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CONSERVATION AND DESIGN
SCHMUTTERTAL GRAMMAR SCHOOL

New ways of learning in new spaces: a model school
by Hermann Kaufmann and Florian Nagler

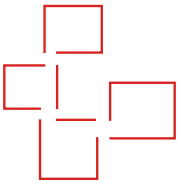
"A CHILD HAS THREE TEACHERS: THE FIRST TEACHER CONSISTS OF THE OTHER CHILDREN. THE SECOND TEACHER IS THE TEACHER. THE THIRD TEACHER IS THE SPACE."

SWEDISH PROVERB

PRAISE FROM THE VERY TOP

On 26 June 2017, Schmuttertal Grammar School received the German Prize for Architecture. This prize is deemed to be the most prestigious of all awards given to completed buildings in Germany. After all, it is awarded from the highest authority: from the Federal Ministry of Building BUMB in conjunction with the Federal Chamber of German Architects. Every two years, a jury comes together and selects outstanding building culture achievements.

In fact, the group of buildings that make up Schmuttertal Grammar School act as a role model in many respects. The rooms comply with the latest educational requirements, the structure is made of the renewable raw material wood, the whole complex has a positive energy footprint and the design reveals high aspirations. The planners of this new building found relevant solutions for the task involved in constructing schools, which must be one of the biggest challenges of the future.



GAINING BY FORGOING

AN INTRODUCTION

Significant steps in the construction of Schmuttertal Grammar School were taken already before work on planning the building began. The aim was to create generous learning environments despite the limited space available, and to make it easier for children and teachers to identify with "their" school.

SCHMUTTERTAL GRAMMAR SCHOOL

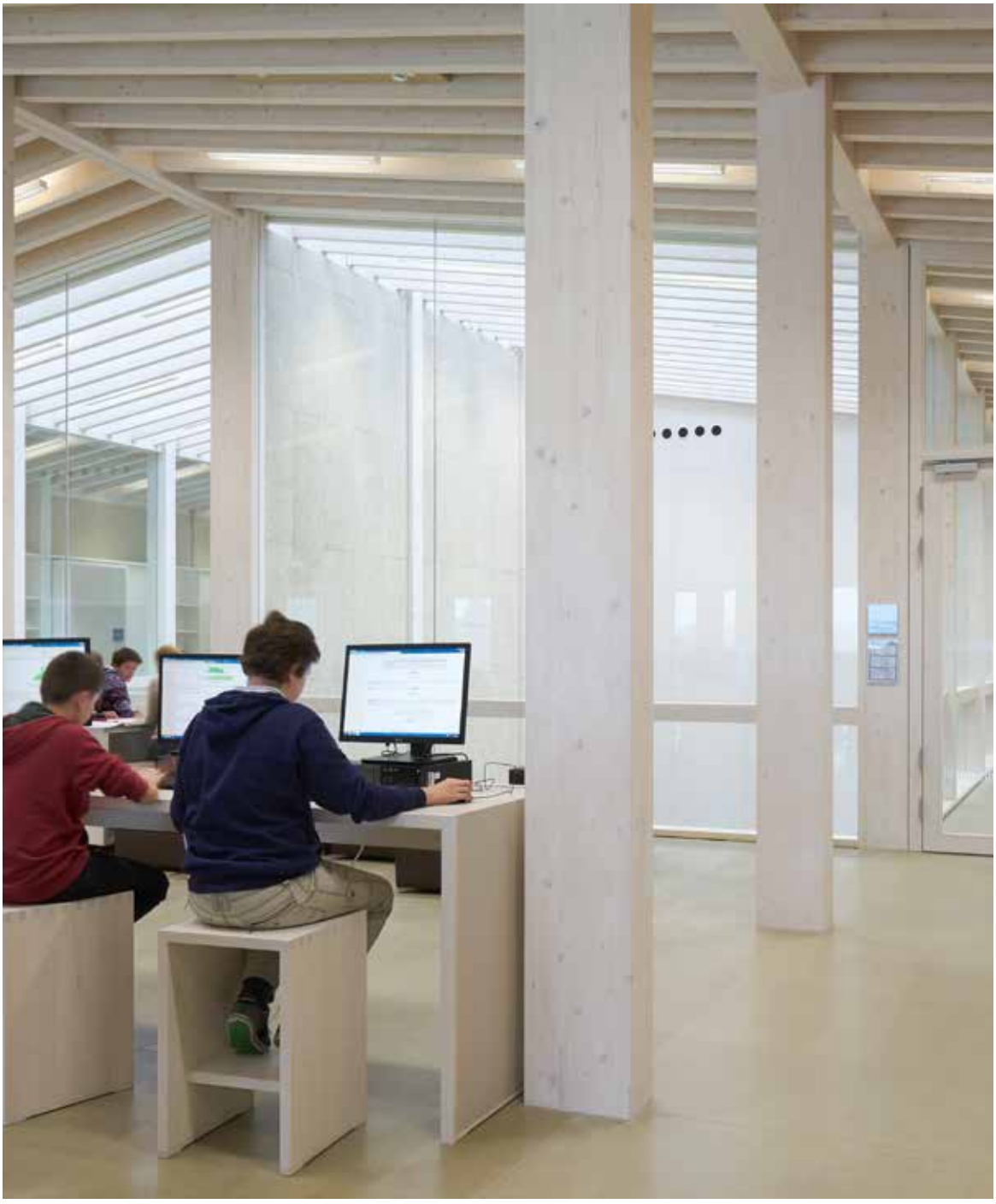
It all began on a small scale. The grammar school in Diedorf began life in 2010 as a branch of a school in the neighbouring town of Gersthofen. Initially it was housed in containers with a staff of only around 15 teachers.

Twelve months later, the rural district gave the go-ahead for a new-build. As part of a research project by the German Federal Environmental Foundation, the intention was to create suitable space to offer state-of-the-art education for about 800 children and youngsters. During a workshop in autumn 2011, teachers, parent representatives and pupils pooled their thoughts about their future school. They came up with some principle wishes, including having enough space for different teaching methods such as lecture-format and working in small groups, as well as stipulating some quite practical requirements, such as having enough shelf space for the satchels, given the frequent need to move the desks around during lessons to change the teaching methods. Chaired by Karin Dobener and her firm "LernLandSchaft", the wishes were translated into functionalities and incorporated in a space program used by the architects as the basis for their design.

