SUSTAINABLE REHABILITATION OF MONUMENT PROTECTED BUILDINGS
LIVING STARTS ON THE STREET

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1. City Expansion towards the Interior

Future-oriented and sustainable city development is the foundation for the revitalization of inner cities with historical building substance.
In 2000, the world conference on the future of cities - Urban 21- took place in Berlin. The, then, Federal Minister for Traffic, Construction and Housing, Reinhard Klimmt described in his inaugural speech to the world conference the quality of life and social peace in the cities as a priority goal.
The preservation of the inner cities is equivalent to the responsibility for tradition, history and culture. Inner cities are the political and cultural centres of the towns. Giving them up would mean irretrievable destruction.
He, who visits a European city has the direction to the old town described to him first. There one expects cultural and architectural highlights as well as lively variety.
The old towns are characterised by their old historical buildings, squares, and lanes etc. These historic buildings which are mostly listed delight with their flair, their beautifully structured ornamented facades, high rooms, staircases, and inner courtyards. However, under the requirements of climate protection and energy savings, old buildings are no longer competitive. With today´ s technology every new house can be erected as a passive house (minmal energy demand).

Buildings are responsible for a 1/3 of the energy consumption in Germany.[1]

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[1] Klimmt, Reinhard, Regierungserklärung zu Urban 21 vom 8.Juni 2000

However, what happens if the energy costs increase rapidly? Do the old towns become depopulated because the energy costs exceed the rents? This would be an extremely sad idea. Therefore, energy-saving modernization in the context of sustainable rehabilitation of buildings is for that reason of great importance, particularly in old towns and indoor Cultural Heritage.
Of course, sustainable construction within an existing building stock does not only mean the rehabilitation of a building or a group of buildings according to energy efficiency aspects. Glance in the quarter, in the close vicinity, in the street and you are already faced with more exciting tasks. Is it not possible that further development, reorganisation or restoration of formerly existing structures could enhance the site further?
Project steering in dialogue with all involved leads to optimal solutions without increasing costs and without decreasing quality.
Here project developers, town developers, architects, engineers, construction physicists, landscape planners, and curators of historical monuments, i.e. private and community partners have to create a team. Together, they have to create common general conditions for effective detail planning. A clean green environment is friendly and welcoming, conveys peace and cosiness. Living literally begins on the street.

The house entrances, staircases, as well as the inner courtyards are the visiting cards of the houses. Concrete deserts or small gardens as communicative places, the choice is actually not difficult. The quarter as the smallest constituent in the structure of a town bears the greatest responsibility towards its image and preservation.

You live, work and breathe in the quarter. We spend the greatest part of our lives in closed rooms, but put paradoxically most people place more value on comfort in the car than in their flats. The car, it is taken for granted that it may only consume a low amount of fuel and we are seldom satisfied unless we have all the extras, it has now cost a little more but we have treated ourselves. It does not interest us in the least that newly-purchased it will have lost half its value after two years. Unless it is a vintage car, which is cared for, cherished, kept in working order and continually increasing in value. Because it represents something very individual that cannot be built again.
You do not scrap an oldtimer! Unfortunately, one allows old houses to become dilapidated. The insight that long-lasting value and a value increase can be achieved through sustainable rehabilitation is only slowly catching on.

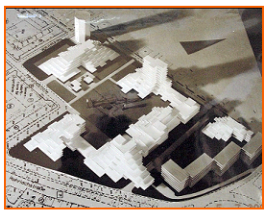
Many private investors who might invest their capital in the revitalization and maintenance of listed buildings are exercising restraint due to the present economic situation.
Most banks regard energy-based rehabilitation sceptically, since the ratio of rental yield to additional expenditure does not produce any immediate return, in other words does not yield a short-term profit.
The opportunity of long-term letting or the future lower expenditure is not at all included in the rating. On the contrary, the idea of short-term return is still decisive for the provision of funds. Owner-occupiers do not fare any better.

The household budget situation of the towns and municipalities is precarious. The federal states and the government argue about sharing the costs. In the old federal states no real subsidies have been foreseen supporting meaningful and energy-based modernization of old buildings since the reunification.
However, financial aid can be obtained from the "Kreditanstalt für Wiederaufbau" (bank, owend by the federal states and the governement) through certain partial loans at favourable

interest rates and by certain income tax breaks. The basic legal framework for this is established in the German income tax laws. Unfortunately, these advantages are partly offset by other taxes and levies. The owner of a rehabilitated property has to pay higher property taxes and insurances since a lot of these costs are levied according to the rateable value of the property. After rehabilitation, from the point of view of the tax authorities, this value has been increased and it forms the basis for further legal taxation. Here energy-based construction turns out to be more of a punishment rather than a reward.
At municipal level a lot of small efforts could be initiated to promote the acceptance of energy-saving modernization or generate incentives for it.

