BEYOND GREEN

5 Case Studies of Sustainable Renovation Projects in Europe

Jingjing Song & Wenxuan Zhang

Beyond Green

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Beyond Green

5 Case Studies Of Sustainable Renovation Projects In Europe

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ABSTRACT

There are two kinds of unbalance regarding sustainable building: unbalance among different aspects of sustainability, especially the environmental sustainability and social-cultural sustainability; unbalance between the attention paid for sustainable new construction and sustainable renovation projects.

We believe this situation is because of the three major barriers to apply integrated sustainable solutions in buildings: high investment costs, lack of information on solutions at all levels, and lack of availability of solutions to specific conditions. We would like making efforts to bridge the later two barriers by providing rich detailed case studies on sustainable renovation projects in Europe.

We embraced the four-pillar concept of sustainable development here as our theoretical frame to arrange our case studies. And the case studies are qualitative and based on record of face-to-face interviews mainly and sometimes companied with site visits.

In the five cases we studied, two are from Germany, two are from the Netherlands, the rest is from Norway. Most of them are residential buildings (houses and apartment buildings), and the one from Rotterdam is an office building. Every project have its unique perspective and approach, but all of them achieved balance among different aspects regarding sustainable renovation to some extend.

Key words: Sustainable renovation, integrated solution, heritage, monument, environmental sustainability, social sustainability, cultural sustainability, economical sustainability, Europe, Germany, Norway, the Netherlands.

PREFACE

This booklet is a product of our master thesis work, the propose for which is not merely to receive a master-degree, but also to explore the possibility and different approaches in real renovation projects, as well as to learn from the most brilliant ideas and thoughts behind them.

We are both from northern part of China (Beijing and Ordos), and both are master candidates in program Design for Sustainable Development in Architecture School of Chalmers University of Technology in Sweden. The partnership between us started from studios we attended in Chalmers: Sustainable Building and Sustainable Building Competition. Sharing common interest in sustainable building, we decided to continue our collaboration on these case studies for our master thesis work, after our cordial cooperation in studios. The process of thesis work was not easy, but we had a very good time and obtained a satisfactory result.

We would like to address our appreciation to everyone who supported, helped, advised, criticized our thesis work, or involved in other form:

Firstly, we want to thank our supervisor and examiner, Assistant Professor Liane Thuvander, for the great insight she shared with us, for the high-quality guiding, and for all her spiritual and financial supports on our work as well as our study trips. Without her, we could not achieve such a loveable outcome.

We want to thank everyone who accepted our interview requests and hosted us during our study trip, architect Randi Augenstein, architect Peter Haimerl, project manager Thomas Boschner, architect Wolfgang Voigt, architect Bart Kellerhuis, architect Duzan Doepel, building manager Ben ten Hove, architect Olivier Henz and Rolf Bruggink. Thanks to their spirit of sharing, their kindness and patience, the investigation becomes a joyful and fruitful adventure.

We also appreciate very much our e-mail and phone contacts from different architecture offices, for their efforts to making things through, as well as all the building users we met and talked with during our study trip, for their enthusiasm.

Thank our peer students, whose comments and quality discussion with us urged our continuous improvement on this work; Thank our parents, for their unconditional love and support; Thank Mr. Jing Wang for his tolerance of Jingjing's bad temper when she was under pressure of work; Thank our friends for their company and caring.

And finally, we would like to thank each other for the mutual supports during the whole working process, for the laugh and joy we shared, the difficulties we experienced and overcame, for all we went through together.

Jingjing Song & Wenxuan Zhang

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PART1 INTRODUCTION

PRESENT SITUATION

1.1 The Present Situation

The unbalance among different aspects of sustainability

In recent years, sustainable development issues have been widely discussed in the United Nations' conferences, in Europe, as well as elsewhere in the world. The importance of environment protection has been emphasized in so many documents and medias, such as Millennium Development Goals, Agenda 21 and Al Gore's documentation *An Inconvenient Truth*, that most people who don't work with this specific field relate sustainability immediately with environmental conservation topics such as renewable energy, water efficiency, etc.

When speak of sustainability in the field of architecture and built environment, which is a important sub-field of sustainable development, most of people referring it to energy-saving, water efficient, biomimic design and fancy-shaped buildings. To be honest, we were holding the same view before we start deeper investigation on this topic, which is perfectly understandable, or per say, as expected:

For a person who wants to access knowledge about sustainability or sustainable building, it is very typical to recourse to search on internet, or use an open intelligence resource such as Wikipedia. By Wikipedia's definition, sustainable building refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from sitting to design, construction, operation, maintenance, renovation, and demolition [1)]. This definition equates sustainable building with green building, which constrains sustainability to "environmentally responsible and resource-efficient", whilst social as well as the economic aspect is not mentioned.

It comes not singly but in pairs that the United Nations Environment Programme (UNEP) document, *Buildings and Climate Change: Status, Challenges and Opportunities*, [2)]tends to equate sustainable building with energy-efficient building to some degree.

Among other similar cases, these two examples represent a common phenomena in our society and everyday live, that people rank environmental sustainability much prior to other concerns in sustainable development. It calls for our attention of the unbalanced situation among different aspects of sustainable development, especially when regarding to building sector. It should not be overlooked or justified just because the urgency of coping with environmental challenges.

As sustainable development often summarized as the 'triple bottom line' [3)] of social, eco-

nomic and environmental considerations, sustainability in building and construction sector should also be a delicate balance amongst economy, human society, and the environment we live in. Of course it should start by focusing on priority elements (or impacts) that are relatively easily measured, and around which there is a strong consensus, for inclusion, i.e. energy and carbon, water and waste/resource efficiency. But one should also notice that technological solutions will not work as expected if people won't use it due to high cost or don't know how to use it in an appropriate way. Also because the loss of social and cultural heritage takes considerable time and the effect won't show in quite a long period, while the consequences are far more severe and irreversible, therefore, the focus on environmental aspect should be broaden to overall concerns about different aspects of sustainability, especially social and cultural sustainability, sooner rather than later.

As a result of our observation mentioned above, one focus of this booklet is integrated solutions, which take care of environmental sustainability as well as other aspects, especially social and cultural sustainability.

The unbalance between new constructions and existing buildings

The attention on sustainable building has been raised in last decades, yet people overlooked existing building stock, which should be part of sustainable building picture, for years. Recently, when we searched "sustainable building" and "sustainable renovation" through the most popular search engine, Google, there were 84,400,000 results for the former while only 20,800,00 results for the later. If search "sustainable new construction" instead, there were still more than 50,000,000 results.

Besides the numbers of search result on Google, according to a pair of our peer students' research about how interested European governments are in sustainable renovation, there are a tendency of increasing policy attention for existing buildings, yet the focus is largely centered on new buildings. Sustainable trend has not caught on to the same degree as new construction did in the renovation of existing buildings [4)].

From the perspective of architecture students, this is not a surprise: it is easier, indeed, to achieve good performance in a new construction than through renovations; there are more tricky details to deal with in renovations which have no ready-made recipes; new energy conserving technologies and new materials which is necessary for energy-improving are not always getting along with old structure; there are restrictions placed

PRESENT SITUATION

on alterations of listed historical buildings; the last but not the least, from our own experience and our observation, in most cases, it seems more exciting and attractive for architects and engineers to build something new rather than fixing an existing one.

With all understandings to the obstacles mentioned above, we believe that sustainable renovation projects deserve higher attention, which is also an arising tendency. There are several researches carried by Delft University recently, showing that renovation is a better choice than demolish and build new ones, because: reusing existing building stock is very important for CO_2 reduction [5] as well as the reduction of demolition waste [6]. From their research, it can be concluded that by following the Kyoto Protocol* guidelines, renovation-based strategies are a much better alternative than demolition, due to decreased environmental impacts and reduced energy consumption.

This conclusion is especially true to Europe countries, because the demand for new construction has been slowing down partly due to low annual population growth rate. According to Eurosats' demographic table [7] over last ten years, the average population growth rate in Europe is lower than 0.3%, and the same source predicted in 2006, that by 2050, the population in European countries might be in decline. One could easily assume that most of buildings we might need in the next few decades in Europe are existing already, and the main task falls on adapting them to fit new demands and requirements.

Building amount in the other part of the world may not be as saturate as Europe right now, but it is never too early to adapt to sustainable development and to start renovation. The overall population growth rate in the world is much bigger than the European one, so there are big demand of new buildings in general. In fast-developing countries, popularization of sustainable building especially sustainable renovation project would be more urgent and influential. Europe as one of the most advanced area in the world, is always in the demonstration position.

Additionally, reusing the existing structure will definitely reduce the cost on material and labor for construction, and helpful to conserve the knowledge and heritage embedded in the structure, as well as to maintain the atmosphere of a place, which are very important to our culture and to people's feeling.

The existing building is so crucial in every aspects addressed above, therefore we will focus on renovation projects to study how to solve problems in existing buildings and put them in to our sustainable development picture.

* Kyoto Protocol: a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at fighting global warming. Under the Protocol, 37 countries commit themselves to a reduction of four greenhouse gases (GHG) (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by them, and all member countries give general commitments.

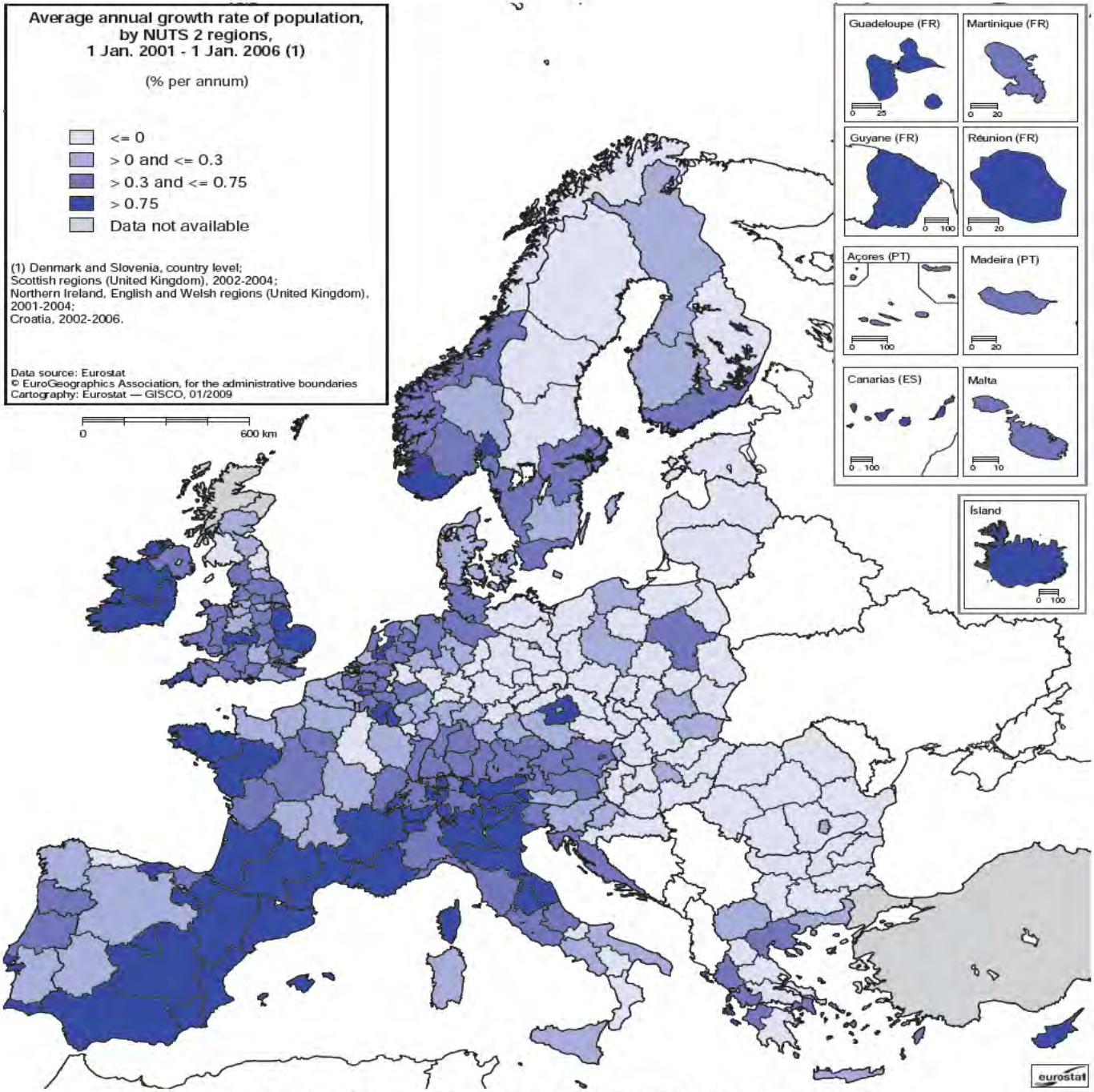

Fig 1: Annual population growth rate of Europe 2001-2006 (source: Eurosats, 2007)

1.2 Aim and Scope

The UNEP identified three major barriers to implementing energy efficiency measures in buildings, which are high investment costs involved, the lack of information on energy-efficient solutions at all levels, as well as the (perceived or real) lack of availability of solutions to specific conditions [2]. And we believe that these barriers are also fit the context of sustainable renovation.

Among these three barriers, we believe that the latter two could be incorporated together as “information gap”. To make substantial changes to the present situation, information is needed from very early pre-design phase of a project when also economical strategies are determined. The information needed during the economic decision phase concerns investment costs, energy measures, a general overview of each solution proposed with experience from other projects and their benefits/limitations, and so on. The information must therefore be easy to find and retrieve, easy to understand and easy to apply [8].

Beside these barriers, there are other bafflement towards sustainable renovation. For example, the lack of sustainable education to people, lack of professional project management which implement with sustainable thinking, and lack of long term facility management. These barriers need probably long time to be soften and overcome, but again, the “information gap” need to be stepped over at the very first.

Therefore, this thesis is aiming at bridging the information gap, which is the second most important barrier. The main body is case studies of sustainable renovation projects, through which runs the principle axis: exploring integrated solutions. In order to provide accurate and comprehensive materials on sustainable renovations within the limited time of thesis work, we determined to study five interesting projects, that will be explored and elaborated in the second part. We consider case studies as media to introduce good solutions in renovation, to inspire for architects, as well as to provide references for the investors, decision-makers and stake-holders.

We set the geographical boundary for our case selection in Europe while outside Sweden. One of the reasons is we were inspired by an ongoing research in Sweden, *Strategies for Integrated Sustainable Renovation*, which focuses on the Swedish domestic building stock ‘folkhemmet’ in the pre-boom era. We would like to provide quality material in different and wider scope, and contribute to this inspiring research.

Fig 2: Global construction spending and growth (source: David Langdon, 2005)

Because integrated solution is a central issue here which can be affected by many specific factors such as local regulations and policies, climate, social background,etc., we chose our cases from countries which have similar social-cultural background and climate features with Sweden. The European countries, especially the northern part of west Europe and the Nordic area are most suitable.

Another reason setting our boundary within Europe is to introduce European countries' advanced experience and knowledge on sustainable renovation into our motherland, China. China was the third largest construction field [2)] in the world in 2005 (see Fig 2) with the largest population which is going through rapid urbanization process. The huge demand for new construction in China is explicit. Under great pressure to meet the demand for new residents and other kinds of building, Chinese should utilize the existing building stock as much as possible.

AIM & SCOPE

Yet there is a pervasive social mind among Chinese people that we worship NEW stuff blindly, everyone wants new resident, new furniture, new clothes. This blindness is reflected on our planning of cities and cause huge loss in social and cultural asset: lots of buildings and parks with significant meaning to the individuals are demolished. For instance, Wulihe Stadium in Shenyang, an very memorable place to Chinese soccer-ball fans which had only been put in service for 18 years, was demolished in 2007, and a new stadium with higher capacity was constructed to host the Olympic Games [9]. Before the 2010 Shanghai Expo there were a bunch of old buildings been demolished in Shanghai, including Carmelite Convent, a 135 years old landmark in Xujiahui. On the site, the convent would be replaced, not by business complex or high-rises, but by a 20% smaller convent. It is no doubt a violence to the city history [10].

Urban wise, Take Beijing for example, the city with 850 years of history now looks like a American city which did not exist 200 years ago. The lifestyle and characteristic of Beijinger changed so dramatically in the last twenty years companied by the changes of the city that lots of scholars and indigenous habitants, exclaiming the spirit of Beijing is falling.

In contrast, European countries have comparable long history as China, but have a profound tradition on conserving and reusing old buildings, even progressed to sustainable renovation. There must be some spirits and good examples we could bring back to China, to show the beauty and potentials of old structures.

As we have already noticed, it is impossible to exhaust all integrated solution choices for renovation project within five cases, because the approaches in renovation are very dependent on local condition and the diversity of approaches will grow over time. Therefore, this work would just be a beginning rather than a finished study, other precious projects and emerging design should be able to add in afterwards.

Following questions emerged at the beginning of this work:

Whether an integrated solution respects all aspects of sustainability is achievable? How different approaches towards sustainable renovation could be realized in the context of Europe? What experience and lesson can be learned and hopefully be helpful in other comparable projects?

The thesis is our effort to have them solved.

1.3 Theoretical Framework

Sustainable development and its three pillars

The most widely recognized definitions of Sustainable Development is from the *Brundtland Report:*

> *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.* [11)]

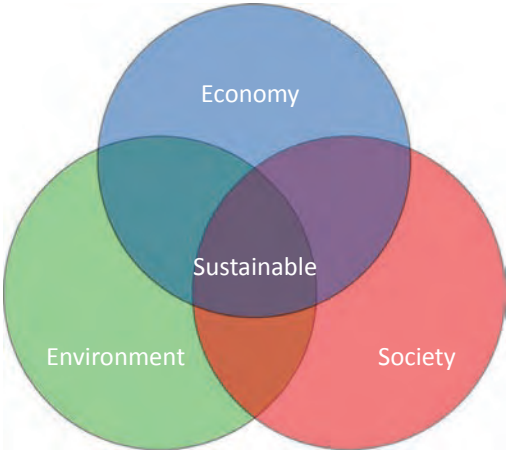

Fig 3: Three Pillars of sustainable development (based on Brundtland Report, 1987)

It is also wildly admitted that there are three constituent domains in the concept of sustainable development: environmental sustainability, economic sustainability and social sustainability; all three domains are interdependent and have influence over each other. But it is not started like that.

The discussion on sustainability issue started from the publication of *Silent Spring* in 1962, with a focus on pesticide and the environment; in the 1970s, the problem shifted to the relation between environment and development (*Limits to Growth*)[12)], which brought economic into the scope; In the 1980s and 1990s, poverty and equality problems started to take over the theme and brought the social aspect into the discussion. This discussion on the scope of sustainability is not closed yet, new focuses and aspects in this field are emerging. Just like the evolution of its scope, sustainable development is not a fixed state we want to reach, but a direction we should approximate to achieve a better and better future.

THEORETICAL FRAMEWORK

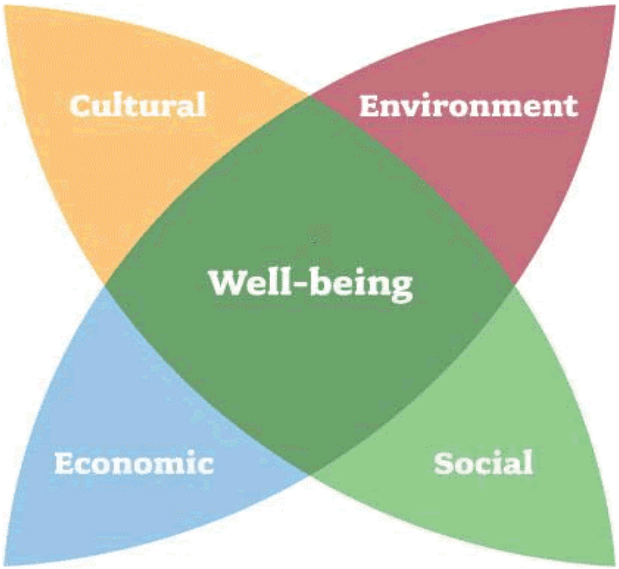

Fig 4: Four types of Well-being (source: New Zealand Ministry for Culture and Heritage, 2006)

Cultural diversity: the fourth pillar

In 2001, Jon Hawkes published his book, *The Fourth Pillar of Sustainability: Culture's Essential Role in Public Planning* [13]. In this book, four interlinked dimensions are identified: environmental responsibility, economic health, social equity, and cultural vitality. Hawkes addresses the need for a cultural perspective in public planning and policy by proposing practical measures for integration.

