

Block of Flats from 1958, Solar Rejuvenated with Wood 2012/14

Florian Lichtblau, DI Univ. Architect

Kaufmann.Lichtblau.Architekten BDA

Soeltlstraße 14, D- 81545 Munich, Germany

florian.lichtblau@lichtblau-architekten.de

Abstract, Dates and Facts

A rundown 1958 post-war housing estate in the west of Munich was first an object of study, then a planning model and finally a showcase project for holistic wood renovation. For an ideal lifecycle balance and overall economy, the following is vital: maintain the carrier substance, rebuild, recompress, passive-building envelope pre-fabricated in wood, timeless design and regenerative energy supply.

Keywords: Solar architecture, renew stock, recompress, set of objectives, lifecycle balance, grey energy, wooden construction, pre-fabrication, passive house, solar thermal and photovoltaic energy.



Fig. 1: Renewal post-war housing estate Munich, arcade view to the East, phase 1

Location	Munich-Sendling, Badgasteiner-/ Fernpaßstraße
Building owner	GWG Städt. Wohnungsgesellschaft München mbH
Planning+construction management	KLA Kaufmann.Lichtblau.Architekten, München/ Schwarzach
Struct./Systems planning	MKP Merz.Kley.Partner/ EST Energie.System.Technik
Funding/ Research	KFW, dena, LH München, E2ReBuild
Construction Dates	Original 1958/ Constr. Phase 1 2010-12, Phase 2 2012-14
Net Dwelling Area	1: 3.323 m ² (origin. 2.012, + 65 %), 2: 2.027 m ² (origin. 792, + 155 %)
Residential Units	1: 46 flats/ district office (origin. 36 flats), 2: 35 flats (origin. 16)
Envelope Qual. Ht'	1: 0.26 W/m ² K (origin. 1.56 W/m ² K), 2: 0,24 W/m ² K (origin. 1,64)
End Energy	1: 22 kWh/m ² a (origin. 280), 2: 21 kWh/m ² a (origin. 296), measured
Primary Energy	1: 22 kWh/m ² a (origin. 340), 2: 18 kWh/m ² a (origin. 362), calculated
Building Costs	1: 950 €/ m ² GFA, 2: 1.075 €/m ² GFA (gross, cost groups 300/400 minus funding ca. 20 %)
Active Climate Protection	1.100 m ³ Constr. Timber, CO ₂ Reservoir 1.100 to, plus Substitution ..

The prototypical GWG project received important awards and it attracts visitor groups from Europe and many other countries. But may be the most important research result is: The tenants feel notably very happy in their new wooden houses ..

1. How is our 'big house' doing?

'Holistic' solutions for building restoration – is that just a new name for an age-old problem? We don't think so. I would like to try to briefly explain why, an idea and a concrete project example. The question here is what does sustainable mean? The answer is to get started with the holistics .. let me start with a very personal story. My children, Leoni, 19, and Lucia, 16, grew up in the south of Munich. Their ecological footprint on the world is still small – and it should stay that way. But if we listen to serious forward thinkers – which we definitely should – by the time they reach our age, their world should be a completely different one than today...

Should we be afraid of that? Well, we probably don't need to be and fear is never a good starting point when trying to find sustainable solutions. The term 'respect' fits better here – faced with the boundless complexity of global events as a result of a burn out of our knocking off economy. The more we think we know, the less we manage to maintain a natural balance. Prof. Radermacher, for example, calls it the boomerang effect. No wonder that there are children who say: we cannot leave the shaping of our future up to the adults anymore. What more can you say to that?

How to handle this 'seven-headed Hydra'? I have found a suitable approach for myself: it is the daily effort to constantly contribute to a solution instead of the problem. Only by living out that idea can a temporary state of calm be reached. Planning and construction offer a rewarding area of work in this respect. The key functions of energy, material and capital circulation are each approximately half directly or indirectly linked to our building construction and present the highest potential by far for sustainable collaboration with their owners and users. Success solely depends on us, the social skills towards high priorities, strength of character and communication.