2. Living space old town

Regrettably in keeping with the facts, if there were not any civil commitment for the conservation of monuments and the commitment of the foundation – Cultural Hertiage in Germany, a lot of historical buildings would not exist anymore. Architects and town planners alike have approved the redevelopment of large areas and have allowed the construction of tower block flats distant from the work places.



left: unrealizied plan in the sixties /right: location 2002

Such planning also existed for the old town of Ludwigshafen; but, fortunately there was a committed building director who had other plans in mind and regardless of the changing political landscape could pursue his objective target for almost 20 years. Here one is speaking about the oldest and at the time of its designation in 1972, the largest coherent redevelopment site in Germany, named Hemshof.

The choice of working and residential locations is determined by the image of a city. Therefore every town district needs a future vision to promote the attractiveness of the whole town. The awareness for the positive development of the city is kindled in dialogue with its citizens. Only the identification of the citizens with their city can increase its attractiveness beyond the borders of the region.

Here is a small dialogue in this form which one frequently experiences:
"Ludwigshafen, where on earth is that, never heard of it" " It is in the Rhine-Neckar-Triangle in the immediate vicinity of Mannheim, just a few kilometres away from Heidelberg." "Oh, Heidelberg, the castle, the old town, we have seen it on our trip around Europe. It was beautiful there."
"Ludwigshafen is the seat of one of the largest chemical companies in the world, the BASF"
BASF, Styropor, Indigo, music cassettes, yes, yes we know and does one live well there?"

One lives here today better than ever, since the rigorous implementation of measures e.g. in the Hemshof redevelopment area, has immensely improved the quality of the residents´ lives. Besides the exhaustive displacement of the producing trade, the removal of the inside blocks,

and the de-sealing of the areas and the greening of all streets, squares and inside zones, a large park with a childrens´ paradise was incorporated.

After the war the Hemshof was, unlike the town centre, not completely destroyed.
Due to the housing shortage, large apartments in the houses dating from the founder´ s period were quickly turned into two to three residential units. This type of living was very uncomfortable, the rooms were small and cramped and most of the residents on a floor had to share the toilet facilities, and bathrooms were extremely rare.
New buildings were then erected on the edges of the town and in the gaps between the existing buildings. Those who earned a little more moved away and the old and impoverished remained. In the sixties, the residents of the converted houses from the founder´ s period became the homes of the foreign workers who could only afford small rents.

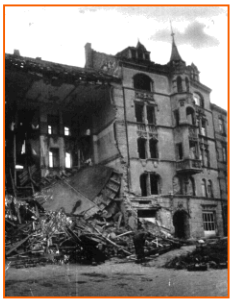
The old town was neglected, the houses were in a dire state, the inner courtyards were obstructed and the streets and squares were sealed.
Living in the town or even in an old building was not "in".
In 1972 the old town was declared a redevelopment area by statute and the measures and the intended goals started to take effect.

Hemshof 1970

Hemshof 2000

Today we are again faced with a challenge to retain a manifold and vivid town in view of the demographic development.
Today, in spite of mobility, residences in the vicinity of the workplace are being sought after. The town offers short distances and an extensive choice of public transportation, a good infrastructure, with schools and kindergartens, day nurseries, cultural and gastronomic facilities, quarters with a large amount of greenery and tree stock. All these attributes can be found in the Hemshof in Ludwigshafen.

We could build on this basis and were able to raise private capital to advance the rehabilitation of the properties in the old town.



examples for sustainable buidlings realized from Osika Ltd. in 1994 and 1997

3. Interior Insulation - an innovative solution for historical buildings.

There is a gigantic energy savings potential in the sustainable rehabilitation of old buildings. Not only, that built architecture represents a stored material resource, with the technical possibilities available today, it is possible to transform a non-refurbished old building with a heating energy requirement between 300 and 400 kWh/m^2/a into a low energy house with a heating energy requirement of 30 -70 kWh/m^2/a.[2]
With our pilot project in Limburgstr.19/21 we have tried to reduce the heating energy requirements for these two listed buildings by over 75% and lower the CO_2 -emissions. [3]

Limburgstr. 19 /21

The sustainable rehabilitation of the houses has been awarded the KfW-Award 2004 "European Life, European Living, Property with Future - Modernization and Energy Saving" by the Kreditanstalt für Wiederaufbau in Berlin. Here is a quotation on the criterion from the brochure " Die Preisträger" (the winners).