In November 2001, been awaken by the tragedies of 911, UNESCO noted cultural diversity a essential component to guardian peace of the world and maintain common well-being of all human. It is further elaborated by the stating

> *…cultural diversity is as necessary for humankind as biodiversity is for nature. Henceforth, Sustainable Development becomes one of the roots of development understood not simply in terms of economic growth, but also as a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence* [14].

In this vision, cultural diversity is the fourth pillar of sustainable development.

Sustainability and the built environment

> *We shape our buildings; thereafter they shape us* -- Winston Churchill [15].

All human products, including the built environment, bears and represents the social and cultural reality of the period, as well as indicates the direction in which the human world is moving.

Macmillan (2006) identified six main types of value that the built environment delivers: social value, cultural value, image value, economic value, use value and environmental value. Among all of them, we considered image value and use value be part of generalized social value in our discussion, thus they are accordingly to the four-pillar structure of stainability.

Loss of social and cultural values of our built environment might not show up for decades, yet has much more severe and irreversible impacts. If environmental and economic sustainability are current synchronic measures, then social and cultural sustainability could be described as important diachronic indicators: the former have more instant impact while the later have more inertia effect which takes time to be seen.

> *It is a slow and shifting reconstruction that cannot afford to shut out the past as we imagine alternative futures. Memory and hope can be connected… where the desire to fashion anew and the desire to engage the past meet in a tentative division and a simultaneous join between oral and written traditions…* [16].

Therefore we embrace the frame of four-pillar concept in this work, and stress the importance of achieving the balance between all four factors.

Sustainability in renovation projects

The term of renovation here is a generalized idea, which includes a group of different approaches: modernization, retrofitting, remodeling, refurbishment, restoration. It means take necessary measures to reuse the existing structure and components (partly or as a whole) on the site, improve or extend them to achieve a satisfactory result. Renovation here is not restricted to simple conservation; it aims saving existing building from been demolished, and giving it a new and better life which would contribute to sustainable development.

THEORETICAL FRAMEWORK

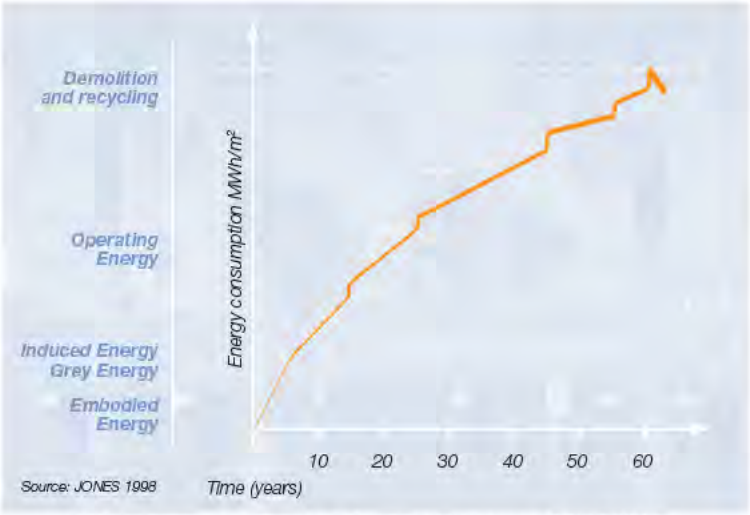

Fig 5: Energy consumption in building life (source: UNEP, 2007)

Sustainable renovation is renovation of existing building that been cautiously executed, and managed to meet the needs of different sustainability domains: it could save materials and human works clotted in the existing structure; save investments for materials and energy; improve living condition and social cohesion; conserve the knowledge and human practice consisted in structures, preserve common memories about a place, etc.

First of all, renovation projects have big potential for positive changes in environmental sustainability In Europe buildings account for 40 45% of energy consumption in society, contributing to significant amounts of carbon dioxide (CO_2) emissions [17]. Most of this energy consumption occurs during the building's operational phase (see Fig 5), for heating, cooling and lighting purposes, combining the fact that new construction is a small minority in building stock. This situation urges us to improve the existing ones to meet the emission reduction goal.

At the same time the building and construction sector accounts for the largest share in the use of natural resources, by land use and by materials extraction. Reusing existing building and structure reduce the demand of new building materials (most of which are high embodied energy materials concrete, steel, glass, etc.); Eliminate environmental impacts from building new ones on virgin lands; as well as avoid using energy and producing waste during demolition.

Sustainable renovation is profitable as well. In most cases, energy efficient solutions increase construction cost in initial investment, but from a long-terms view, money saved from reduced energy consumption during operation phase will excess the extra cost in construction, especially considering the possible higher price for energy in the future. On the other hand, better indoor climate after sustainable renovation might increase the productivity of the tenants as well. So sustainable renovation is a very reasonable choice which emphasis on sustaining in a long run, rather than earning/saving money at the moment.

As far as we could understand, social sustainability is relating to people's life as well as their relationship with each other, including the quality of life, equity, mutual understanding, social tolerance, communication between each other. In this field, it is most likely that sustainable renovation could improve people's life quality. Moreover, since the built environment could have big influence on our behavior, renovation could be sustainable in a way of encouraging communication and mutual understanding in the society.

Culture sustainability is a vaguer concept to us, because culture might mean different things to different people. Here we embrace the definition of culture from the UNESCO as our baseline:

> *…the set of distinctive spiritual, material, intellectual, and emotional features of society…it encompasses, in addition to art and literature, lifestyles, ways of living together, values systems, traditions and beliefs.* [16)]

Based on this definition we believe that sustainable renovation should not simply conserve physical cultural substances like art work and historical structures but also influence the way we live and think, and trying to pass on the knowledge, the spirit, the tradition and other intangible features we have to the later generation.

Sustainability check-list

In order to make credible comparison between different renovation projects, a check-list is established. It is abstracted from several evaluation systems, the entries are qualitative, and should be used as an analyses tool for each case.

LEED* and BREEAM** both have very clear and detailed requirements covering different issues in environmental sustainability, LEED have a ready guidance regarding existing buildings while BREEAM left a blank in this field. But BREEAM have an international

* Leadership in Energy and Environmental Design(LEED): consists of a suite of rating systems for the design, construction and operation of high performance green buildings, homes and neighborhoods. The LEED rating systems are developed by the U.S. Green Building Council (USGBC) in 2000.
http://www.usgbc.org

** BREEAM: an environmental assessment method and rating system for buildings, witch was first launched in the UK by the Building Research Establishment (BRE) in 1990.
http://www.breeam.org/

scheme, especially schemes relating corporation with other European countries, make it more preferable to us. Therefore we tried to adopt the catalog from BREEAM and defined our own environment check-list. We ruled out two issues under BREEAM's frame: land use and ecology, transport, because they are less involved in renovation project.

The economic sustainable check-list is based on Jerry Yudelson's book *Green Building through Integrated Design* (2008) and *Can we assess the worth of environmental and social characteristics in investment property*. Both of them paid attentions on operation and management cost, as well as the productivity issue. Jerry Yudelson also stressed on increased building value which acts as a common intention for renovation projects we investigated.

The social sustainable check-list is based on Murdoch University's research *Social Sustainability Assessment Framework*. We agreed with the declaration it made on the five principles in the field of social sustainable development, yet the last one, Democracy & Governance, is more relate to the policy maker rather than specific project. Therefore we kept four parts: quality of life, equity, diversity, social cohesion, and left the democracy & governance outside our list.

Because we adopted the four-pillar definition of sustainable development, there is a cultural section in the check-list, which is based on our understanding of cultural sustainability and *10 Key Themes Of Cultural Sustainability* of Creative City Network of Canada [18)]. We reorganized and retrofitted the idea from the article in order to have suitable classification for the cultural approaches in our case study.

To sum up, our check-list includes four domains in sustainable development: environmental, social, economical and cultural sustainability. Each domain contains several sub-domains, each of which is checked in the case studies. If the vision of a specific sub-domain is fulfilled in a project, that sub-domain would be marked in the case study. This list is used as a tool to remind about the issues we need to check and cover in the case studies. If a case is extraordinary in one or more of these sub-domains, there will be a detailed description afterwards. We present you the list as below:

- Environmental sustainability

  1. Management: If the project has either a well functioning operational environment management system or individual measures been taken from the commissioning stages to maintenance, that helped with monitoring and setting targets for improvements of minimizing the environmental impact, it is tagged with this label.

  2. Energy efficiency in construction: if the project introduced one or more methods to minimize energy consumption during construction, it is tagged with this label.

  3. Energy efficiency in operation: if the project introduced one or more measures to minimize the energy consumption during operation, it is tagged with this label.

  4. Energy quality: If the energy source of the project is renewable, then it is tagged with this label.

  5. Water efficiency: if the project takes effort to reduce the water consumption by introducing water-efficient sanitary wares, reusing grey water, utilize rainwater, it is tagged with this label.

  6. Material, waste and pollution: if the project takes effort to utilize recycled or recyclable material, reduce waste in construction and/or in use, avoid high embodied energy material and/or high pollution/emission risk, it is tagged this label.

- Economic sustainability

  1. Reduced construction cost: projects which successfully reduce the economic cost in construction phase (by lower cost on labors, less spending on materials etc.), is tagged with this label.

  2. Reduced operating cost: projects which successfully reduce the economic cost in operation (mainly in forms of costs in electricity and heating/cooling) is tagged with this label.

  3. Reduced maintenance cost: projects which successfully reduce the economic cost for maintenance (by using long life-span materials with low or minimum maintenance need, or conducting comprehensive functional testing before occupancy, etc.) is tagged with this label

  4. Increase building value: projects which successfully increase building value is

tagged with this label. Building value should not only include higher trade price in market, but also be represented as higher rent or higher occupation rate, etc..

5. Tax benefits and incentives: project which is granted incentives or applied lower tax rate because of sustainable design is tagged with this label.

6. Productivity gains: project which increase productivity is tagged with this label.

- Social sustainability

1. Quality of life and well-being: if the project takes effort to improve life quality (better indoor climate, healthy environment, better control of life, etc) and happiness of any group of people (users, in most of cases), it is tagged with this label.

2. Equity: if the project takes effort to help the enhance equality between different groups in society, it is tagged with this label.

3. Diversity: if the project takes effort to embrace different values, beliefs, religions, races, etc; or by other means to enrich the diversity of the society, it is tagged with this label.

4. Social cohesion: if the project takes effort to improve reduce social conflict, encourage communication, or promote mutual understanding between different groups, it is tagged with this label.

- Cultural sustainability

1. Culture of sustainability: project which encourages people to change their behavior and consumption patterns to a more sustainable way, and to adapt to a sustainability-conscious lifestyle is tagged with this label.

2. Heritage conservation: project which conserves valuable cultural heritage especially when dealing with listed heritage, it is tagged with this label.

3. Indigenous knowledge and traditional practices: project which recovers and protects traditional practices (including cultural health, history, and the culture of indigenous knowledge in society) and passing down cultural values to future generations is tagged with this label.

4. Design value: project which enhances the aesthetic feeling or architectural value of a building or space is tagged with this label.

1.4 Method

The study method we use here is mainly qualitatively studies. It starts with literature and case research, followed by face-to-face interview and analyses of collected materials in a frame of sustainability check-list we developed.

Theoretical Frame

The theory research on sustainability and renovation is based on books and journals in library as well as on the internet. Arguments and reference materials of Part 1 are majorly based on journals *Building Research & Information* from the last ten years and official documents from the UN or its agencies we found on-line. After reviewed the evolution of theories about sustainability, we choose the four-pillar concept as our theoretical cornerstone.

We browsed the journal *A+U* from the last ten years as well, to find suitable cases. This selection was started with an aesthetic filter: we first picked out the most attractive and interesting projects (from a architect student's view) by looking at pictures of them; once found a project interesting enough, we then read the description text and see if it fits our other criteria (see detail in §2.1). If the project fits, then we set it as our study object. Sometimes, interesting projects published on the magazine do not fit our criteria, but they could lead us to very interesting firms, and we will explore and find other projects they did which fits our criteria on their websites.

To establish the sustainability check-list, we also studied several sustainable assessment systems, including BREEAM and LEED (for environment and economical aspects), Social Sustainability Assessment Framework (for social sustainability) and Ten-Key-Themes of Cultural Sustainability (for cultural sustainability).

Sustainability Analyses

For each project, information regarding background, intention, progress as well as a short description on architects were collected and will be presented to you in the case studies. Our assessment on each project is sorted within the frame of sustainability check-list we established. Cases will be marked with/without sustainable labels on the list, to show if there is any measurement that fulfills our requirement.

This assessment should not only base on the measurements and effort they took, but also the operation result in the reality. But since most of them are very new and don't have a running report on operational efficiency, we will use our judgment and the information

we can access to make our best predict.

Interview

Our major channel to achieve useful information is through face-to-face interview with architects, and sometimes also the building managers and users. We contacted architecture firms of the targeted projects through e-mail and phone calls, then set a schedule for interviews. Interviews are based on a questionnaire (see attachment) which concerns about the architect's general understanding of sustainability and information about the specific project, it also includes questions for building owner/manager and users to prepare for contingencies. All interviews were recorded; other project related materials (drawings, photos) were collected during or after interviews.

All interviews on selected projects were carried out during our study trip from 27th March to 10th April, 2011. We visited Stavanger in Norway at the beginning and had a conversation with Randi Augenstein from H&H (28th March, 2011), followed by interview with architect Peter Haimerl (31st March, 2011), project manager Thomas Boschner, and architect Wolfgang Voigt form K+P (1st April, 2011) in Munich. Afterwards we moved to the Netherlands and met architect Bart Kellerhuis From Zecc(4th April 2011) in Utrecht, and architect Duzan Doepel from DSA, together with building manager Ben ten Hove from Urban Breeze (6th April, 2011) in Rotterdam. In addition we also visited two other architects, Rolf Bruggink(7th April, 2011, Rotterdam) and Olivier Henz (9th April, 2011, Eupen, Belgium), but their projects are not included in this booklet.

1.5 Layout of the report

The first part is the introduction, in which we discussed the present situation regarding sustainability and sustainable building; explained why we make this booklet and what we want to achieve; reviewed different concepts of sustainability, analyzed which concept is suitable for our aim; discussed the relationship between sustainability and renovation projects; described what method we used and what we did during the work process.

Part 2 is the main body and essence of this booklet, the case studies. In this part, the explanation about how we organized the interviews and information collecting progress is followed by elaboration of specific projects from every angle. In the specific case studies, we describe what measures were taken during the renovation and try to analyze what impact they have regarding sustainability.

The last part is our conclusion about what we find in the projects and our reflections on them . It includes the features discovered in different domain of sustainability, the restriction of our study, our unaccomplished intention, and possible direction for further development of this work.

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PART2 CASE STUDIES

CASE OVERVIEW

2.1 Case Overview

We set some criteria for case selection:

- In Europe: similar climate condition and social-cultural background to Sweden.
- Sustainable renovation project: reuse, revitalize or transform existing structure while bearing sustainable thinking.
- Integrated solution: approaching sustainability from various angles, i.e. caring about both energetic improvement and social contribution, preferably concerning as more items listed in our check-list as possible.
- Interesting from an architecture point of view: with innovative special design, unique style and be a feast for eyes.
- Be accomplished in recent years: not too old to be discussed in today's situation, meanwhile received some feedback and comments in various fields.
- Not too famous: should not be over exposed by media, so that still keep some fresh content to be discovered.

With these criteria in mind, we started browsing journals, books, and Internet, thereafter got the first selection of cases for further studying - proceed from a bunch of keywords: renovation, refurbishment, restoration, rehabilitation, renewal, retrofit and rebuilt. It was quite an assemblage, including 23 cases distributing in 7 European countries - Belgium, Germany, Switzerland, the Netherlands, Italy, Denmark and Norway. 8 of the cases are in the Netherlands, while 7 are from Germany, which composing a large proportion of the candidate list.

The next step was a series of elaborate filtration to narrow down the range. We looked at these cases through our "a lens" which is an aesthetic lens, that adoring the attractive, alluring, artistic or amusing architecture. We continued with looking into the project's background, intension, process, and result. The cases caring about sustainability in different stages of the entire process, while from diverse aspects were selected. We got help from our supervisor, too, who is more experienced and acute to hit interesting projects.

In the end of selection, we had to face the reality that there is no perfect project that is a good example in any respect. But we got five cases that all tried to reach sustainability from multi-approaches, while placed their emphasis on different angles. They are:

Stavanger Viechtach Munich Driebergen Rotterdam

- Student Dwellings on Mosvangen in Stavanger, Norway, from Helen & Hard Architects;
- Birg Mich Cilli - Holiday House in Viechtach, Germany, from Peter Haimerl and Jutta Görlich;
- Boschetsrieder Residential Estate in Munich, Germany, from Koch + Partner Architects;
- Energy-Neutral Monument in Utrecht, Netherlands, from Zecc Architects;
- HAKA Building: Recycled Office in Rotterdam, Netherlands, from Doepel Strijkers Architects.

Among the five cases, 2 are private houses, 2 are multi-family buildings, and 1 is office inside industrial building.

In order to get sufficient first-hand materials and deeper understanding about these cases, we planned interviews with architects of all cases, preferably with site visits and conversation with user or real estate owner, for getting more information on them, from proposal and construction to result and feedback. We contacted the architect office by e-mail and phone, explained our intension and asked if they would like to have an interview about their projects and their opinion about sustainable design. We were fortunate to have all response positively. We prepared questions for each project which we brought to the interviews. A prototype of questionnaire is attached in the end of this thesis.

We did two weeks traveling around Europe from the end of March to the beginning of April 2011. We managed to meet architects for all five cases and visit three of the projects. Birg Mich Cilli and Energy- Neutral Monument buildings are private house that we did not reach in person. Our route is shown on the map on next page. Detailed facts on our interviews will be listed in Table 1.

CASE OVERVIEW

Study Trip Map

Interview with Zecc

Interview with Urban Breeze

Interview with DSA

Interview with Peter Haimerl

Interview with K+P

Interview with H&H

CASE OVERVIEW

The trip started from Stavanger where we met Randi Augenstein, an architect from H&H in their office, who explained their work philosophy and introduced some of their projects to us. We were guided on a city map about H&H's interesting projects in Stavanger, after which we visited the projects as well as the Student Dwellings on Mosvangen. At the site of Mosvangen, we took photos of the building appearance and indoor common space. Two students who live there showed us the common facilities, kindly.

The second stop was Munich. We had an interview with architect Peter Haimerl - the owner and architect of project Birg Mich Cilli - in his studio, which is located in a residential area, accessed through an exhibition space in the ground floor. We liked both our conversation with Peter and the exhibition down there. Another day in Munich, we met Thomas Boschner (construction supervisor for the renovation of Boschetsrieder Residential Estate) and Wolfgang Voigt (managing partner of K+P) at the site of Boschetsrieder residential estate. All three of them were very kind and hospitable, who told us a lot of stories about their work, the projects and even recommendations to local restaurants.