2. Challenge and objective

Buildings are and will remain our most costly and longest lasting commodity. We are faced with the simple fact that with the turn of the millennium, we entered an era in which we need to reflect on those unique energies and materials, which have always made living even possible: our sun, its light. High-tech on the roof, smart-tech in the house and/ or religious beliefs of divine salvation is not enough. But what does 'solar construction and restoration' mean? Integral planning concepts are aimed at a rational, sustainable overall context of:

- Induced energy and land consumption in urban building or landscape preserving credibility,
- energy consumption due to production and transport and the minimisation of synthetic materials in construction,

- of operational energy consumption when using the building and installations, linked to optimised quality of use,
- energy input and problem waste on 're-use/ down-cycling/ disposal' after restoration or demolition,
- and the easing or reshaping of our social, cultural and economic network of relationships.

Energy, anything material and also our culture are not reproducible. Solar architecture is about the complex equilibrium of energy and material balance of our earth. Above all, it is pleasing and works simply, is flexible and long-lasting – three barely perceived, but ultimately decisive multiplier properties for the ecologically rational lifecycle balance. This suggests a decisive turnaround against our political and economic behaviour, our smart and responsible contribution towards an open solution process – as an essential contribution towards peace and the well-being of generations.

The building owners may ask: Who should pay for that? The counter question is: what is the future worth to us? Stay calm, thinking helps. Independent expertise and creative reflection are by far the most cost efficient resources for real sustainable construction. A macroeconomic observation – compiled under ecological cost transparency – leads to extensive different decisions than in today's building industry. Relevant research results have expressly proven this several times. The simple, comprehensive dynamic CO2 taxation would be a highly effective motor.

Long-term ecology will become long-term economy by the time the overdue internalisation of external costs at the latest. 'Holistic and sustainable' will become the only form of building construction we will be able to afford in the future. Good architecture has so much more to offer than low energy demand values, but only when architects and engineers take on this system-changing planning attitude in design realisation and render a backward-looking, knotted sustainability certification redundant, will a substantial economy, new 'archi-culture' and genuine quality of life synergistically arise – wouldn't that be a legacy worth striving for?

3. The example: From object of study to prototype

A large part of the overall housing stock in Germany is functionally outdated, has high operational costs, is inadequate in terms of energy consumption and does not comply with society's living standards of today, let alone of the future. That means, that our central construction tasks lie in the renewal of our existing building stock. This necessity poses many dangers, however, when thought through it poses unique opportunities: it calls for a fundamental approach and new interpretation of old housing. Structural sins of the past can be alleviated or even eliminated and the demand for a more sensitive recompression and redesign presents the possibility of sustainable urban corrections linked with high overall economic efficiency and an attractive future orientation.

As an example we present a Munich GWG housing estate in Sendling: Mass commodity in the 1950s, masonry bolts with unit floor plans and individual room heating, after two generations it is still in its original condition for the most part. The heating requirement is approximately at factor 5 above the new construction value according to EnEV2009/13. It was only the excellent location, that kept the building from permanent vacancy. In 2006/7 we had focused on a study design about sustainable development goals by the chair of wooden constructions at the TU Munich – with remarkable results. A research project 'TES Energy Facade' subsequently followed, then the contract for the planning and implementation by the public housing association to our ArGe Kaufmann.Lichtblau.Architects – in short: it got serious!



Fig. 2: Renewal post-war housing estate Munich, paths of the sun 21 March / Sept.

So the modern engineer's wooden construction was to become the renovation method of building stock?! Until now, a lot was theory as in architecture. The design, it is said, shows the talent; the art begins with the implementation and realisation. The building owner and our planning team – after detailed preliminary discussions – agreed on a set of objectives. This corresponds entirely with the requirements and, among other things, the widest possible preservation of existing primary structures to the prevention of grey energy and waste from demolition and reconstruction. An upgrade-free economic life expectancy of at least 40 years for complete renovation – 46 flats and new regional administration in the lowest energy standard – essentially covers three areas, our set of objectives:

A / The use: Quantity, quality and environment

- Compress rentable living areas of the 1b site by above 100 % - use building ground, ensure revenue,
- Create market-conform mix of flats with light, attractive layout – offer new living quality,
- Interlock disabled, elderly and child friendly functional residential use – include demography,
- Make the new living environment spacious, social, close to nature and robust – design urbanity,
- Studies of the yearly suncycles show daylight quality in each residential area in the quarter.

