly used in e.g. Norway but showed lower ethanol resistance compared to a commercial polyurethane lacquer used as a benchmark.

The project also addressed the aspect of moisture buffering capacity – i.e., the ability to absorb and release water vapour in response to changes in relative humidity (RH). Laboratory tests showed that the developed coatings had vapour permeability values between those of the two benchmark products: higher than polyurethane lacquer but lower than hardwax oil.

To assess the practical implications, hygro-thermal simulations were conducted for a hospital patient room located in Oslo, featuring varying degrees of visible wood in the interior design (none, partial, or extensive use), under different HVAC configurations.

The results showed that wood's contribution to moisture buffering in patient rooms is negligible, mainly due to the low indoor moisture loads and high ventilation rates required in Norwegian hospitals. Although this may seem discouraging at first, it is not. While moisture buffering is often seen as one of wood's key indoor climate benefits, this study shows that its contribution in hospital patient rooms is minimal. This finding is important because it resolves a common dilemma: achieving the required mechanical and chemical resistance typically calls for robust surface coatings, which are known to reduce vapour permeability.

The results suggest that this trade-off has been overstated in the context of healthcare buildings. Architects and designers can confidently use technically resistant coatings – such as lacquers or advanced stains – without compromising any meaningful moisture buffering benefit. This clears the way for wood to be applied safely in demanding healthcare environments, where its psychological and aesthetic qualities remain its primary value.

Finally, NTI conducted a life cycle assessment (LCA) of the new coatings. In summary, the cradle-to-gate analyses showed that their environmental impacts were comparable to those of commercial reference coatings. The coatings manufacturers in the consortium may use these findings to establish Environmental Product Declarations beyond the project's completion.

“

Architects and designers can confidently use technically resistant coatings, such as lacquers or advanced stains, without compromising any meaningful moisture buffering benefit.

LHL Hospital, Gardemoen, Norway
Nordic Office of Architecture

On rules and regulations

WHITE ARKITEKTER

There is an overwhelming amount of policies, rules, recommendations, and other sources that influence the choice of materials in healthcare buildings. These documents address aspects such as infection control, safety, fire protection, maintenance, and more. National legislation has an impact the use of wood, although often to a lesser extent than various local recommendations and regulations.

Regulations and recommendations vary widely from country to country and even from region to region, which makes it difficult to identify clear and consistent rules for the use of wood in healthcare buildings. As a result, it is challenging to find generic regulations and in addition corporate policies, personal opinions, fragmented markets, and regional building traditions tend to influence the choice of materials.

> **When focusing on exposed timber in environments with specific hygienic requirements, it is important to distinguish between legislation and recommendations.**

Regarding exposed timber in environments with specific hygienic requirements it is important to distinguish between legislation and recommendations. Legislation rarely prohibits the use of timber outright. It is rather rules and regulations related to infection control (i.e., hospital hygiene) or fire safety that tend to impose restrictions. Fire safety is governed by legislation, but it often allows for flexibility depending on the adopted fire safety strategy.

Many of the exisiting guidelines are qualitative or flexible in nature, meaning there are few, if any, quantitative requirements. Instead, they typically state that materials should be ‘wipeable’ with various disinfectants or ‘easy to clean’. This vagueness combined with a lack of relevant knowledge or confidence among decision-makers, makes it important to have a coherent and knowledge-based strategy for the use of wood in healthcare buildings, and multiple types of actions are required.

To continue the discussions with policy makers and stakeholder organisations is an important measure to increase their understanding of both the risks and the benefits of wood in healthcare buildings. As this guide shows, there are many good examples to take inspiration from.

Wood for Health project participants

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Ilse Ekman, project researcher

White Arkitekter, Sweden
Dr. Anna-Johanna Klasander, project leader
Jens Axelsson, project coordinator
Matilda Leffler, editor

Fraunhofer Institute for Wood Research WKI, Germany
Dr. Claudia Schirp, project leader
Dr. Henrik-Alexander Christ, scientist

Norwegian Institute of Wood Technology NTI, Norway
Dr. Ulrich Hundhausen, senior researcher
Dr. Daniela Altgen, senior researcher

Latvian State Institute of Wood Chemistry, Latvia
Dr. Bruno Andersons, researcher
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Dr. Dace Cirule, researcher

Auro Pflanzenchemie AG, Germany
Dr. Christopher Hirth, R&D scientist
Katharina Mack, R&D scientist
Dr. Markus Lettau, head of R&D

Iecavnieks & Co, Ltd, Latvia
Viktorija Barovska, scientific manager
Maris Valdmanis, project manager

Website
https://www.woodforhealth.eu/about

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Treteknisk

Fraunhofer WKI

LATVIAN STATE INSTITUTE OF WOOD CHEMISTRY

AURO

iecavnieks

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Ministry of the Environment Finland

Latvian Council of Science

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WHITE RESEARCH LAB