After Munich we went to Utrecht by a long rail trip. The Energy-Neutral Monument itself is out of the city area that too far and inconvenient for us to reach. But we had a pleasant and informative interview with Bart Kellerhuis - architect, project leader, technical engineering and restoration - in the office of ZECC. We could easily tell the vigor, force, activity, and sensation of the young office from their working manner as well as their office arrangement.

The last stop of the trip was Rotterdam the harbor city. We had two meetings separately in the HAKA office building, with Duzan Doepel (one of the two partners of DSA) and Ben ten Hove (building manager from the development team Urban Breeze). Talking with both the designer and the operating manager gave us a comprehensive view of the project. We have to mention that the interior design of HAKA looks just as impressive as the photos we saw from the media coverage.

In the gaps between our interviews, we have visited some other related interesting projects and talked with some other architects and users. There are two other renovation projects in Stavanger also from H&H that we found fascinating, one is an cultural center on the east coast of Stavanger called Tou Scene, and the other one called Finn's Bakery is in the old town area. Another house refurbishment project in Eupen, Belgium by architect Olivier Henz is worth to study but doesn't fit our criteria since it was not finish by then. Also, a transformed art studio project called Black Pearl from architect Rolf Bruggink in

Rotterdam was amazing for its divertive spatial composition within the very limited floor area, and the interior contrast between old, rough and new, delicate. We enjoyed the great benefit from these trips.

When we came back to Chalmers, we started to review our notes and records from the interviews, and organizing the raw data got from the trips about the cases, at the same time we kept in touch with the architects for further material requiring and disabusing. We placed the case studies with a geographical order of the project locations that from the south to the north. We arranged all case studies with the common structure as you will read in the following part of:

- Brief
- Background
- Architects
- Intention
- Process & Result
- Sustainability Check List
- Comments

Table 1: Information on interviews

CASES	INTERVIEWEE	WORKING PLACE OF INTERVIEWEE	PLACE	DATE	DURATION	DOCUMENTATION	OTHER DATA
Student Dwellings on Mosvangen	Randi Augenstein	Helen & Hard Architects	Office of Helen & Hard Architects	2011.3.29	1h	Voice records, photos, notes.	Digital model building plans, sections
Birg Mich Cilli	Peter Haimerl	Peter Haimerl Architecture Studio	Studio of Peter Haimerl	2011.3.31	1.5h	Voice records, photos, notes.	Video of pro-cess, foam glass sample.
Boschetsrieder Residential Estate	Thomas Boschner, Wolfgang Voigt	Koch + Partner Architects	Boschetsrieder Residential Estate	2011.4.1	2h	Voice records, photos, notes.	Plans, material sample.
Energy-Neutral Monument	Bart Kellerhuis	Zecc Architects	Office of Zecc Architects	2011.4.4	1h	Voice records, photos, notes.	Plans, sections, elevations.
HAKA Building	Duzan Doepel, Ben ten Hove	Doepel Strijkers Architects Urban Breeze	HAKA office building	2011.4.6	1.5h	Voice records, photos, notes.	Project report

2.2 CASE 1

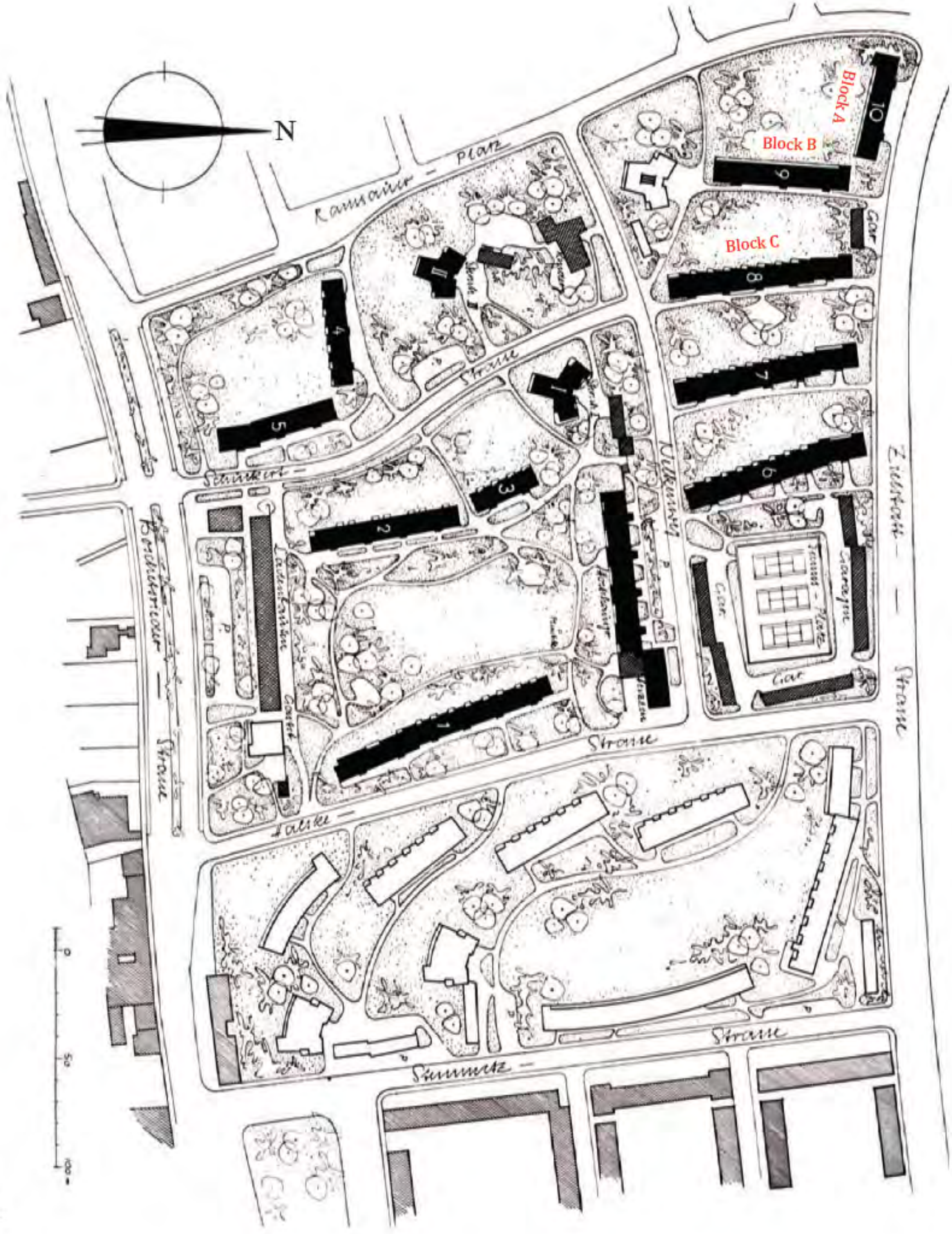
Boschetsrieder Residential Estate

-- From monument to energy efficient building

2.2 CASE 1

Brief

Location:	D-81379 München-Obersendling, Germany Block A - Zielstattstr. 145-147, Block B - Zielstattstr. 139-143, Block C - Zielstattstr. 133, 135, 137, Leo-Graetz-Straße 12+14,
Client:	Siemens Wohnungsgesellschaft mbH &Co. OHG
Architect 1953-1955:	Emil Freymuth
Architect 2006-2009:	Koch + Partner Architekten und Stadtplaner GmbH, Munich
Energy consultant:	Block C - Bau Haus und Garten Sachverständigenbüro Pils, Munich
Main contractor:	Probat Bau GmbH und CO KG
Renovation type:	from monument to energy efficient building
Original built:	1953-1955
Completion of renovation:	Feb 2009
Area of construction:	6341m^2
Cost:	ca.. 821.Euro (before deduction)/m^2 (ground face area)
Award:	Best practice example, Bayerische Klimawoche 2011 German builders' award / Deutscher Bauherrenpreis 2009/2010 Special Award: "Monument protection in house building" Bavaria builders' award / Bayerischer Bauherrenpreis 2009 dena Award for energy efficient buildings 2008/2009 Design Award of Wüstenrot Stiftung 2008 Award for the Renovation of Facades 2007, City of Munich



Pic 1: Bird view of the settlement.

Fig 1: Site plan of Siemens Siedlung (K+P, 2009)

2.2 CASE 1

Pic 2, 3, 4: Photos from the 50s'.
The settlement was famous at the time. Some of its photos were published as postcards.
Pic 5: Appearance of Block 6 after the first renovation in the 1980s.
Pic 6: Appearance of Block 5 after the first renovation in the 70s'.
Pic 7: The third star house built up in 2006.
Pic 8: Appearance of Block 6 after the first renovation in the 70s'.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2.2 CASE 1

Background

The settlement is a residential development on the Boschetsrieder Street in Munich Obersendling, known as “Siemens-Siedlung”. The settlement was planned in the early 1950s by Cologne Architect Emil Freymuth. It originated in 1952 as a residential area for workers of the company Siemens. It was also called the “white settlement” because of the pure white facades, originally.

It includes in total of 13 buildings. The most prominent buildings among them were two 17-storey high-rise buildings, that been called "star houses", because three wings branching off a central part that form the star-shape on the plan. It was the first residential development with high-rises in southern Germany. The two 51-meter-high buildings were the tallest building in Munich at the time of their inception. Besides the high-rise buildings there are blocks of different heights, including two-storey terraced houses and a 12-storey residential building in block form. A row of shops bordering the neighborhood on the south edge, kept the area therefor free from traffic of the busy street Boschetsrieder. [1)]

All together 528 apartments were constructed. In addition to the equipment of garbage chutes and intercom, all apartments got a balcony or had loggia. The floor plan layout was taken to ensure the best orientation that most flats have the bedrooms on the east or north side, while the living rooms face south or west.

The settlement was not commonly done as other developments in the 50’s. One must be aware of the situation at that time, that material and resource were not easy to get after the World War II, meanwhile workers were not professionally trained, and of whom some even might be unreliable. It was hardly to get enough material for building and to manage workers, no wonder that architects didn’t consider much about building performance, landscape, nor other architectural values at that hard time. But Siemens-Siedlung was special. Thanks to the pursuits of high quality of the developer and the architect, that it was assessed as distinctive for its elegant exterior and well-designed interior.

The entire ensemble of Siemens settlement was listed as pioneering post-war architecture. This was one of the unique places in Bavaria. You may find such settlement in Berlin, but not common. I think this is one of the two settlements built from the 50s in Germany which has been protected. Very special… --Thomas Boschner[2)]

The buildings were modernized in the 1980s when the first Thermal Protection Regulati on(Wärmeschutzverordnung)* went into effect. Thermal insulation system has been applied as part of this modernization to the buildings, together with replacing wood windows and doors with plastic windows, and placing a wooden structure with tin roofing on top of the original metal sheet roof. Because of this modernization, the original appearance was destroyed - there was nothing left that reminds of the 50's. [3)]

A third star house which was planned but not built in the 50's was built in 2005-2006 at the Leo-Graetz Street 16. Its design was modeled on the other two residential towers from the 1950s by the Otto Steidle office. The third star house was awarded the prize "Maintenance of Munich City / Stadtbildpflege der Stadt Munich 2008".[4)]

From 2006 to 2009, K+P architects appointed by Siemens did thorough renovation of blocks A, B and C – 3 out of 13 buildings of the settlement (see Fig 1). The renovation applied a new energy concept, restored the original appearance for the sake of heritage conservation, and increased the potential for a higher quality of life.

According to a report released in early 2009 by Siemens Real Estate, the entire housing stock of the Siemens-Siedlung was sold to a consortium consisting of Wohnbau GmbH (Bonn), the GBW Gruppe (Munich) and the Volkswohnung GmbH (Karlsruhe). [4)] This caused the suspension of further restoration to be conducted for the whole settlement.

* Thermal protection regulation (Wärmeschutzverordnung – WärmeschutzV) :
The German regulation on energy-saving thermal insulation in buildings, first appeared on 1 November 1977 as a result of the 1976 passed Energy Conservation Code (EnEG) came in force.

2.2 CASE 1

Architects

K+P Architekten und Stadtplaner[5)]

Munich, www.kochundpartner.de

K+P Architekten und Stadtplaner is one of the large German architectural offices. It has a highly trained team comprises of architects, urban and regional planners, building and civil engineers and interior designers. Their employees, who have been with the company for many years, have invaluable experience and knowledge acquired both in Germany and abroad. The office is involved in all stages of the planning and design process. Their service extends from early phase planning to engineering work. K+P works with sustainable consciousness. They would persuade client to support a sustainable project with different means, like a long-term economic benefit report is typical.

At the time when we met Thomas Boschner and Wolfgang Voigt in Apr 2011, 5 out of 40 people in the office were working on renovation projects.

Pic 9: Photo from the 50s'. © K+P

Intention

Urban heritage conservation and energy efficiency was the motto of this project. While energy optimization of this special settlement is not just a matter of technology and money, to restore the original appearance is not just a face-lift neither. Consideration of monumental buildings under the energy-related issues should be discussed and resolved by this renovation. The beauty of this settlement in the 50's should be recovered, and the whole settlement would become the pioneer that reaches the energy-efficient standard of EnEV*. It was Siemens' idea, but more like every stakeholders' wish about this project: show the possibility to the world. [2)]

* Energy Saving Regulation :
On 1 February 2002, the Germany Thermal Protection Regulation was replaced by the Energy Saving Regulation (EnEV), which the first time combines the thermal protection regulation and the regulation of heating system (HeizAnlV) into one.

Pic 10: The appearance changing. © K+P

2.2 CASE 1

Process & Result

In early 2007, German heritage management organizations* had advocated that memorials should be adapted to the requirements of energy conservation. [6)] Monuments can be viewed energetically, and should have been. Monuments can also have a pleasant atmosphere that conforms to the modern society's aesthetics. These called for the renovation to deal with more in terms of a comprehensive view of the relationship amongst historic preservation, resources conservation and energy efficiency.

The challenge was to restore the original appearance from the 1950s in a situation of lacking original architectural drawings and technics, at the same time, taking care of energy optimization and indoor climate. Because of the special protected status of the settlement, the renovation was carried out in close collaboration with the heritage authorities. For this purpose a comprehensive restructuring plan was developed that creates a consensus between the creative aspects of historic preservation and the energetic, structural and civil engineering needs.

The renovation took place in three phases corresponding to Block A, B and C. The parallel logistic work of moving and rehabilitation of 80 households was conducted. Inhabitants were offered alternative apartments to live during the renovation. They could make their choice weather moving back into the block after renovation or to somewhere else. Many detailed problems came up during planning and construction that had to be solved individually which required extra effort from the architects.

* German heritage management organizations in this case including:
Deutsches Nationalkomitee für Denkmalschutz
Vereinigung der Landesdenkmalpfleger in der Bundesrepublik Deutschland
Deutsche Stiftung Denkmalschutz
WTA-D: Wissenschaftlich-Technische Arbeitsgemeinschaft für Bauwerkserhaltung und Denkmalpflege
DBU:Deutsche Bundesstiftung Umwelt

Exterior Insulation and Finishing System (EIFS)

EIFS was crucial for this settlement to reach the energy-efficient standard. Highly insulated EIFS was applied which is a combination of former added 5cm-thick insulation and a new layer of insulation.

> *Above the ground we used mineral wool which made of stone, because the fire protection character. Like beside the window and openings, the material should be able to stop the fire spreading from side to side. We added mineral foam as insulation especially on the ground area, since it's good at bearing pressure and can stay in the wet. -- Says Thomas Boschner.* [2)]

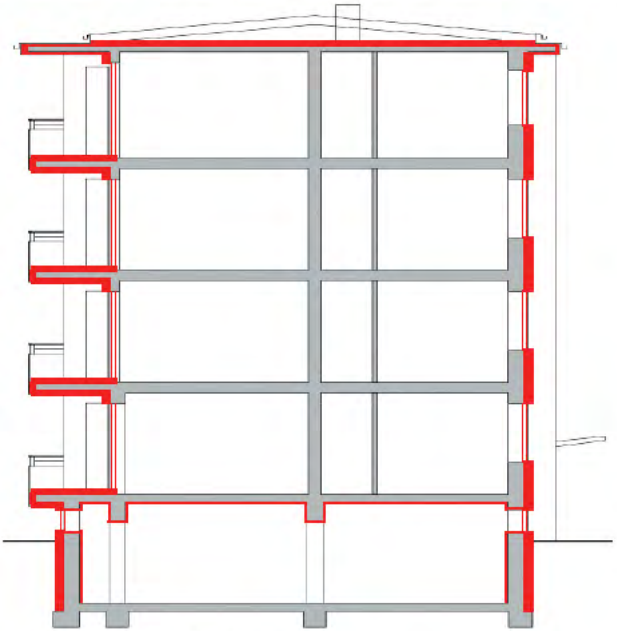
On the facades, mineral wool layer got double secured connection to the wall structure by both glue and nail, so it would stay at the right place lifelong.

Though insulation could not be laid under the floor of the basement which is commonly done with new constructions today, the cellar was not very cold in winter. That is because the mineral foam was added on both sides of the cellar wall, which went 1.5 meters down below the ground surface , in order to seal the building properly. 1.5 meters deep is below the frozen line of Munich, so not much heat or cold could pass around it. Finally, the insulation layer for exterior wall reached U-value of 0.20 W/m^2K; under the basement ceiling 10cm of mineral foam layer was attached that decreased the U-value to 0.26 W/m^2K. Windows were replaced with better thermal-insulated ones with triple-layer glass which has U-value of 1.10 W/m^2K (see Fig 2).

Thermal image technology was helping with detecting thermal defects. All problems were solved as perfect as possible. For example, more efficient insulation* was put at the corners and joints to block out cold-bridges. As one could see from the thermal images took before and after the renovation, heat loss from the interior was greatly reduced[3)] (see Fig 3).

* More efficient insulation here means still mineral wool board but with greater performance and thickness.

2.2 CASE 1



Roof: 25-30cm mineral wool around top ceiling.

Corner: extra insulation was put at corners.

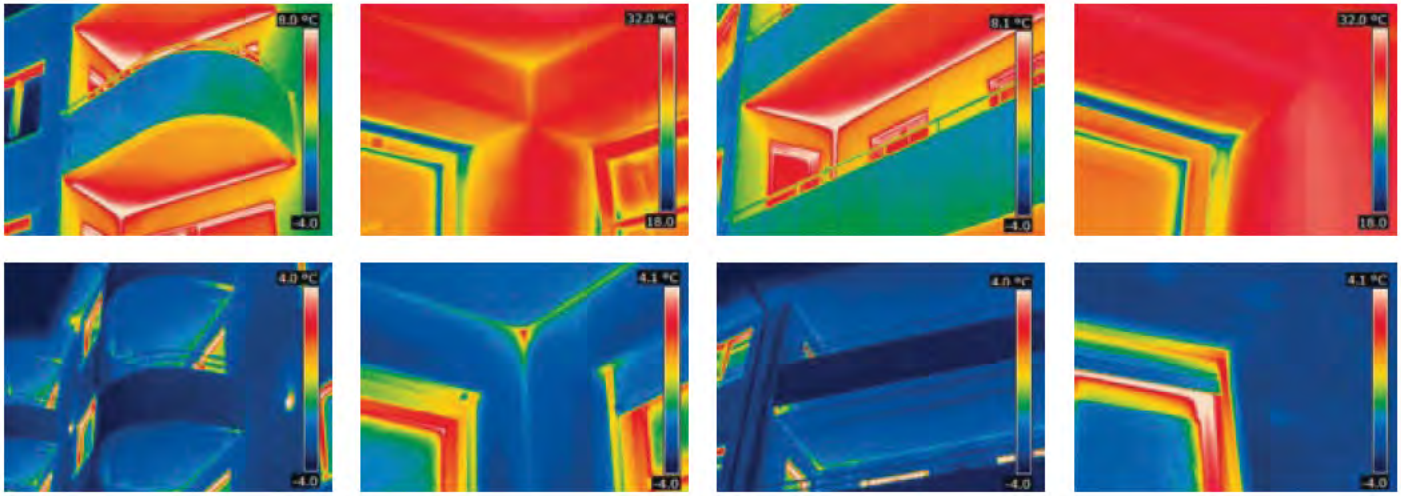
Balcony: the whole balcony slab was wrapped with insulation material.