B / The energy concept: Standard, maintenance, economy

- Lower the energy demand, heating, air and light to under 50 % of a new construction – achieve maintenance security,
- As much as possible, provide regenerative residual energy from heating and electricity – achieve zero emissions,
- 'triple win' – ease the burden of the owner/ tenant/ environment – produce overall profitability,
- Offer simple, safe, long-lasting technology for ease and cosiness – promote health and comfort.

C / The structure: Ecology, process and design

- Perfectly ecological assembly system of high quality and precision – optimise life cycle balance,
- Constructive integration of sound insulation and fire protection, as well as statics, hvac and solar active components – understand flexibility,
- Digital on-site measurement and a maximum pre-fabrication, low weight and short construction period – track process efficiency,
- Low maintenance surfaces and many selectable design variations – enable time-less, attractive architecture.

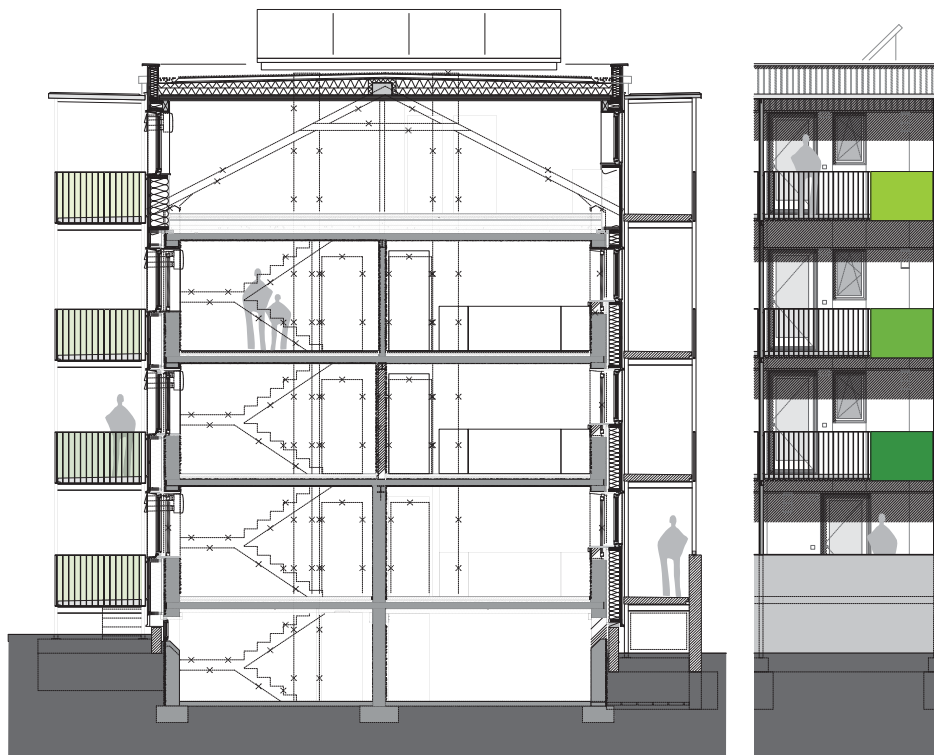


Fig. 3: Renewal post-war housing estate Munich, layout construction in wood, phase 1

The provocative demand of the building owners to the planners: all aforementioned objectives should be reached cost-neutrally within public housing subsidies. The unavoidable extra costs for prototypes with 'sustainable attributes' must be financed in full by appropriate subsidies for energy renovations and 1 € / m² rent exclusive of service charges as a user contribution for minimal energy costs. That should occur through the holistic added value as described, and furthermore a new 'league of efficiency' will be reached. Despite obstacles and risks we accepted the challenge.