"A decisive factor for the jury for awarding this building, was the exemplary solution for the integration of the neighbourhood regarding the technical equipment. Thus, the rehabilitation of Limburgstr.19 was completed at the same time as Limburgstr.21. The new gas central heating with calorific value technology installed in the basement of Limburgstr.19 also supplies the neighbouring house with thermal energy. There was sufficient space on the roof of Limburgstr. 21 for a solar energy device for service water heating which also supplies both houses. Thus by sharing this heating system, one system could be eliminated and correspondingly the CO_2 emission could be reduced. On the other hand this solution is not only exemplary from the energy point of view but also from a socio-political aspect since here two adjacent houses were beautifully refurbished for the condominium association. The dwellers of both houses have agreed, by the way, not to build a dividing wall in the garden between the two houses."
This high carbon dioxide reduction cannot be achieved by one single measure, only the bundling of different measures led to this result.

The rehabilitation was essentially related to the rearranging of the ground layout plan to more spaciously laid-out flexible units, the complete renewal of the supply and disposal facilities, the restoration of the monument protected street facades, and the enhancement of the sound insulation.

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[2] Prof. Dr. Ing. Karl Gertis „*Vom Niedrigenergiehaus zum Nullheizenergiehaus*“ Vortrag 1997
[3] Gutachten v. Dipl.- Ing. E. Baffia, Sachverständige für Niedrigenergie- und Passivhäuser 2002

The energy-based rehabilitation included:

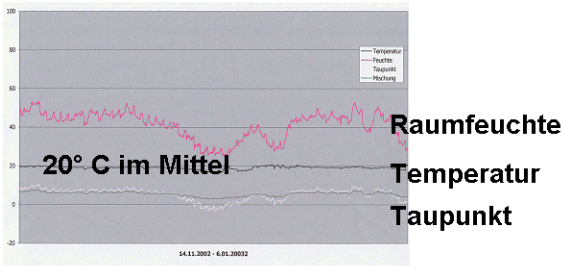
- installation of new wooden windows in historical partition with heat protection glass with U 1.1
- installation of central heating with calorific value technology with water heating
- installation of a solar energy device for service water
- installation of a decentralized ventilation system per unit with heat recovery
- insulation of the roofs, the ceilings of the basement, the neighbouring walls and the ceilings of the flats (material: Isover thermal conductivity 0.35, 240mm in the roof)
- insulation of the courtyard facades with an external thermal insulation composite system (material: Neopor 0.35, 160mm)
- insulation of the street facade from inside (material: Neopor 0.35 and Isover 0.35, every 80mm, for the study).

The detailed planning before the beginning of the measures covered stock-taking of the suitability of the wall construction, the thermal bridges, - and moisture proofing calculations for all critical components, mainly for the wooden beam ceilings.
In order to measure the suitability of the interior insulation, sensors were installed on neuralgic points of the street facade to provide information about eventual dew point shifts. This work was conducted under the supervision of and in cooperation with Dr. Feist, Passivhausinstitut Darmstadt.

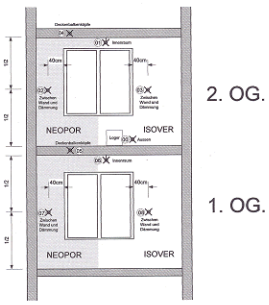
Combined sensors were fixed on the boundary layer between the old inner surface of the wall and the insulation and air temperature and humidity was recorded in each room and compared with the outside temperature and outside humidity.
The air tightness was reached by means of a climate-regulating membrane placed over the insulation material. The extremely careful workmanship of the membrane on all joints and connections was mandatory.
The air tightness was checked by a Blow-Door method, for all rooms one by one in order to specify the tightness.

Highly insulated houses have to be equipped with a controlled ventilation system, preferably with heat recovery.

The recorded data were read by EDP via a network system in the house and submitted to the Passivhausinstitut for evaluation.



Measuring record showing humidity, temperature and dew point shifts



Scheme for built-in the sensors and the two different materials of insulation for the study

This measuring programme has been running for two years now and covers two heating periods. These results are already available. All results are perfectly fine, internal insulation in combination with the ventilation system reduces the heating energy consumption by an additional 25%.

The expertise which was drawn up before the rehabilitation revealed a realistic starting point. However, the savings potential could vary depending on the utilization behaviour.

Therefore taking care of the properties and advising of the residents is of major importance. The residents have to find a competent contact person e.g. during the commissioning of the ventilation system and its programming according to personal behaviour patterns.

The exchange of experience amongst each other and the permanent possibility of receiving free advice, has freed the residents of the initial shyness of the new house technology.

And here we have come full circle, i.e. developing self-dynamic concerning the climate- and environmental protection. The people develop a new sense of responsibility and translate it into practice within their own four walls, on the street, in their quarter, in their town and region.