Door and window: with 3-layer insulated glass.

Cellar: mineral foam was added on both sides of the wall.

Fig 2: Exterior Insulation and Finishing System. (based on K+P, 2009)

Fig 3: Thermal images of before and after renovation. (K+P, 2009)



Pic 11 - 14: Before and after renovation.

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© K+P 15

Pic 15: Construction photo of facade renovation.
Pic 16: Mineral foam insulation in the bicycle storage.
Pic 17: Mineral foam insulation in the corridor of basement.

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Restore the original beauty

Comply with the requirements from heritage authorities, the architects tried to bring as much as possible of the appearance and indoor details back to the original, which was not an easy job. The original was destroyed in the 80's as mentioned above, so the work is not simply preservation. There were many issues, for example with only some old photographs and limited knowledge of experience handed down, the architects had to figure out how details were solved in the 50's; at the same time, the manufacturer who produced building elements for the settlement cannot be found today, so lost some technics that have been used in the original.

Colors on the façade that have been painted in the 80's were reversed to the "broken white" same as when the buildings were called the "white settlement". The ceiling of balcony used to be dark red, which was complained that the reflection gave living room a dark and unpleasant atmosphere. So there was an agreement on a small variation from the original that the balcony ceiling would be painted with the same white as façades.

The restoration was more complicated than expected, but all problems were finally solved with careful solutions. We would mention some details of the restoration to roof, window and staircase where the key to success was.

Roof

The roof restoration was a tricky one. As required by the heritage authorities, the roof should look like the original from above (view from the skyscrapers) except the new ventilation fitting that been added; and from the street view, the typical narrow roof edge should be kept, while renew the roof overhang, gutters and corners; plus insulation measures.

Another structural problem emerged to the architect made it worse. When people opened the roof top for aesthetic renovation, they saw the concrete iron stretched out that was not the right position it should be, and which means the structure was not reliable. So occasional columns were put up supporting the top ceiling, as what we saw during our site visit when the roof renovation was ongoing in April 2011. Had to do energetic renovation and reinforcement to the roof, but couldn't just do normal additions, like casting another layer of concrete on top of the old structure or attaching another layer of insulation material, because of the aesthetic consideration that additions would make the roof too thick

Pic 18: Construction photo of roof renovation. The roof cover was opened and cleaned for reinforcement and insulation.
Pic 19: Bird-view of one renovated block. The roof looks almost the same as the original, except some ventilation fittings added on.

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2.2 CASE 1

and heavy. This hot potato made everyone anxious at the time.

The cure came up just for this case was a special renovation with very new technics. Fiberglass* was explored which is a lightweight, extremely strong, and robust material that could recover the roof structure and won't bring aesthetic trouble in this case.[7)] Strips of fiberglass were glued on top of the roof concrete and thermal insulation was attached to the top ceiling under the roof. One could see the strips grids on the roof before the cover layer of stainless steel plate was put on. But from the street view, "the roof edge looks so thin, like you cut it out with a scissors", says Thomas.

Windows

The original windows have been changed with new in the 80's that brought subtle but annoying alteration to the appearance. In the latest renovation 2006-2009, as mentioned above, all windows were replaced again by new ones for the sake of energy saving, while the disharmony of white window frame was taken care of: dark green frames combined with white moving wings made the frame look thin and narrow, so that the overall look now is very close to the original.

* Fiberglass (also called glass-reinforced plastic, GRP, glass fiber-reinforced plastic, or GFRP), is a fiber reinforced polymer made of a plastic matrix reinforced by fine fibers of glass. It is also known as GFK (for German: Glasfaserverstärkter Kunststoff).

Pic 20: Roof edge detail - above wavelike balconies.
Pic 21: Facade detail photo.
Pic 22: Exterior wall foot detail photo.
Pic 23: Roof edge detail - corner.
Pic 24: Window frame detail photo.
Pic 25: Windows of the staircase.
Pic 26: Windows on the facade.

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Windows with gray frame that occupied the whole east elevation of the staircase were lucky to survive. They got also updates in this renovation – original frame was kept and installed with better insulated glass.

Because of the additional insulation layer attached to the exterior wall, window reveals would became deeper on the façade. That would be another small but not tolerable change to the overall appearance, so that the windows were shifted a bit towards outside, constructed at the same depth as the insulation layer. As the result, the original scale of the outdoor window sills are kept, and bigger indoor sills are available.

Stair case

Staircase of a residential building could be called the reception for tenants and their guests. So the identity of staircase would be the first image of the families living in the building. Architects paid attention to restore the staircases simple and refined, as they were in the 50's.

The staircase got renewed carefully with all the details. Entrance to staircase has been renovated as the original, where gray marble tiles added in the 80's were removed then painted white as the facade. Pavement in the staircase which originally was imitation black marble was mended with natural marble tile that looks exactly like the old. While the natural marble was not the preferred option, but the formulation of producing that kind of imitation tile does no longer exist. Fortunately, there is still manufacture that produces the old style of rubber handrail which was popular in the 50's. Great effort was done to recover the original fringes, small as the baseboard.

Pic 27: The appearance changing of building entrance. © K+P
Pic 28: Detail photo of preserved original window handle.
Pic 29: Detail photo of original window frame installed with new glass.
Pic 30: Detail photo of handrail produced by traditional technique.
Pic 31: Inside the staircase.

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2.2 CASE 1

New standard of life

Adjusting the historical building to meet the modern life standard is a big operation to the building which is not possible to conduct without affecting the whole. So the architects did take the chance this time, together with the energetic and aesthetic renovation, made thoroughly updates to the entire building. This attempt to a better living condition and better indoor climate was processed mainly form three perspectives: building material, fittings, HVAC system.

In most cases, the layout on the plan of an old building would need adjustment to suit the modern living style; but in this case, thanks to Emil Freymuth's carefully work, the plan was so well optimized that the only thing left to do was keep the existence as much as possible. Although the buildings were evacuated and all subsidiaries were demolished during the renovation, the floor layout was preserved. (see Fig 4, Fig 6) While the interior designer was not easy, because among other things, there had many detailed requirements protecting the monument.

Building material

When cleaning up the building, contaminated materials, moulds and dusts were found between wall layers, inside pipes, pockets or other dead spaces. They would impact on the health of people who lives in the building, cause serious disease even. They have been totally removed and replaced in the renovation with qualified building material.

New fittings

Fittings in the kitchen and bathroom were renewed with up-to-date norms. New appliances and sets are easy to operate, meanwhile have better electricity and water efficiency.

HVAC systems

Heating, ventilation and air-conditioning systems have also been updated for better performance and less operating cost.

The single-pipe system from the 1980s was replaced by a two-pipe system with radiators and convectors. The conversion of the hot water was from a decentralized heating with

electric boiler per household towards a central heating supplied by district heating with central circulation per building. A ventilation center ensures each building to achieve continuous fresh air by means of a central exhauster in bathrooms and kitchens, and fresh-air inlet on the facade. [3](see Fig 5) Now the apartments get completely air exchange three times a day which means that there is almost no need to open the window. This is in a way convenient for the senior tenants who retired from Siemens. It also assures that the apartments are served with fresh air to avoid humidity damages [2]

Energy concept [5]

Heated volume: 11121m^3

Envelope insulation value (actual value): 0.35 W/m^{2}K

Heating / energy: district heating

Hot water production: district heating

Heating demand (actual value): 32.00 kwh/m^{2}a

Final energy demand: 53.40 kwh/m^{2}a

Energy consumption was reduced by over 60%.

Primary energy saves 82.1%.

CO2 reduction is 63 t / a

The rent of apartment in the renovated blocks has been raised a little bit according to the Germany regulation*. But the gain from reducing energy cost could easily make it up. So as the tenants feel very happy about the result.

As mentioned above, the settlement was sold to a new owner and the overall renovation stopped after the block A, B and C. The other buildings including the two star houses got only requisite fire-protection and safety retrofitting. Nevertheless, the efforts of renovating this historical settlement were rewarded by multiple awards.

* Rents are tightly controlled and cannot normally be increased by more than 20% nominally over three years in Germany.

2.2 CASE 1

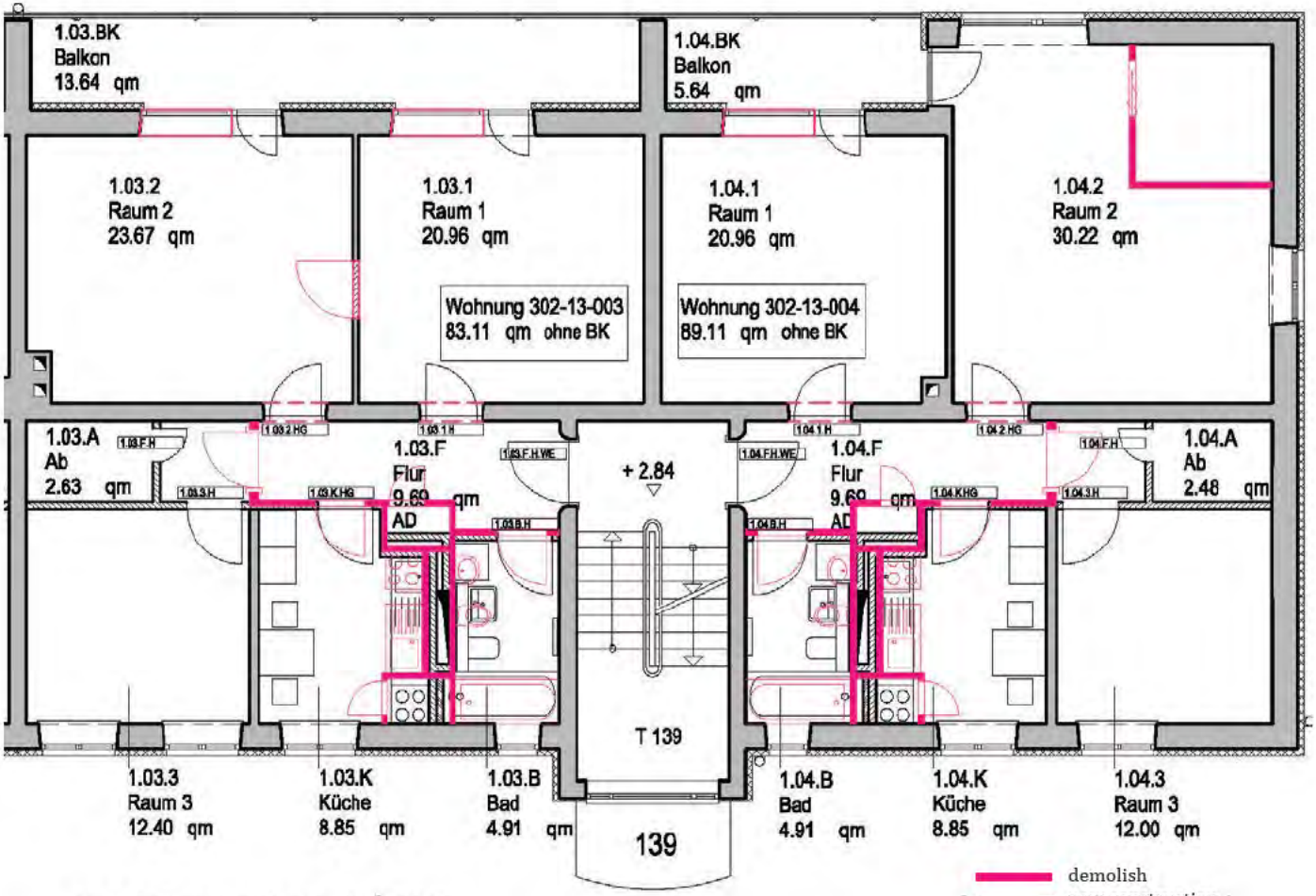

Fig 4: Flat layout modification. (K+P, 2009)

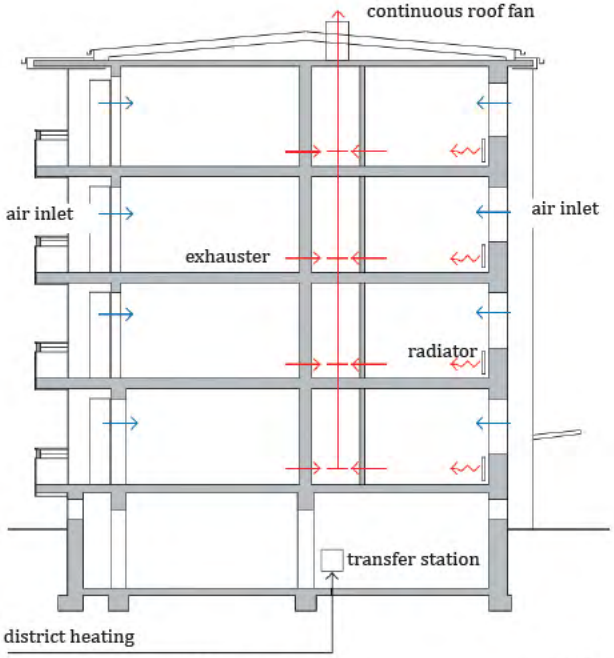

Fig 5: Ventilation and heating system scheme. (K+P, 2009)

Pic 32: Construction photo of interior.

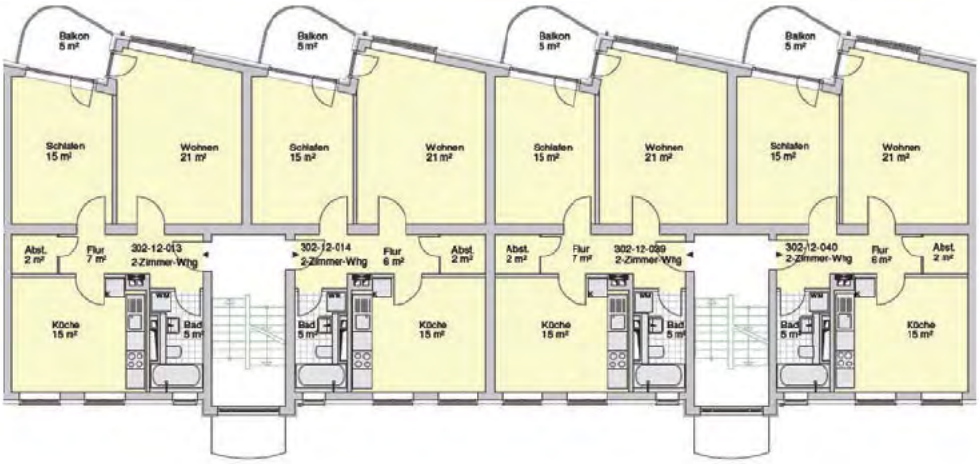

Fig 6: Flats layout. (K+P, 2009)

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2.2 CASE 1

© K+P 35

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Pic 33, 34, 36: Photos after renovation of the white facade and balconies.
Pic 35: The building looks elegant and the area is full of peace in the snow.

2.2 CASE 1

Sustainability Check List

Environment:

- ☻ Energy efficiency in operation
- ☻ Material, waste and pollution
- ☻ Water efficiency

Energy Quality

Energy efficiency in construction

Management

The renovated Siemens settlement in Munich is a successful example of cautious use of existing listed structures, in particular, to rehabilitate the buildings more energy efficient which greatly reduced the environmental impact in operation. As one could read from the energy concept of the building, final energy demand is 53.4 kwh per square meter per year. While a comparable EnEV standard for new constructed energy efficient building should have annual energy demand less than 81.9 kwh/m^2. It is very clear that in this case the renovated buildings have much smaller energy demand than the standard; as the envelope insulation value of the renovated building reached 0.35 W/m^2K, while the nominal value from EnEV standard is 0.67 W/m^2K, the renovation result surpassed the standard again. [3] This remarkable result is not commonly reached for renovation not even for new constructions.

Mineral foam is kind of new insulation material that was attached on the basement wall and ceiling in this project. It is essentially a concrete mousse, filled with millions of microscopic air bubbles that puff it up to a shaving-cream like consistency. Mineral foam offers all the benefits of spray-foam insulation plus it is fireproof, and it is inert with no off-gassing. It offers not just insulating resistance and airtight sealing as with expanding foam, but also it has thermal mass unparalleled by any insulation on the market today. Mineral foam could be seen as a sustainable material since it consists of magnesium oxide and air, made from magnesium oxide extracted from seawater, at the same time, unlike other methods, mineral foam does not emit dust, fibers, or chemical vapors/volatile organic compound into the air, it is nontoxic, even during application.[8]

As the renovation have faced many limitations for the sake of heritage protection and lost original technical drawing and supplies, it was not easy to arrange the construction process while to control the construction cost. It is not surprising that the impact of environment was not very much considered during the construction even if the project really wanted to manager every issue perfectly.

Water consumption reduction in this case is neither a focused task. It is very much depending on the habits and customs of the inhabitants. But still, by updating the kitchen, toilet and bathroom facilities with new ones with better water efficiency, water consumption would be hopefully reduced.

Pic 37: West perspective photo of Block C after renovation.

Pic 38: Kids playing in the area.

Social

- ☻ Quality of life
- ☻ Social cohesion
- Diversity
- Equity

Besides the main tasks that were conservation and energy efficiency improvement, this project worked for elevating the living standard of tenants which contributed to social sustainability. The renewed apartments are more intelligent and comfortable at the same time cost less for heating while need no big maintenance in the near future. The area looks been well set up and taken care of, where one could live in peace and contentment. No wonder tenants who live there are very happy to see the result.

Furthermore, the restored appearance shows the manner and vitality of the settlement. It regained the landmark state in that urban district, which it used to have in the 50's. So in another way, the tenants are proud of their settlement.

Accessibility for wheelchair is remaining a problem. It was not possible to add elevator to the building without big changes of the structure, which will destroy the protected feature. It is a defect of this project but reasonable and quite common among renovation projects.

Pic 39: South perspective photo of Block A and B after renovation.

Economic

- ☻ Reduced operating cost
- ☻ Reduced maintenance cost
- ☻ Increased building value
- ☻ Tax benefits and incentives

Reduced construction cost

Productivity gains

The renovation cost is reasonable but not cheaper than other general renovations. Due to the difficulty to get the comprehensive solution - one has to pay more for getting the eye for details and perfectionism. This is common for renovation projects that the initial investment and construction would cost a bit more, but the long-term interests is better, as well as other added value when look from other aspects. In this case, the great improvement on energy efficiency and property value will pay back to the project in a long-term plan.

In particular, this renovation project received incentives from the Bavaria state for its special heritage status and its demonstrational energetic refurbishment. As well as many awards and prizes from different institutions for its great achievement.

2.2 CASE 1

Cultural

- ☻ Architectural value
- ☻ Heritage conservation
- ☻ Indigenous knowledge and traditional practices

Culture of sustainability

The superb design from Emil Freymuth in the 50's made the settlement a pioneering post-war architecture listed building set. The renovation dedicated to restore the original appearance while keep the nice flat layout, while successfully. Their trying to recover the true details following the traditional crafts deserves credit.

The white settlement after renewal, maintaining the historical moment with its appearance be extremely clear and just like nature itself. It is very harmonious to its surroundings, especially in the winter after snowing. The area looks full of peace and delight.

Pic 40: Block C in the winter.

© K+P 40

Comments

When working with heritage building, the discussions are normally about preservation, very little from social aspects, and nothing about environmental concern. "Preservationists here are usually not for the 'good conscience of society'. They are not as 'reminders' in the positive sense, but rather than naysayers to progress and future inhibitors that impede the development of society at least, if not their survival. "[9] So it was very interesting to see the meeting of historical conservation and energetic refurbishment in this project.