The planning team led by Kaufmann.Lichtblau.Architekten developed a higher-density 'Rejuvenation' model, 100 % additional living area where realised. Construction Phase 1: By incorporating a new building for the district office of GWG, the load-bearing structure of the original buildings could be retained but the access was changed, and the flats were transformed into individual modern residential units, barrier-free and with attractive outdoor areas. The new building envelope, including that for an added storey, consists of pre-fabricated wooden elements meeting passive-building standards, with maintenance-free wall cladding and green roofs.

Exemplary solutions were developed for life-cycle and energy balances, building science and structural aspects, fire safety, sound insulation and an efficient construction process. Construction Phase 2: The existing structures proved to be quite inflexible, the necessary quantity and quality of flats, including an underground garage, could not be found in a reasonable way. So the client decided to break the old structure down and design and optimised new building in wood construction as in phase 1. The minimal energy demand is primarily covered by regenerative sources.

The first building phase was completed in 2012, phase 2 in 2014. An extensive monitoring for result validation was carried out and proved: holistic value enhancement, energy efficiency which is fit for the future and a wooden construction offering active climate protection, combined with optimal usage quality, promise the highest total economic viability for generations. With a widely successful completion of the comprehensive mutual set of objectives, K.L.A. has consciously entered new territory for GWG and in doing so has also reached unforeseeable limits to the affordable input of working time. We owe that to our cause, our building owners and their (happy) tenants.

Provisional conclusion: The obtained result is an example of the simple fact that the renewal of existing buildings with the title 'real sustainability' – on today's conditions – is achievable, of course not by means of standard planning, standard processes with standard partners and at standard costs. We also had to deal with obstacles and risks, as well as priority struggles and completely new solutions. Follow-up work shows plenty of valuable experience and learning success, which we will hopefully be able to consistently develop. We cannot go back. The reward for all our efforts lies in durable high use and structural quality with unbeatable overall profitability, but with reference to the life cycle – just like in sustainable forestry.

4. The second chance: Future perspectives ..

At this point a discussion about the new planning and construction techniques 'wooden pre-fabrication' would be appropriate. What systematic wooden construction is really capable of achieving for climate change was first shown at the 'Building with wood – ways into the future' exhibition at the architecture museum in Munich, then in Vienna, actually in Berlin. It aroused an interest which never existed before in modern wooden construction, our GWG project was chosen as the restoration example. We urgently demand a policy be issued to duly support planners and building owners on the development of this enormous CO₂ reduction, active climate protection potential.

The focus is on attaining industrial cost-saving production and in doing efficiently increase building stocks' slowing restoration rate, using the most natural, healthy and environmentally friendly materials and processes as possible. Only through competently optimised planning under equal observation of effective land use, ecological structural engineering, zero-emission building operation as well as first class use and design quality is macroeconomic, affordable and real sustainability achieved. 'Solar construction and restoration' as we know it does not harm anybody, it presents the basis for personal freedom and in doing so embodies true modernism.

Therefore it should be up to us construction masters to change the attitude from the bottom up, to learn something new, to present results and to tell happy customers: it really works! Wooden construction marks the most sensible way of using raw material, whose abundance and innocence will finally pass. Every well-

made, energy autonomous and nice looking wooden architecture can become a clear sign of change. Let's protect our riches of timber against foreign desires and wrong usage. With wood as a construction material, warmth returns as a life metaphor, haptic trust creates a new confidence that there are solutions for our problem of the century: sustainability. They grow in the forest and demand nothing more than our sensitivity, fantasy and unity. That is why it is important to endlessly discover new things, rediscover and develop further.

I would like to finish the illustrated boardsheet with this: let me quote what occurred to me when I woke up in the night and luckily found a pencil and paper. I will take the liberty of including our partners and building owners: 'We have not dedicated our lives to architecture to later on have to say: we failed on the most important dimension of construction: a universal sustainability. It may appear quite emotional to some people – nevertheless and now more than ever: we will not stop being nonconformist and controversial until we hand over to our children and grandchildren'. That is what we can do - and what you can do with us. Thank you all the best !



Fig. 2: Renewal post-war housing estate Munich, garden view to the West, phase 2

Kaufmann.Lichtblau.Architekten, 05'2016

before ..