4. Sustainable revitalisation of a former barracks area

Another project is being realized in the town of Speyer. We started in spring with the first part of the revitalisation of a former barracks area. Erected in 1889, the 12 ha area was militarily used until 1997 mostly by French Armed Forces and was closed to civilians. This area is now to be integrated in the urban framework. In doing this, an important aspect is to go easy on resources. The Quartier Normand is situated right in the centre of the more than 2000 years old city.
The area is framed by historic buildings while in the interior small plain plaster buildings have been torn down.
The concept intends to realize the energy efficient redevelopment of the old building stock, supply the complete area with nearby generated heat from regenerative energy sources (biomass and solar energy), abstain from parcelling out of the area and erect a park in which the new houses will be placed. The historical buildings are under monument protection and can only be equipped with insulating measures in their interior.

Internal insulation in combination with heat recovery will lead to an energy conservation of more than 80% for this project as well.

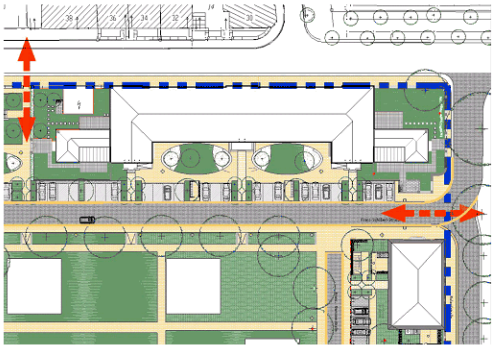
Innovative detail solutions for various structural elements, e.g. thermal bridge free connections of appended filigree balconies give the impression of an open facade and do not impair the character of the building.

Preserving the character, up to date equipping of the buildings allows new patterns of use and in doing this saves resources, which is roughly the aim for the revitalization of these former barracks.

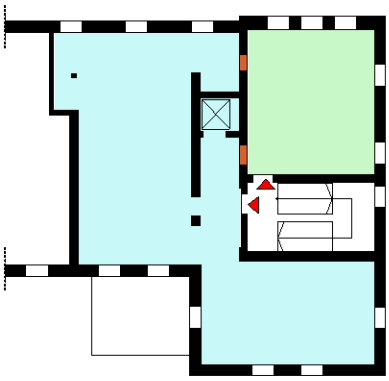
The new quarter is to provide living-quality by a variety of utilisation. Living and working for all age brackets near to the town centre but nevertheless quiet in a green environment containing high trees will be greatly appreciated. The Quartier Normand will appear, almost as if it had always existed, naturally-grown, in contrast to the many newly-developed estates on the periphery.

Here a listing of the various uses in the quarter:
New Houses:
Nursing home for the elderly operated by the Diakonie
Looked after housing for the elderly
Living in multi-storey town villas
Health Centre
Historical Buildings:
Leisure time provision for the young
Offices and Surgeries
Living in annexes with the character of a single family home with private garden
Living in lofts
Hotel providing service for the entire quarter

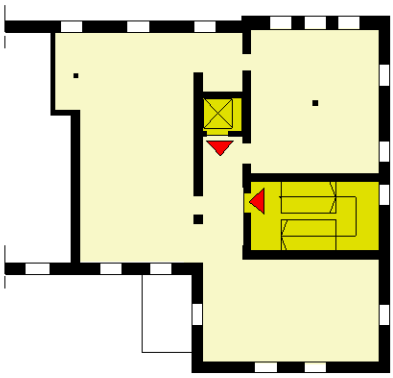
Quarter Normand



Plan of details, the green shows the park



Flexibility of the ground plan: two flats



or a spacious loft with only two operations

The few roads existing in the quarter will be tree-lined playstreets and subterranean garages will largely absorb stationary traffic.
Cross generation living will be appreciated by an ever more "single-living" society. Tolerance and cooperativeness are self-evident here. Having access to service features when required, provides a sense of security not only for the elderly.

5. Summary

Parallel to this conference, the International Trade Fair for Conservation, Restoration and Urban Renewal is taking place in Leipzig.

German monument curators are aware that a large number of buildings worthy to be listed as monuments have been destroyed by the improper and the uncontrolled application of interior insulation as well as by the misbehaviour of the users. The implication of this has been irreparable damage on load bearing structural elements.

The sustainable redevelopment of monument protected urban fragments in Ludwigshafen and Speyer makes a contribution to monument curators, town planners, project developers and persons willing to redevelop by offering solution methods based on field tested innovative and commensurable measures.

Shortly a publication will appear containing the principles, the detailed execution and the results of the measured data of the interior insulation measures in the buildings on Limburgstr. 19/21. The responsible authors are Klemens Osika and Dr Feist, Passivhausinstitut Darmstadt.

We follow the call "Join the action", "The time for talking is over- time for action is now." on the homepage of UNEP (United Nations Environment Programme). We hope that we are able to contribute to this programme with our work.