Here the renovation of Siemens-Siedlung demonstrated the possibility to take multi aspects of sustainability into consideration. As a result, it built up "a consensus between the creative aspects of historic preservation and the energetic, structural and constructional requirements created and thus the conservation and sustainable appreciation of the stock for the future secure."[9]

2.2 CASE 1

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3) Oberste Baubehörde im Bayerischen Staatsministerium des Innern (2011), “Generalsanierung Boschetsrieder Siedlung, Beispielhafte Bauten, Energieeffizientes Bauen in Bayern”, available at: http://www.kochundpartner.de/cms/download/ZIEC_Best_Practice_D_OB_2009_KundP.pdf (accessed 2011-11-2), translated from German.

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2.2 CASE 2

© Peter Haimerl Architektur 1

2.2 CASE 2

Brief

Location:	Cilli Sigl, Eben 4, 94234 Viechtach, Germany
Client:	Jutta Görlich and Peter Haimerl
Architects:	Peter Haimerl, Jutta Görlich, Munich
Main contractor:	AKA – Ingenieure, Munich
Renovation type:	From abandoned farmhouse to holiday house
Original built:	1840
Completion of renovation:	Aug 2008
Area of construction:	ca. 200m^2
Cost:	100.000 Euro, 500 Euro/m^2
Award:	" best architects 09 " gold (Kategorie: Wohnungsbau) Architecture Award for Concrete Buildings / Deutscher Architekturpreis Beton 2008 Regionalpreis Niederbayern Oberpfalz 2009 BDA Preis Bayern 2010 (Kategorie:Umbau) Deutscher Architekturpreis 2011 (Recognition)

 2

2.2 CASE 2

Background

Bavaria, the largest German state by area, is located in the southwest of the country. It is one of the oldest states of Europe, established as a duchy in the mid first millennium. Modern Bavaria also includes parts of the historical regions of Franconia and Swabia. Bavaria's capital is Munich. Some features of the Bavarian culture and mentality are remarkably distinct from the rest of Germany. Noteworthy differences (especially in rural areas, less significant in the major cities) can be found with respect to different perspectives, such as their traditional music, dance, food and drink.[1)]

The original farmhouse was built inside the German Bavarian forest in 1840 (see Fig 1). The farmhouse was typical which reflects the past rural life: Barn in the house, the sitting room as only warm core, the attic as grain storage, cheap and recycled building materials, etc. The house had several owner changes. They brought additions and extensions to the house, e.g. (see Fig 2). The roof framing were raised in 1890.

Fig 1: Satellite photo of the house in the forest.
(Google Imagery, 2011)

Pic 1: North facade photo.
Pic 2: South facade photo - before renovation.
Pic 3 (Pictures on next page): Cilli in 1970s. Stills from Drei sind einer zuviel.
(Drei sind einer zuviel, 1977)

The last farmer's wife, Cilli Sigl, died in 1974. The house was named after her, which follows the folkways. In 1976 was the series "Three is one too many" /"Drei sind einer zuviel" (see stills on next page) [2] shot in Cilli. After then Cilli was standing unattended.

In the past thirty years, most of the old farmhouses in Bavarian forest were destroyed by demolition or replacing with modern houses. The reason could be simple as modern house brings very different quality that suits the modern life; It could also because of ignorance and the lack of appreciation to the "old stuff"; Maybe also to erase the witness of a rather poor time. Anyway, the consequence was the deficit of regional architectural tradition - Space for the "elderly" can be found almost only in farm-museum villages.

Peter Haimerl - the architect, the owner and the client - got the farmhouse from his mother. He together with his wife - artist Jutta Görlich, planned for long and carried on the renovation "Birg Mich, Cilli!", literally means "Harbour me, Cilli" , in 2008.

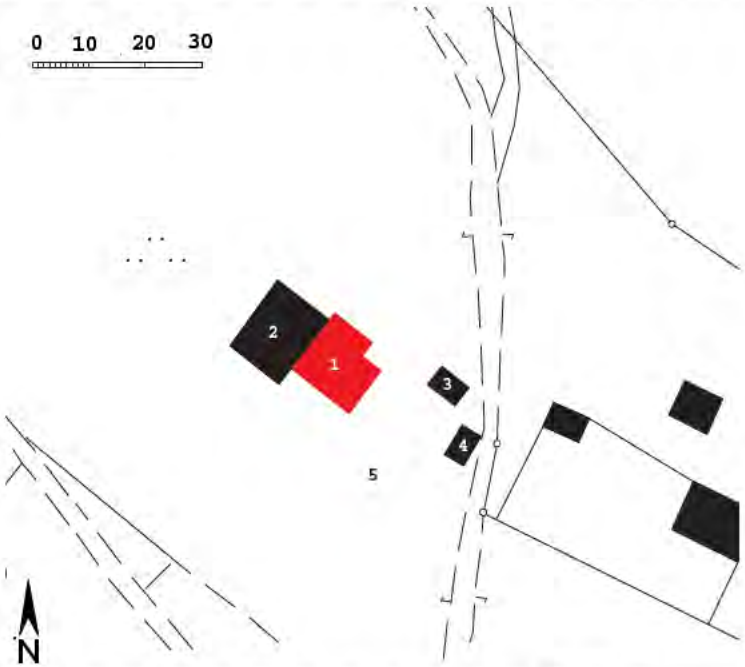

Fig 2: Site plan.
1 old farmhouse
2 barn
3 hovel
4 old oven
5 mixed orchard meadow
(Peter Haimerl Architektur, 2008)

2.2 CASE 2






















2.2 CASE 2

© Gero Wortmann 6

© Peter Haimerl Architektur 5

© Peter Haimerl Architektur 7


8


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15


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13


14

Pic 4, 5: Situation of Cilli been "abandoned" before the renovation.
Pic 6, 7: The living room before renovation.
Pic 8-14: © Peter Haimerl Architektur Details of the original farmhouse after vicissitudes.
Pic 15: The wood structure.

2.2 CASE 2

Architects

Peter Haimerl . Architektur

Munich, www.peterhaimerl.de

Peter Haimerl – Studio for Architecture und Consulting is a company specialized in architecture and urban issues. Since its foundation in 1991 the studio explores the potential of existing technologies for architecture through several projects.

> *"Technology is changing our spaces; technology is changing the way people relate, move and live. The projects we carry out develop these changes in spatial relations achieving unexpected solutions with high levels of comfort. A building should always be a source of true comfort and interest and, if desired, have the ability to become an icon… We search for innovative solutions that fit the best to each situation, exploring the different challenges our clients propose us." Peter Haimerl*[3)]

A big portion of Peter Haimerl's work is renovation projects and he has special interests and plans to work with old farmhouses. He has enthusiasm and pride to rural culture and architecture, due to his experiences. He loves and respects to wisdoms contained in the simple-design and well-functioning farm houses. He deals with old building gently that to keep the historical beauty alive while suits the modern life. He believes that design starts from and follows one's cerebration about life and architecture, but should never adore the fashion or luxury. He takes care of sustainability like environment and energy issues in his work but he doesn't do it for a "green" label. Good architecture is born to be sustainable. [4)]

Intention

The abandoned farmhouse was planned to transform into a holiday house which could ensure a periodical modern quality life, while at the same time memorize the past. How to improve the living condition so carefully that not to destroy the historical value of Cilli was the main task for renovation. Here the historical value is not only the ancient skills kept in the structure, nor the artistic image come from vicissitudes, but also the emotional ties between the clients/architects and the past time.

A TIPTOP-Jodel cottage renovation for my old farm house is out of the question. I want the patchwork-like, fractional of the old house remains visible ... you should see the places where it had expanded, where it had grown with the needs of the people ... its history still readable inside the building, from the layers of peeling paint, from different wall thicknesses, from the different phases of construction, from the age-old power lines, and the manger in the barn... Therefore, a conventional renovation to me is unthinkable, as to change existing layers of insulation, paint and plaster after which the actual building is very little left. The climate in the house may not change completely, to remain rural and non-urban with Bayerwald folklore.-- Jutta Görlich [5)]

First of all, I look at the historical value, if the history still visible or alive. But what also important is a step to modernism, I tried to not just renovate it, but to find a connection to nowadays… I feel there is a real gap of architecture quality between the 50s and nowadays. I tried to connect to the historical point… Concerning of old buildings is very interesting to me.-- Peter Haimerl. [4)]

2.2 CASE 2

Process & Result

The architectural concept intends to keep the existence - as ruinous at it might be - and not to intervene into the structure of the old farmhouse “Cilli”. For about ten years, Peter and Jutta were looking for the optimized solution for “Cilli”, not only about how it should look like, but also how it should be built. They came up with three architectural concepts:

I. Almost everything stays as it was

II. New rooms in the original

III. Open the old: cut-outs in the walls

The construction started with carefully cleaning up of “Cilli”. The rooms of the old building stay as they are; barely anything of the existent has been removed, that is imperative to the windows, the old plaster, the floor tiles and the other old fixtures. Other material which would be removed will be recycled to produce furniture.

Followed was setting form for new concrete cubes and casting them on site. Those concrete cubes were planned to be placed into a few central rooms, for example the old parlor. New kitchen, bathroom, living room and bedrooms, new furniture and fittings, came along with the concrete cubes, were equipped to “Cilli”. Floor heating system was embedded into the concrete cubes which connected to a wood burning stove. So rooms inside the concrete cubes are cozy for the new life to take part in.

Everything went well as the design at the beginning, but there appeared a problem for the architect/client of getting permission to build with that particular cellular concrete. In Germany every building material gets a “passport” after it being proved to be able to use in construction. The concrete that Peter wanted needs foam glass aggregate, which was kind of breakthrough, and didn’t get the “passport” at that time. This brought some trouble to the construction, and once the construction had to be paused for a while. Anyhow, it just took time for the brand-new concrete to pass the examination, and the construction was continued. (see Pic 15 - 23)

A short film was made by the local TV station while finishing the renovation, to introduce this unique project where concrete cubes cover the old structure, however, the original are still visible because of large cut-outs on the cubes, and to show how people spend their modern holidays inside this 170- year-old farmhouse - Cilli. Sandra Hofmeister [6] has

also written about this inspiring renovation from where one can learn more about today's situation of "Cilli". At the same time, "Cilli" has played a main role in Jutta's artistic photos. (see Pic 25 - 32)

Unfortunately, we didn't get the chance to visit Cilli in person. But according to Peter's representation, Cilli got a lot of attention and comments from the media and other people, especially the locals, no negative report almost. The project got several architectural awards from both the state and the region. In one word, "Birg Mich Cilli!" is a successful renovation that how it takes care of tradition and modern life worth to visit and learn from. But Cilli is enjoying its new life and doesn't want too many visitors.

Pic 16:
The living room ceiling was missing before renovation, therefor the form work and concreting were easier in this part of the house.

2.2 CASE 2

Pic 17: In order to reach the kitchen a comfortable height, was dug the soil over a meter deep.
Pic 18, 19: During construction: The exterior walls were supported, as they serve in the concreting of new cube inside as permanent form work.

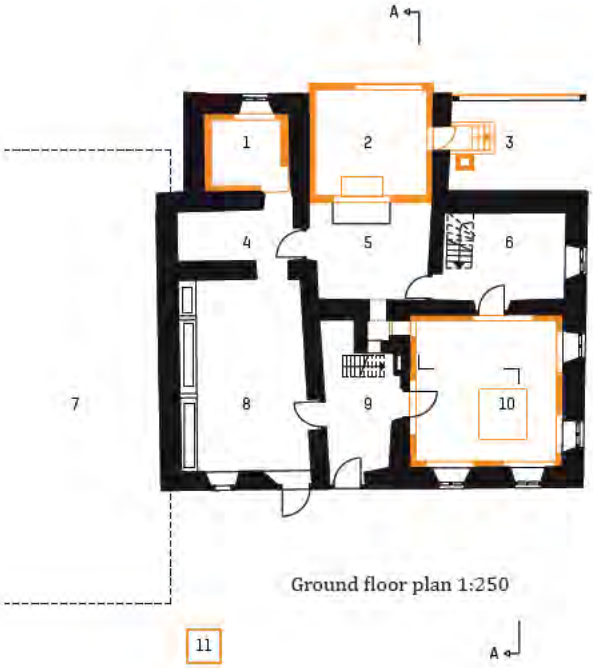
2.2 CASE 2

Pic 20-23:
Construction inside the house.

2.2 CASE 2

First floor plan 1:250

A-A section 1:250



Ground floor plan 1:250

new
old

1 new bathroom
2 new kitchen
3 old leaf litter shed, new timber storage
4 old larder
5 old accommodation
6 chamber over the old potato cellar
7 old litter barn with former coop and pigsty
8 old barn
9 old corridor
10 new parlor with clay field
11 new toilet
12 old barn floor, new game room
13 old hey loft
14 old chamber
15 new dormitory
16 deck
17 old balcony

(Peter Haimerl Architektur, 2008)

Pic 24: In winter, close the wooden cover of openings on the ceiling of the concrete cubes. While they could be opened in summer, supplying natural ventilation. © Jutta Görlich

2.2 CASE 2

25 © Edward Beierle

26 © Edward Beierle

.2 CASE 2

27 © Edward Beierle

28 © Edward Beierle

2.2 CASE 2

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30 © Edward Beierle

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31

Pic 25 - 32: Jutta's artistic photos. With clothes and stuff found in Cilli before renovation, performing with Cilli after renovated

32 © Edward Beierle

2.2 CASE 2

Sustainability Check List

Environment:

- ☻ Energy efficiency in construction
- ☻ Energy efficiency in operation
- ☻ Material, waste and pollution

Energy Quality

Management

Water efficiency

As the focal and difficult point was to preserve and revive “Cilli”, while make sure that no harm would be done, the architect made very careful design which is simple and reliable. A real minimalism was realized by simplified structure and material system of cellular concrete, with no finishing almost. No complicated layers, combination nor connection was behind the concrete surface of “Cilli”. Therefore, efforts and energy were saved during the construction involuntarily. New furniture that looks old is made from recycled components. Wood structure is original. New-inserted four cubes were built with cellular

Pic 33: Foam glass gravel.
© Misapor

concrete. What you see is what it is - environmental value was achieved in this case as by products. There are many good qualities with the cellular concrete (see Fig 3). In this project, material plays a key role in reducing environmental impact both in construction and operation.

There are clear divisions between heated and unheated space in this project, which reduces unnecessary energy consumption. The new concrete cubes were designed smartly with floor heating system embodied, which could be heated by a wood stove in winter. Other space where the original structure was kept without further insulation is unheated. It is not an intelligent house at all, that won't be able to adapt to people's need by itself. Meanwhile, it will never be a problem, since no one lives there for a long period and one is always able to move and find himself a cozy place in the house.

Natural ventilation was achieved in hot summers by designing holes on the ceiling of the concrete cubes that could be opened, which also saves energy. The attic above the cubes would not be a desirable space to stay in hot time.

Because "Cilli" functions only in holidays as well as the concept of minimum intervene, no soundly design was done for conserving electricity and water, and it's not easy to compare with other sustainable house of the annual consumption of energy and resource.

Fig 3: From recycled glass to foam glass aggregates to cellular concrete (with white cement).
(based on Misapor, 2011)

In a thermal process, foam glass gravel is produced out of recycled glass and just a few added materials. They are baked at a temperature of up to 950 degrees. The glass foams and then leaves the furnace as foam glass, where it is cooled down quickly, causing it to break up into gravel-sized pieces. The result is a ecological and resource-saving material.
The finished aggregate consists a whole lot of concealed air, that gives its essential properties: ideal thermal insulation and a very low weight. This combination of properties makes it an ideal new material for a wide variety of applications, especially for complex situations.
Cellular concrete could be local produced, easy to apply, rigid, light weighted, water proof, heat insulated, durable with no need of maintenance. [7)]

2.2 CASE 2

Social

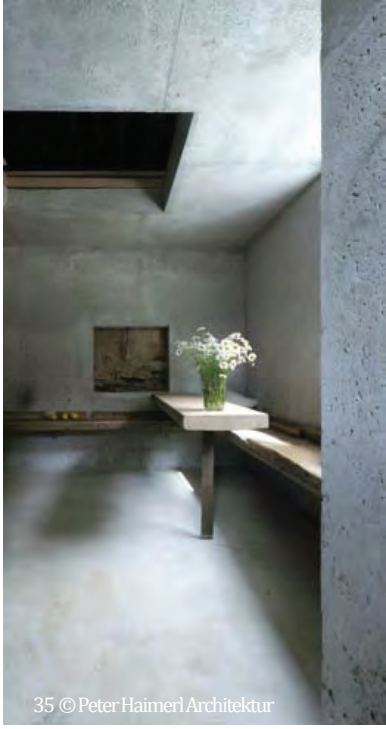
- ☻ Quality of life
- ☻ Diversity
- Equity
- Social cohesion

The architects appreciate the quality of life in this case as living a modern life in the old house where all the history, traditions and memories exist in. Before the renovation, “Cilli” had very bad situation that hardly functioning. Let people live in and warm it up is how one keep a house alive, better than just lock it. This is just what the renovation did for “Cilli”. New facilities that been added to “Cilli”, bringing possibilities to meet requirements of modern life.

The architects showed their respect to the old farm life and the rural area by different ways. The outward appearance of “Cilli” was almost maintained as the old farmhouse, which fitting into the natural environment as if they born together. The historical wood structure was kept visible and strengthened by new beam and the concrete cubes. Recycling material is one of the valuable rural wisdom, that inherited by the architects. Only heat the room which people stay most of the time in is another tradition that been succeed. To some extent, these means contributed to keep social diversity.

Since this house located in the Bavarian forest where the surrounding is mainly natural elements, no consideration was taken on achieving good communication and relationship within the neighborhood.


34 © Jutta Görlich


35 © Peter Haimerl Architektur

Pic 34, 35: The new kitchen with a minimalist look.
Pic 36: The bedroom.


36 © Gero Wortmann

2.2 CASE 2

Economic

- ☻ Reduced construction cost
- ☻ Reduced operating cost
- ☻ Reduced maintenance cost
- ☻ Increased building value
- Tax benefits and incentives
- Productivity gains

The renovation was self-supported by the owners who are also the architects. So the architects were tried hard to reduce the construction cost. It was a low-budget design with simple construction. As described above in the environmental part, the energy consumption was minimized during construction, labor and high-tech were not very much needed, too. As a result, the cost of the project was quite limited. The cost of renovating Cilli which was 100,000 Euro[8)] - ca.. 500 Euro/m^2 is relatively low for such a project that located in side forest. Full renovation costs are high in Germany, 400-1000 Euro/m^2 depending on standard[9)].

Today, “Cilli” consumes normal amount of energy and water, but only part of it needs heating, that reduced the operating cost. It is very sustainable in a way of good durability. The major addition with material cellular concrete is relatively cheap, light and strong, and requires no maintenance for a 100-year life.

The building value was very much increased after the renovation, though the owners don’t plan to sell it. The project didn’t get any subsidy from the state during the construction, but only got some repay from getting architectural awards afterwards.

Pic 37: New concrete and old wood elements, both have simple finishing, set en example of minimalism.

2.2 CASE 2

Cultural

- ☻ Culture of sustainability
- ☻ Indigenous knowledge and traditional practices
- ☻ Architectural value

Heritage conservation

This project has great cultural achievement when talking about keeping and promoting the rural tradition and its impressive architectural characters.

“Cilli” was not a heritage listed building, but one of the “surviving” typical farmhouse in the Bavarian forest that has its special historical, architectural and other cultural values. With a deliberated architectural design, the rural tradition and history was persevered and exhibited in the holiday house. The architects/clients also advocated the simple rural life style which looks philosophic and sustainable to modern minds. In one way, this renovation conduces to cultural diversity.