At heart, the concept consists of learning environments, open areas where the classrooms in a year group are arranged around a "marketplace" measuring 100 m² in size. The teacher begins the lesson in the classroom with a short introduction, and then gives the pupils a task to solve unassisted in teams. They can move around freely in their learning environment and use various resources such as books and computers. Later on they all come together again to discuss their results with the teacher.

The building has altogether seven of these "marketplaces". How can such generous spacing be implemented in the framework of state school construction guidelines with their precise space allocations? By saving space elsewhere. For example, normally a school of 800 pupils will be granted three computer rooms measuring 70 m² each. But in this case, computer stations are integrated in the learning environments so that separate rooms are not needed. But the main thing is that the four classes in a year group share just three classrooms. After all, when the pupils are having sport, art, music, chemistry, biology or physics in a special room, one of the classrooms is usually empty. Making more efficient use of the space available gave the school the scope to implement its generous learning environments.

The fact that the teachers were involved in devising this concept right from the start certainly made it easier for them to identify with their school. The same applies to the children and youngsters: while the building was under construction, the teachers and pupil representatives visited the wood construction company that produced the elements for the new building.
This has apparently also helped the pupils to identify with the building: even three years after the grammar school opened, it is striking to see how few signs of wear-and-tear or vandalism there are. Headmaster Günter Manhardt puts it like this: "The pupils really appreciate what we've built for them here and they treat it carefully".



In the centre of the building invite open spaces for independent studying.

BARNS IN A GREEN MEADOW

ARCHITECTURE AND SPACE

A grammar school with modern open-plan learning environments, made of wood, according to the energy-plus standard: those were the stipulations for the new-build Schmuttertal Grammar School. Hermann Kaufmann and Florian Nagler managed to give the whole thing a manifestly appropriate design.

The school can already be seen from the station. Anyone who leaves the train in the small town of Diedorf near Augsburg and looks to the north west will notice four building structures positioned in the open countryside. With their gently sloping gable roofs and the grey board facades, it would be easy to think they were barns – which is exactly what the architects wanted. The grammar school is located at the edge of a landscape conservation area, and should blend as naturally and inconspicuously as possible in its rural setting.

This is why the rooms for the school are shared out between four smaller buildings, rather than all being grouped in one larger structure. The three-pitch sports hall and the entrance building with the school hall, canteen, library, offices and music room act as a noise barrier to the railway line. These two buildings stand in front of the two classroom complexes, which are thus facing away from the railway line. The buildings are grouped around the school yard that forms the heart of the premises. Here the pupils are protected from the wind and can enjoy their breaks outside.

The facades already indicate that the buildings are made of wood. A curtain wall of vertical spruce boards envelops the structures. While appearing to be plain from a distance, a closer view shows a more varied structure with the boards of differing widths arranged in a "wild pattern". The facade protrudes by about 15 centimetres with each additional storey – an old wood construction principle where the upper storey protects the windows of the storey below. Here the concept was used to ensure that the cassettes for the window blinds are concealed unobtrusively behind the boards. The shadows created in this way give the building a lively, vivid appearance.

The buildings frame a central schoolyard, glazed walkways provide wind protection.

View from the open music hall through the auditorium to the main entrance: strikingly slender columns support the roof.

Wood also plays a main role inside the buildings. Consistent use of the renewable construction material makes a major contribution to minimising the school's ecological footprint. Left visible in its natural state, the material defines the rooms. The functional structure is immediately visible right behind the main entrance in the generous two-storey vestibule: pillars, beams and rafters carry the load, while wall panels shape the space. The wood surfaces all have a white glaze. This prevents any mountain-chalet atmosphere and stops the wood from darkening with age, which would make the rooms seem gloomier after a few years.