As one could see from photos of Cilli after renovation, the renewed indoor space looks very elegant, overall, and still keeping and stressing some parts rustic, like the original wood structure, cracked wall and rammed earth floor. People would get a vivid image of the old rural life when looking at this house, but meantime be conscious of the modern living that been hosted inside, from the minimalism interior and furniture that installed along the wall continually.

Now “Cilli” attracts more and more attention from the public, which helped to propagate the value it supports. Furthermore, the way it was renovated and the value it stressed may become a new culture.

Pic 38 - 41: The outside appearance of Cilli was preserved almost as it was in the 70s’. While inside the new concrete cubes, the historical traces were framed, supported and protected by the new structure.

38 © Peter Haimerl Architektur

39 © Peter Haimerl Architektur

40 © Peter Haimerl Architektur

41 © Peter Haimerl Architektur

2.2 CASE 2

Comments

It is interesting to see how sustainability was achieved in this holiday house that working periodically. The project had different focus from other normal residantial renovation.

Because the aim of this renovation as described above, the social and cultural values were highly emphasized and developed successfully. How the architects deal with concrete cubes that to realize multi purposes with “one action”, in another word, a minimalism approach to sustainability, was the highlight of this project. The project gets quite much echo in society, and arouses awareness of preserving culture values that contained in old architecture.

Environmental and economic aspects were not the crucial part in this case, but still been taken care of. Eco-footprint was limited by applying minimized design in construction and simple living styles that follows the local tradition.

As a holiday house in ancient style, renewable-energy generator was not considered in the renovation. But it could be an option for future improvement, which leads to a more eco-sustainable posture.

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2.2 CASE 3

HAKA Building: Recycled Office (First Phase)

--From Abandoned Factory to Office

2.2 CASE 3

Brief

Location:	Vierhavensstraat 38, Rotterdam, the Netherlands
Client (Research):	Clean Tech Delta, Rotterdam
Client (Design):	Estrade Rotterdam
Architects:	Doepel Strijkers Architects
Renovation type:	From Abandoned Factory to Office (Interior Design)
Originally built:	1932
Completion of renovation:	2010
Area of construction:	1000 m^2
Award:	Annual Office Space Award by Modern Decoration, Shenzhen, China.

Background

Rotterdam is the second-largest city in the Netherlands and the largest port in Europe. Its strategic location and developed transportation channels made the city a very important transit point for bulk materials between the European continent and overseas[1)]. Therefore port related trade and industry, such as material processing/packaging and shipbuilding industry, dominated the economy of this city. During the Second World War, Rotterdam was severely damaged by Nazi's continuous bombing. Between 1950 and 1970, "a new and better city" was rebuilt on the ruin.

The HAKA gebouw (HAKA building) is a striking building seated at the Merwe Vierhavens of Rotterdam (see Pic 2), which was built in 1932, designed by architect Hermann Friedrich Mertens. From the beginning of its life to the year 1964, HAKA building served as the headquarters of the Cooperative Wholesale Chamber of Commerce (Handels Kantoor in Dutch, of which HAKA is an abbreviation) [2)].

2 @ Suzanne Fischer

Pic 1: Street view of the HAKA building.
Pic 2: Aerial view of HAKA Building. (Historical Research by Suzanne Fischer)

2.2 CASE 3

This cooperative was founded in 1914, looking after the interests of the labor class, providing them with good products at a reasonable price, ranging from coffee to shoe polish. A large number of Dutch retail associations had joined the cooperative. This cooperative was also where labors were trained and educated.

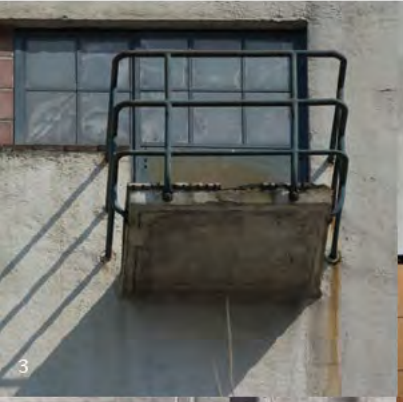
Surviving the Second World War, this building was the first “concrete pumped” building in the Netherlands, an expression of the self-confidence of the Dutch cooperative movement: a progressive, industrial building with heroic 30s portrayed in beautiful stained glass scenes (see Pic 3-18 on opposite page). Along with the Van Nelle Factory, HAKA building was and is an important example of architectural movement “het Nieuwe Bouwen” in the Netherlands.

The Offices were located mainly in the east wing, while the west wing of the building contained factory premises, combined with a working centre where goods and foodstuff such as grains, seeds and coffee were collected, packaged and shipped.

Originally, the building was adjacent to the rear of the Lekhaven (Leak Port); ships could come directly to this part of building, for loading/unloading goods[3)]. Now the channel at the back side of the building had been filled up and ships could no longer come close to the building.

During the 1960s, the cooperative dissolved, and the building went partially vacant. In the late 80s, this building was renovated by architect office Post Ter Avest Van Remundt and served since then as a business center.

Pic 3- 18: Original Elements of HAKA building.
Pic 3: © fotorob, Flicker
Pic 4, 12, 14, 16: © Studio Roffert
Pic 5, 10, 18: © DSA Rotterdam
Pic 6, 8: © Project Website
Pic 7, 11, 17: © Jan1968, Flicker
Pic 9: © Studio Roffert
Pic 13: © Suzanne Fischer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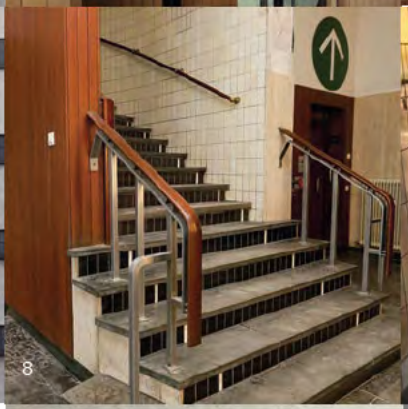
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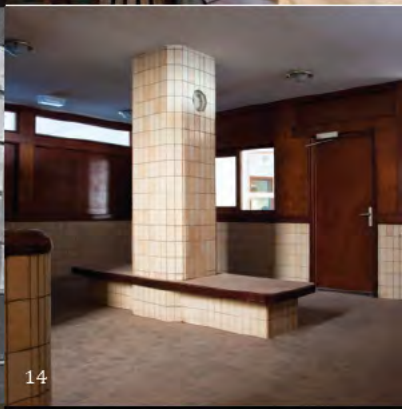
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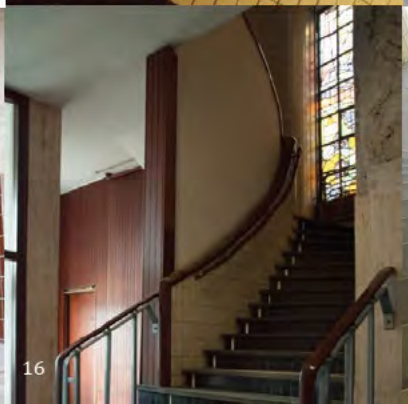
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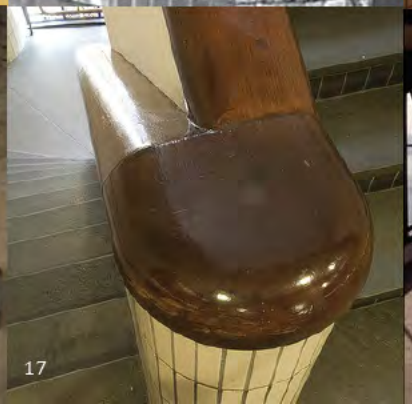
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18

2.2 CASE 3

In 2009, the owner commissioned a new concept for this remarkable building: “Icon of sustainability”[4], which is an important step in the city’s plan for the re-development of port area. HAKA building was designated as office for Clean Tech Delta, a partnership of industry, knowledge institutes and government innovation in clean technology and sustainability.

The renovation is underway, and the renovation construction of the whole building is expected to take several years. Different from other similar renovation projects, in which business promotion won’t be launched until the whole construction is finished, the exploitation team of HAKA building wants to inform the public and attract attentions from companies before the very beginning, at the same time have more activities, to bring the building back to live. Therefore the interior renovation on the ground floor was carried out as the first phase and completed in autumn 2010. Now this initiative phase become an open window towards the public and perspective tenants.

The exploitation team has a very special vision for the whole renovation and they planned for a very unique business model for this building when it will be put in use: instead of having their own facilities spreading in their area vacant most of the time, all tenants will share meeting rooms and restaurant as well as a common reception in the ground floor, therefore keep office small and focused, meanwhile encourage the communicating and cooperating between companies who works with the same field. The rent will be based on the turn-over of each company instead of the area they occupies. The building manager believe that this organization form could stimulate innovation and productivity.[5] This project does not only try to run an efficient and socially responsible business for their own sake, but also encourage tenant companies to be more efficient and responsible also, which is a very interesting starting point.

Estrad / Vestia: the owner of HAKA building, the design client of the project, who decided to collaborate with Clean Tech Delta and Stadshavens Rotterdam to revive the building after years of partial vacancy.
Clean Tech Delta: is a collaboration that promotes innovation and clean technology and actually practice. It is also the research client and, after the renovation finish, will be the main source of new tenant.
Stadshavens Rotterdam: is the collaboration projectbureau of Rotterdam City Council and the Port of Rotterdam Authority, whose major task is to redevelop the port area in the city of Rotterdam.
Urban Breezz: the exploitation team of HAKA building.

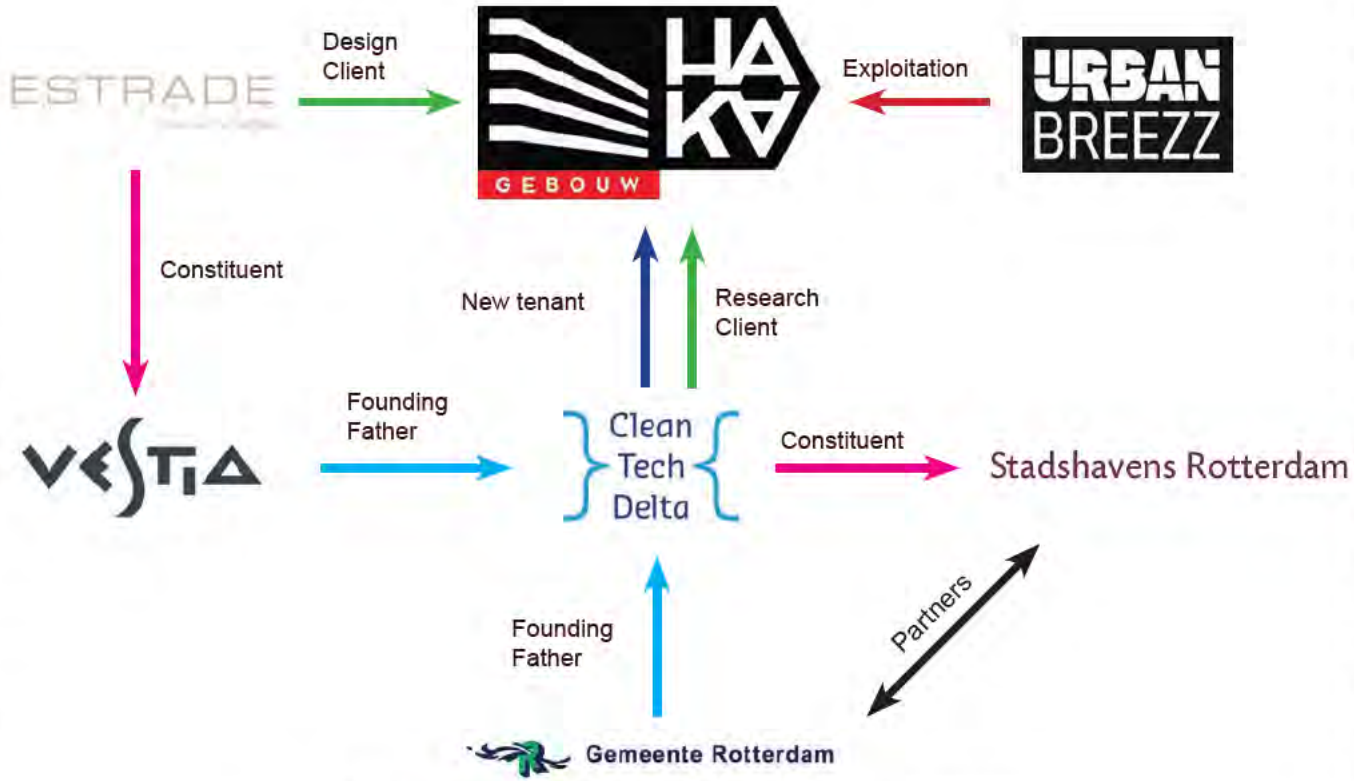

Fig 1: Different parties involved in the project. (based on Interview with DSA)

2.2 CASE 3

Architects

Doepel Strijkers Architects

Rotterdam, http://www.dsarotterdam.com

Doepel Strijkers Architects is a newly raised office cofounded by architect, Duzan Doepel and interior architect, Eline Strijkers, in 2007. Both of them used to work for the famous firm MVRDV in Rotterdam for years[6].To keep the office work efficiently, they manage it in a small scale, the staff only includes several architects, while keep several engineering office in cooperation.

Doepel Strijkers Architects worked with projects in different scales, including interior design, architecture and urban planning. They are also among the partners of REAP (the Rotterdam Energy Approach and Planning, a sustainable urban development methodology in which not only energy, but also water, wastes, material cycles are included), which provides the content framework of the transformation of the HAKA building.

Though Doepel Strijkers Architects has investigated closing energy, water, material and waste cycle for years, the office still holds the believe that a successful proposition demands more than a technical response to these driving concerns. A good solution is always an intersection of communication, social structures, economy and use.

Duzan Doepel worked a lot with a wide range of existing buildings as a project architect during his six years in MVRDV. With a long-term interest in sustainability, he as an individual and also the firm devoted to several research programs to discover different approaches towards sustainable development.

The other partner of the firm, Eline Strijkers, has an education background as an interior architect. She has strong fascination for the analysis and optimization of movement and behavior of people, and also motivation to combine innovation and craft in materialization and detailing, which leads to enhancement of the special characteristics.

Owing to their specialty, the outcome of the renovation of HAKA Building (First Phase) is not only a good interior design, but also an experimental project integrating architectural design, social solution and sustainable recycling.

Intention

There are several ambitions stated by DSA in their final report of this project, the core is to realize a mix-ues interior, flexible enough to change in function in the future.[7)] There are also ambitions are relating to the three aspects of sustainability, including :

Socially:

- Cluster collective functions to facilitate informal encounters
- Involve end users in a co-creative process.
- Design for build by unskilled labour - the social component.

Environmentally:

- Reduce the CO_2 Footprint through reuse of local waste materials and products.
- Limit the number of kilometers travelled by harvesting materials close to site.

Economically:

- Create an alternative financial and development model to generate added value.
- Ensure that the project is cost neutral (compared to an interior built with new materials).

In 2009, the 80-year-old building was appointed to become a campus for clean-tech activity, a ‘Living Lab’ for companies, institutions and authorities in the field of water and energy. In order to strengthen the new identity of the building: the heart of Clean Water & Energy in the Netherlands, Doepel Strijkers Architects was asked to develop a concept for the ground floor that illustrates how the strategy of closing material cycles on a city scale can be translated in the interior of a building.

This task could be divided into two parts: material flow research and realizing the interior design. The design task is to make the interior workable for the design client Estrade, and the research task is to study how to close the material flow in a city scale, which is mainly for research client Clean Tech Delta Rotterdam, who is also the new tenant after the renovation.

2.2 CASE 3

To accomplish the research task, the whole material flow process needed to be recorded in certain form, which allowed people to make quantitative comparison afterwards. And after the whole process finished, the architect proposed for a more efficient model for further development this recycled material business.

To accomplish the design task, the interior of ground floor should speak for the history of the building, as well as the new tenant's ambitions related to sustainability. The innovative business model needed to be reflected in the design so that the promotion of this fresh idea could be achieved.

Another key word to the design is flexibility. The first phase construction is a temporary installation, which serves as office for a few pioneering tenants as well as a convention center where events and meetings are held at present. However, when the whole project is finished, this floor will be converted into a restaurant and several meeting rooms. The changes required by this conversion should be taken without being hurdled by present design.

Visibility was also an essence to this phase. The responsibility of the design is to tell people passing by about what is happening in the building. Therefore it should be visible from the street, preferably eye-catching, to draw public attentions.

Process & Result

In collaboration with the Rotterdam Public Works and the van Gansewinkel Group, demolition sites and other possible sources, green houses, factory, etc. in and around Rotterdam were selected and visited (see Fig 2). During this stage, various material flows were investigated from demolish buildings for the interior of the HAKA building (see Fig 3). All recycled materials were collected, transported and processed in the HAKA building to form the new interior objects (such as furniture, working platform, meeting room and catering point), which were evaluated after the completion of this phase.

The design of objects in HAKA is 'supply' driven, in contrast to conventional interior design, which is 'demand' driven. The availability of certain recycled materials could affect the design remarkably, therefore the architect were involved in the process all the time, it actually costing rather than gaining money from the architecture office's view. The demolition process takes longer time than purchasing new material directly from the market, and it is not unusual that desired material were not delivered in time or sometimes, not delivered at all, plus introducing the social component which requires to hire more unskilled labour rather than well trained workers, the project took much longer time compare with a similar conventional interior construction[7] (see Fig 4).

Therefore, after the project complete, DSA were also trying to optimize the model and improve logistical aspects before implement the concept on larger scale. One of these logistical improvement is recycled material brokers (see Fig 5), where locally collected waste materials were stored and labeled regarding sustainability indicators. Actually, there existed several facilities (Komu for example, in this project) in the Netherlands acting as a recycled material market, but they are not tracing the origin and history of the materials they sell. When a recycled materials broker with a comprehensive database with this information is realized, one could choose recycled materials in the market by their own criteria, evaluate projects using sustainability standards, saving time for their own investigation/calculation, as well as waiting for the demolition.

They have also developed a toolbox with generic applications to fill office space (see Fig 6 as a example). The toolbox include five serials of office applications, each serial consisted of 6-8 office functions ranging from seating to pantry made by one type of recycled material. With this toolbox, the availability of certain type of recycled material will have much less affection on the project duration.