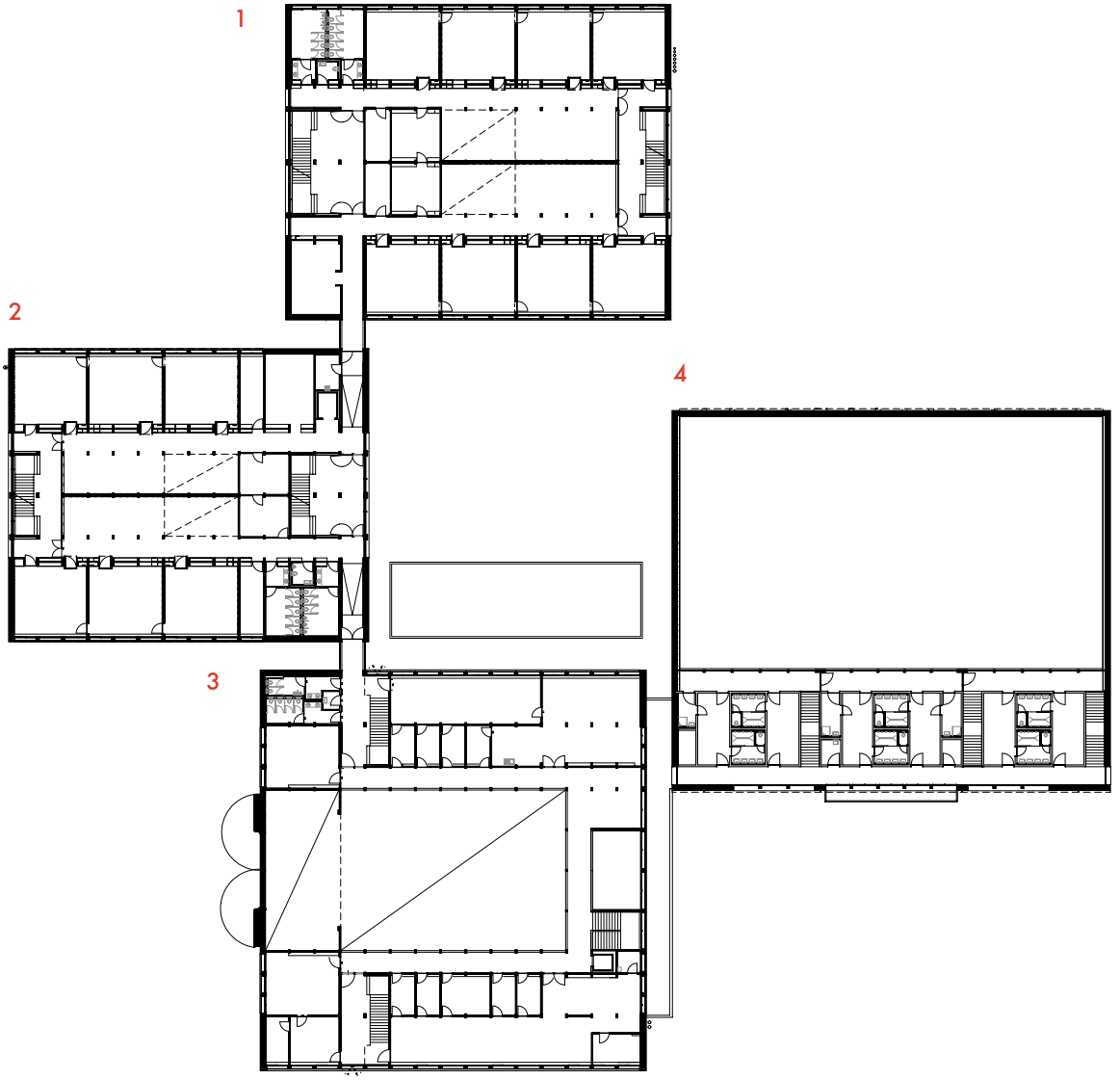
A large glass door opens into the two-storey school hall. The two rows of columns on the right and left, the symmetrical gable roof and the light penetrating from the "side aisles" create the impression of a basilica, radiating a certain dignity and peace. Those who are so inclined can even let the closely spaced wooden supports remind them of a forest. But the planning team's declared intention with the close spacing was to minimise the pillar cross-section, resulting in very slender, elegant proportions.

A short glazed walkway leads to the two classroom buildings, where the layout is organised in layers. The ground floor has the art and science rooms positioned at the facade, while the dark zone in the middle of the building is used for ancillary rooms to store collections of materials, for example. The learning environments are located in the two upper storeys. The classrooms in a year group are arranged in each case around a generous "marketplace" instead of the traditional corridors. These areas are furnished with sofas, computers, pinboards and much more besides to encourage independent learning. Each storey has two such learning environments. The classrooms are arranged along the north and south facade with the marketplace in the middle of the building, where daylight shines down from above through voids that let it penetrate deep into the building. The storey is rounded off by a shared cloakroom, a small staffroom and sanitary facilities. Each year group has its own toilets to encourage the pupils to treat the facilities with due care.

A spacious wall acts as the transition between classroom and "marketplace", accommodating not just shelves, cupboards and washbasins but also the extensive building systems needed to keep the building supplied with fresh air. The doors are usually open when the pupils work on their own or in small groups, spreading out throughout the rooms; large glass panels give a clear view and make supervision easier for the teacher. The installations follow the rhythm set by the support structure, resulting altogether in an artistic entity made of wood.

There's no point in looking for the traditional school desks for two children each. Instead, small, lightweight single tables on casters make it quick and easy to rearrange the furniture, depending on what specific approach the teacher is taking. After all, the concept aims to make it possible for the learning methods to be changed repeatedly during the lesson. At long last, Diedorf now has enough space for this approach.

When walking through the rooms, one striking aspect is the good air: it's not dusty or stuffy, there's not a hint of floor polish or other smells. This is due not just to the ventilation system that diligently does its job but also to the special effort that went into selecting the construction materials. All materials had to comply with the strictest biological requirements, with more than 500 products being carefully examined before they were used. Indeed, the whole project was geared to a high ecological standard. The well insulated buildings are so economical that the photovoltaic array on the roofs generates more primary energy than the whole school needs. That makes Schmuttertal Grammar School an energy-plus school – by the way, one of the first in Germany.



1 Classroom with open-plan learning environments

2 Classroom with open-plan learning environments

3 Administration wing with auditorium

4 Gym

On leaving the school, the impression remains that this is an exemplary achievement. Instead of superficial, sensationalist, spectacular architecture, the convincing buildings stand out with unobtrusive, quiet solutions that have nevertheless been thought through right down to the very last detail. Detailed records were kept of the pilot project sponsored by the DBU (German Federal Environmental Foundation) and all the experience gained with the project has been put in the public domain to make it accessible for every planner. And so there are good chances that the grammar school in Diedorf may be replicated elsewhere.

PROJECT INFORMATION

PROJECT PARTICIPANTS

Client	Augsburg District, represented by District Administrator Martin Sailer
Educational concept	LernLandSchaft, Röckingen Mariagrazia Lanza, Maha Kutay
Architecture	"Diedorf" consortium: Hermann Kaufmann + Partner ZT GmbH, Schwarzach Florian Nagler Architekten GmbH, München
Project management	Department for Structural Engineering Augsburg District, represented by Senior Director of Construction Frank Schwindling
Cost planning	Architect Roland Wehinger
Structural engineering	merz kley partner GmbH, Dornbirn
HVAC planning	Wimmer Ingenieure GmbH, Neusäß
Fire safety planning	Bauart Konstruktions GmbH & Co. KG, München
Energy concept	ip5 Ingenieurpartnerschaft, Karlsruhe
Structural and room acoustics, thermal construction physics	Müller-BBM GmbH, Planegg
Electrical planning	Consultant engineers Herbert Mayr, Rommelsried
Light planning	Lumen3 GbR, München
Hazardous materials, eco-footprint and lifecycle costs	Ascona GbR, Gröbenzell
Landscape planning	ver.de landschaftsarchitekten GbR, Freising
Project support and coordination	kplan AG, Abensberg
Safety und security coordination	InterQuality Service AG, Augsburg
Wooden construction companies	Kaufmann Bausysteme, Reuthe ZÜBLIN Timber GmbH, Aichach
Monitoring and quality assurance	ZAE Bayern, Garching

FACTS AND FIGURES

Location	Schmetterlingsplatz 1 86420 Diedorf
Construction period	09/2013 – 09/2015
Main effective space	7.816 m²
Net floor space	14.048 m²
Gross floor space	16.046 m²
Gross building volume	81.390 m³
Primary energy requirement without user-induced consumption	39,7 kWh/m²a
Primary energy requirement incl. user-induced consumption	62,9 kWh/m²a
Installed power PV array	440 kWp
Facade glaze	KEIM Lignosil-Verano in grey 4861
Glaze on inner wooden structures	KEIM Lignosil-Inco, white

AWARDS

German Prize for Architecture 2017 (1st prize)

DGNB Prize for Sustainable Construction 2016 (1st prize)

German Prize for Wooden Construction 2017 (prize for new-build)

Iconic Awards 2018 (Innovative Architecture Selection)

Bavarian Energy Prize 2016 (category: building as energy system)

Geplant + Ausgeführt 2017, IHM trade fair prize (special prize: Focus Healthy Construction)

Vorarlberg Prize for Wooden Construction 2017 (recognition from outside the country)

Hermann Kaufmann and Florian Nagler in a conversation.

The client responsible for Schmuttertal Grammar School benefited from input from two firms of architects with a focus on sustainability and modern wooden construction. Prof. Hermann Kaufmann and Prof. Florian Nagler discuss the planning process and their collaboration.

How did the collaboration between your two firms come about?

Hermann Kaufmann: Schmuttertal Grammar School was to be Germany's first school built as a wooden construction in the energy-plus standard. The project is sponsored by the German Federal Environmental Foundation (DBU). They approached my firm in their search for architects who could offer experience with wooden construction. In view of the project location in Germany, I invited my colleague Florian Nagler to reinforce the team.

We know each other as professors at TU Munich and share a similar mindset in many architectural issues.

Was the design a joint development?

Florian Nagler: Yes and no. Initially we each produced a rough concept of our own, and then we joined forces. The solution that has now been used emerged gradually from the subsequent discussions.

What was the difference between your first concepts?

Hermann Kaufmann: I put all the rooms together in one single compact building, while Florian Nagler shared them out between individual buildings that blended in harmoniously with the landscape. This was then the approach that we took.

Florian Nagler: Originally we wanted to have six smaller buildings but the initial cost estimated showed this to be too expensive because of the large enveloping surface. We then changed the concept to four compact buildings with an extra storey each.

Did you work together on all the planning, or did you share the tasks out?

Florian Nagler: My team is better acquainted with German building law, so we produced the plans for the building application and dealt with construction phases 1 to 4. Hermann Kaufmann was responsible for detailed planning for phase 5, then my firm took on the tendering and construction supervision phases 6 to 9 because Munich is closer to Diedorf. Hermann Kaufmann took care of the costs throughout the planning process and wrote the research report that was published about the school building.

Did this pilot project involve more planning than comparable projects?

Florian Nagler: Much more. Wooden construction generally demands more complicated detailed planning than a plastered solid building, for example. But this wasn't the issue as we had both already gained experience with wooden construction from earlier projects. The issue was that we were breaking new ground with this school in many respects.

Hermann Kaufmann: The open-plan learning environments and visible wooden structures in a public building of this size demanded a particularly convoluted approach for integrating the building systems in the context of fire safety. The ambitious energy-plus concept also resulted in a far greater need for planning and consultation.

Could you then say that the project was at all "worthwhile" for your firms?

Hermann Kaufmann: Well, let's put it this way: we are extremely pleased with the recognition and with the many awards that have come our way through the project.

Hermann Kaufmann + Partner ZT GmbH
www.hkarchitekten.at

Florian Nagler Architekten GmbH
www.nagler-architekten.de

1

2

BUILDING WITH WOOD
HERMANN KAUFMANN

FLORIAN NAGLER ARCHITEKTEN GMBH

I. Conversion Tannerhof, Bayrischzell
II. Residential Building Dantebad, München
III. Foundation Nantesbuch, Karpfsee Estate
IV. Entrance Glentleiten open-air museum
V. Residential Building in Berg, Lake Starnberg

I

II

III

3

4

HERMANN KAUFMANN + PARTNER ZT GMBH

1. Office bulding Montafon, Vandans
2. Local history museum, Alberschwende
3. Commercial building with workshop, Lauterach
4. Nebelhorn summit station, Oberstdorf
5. Residential building Kopf, Au

5

+ FLORIAN NAGLER

IV

V

PERFECT CLIMATE ALL YEAR ROUND

CLIMATE, ECOLOGY AND ENERGY

Ecological role model: Schmuttertal Grammar School is one of the first school buildings in Germany that generates more energy than it consumes, which means it has a carbon footprint of practically zero. A sophisticated energy concept ensures the rooms always feel comfortable with pleasant temperatures, even in the summer.

A cool head in summer, warm feet in winter: The floor can cool and heat and increase comfort.

Stuffy classrooms after doing a test, pupils and teachers groaning from the summer heat – not in this new school building! The planning process gave absolute priority to ensuring that there would always be a pleasant climate in the rooms without consuming too much energy. The concept is based on a well-insulated building envelope that keeps the heat out in the summer and the cold out in the winter. But it is above all the losses entailed when the rooms are aired that impacts on energy consumption in school buildings. The recommendations for school buildings stipulated that the densely packed classrooms must have three air changes per hour, which is six times more than in residential buildings with an air change rate of 0.5. The school therefore has mechanical ventilation with heat recovery to minimise energy losses.