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HARVEST CLOSE TO SITE

The reuse of materials reduces CO_2 emissions and in this sense is a mitigation strategy. An additional advantage is that the distance the materials travel for reuse is usually limited to the local and regional scale. If one considers that the use of one liter of diesel equals 2,9 kg CO_2 in the complete life cycle analysis, it makes sense to harvest materials as close to the HAKA site as possible. (DSA, 2011)

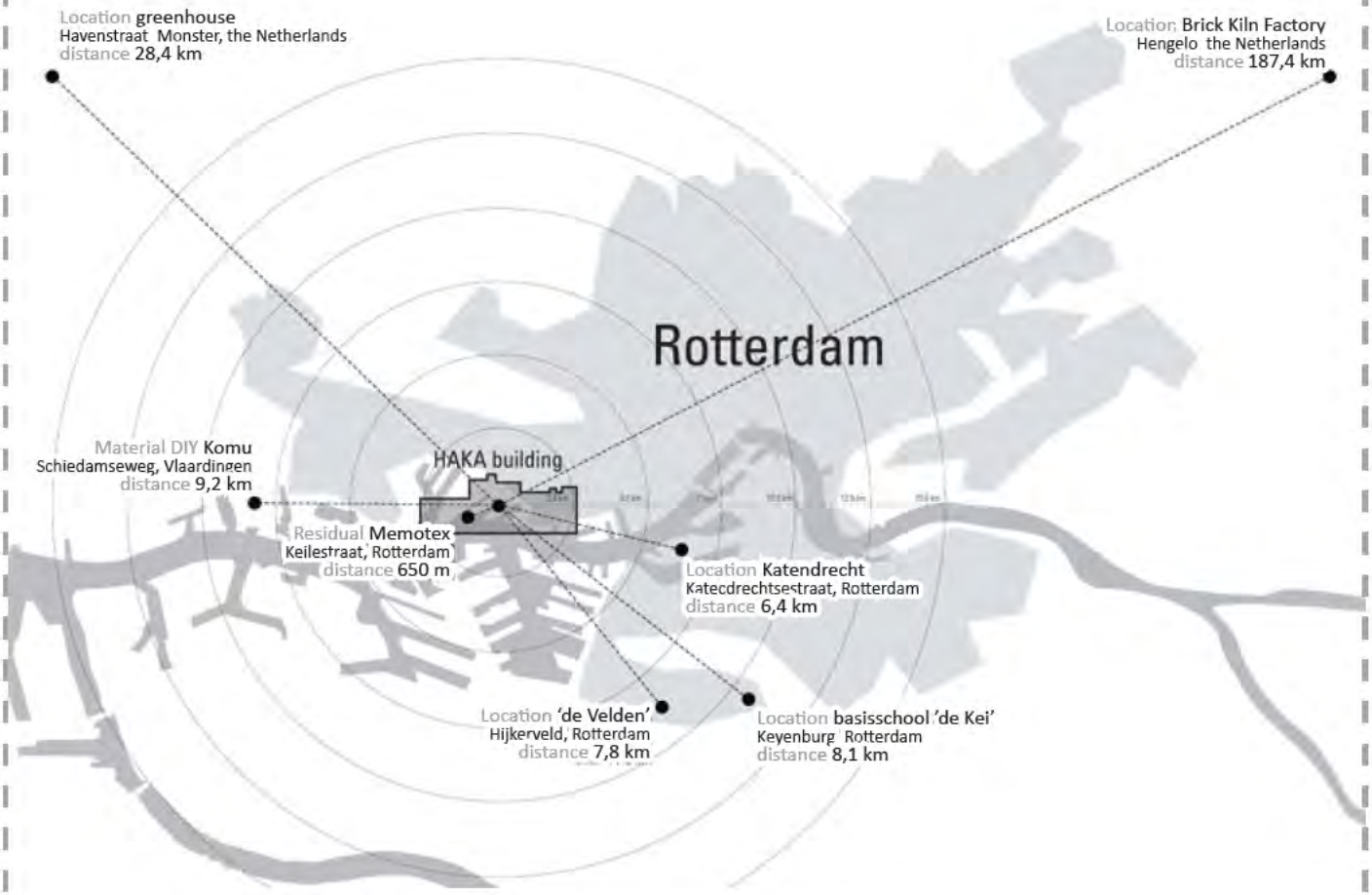


Fig 2: Material Flows within District Scale (DSA, 2011)

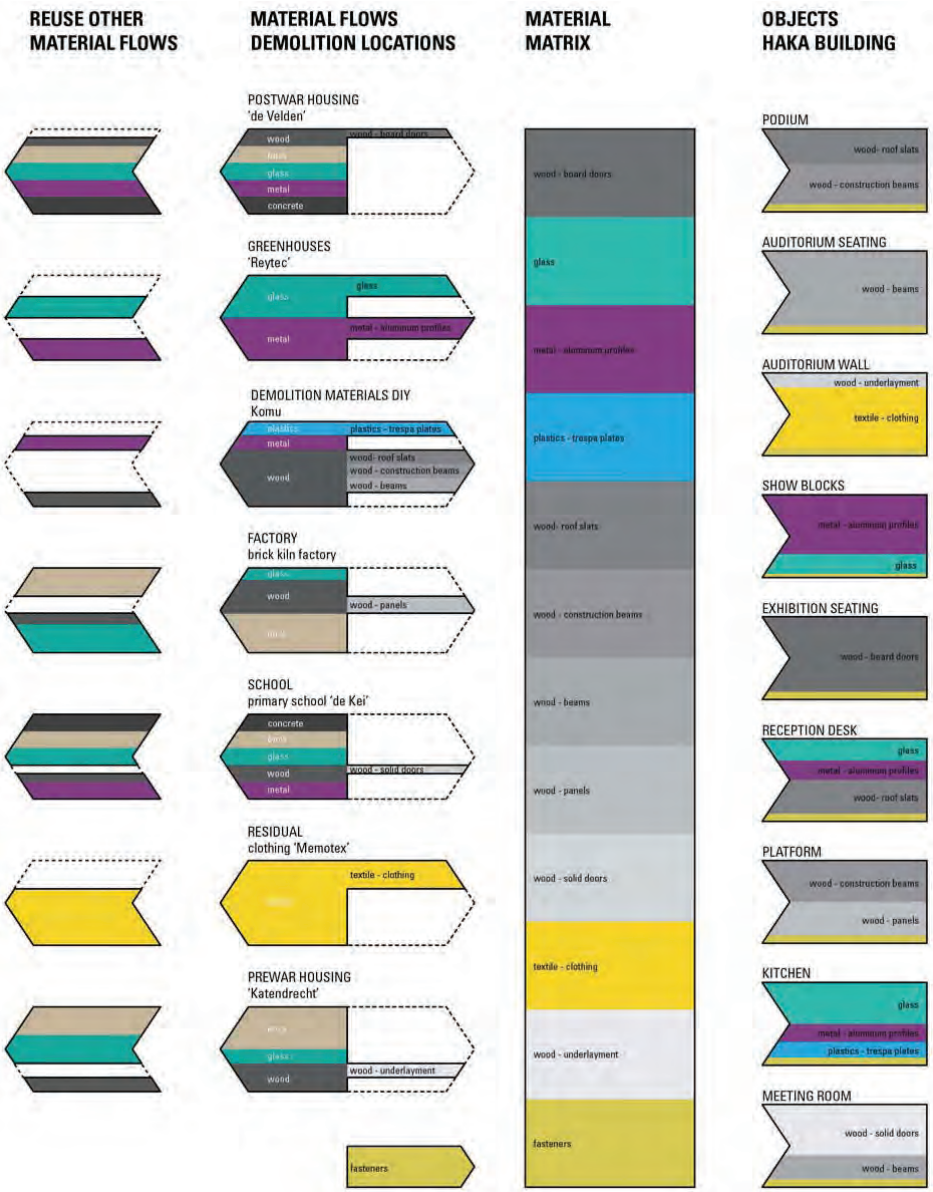


Fig 3: Material flows from demolition sites to HAKA (DSA, 2011)

2.2 CASE 3

The design was regulated by a number of criteria:

- Design objects based on the intrinsic qualities of the materials.
- Limit the amount of material used.
- Limit the amount of waste produced.
- Limit the use of technical handlings.
- Limit the use of fixatives.
- Design simple details that can easily be repeated by unskilled labour.
- Don't erase the history of the material.
- Design for disassembly in the future.

The ambition went beyond reducing CO_2 footprint through reusing materials. They introduced an alternative social development component. In cooperation with the Werk en Leerfabriek, big proportions of interior elements were made by a team of ex-convicts, in order to create livelihood and help them to reintegrate into the society.

Like many other countries in Europe, the Netherlands' government pays money for unemployed people. This is a big cost of tax money, and if the ex-convicted could not re-enter the labor market soon enough, when the social relief is cut off, they might go back to their old track, and become a threat to the social security. But if they could find a work with reasonable payment to sustain themselves, the situation referred above is less likely to happen.

In order to hire more ex-convicts to help them reintegrating into the society and prevent them from committing new crimes, the architects tried to conduct the design in a very simple and straight forward way, so that the work is suitable for this group of people. The detailing of elements was kept very simple, and all objects are composed by repetitive elements, therefore no complex technical operation was necessary and all unskilled workers could easily handle the job. By designing in this specific way, a new affordable craftsmanship was made possible.

The effectiveness of the strategy used in HAKA building can be measured in terms of the three E's; Equity, Economy and Ecology. At each stage of the process, data was recorded in order to evaluate the project per object and as a whole. The data collection was categorized into three groups: CO_2 footprint, material and labour costs, and the number of man-hours spent per object. The conclusions were that this strategy was effective in terms of

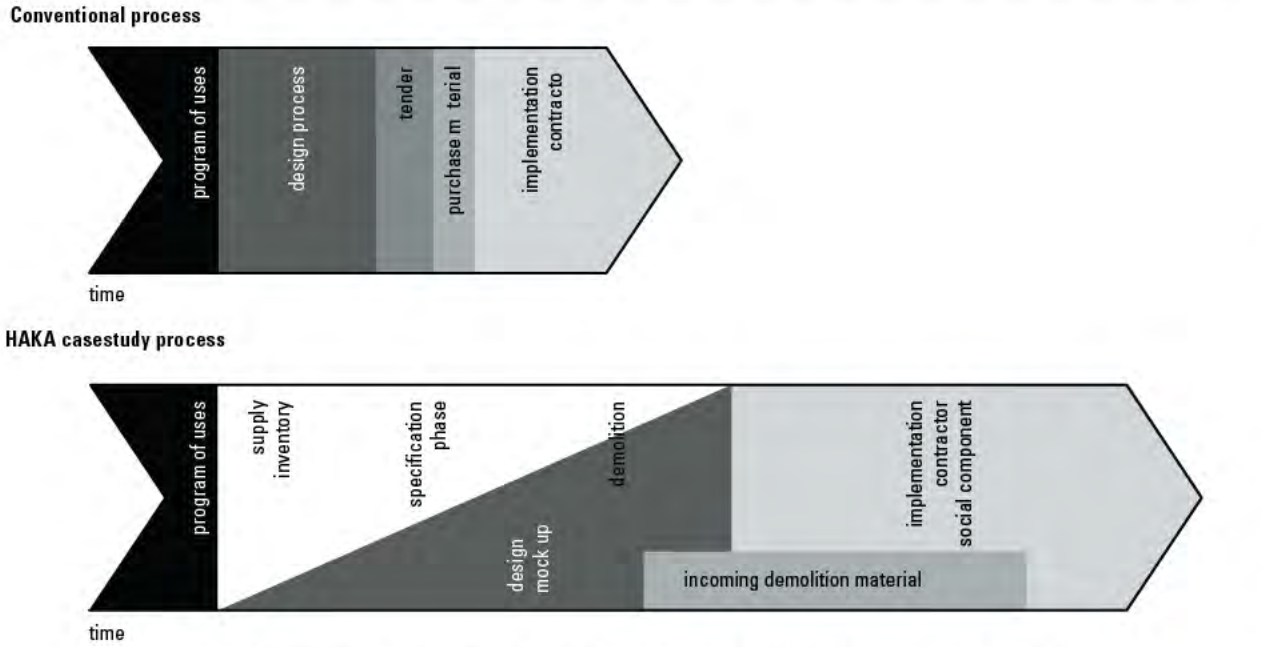


Fig 4: Comparison of Traditional and Recycle Office Design to Realization Process (DSA, 2011)

Fig 5: New Module for Recycled-Materials Business (based on DSA's Final Report)

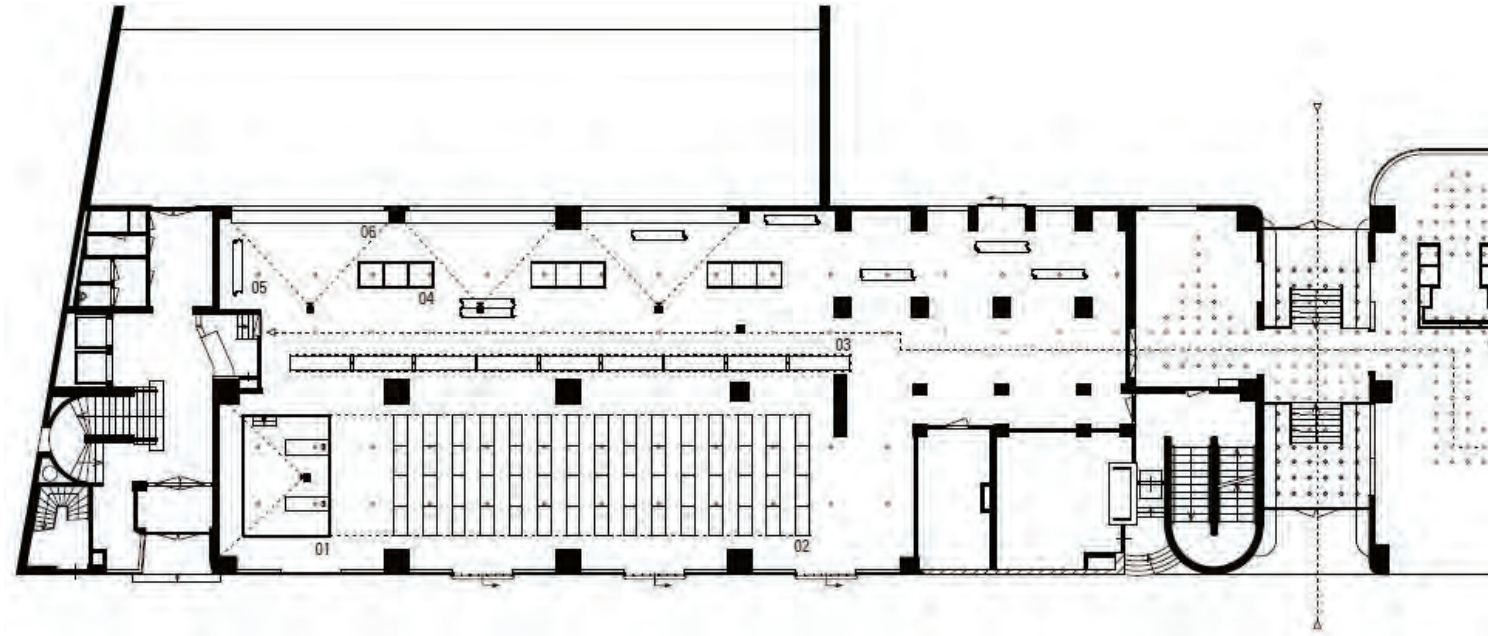
2.2 CASE 3

CO_2 reduction, and material and labour costs. The average number of man-hours spent to make the elements was however three times higher than a professional team would have spent.[8)] . This could be explained by introducing the social component.

Since the function of ground floor as an initial exploitation centre will be shifted right after the rest of renovation completed, one of the design principles was to make the first phase renovation very flexible, and easily adapted into the new functions. The central street separating the offices to the east from the factory spaces to the west in the original design was kept and re-activated as the main entrance. By opening up large glass windows, orange, vertical TL-lamps are visible from the road, clearly designating the position of the entry.

The public area in the original factory part offered space to work, as well as meeting and hospitality functions. A raised platform - made of scaffolding wood – provided temporary

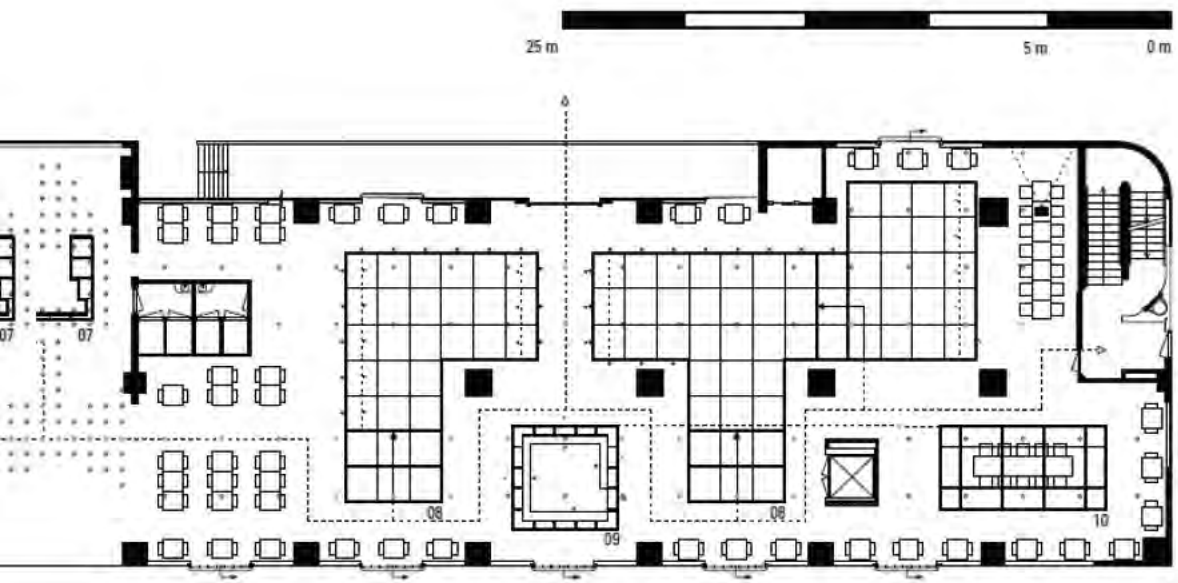
Plan Ground Floor (DSA, 2011)



office space for current tenants will be used as the serving area of a restaurant in the next phase of the development. Tables around the platforms double as flexible working stations with WiFi internet connection.

The centrally located catering point was made by demolished greenhouses, which functions as a pantry for the companies on the platforms and as a kitchen/bar during events. This pantry will be extended into a professional kitchen for a restaurant operator in the next phase of development.

To the east, the original office area is converted into an auditorium and temporary exhibition space. A flexible acoustic partition wall, constructed with 8.000 kilograms of clothing, ensures that the space can be adapted to changing needs. The auditorium and exhibition space can function as separate areas but mixed forms are also possible.