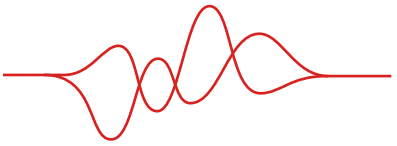
Sensors measure the CO_2 level in the rooms so that there is always an inflow of fresh air whenever the need arises. This prevents any "stuffy air" which is detrimental to concentration. The windows can still be opened on request, but there is no longer a need to open the windows regularly with the resulting loss of heat in winter.

Heating is scarcely needed at all, because 20 to 30 pupils in each classroom generate enough heat to maintain a pleasant temperature in a well-insulated room. A pellet boiler fired with renewable raw materials covers the remaining low energy demand. An underfloor heating system distributes the heat, which is only needed on particularly cold winter days.
In summer on the other hand, the building has to be kept cool. The rooms therefore mainly point to the north or south so that they aren't heated up unnecessarily by the low-lying sun in the east and west. South-facing windows are fitted with venetian blinds whose slats keep the sun out when it is standing high while still letting enough indirect daylight into the rooms to manage without artificial lighting. These passive measures already bring about a considerable reduction in the cooling requirements. If more is needed, the underfloor heating is changed over to an active cooling system: cold water flows through the pipes during the night and extracts heat from the room. The 10 cm cement screed acts as an accumulator that preserves the coolness of the night for the next day.

Electricity is generated by a photovoltaic array on the roof. The annual energy yield exceeds the total primary energy needed for heating, cooling, ventilating and lighting the building. Schmuttertal Grammar School therefore complies with the energy-plus standards, far surpassing most other school buildings.

But the question is, will this annual energy surplus actually suffice to balance out the embodied energy that flowed into the actual construction of the building. After all, on the bottom line it is a case of how much harmful CO_2 is saved throughout the entire life cycle of the building. The ecological footprint was based on a service life of 50 years. During this period, the building manages almost completely to "recover" the quantity of CO_2 emitted during its construction, giving the school a carbon footprint of nearly zero.

The carbon footprint of any building has to consider the climate impact of both the construction phase and the building's subsequent use. A major role in the case of Schmuttertal Grammar School is played by the very low impact that the wooden construction has on the climate, as seen in comparison with a conventional solid construction built according to the EnEV standard (German Energy-Saving Ordinance). Taken over a period of 50 years, the school in Diedorf managed to reduce the CO2 equivalent for construction and usage by around 95 percent.



SHHHHHH!

ACOUSTICS

The acoustics of school rooms has an influence on concentration and learning results. A new approach was also necessary for the building acoustics because the educational concept entailed less lecture-format lessons and more group work using all parts of the room.

Soundproofing between the rooms is usually very important in schools. However, this made less sense in the learning environments for Schmuttertal Grammar School where the doors between the classrooms and the central "marketplace" usually stay open.
Furthermore, the emergency exits between the classrooms also acted as an inevitable weakness in the acoustic concept. Attention therefore focused primarily on reducing the noise level in the rooms. Here the planners reverted to experience gained in Denmark and Sweden, two countries that already have several schools with open-plan learning environments.

Ceilings and walls are optimised for decentralised teaching which entails a certain noise impact.

The aim was to achieve a short echo time so that the spoken word would be intelligible across short and longer distances. To this end, the end walls are lined with sound-absorbing wood wool panels and spruce strips with narrow spacing. The original design for the ceiling featured suspended felt baffles to keep the structure free and to use the space as a thermal accumulator. However, the baffles would not have been capable of absorbing sound sufficiently in the low-frequency range, so that it was decided to use a flat ceiling lining with wood wool. The floor is designed with a 10 cm cement screed to act as accumulator instead.

Does the acoustic concept also work in practice? Measurements in the completed building have shown that all the values calculated in advance are indeed met on site. And what do the teachers say subjectively about the noise level? They are most satisfied: they don't have to tell the pupils to quieten down nearly so often in the new rooms.

ESCAPING FROM FIRE

FIRE SAFETY

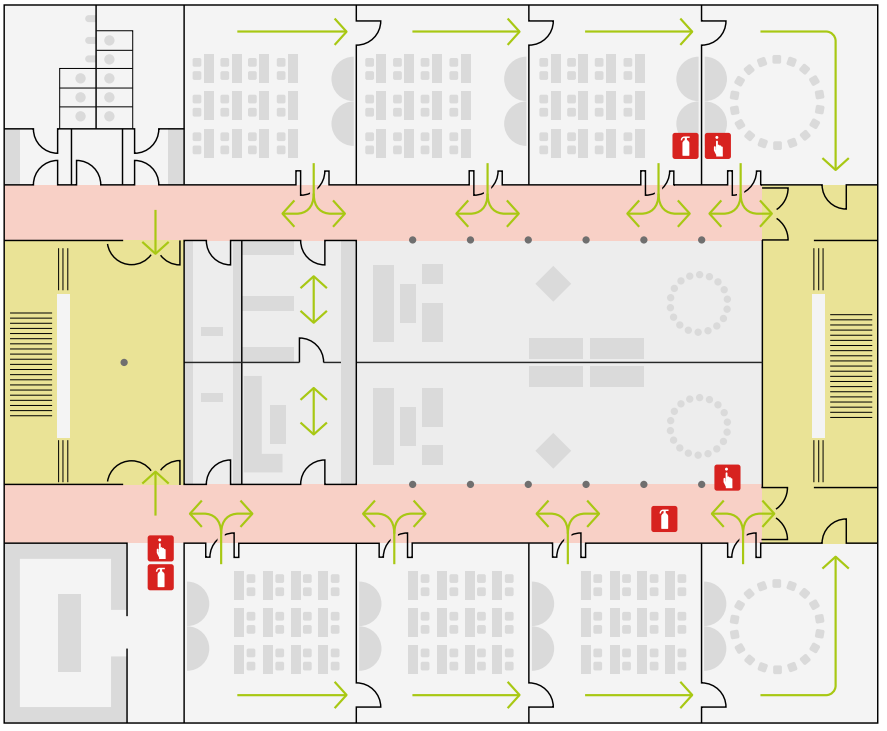
Neither the school construction guidelines nor the state building codes contain any regulations about open-plan learning environments. The planners have therefore come up with special fire safety solutions that could also apply to other schools.

FIRE SAFETY

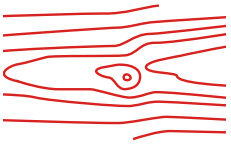
In the event of a fire, pupils and teachers have to be able to leave the building as quickly as possible. Normally the escape route would take them out of the classroom along a necessary corridor to the necessary stairs. But this was not possible at Schmuttertal Grammar School due to the open-plan learning environments and all the furniture, which acts as a fire load. The planners had to prove that they had provided compensation for this deviation from the regulations. The most obvious solution with emergency exit balconies and fire escapes on the outside of the building was out of the question because this would have interfered with the barn-like appearance that the architects wanted to give the buildings. It would also have been a very costly solution.

Instead, they took another approach: in the upper storeys, the first and second escape route from the classrooms goes along the corridor of the open-plan learning environment which just acts as a circulation route; at either end of the corridor the escape route leads to a necessary staircase which fulfils the requirements of the state building code. The crucial aspect is the third escape route to compensate for the corridor which is a problem in terms of fire safety: a connecting door between the classrooms lets pupils and teachers escape directly into a staircase, regardless of the open-plan learning environments.

The fire safety concept naturally also includes fire alarms, automatic smoke extraction openings in the roof and much more besides. The combination of structural, technical and organisational fire safety achieved a level equivalent to that in conventional school buildings.



First floor floor plan of a class tract



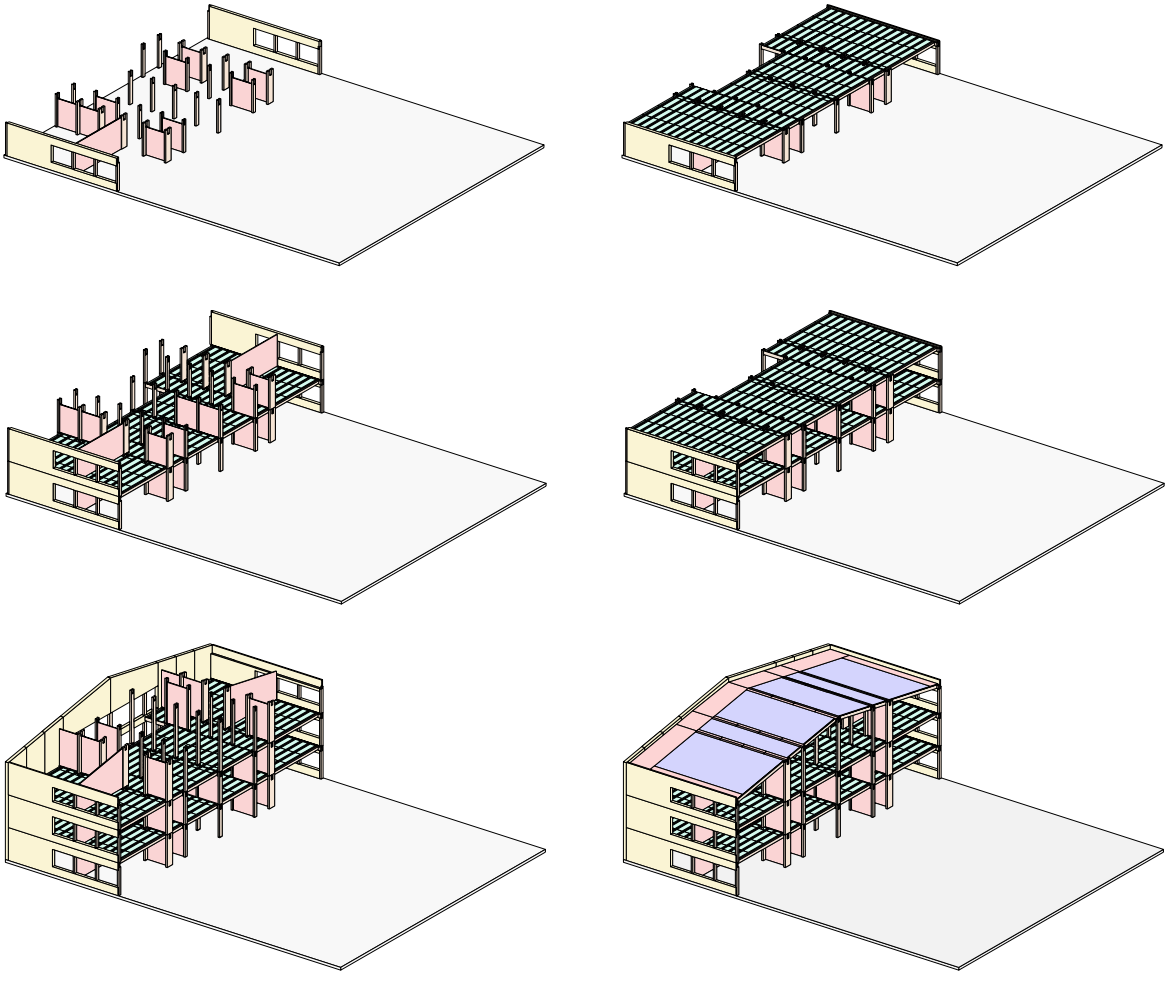
THE WOODEN STRUCTURE IN DETAIL

STRUCTURE AND CONSTRUCTION PROCESS

It's not every day that a grammar school for about 800 pupils is built as a prefabricated wooden construction in Germany. Which support structure, which degree of prefabrication and which construction stages did the planners in Diedorf choose?

Counting from the surface of the basement ceiling, nearly all structures of the Schmuttertal Grammar School are constructed from spruce wood. The layout of the buildings is based on a grid of 2.7 m. All rooms are designed accordingly, with the basic dimension being divided or multiplied as the need arises. The grid has more than 1,000 supports. They carry the joists which in turn support the ceilings, which consist of wood-concrete composite structures for soundproofing reasons. Lightweight ribs made of laminated wood with a cross section of 18x32 cm are laid at intervals of 90 cm to form the tensile zone. OSB boards are placed on top as lost formwork and covered by a 10 cm layer of heavy in-situ concrete as pressure zone. The interaction of wood and concrete results in coffered ceilings which span the rooms at a very low height with a centre-to-centre distance of 8.1 m.

The storey ceilings brace the skeleton construction, with the sloping roofs lined with three-layered boards in certain places for the same purpose. In the vertical level, they are supported by individual timber-frame walls also lined with OSB. The other inner and outer walls do not have a structural function.



Structure, space formation and assembly steps

Up to 12 m long, the prefabricated wall elements were delivered to the construction site.

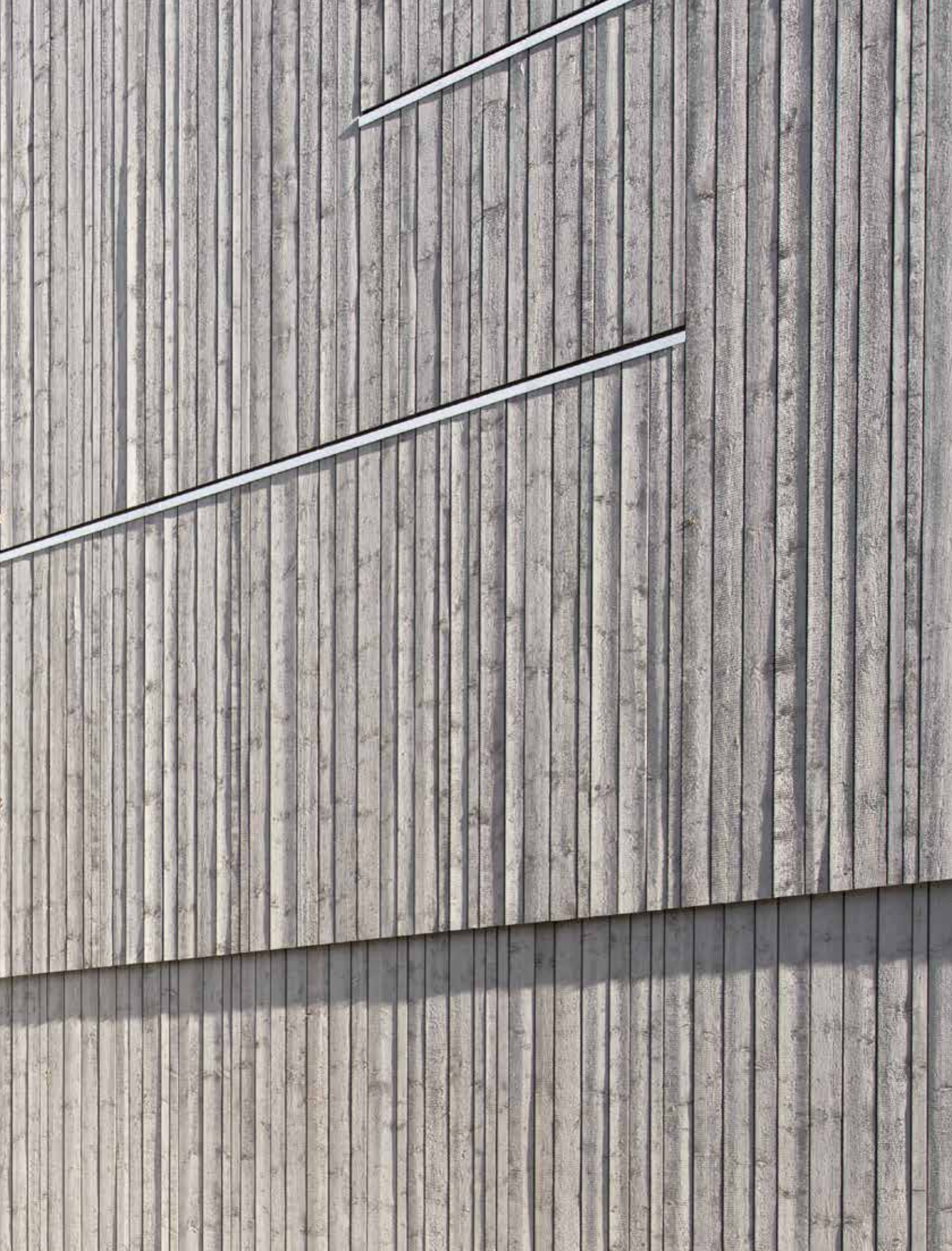
The declared aim of the client was to have a high degree of prefabrication. The structures were therefore designed with ideal dimensions for transport. The facade elements measuring 12 m in length for example were prefabricated in the factory including thermal insulation and windows and brought in vertical position to the building site, before being fitted with the prefabricated outer formwork on site. The entire wooden structure was going to be subsequently visible in the interior rooms, so that rain protection had to be provided as quickly as possible during the construction phase. The classroom buildings were therefore not assembled storey by storey but in vertical sections, each covering a third of the base area. This approach meant that there was always a roof present. As a useful side effect, the in-situ concrete was thus also protected from the rain and from strong sunshine, avoiding the need for elaborate protection during the curing process.

The construction work for all four buildings including top concrete layer and windows was finished within six months. However, this shorter construction phase compared to projects without prefabrication must be seen in the context of a longer planning phase, so that no great time savings were achieved all in all. Even so, the prefabrication approach has its advantages, including being less dependent on the vagaries of weather, together with greater execution precision in higher quality.

NATURALLY GREY

WOOD PRESERVATION

The architects worked together closely with the product developers at KEIM when it came to treating the wood facades. They aimed to achieve a colour shade that would anticipate the wood's natural tendency to turn grey. Furthermore, the protecting glaze had to be absolutely free of biocides, given the school's position right next to a nature conservation area.

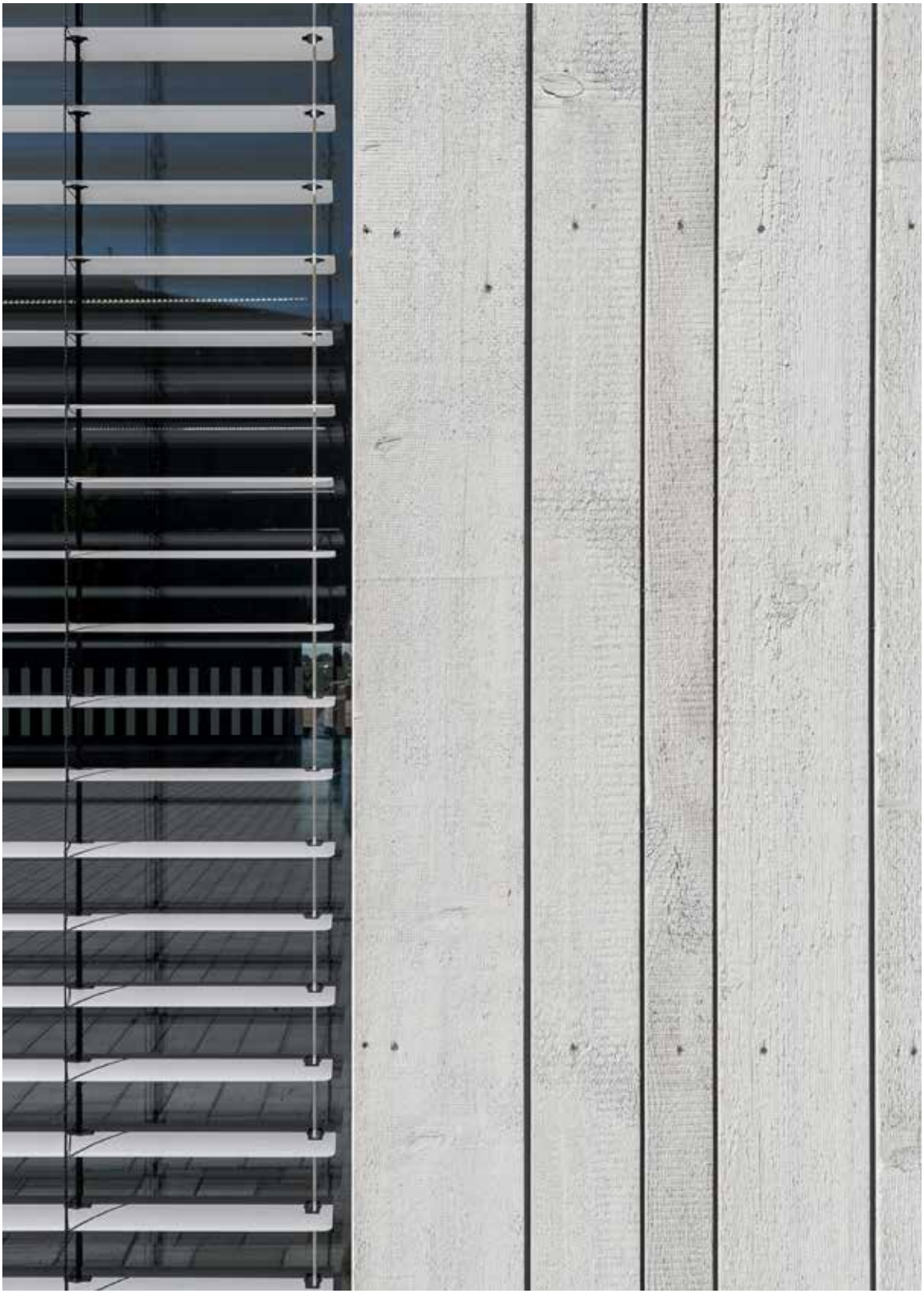


Schmuttertal Grammar School's four buildings stand in the landscape like large barns. The impression is reinforced by the simple facades made of rough sawn boards that seem to be untreated. But in fact, the silvery-grey wooden surface conceals plenty of work and know-how.

The intention was for an appearance that looks as natural as possible. Treatment with a common wood coating was therefore out of the question. Most varnishes form a film on the surface which conceals the structure and grain of the wood. On the other hand, the wood should not be left completely up to its own devices because the natural greying process is usually very irregular, with sections below roof overhangs or window sills starting later than the rest of the facade. And so the decision was taken in favour of a glaze that would anticipate the greying process. Lignosil-Verano by KEIM seemed appropriate for two reasons.

Firstly it is so hydrophylic and permeable to vapour that it leaves the natural characteristics of the wood almost unchanged better than any other glaze. This is a mineral system that forms a unit with the hygroscopic wooden substrate. As a result, the structure absorbs moisture. Together with UV radiation, this is an important prerequisite for triggering the natural greying process. In time, the grey in the glaze will diminish and be gradually replaced by the natural grey of the wood. Architects and product developers tested more than 50 different samples to find a colour shade that came as close as possible to this natural grey. The shade that was eventually chosen was still mixed individually at that point in time. It is now available as standard product number 4861. It has been used to cover the facade of spruce boards measuring roughly 5,000 m² in size. Furthermore, an absolutely biocide-free wood preservative was needed for the panelling. The glaze is designed as a sacrificial layer which is washed out little by little over time. Given the proximity of the building to a nature conservation area and the fact that the Schmutter (a stream) flows past just a few yards away, it was out of the question to use any glazes containing toxins, such as those added to numerous facade paints to prevent algae growth. During the planning phase, KEIM Lignosil-Verano was the only grey glaze available on the market that fulfilled the strict environmental requirements.

Other reasons in favour of this product included its matt look and colour stability with no fading. It was the right decision: even after the building has been standing for three years, the facades show absolutely no signs of wear and tear. They are ageing gracefully.



Glazed with KEIM Lignosil-Verano: The rough-sawn board formwork still shows a matt, open-pored surface.

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KEIM. FARBEN FÜR IMMER.

"THE ENTIRE QUANTITY OF WOOD USED TO BUILD
THIS SCHOOL WILL HAVE REGROWN ON GERMANY'S
TOTAL FOREST AREA IN JUST 55 MINUTES."

GÜNTER MANHARDT,
HEADMASTER SCHMUTTERTAL GRAMMAR SCHOOL