LEGEND

01 podium
02 auditorium seating
03 auditorium wall
04 show blocks
05 exhibition seating
06 projection wall
07 reception desk
08 platform
09 pantry / bar / kitchen
10 meeting room

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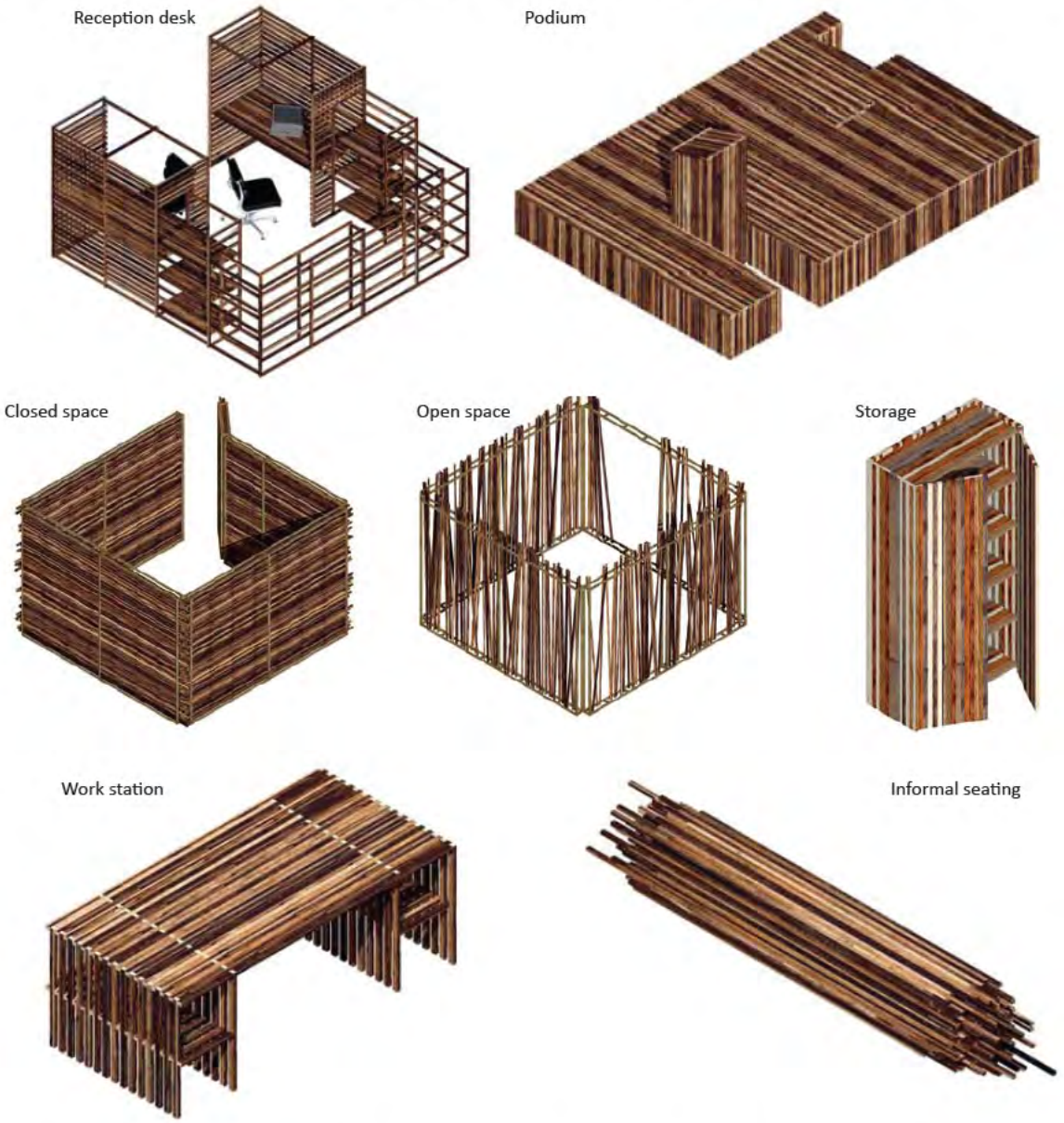
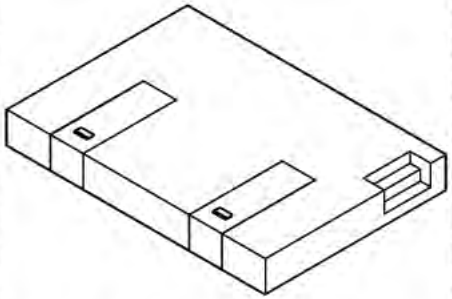


Fig 6: Toolbox , serial slats. (DSA, 2011)

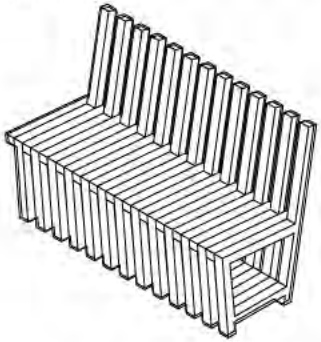
Overview of HAKA Elements

Based on the available material flows, nine elements were realized in the first phase of the HAKA development. Although each element has its own distinctive look and feel, the collection works as a homogenous whole. This can be attributed to the clear predetermined design criteria. (DSA, 2011)

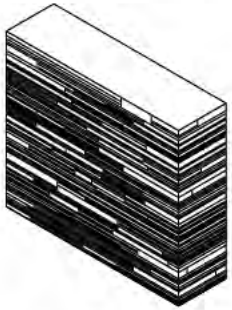
Podium



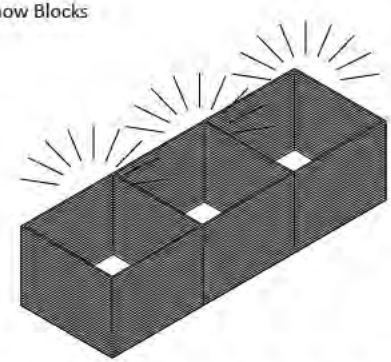
Auditorium Seating



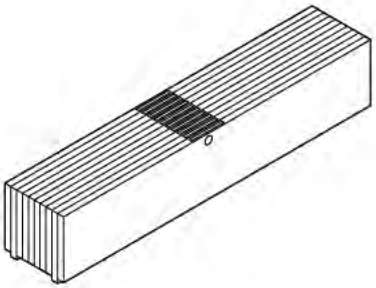
Acoustic Wall



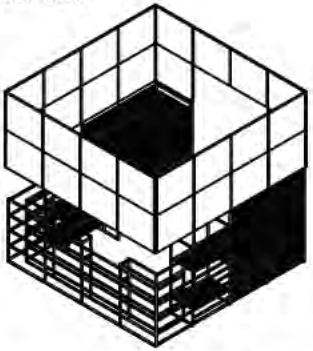
Show Blocks



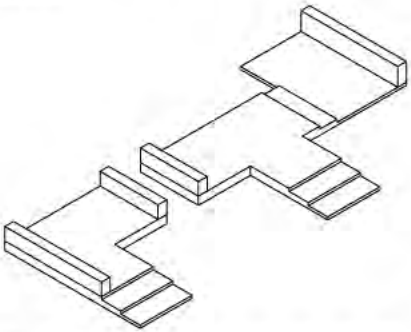
Exhibition Seating



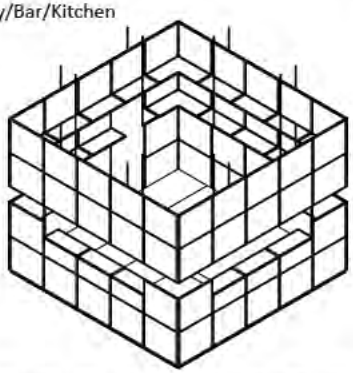
Reception Desk



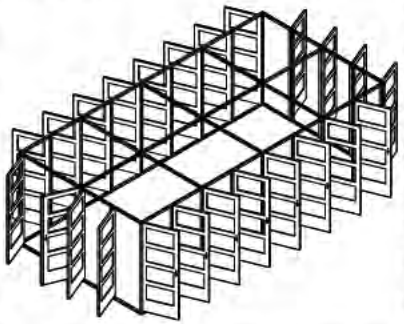
Platform



Pantry/Bar/Kitchen



Meeting Room



2.2 CASE 3

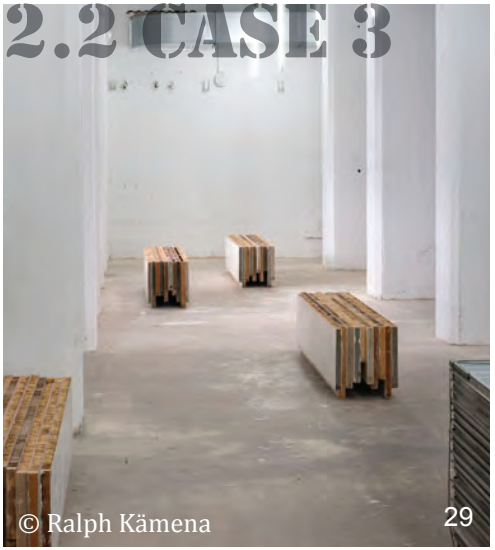
Pic 19: Main entrance with vertical TL-lamps.
Pic 20: Reception desk,side.
Pic 21: Reception Desk, front.
Pic 22: Reception Desk, back.

2.2 CASE 3

Pic 23: Pantry from second hand greenhouse elements.
Pic 24: Platform and storage space.
Pic 25: Working space is raised by stair-like elements.

Pic 26-28: Meeting room made from social housing doors.

2.2 CASE 3



Pic 29: Exhibition benches in the exhibition room.
Pic 30: Acoustic wall divides a big space into two parts: the exhibition-room and the auditorium.
Pic 31: Auditorium.
Pic 32: Auditorium benches and podium.
Pic 33: Podium, benches and acoustic wall.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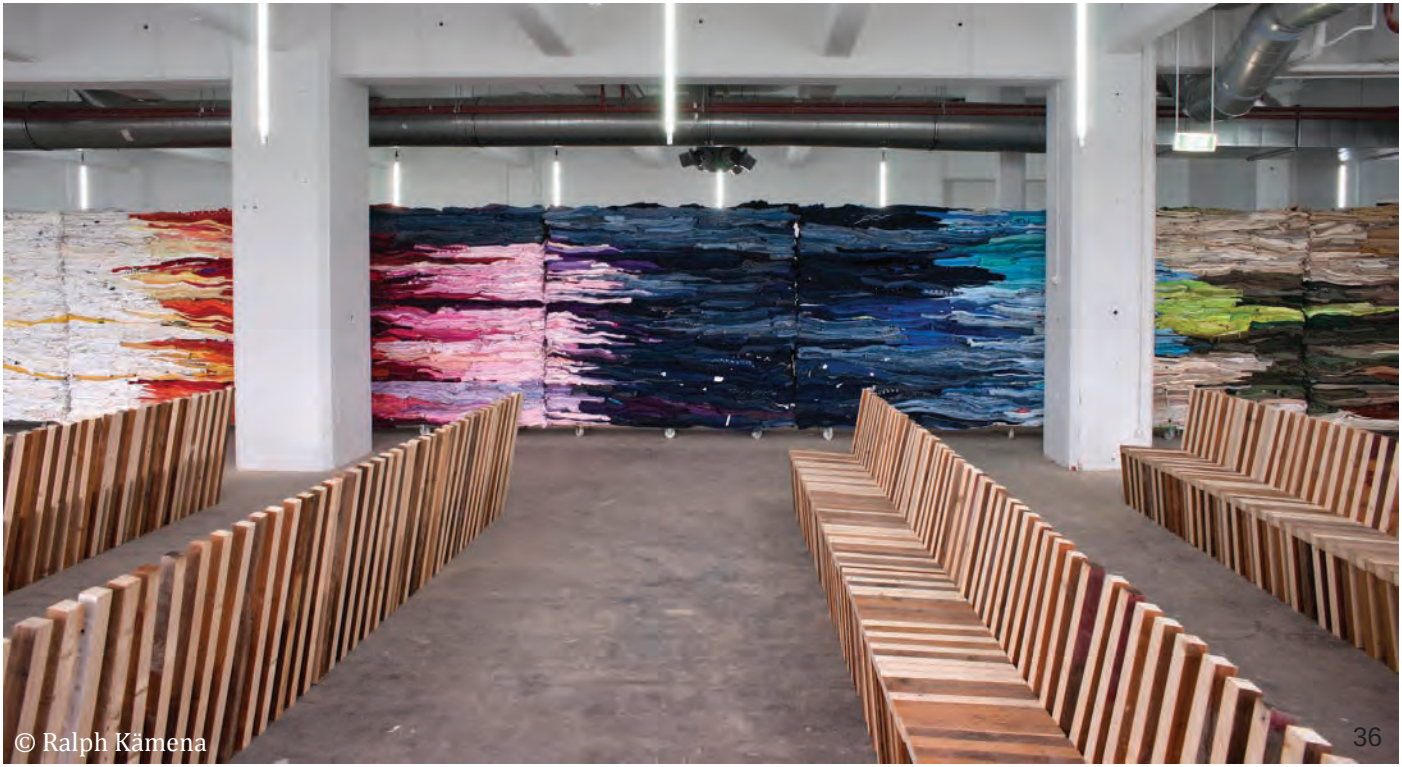
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Sustainability Analyses

Environmental Sustainability:

- ☻ Energy efficiency in construction
- ☻ Material, waste and pollution
- Energy efficiency in operation
- Energy quality
- Management
- Water efficiency

Recycled material is a very popular topic nowadays, yet not only the material itself should be taken into the consideration, but also energy consumption in transportation and human labor to process them. From these aspects, this project did a very thorough work. Almost all construction materials were collected wastes from demolition sites and factories near to the building, so that both the embodied energy for materials and the energy consumption in transportation were dramatically reduced.

By conducting the design based on the intrinsic qualities of the materials, electricity consumption and skilled human-labor were minimized in production process. Meanwhile the design maximized the efficiency of material usage, with limited amount of material eliminated, therefore minimum amount of wastes were brought about.

Since this phase was a temporary installation for the preliminary promotion, there were not many considerations regarding the energy or water efficiency or management in long-term operation. On the other hand, the flexible design allowed minimum work in the later converting as well as reuse the materials recycled for this phase. This will also contribute to the CO_2 and waste reduction after the mission for this phase ends.

Pic 34: Stacked clothing organized in colour.
Pic 35-36: Acoustic wall could work separately or work as a whole.

2.2 CASE 3

LINEAR METABOLISM

Social Sustainability

- ☻ Quality of life
- ☻ Equity
- ☻ Social cohesion

Diversity

Coached professionally, people with problems re-entering the labor market were trained in this project. This project provided both short-term occupation and professional education to ex-convicts. In short term, they could earn money from their work to support themselves, while in long term, the professional education made it easier for them to find another job in construction in the future.

When people could sustain themselves, they find their dignity and responsibility back, and less likely to go back into the old track of crimes. So this project definitely could help with this specific group of people to improve their life quality, and eventually get back into the society harmoniously. However, these benefits are obtained at the cost of much longer construction time (3 times as long as a conventional interior).

The location of HAKA is in a declined industrial area, close to a help center for ex-convicts [8]. As a redevelopment project, it is very brave of the project team trying to hire and help them rather than expelling them from the process, and we hope all their good wills would have positive effect on this particular group of people.

Fig 7: The basis for the HAKA pilot: Circular Metabolism could provide more livelihood with less resource. (DSA, 2011)

Economic Sustainability

- ☻ Increased building value
- ☻ Reduced construction cost
- ☻ Productivity gains
- Reduced maintenance cost
- Reduced operating cost
- Tax benefits and incentives

The project is cheaper (according to the final repo t [7]), than a traditional inter or compared to an interior built from new materials, but the money is distributed differently (see Fig 7) In the HAKA model, the use of cheaper second-hand materials made it possible that money saved could be invested in the social component, the salary for workers and also the professional education to keep them on track.

2.2 CASE 3

Cultural Sustainability

- ☻ Culture of sustainability
- ☻ Design value
- ☻ Heritage conservation

Indigenous knowledge and traditional practices

HAKA Building was a Rotterdam icon, a symbol of the industry booming period in the Netherlands. The fact that it survived the Second World War while most of other building from the same period in Rotterdam did not make it a very important heritage. The project left the structure and layout in the original design intact to conserve this historically precious architecture. The design gave the interior a rough and straightforward feeling. The sense of space was amplified by carefully designed elements and furniture.

The building was the headquarter of an association which looked after the interest of the labor class, not only providing them necessary means of livelihood but also training and educating them in the building. This project inherited the spirit, trying to help people who were in disadvantageous position of the labor-market, by providing them jobs and education necessary for their future development.

Even though it is not a credit of the architect, the business model of this project encourages and promotes sustainable and socially responsible way of thinking, living, and operating, which is also the source of inspiration in this design.

Comments

Though this project is only a temporary installation, yet the architects considered every angle of possible impact, both in construction and in disassembling stage.

The project scores well on CO_2 emission, material and labour costs (it cost ca.. 25% of what a new interior with new materials and a professional constructor would cost). However, it took 3 times as long to build with the social component. This can be argued to be sustainable though as these people are obtaining working experience in the process.

By introducing the social element, this project was not only a good example of how people can make an interior from waste, it also created added value through empowerment and education. The project also demonstrated that the realization of an interior could have more impact environmentally, socially and economically than traditional interior projects.

We believe that the interior design developed by Doepel Strijkers is brilliant and successful, which should be carried on in the subsequent construction. Yet despite the office showed their intense enthusiasm for the further design in this project, the client thinks that in the second phase involves quite a lot engineering design (such as insulation and other infrastructure), they turned to a bigger architecture office.

The social-responsible business model is another highlight in this project. It not only encourages future tenant to operate in a high efficient way, but also works as inspiration for the architects.

2.2 CASE 3

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2.2 CASE 4

Energy-Neutral Monument

- From Cultural Monument to Energy-Neutral Villa

2.2 CASE 4

Brief

Location:	Diederichslaan 12, Driebergen, the Netherlands
Client:	Paul Bloemen, Liebje Paalman / Foundation for Sustainable Renovation of Historic Buildings
Architects:	Zecc Architects
Energy Concept:	One Planet Architecture institution
Renovation type:	from cultural monument to energy-neutral house
Original built:	1920
Completion of renovation:	2010
Area of construction:	210 m^2
Cost:	140,000 Euro (apart from new kitchen, bathroom and extension)
Award:	BNA Building 2011, region Northwest/centre.

Background

Driebergen is a former village in the province of Utrecht in the nature forests of the National Park. The former municipality of Driebergen existed until 1931, when it merged with Rijsenburg, to create the new municipality of Driebergen-Rijsenburg. Presently it's part of Utrechtse Heuvelrug in the central Netherlands.

The villa is located on a quiet street in the centre of Driebergen, backed by woods in Park Seminarie (see Fig 1). It is a historical monument from early 20th century. Owned by the municipality, the house had been occupied by several terms of mayors until 1951.

Since the 50's, the municipality rented the house to individuals. From 1956 to 2007, Ms. Van Der Meulen lived there. Due to a fall from the balcony because of overdue maintenance, she was badly injured and disabled. Until her decease she had never return to the

Pic 1: The new kitchen.

Fig 1: The villa sited on a quiet street, backing the woods of Park Seminarie. (Zecc, 2009)

2.2 CASE 4

house, which has been abandoned since then.

When the clients purchased it from the municipality, the villa was in a very poor condition, yet they were so fascinated by the mysterious atmosphere and beauty of the old structure and details.

> *"It feels like the time inside the house has been standing still for more than 100 years"* [1)]

In contrast with the "dusty dilapidated" house, the client had a very fresh idea from the very beginning, which was to convert the monument into an energy-neutral* house. At the meantime, the monument committee was very insistent about keeping the original character and structure, while the municipality wanted to make this project a pilot for other old buildings in the area.

These three different purposes made the renovation work very difficult and restrained. Yet the architect found his way to fulfill all requirements and archived a very satisfactory result.

This is a special project because there are two architecture office involved: OPAi in Rotterdam, as a specialty regarding sustainability and energy issues, works for the client on the energy concept in the initial step; Zecc on the other hand, is very sophisticated on heritage renovations, and they are close to the site, which entitles them the privilege to have efficient communication with the local authorities and the monument committee.

* Energy-neutral here means all energy needed for building-related use is provided within the house, household appliances are not included. And energy-neutral does not equals to energy independent. The house stays connected to the electricity network.

Architects

OPAi, RAU Amsterdam
Amsterdam, The Netherlands, http://www.opai.eu/

OnePlanetArchitecture institute (OPAi) is founded on December 2008, as knowledge center of architect Thomas Rau. OPAi is an independent network organization focusing on sustainable knowledge specialized in architecture, urban design, technology and social structures.

Thomas Rau founded his architecture firm RAU in 1992, which designs buildings with strong emphasis on sustainability. The firm is actively involved in the current international discussion on sustainability and in developing energy-saving technology and concepts for energy-producing buildings.

Zecc Architects BV
Utrecht, The Netherlands, http://www.zecc.nl/

Zecc Architects is a very young firm in terms of the age of the company and also the average age of the team. The firm was founded by Marnix van der Meer and Rolf Bruggink in 2003, and has 8 members at present, whose age range from 20 to 39.

As a young group, they are energetic, enthusiastic, and also with pioneering attitude for oncoming challenges. Almost every architect in the firm has both architecture and building engineering degrees, and thinks about how it's made during the whole design process, therefore the firm comes to problem-solving designs, and aims to create charming, attracting, as well as sustainable buildings.

Zecc is especially dedicated to renovation projects, and gathered rich experience on renovation of monuments and re-use of cultural heritages. Since their first mission, a water-tower house, renovation and transformation projects take a big proportion of their work. According to Bart Kellerhuis, more than half of their works are related to renovation. With these projects, Zecc worked primarily towards two objectives: preserving the monument and give a second life by a contemporary adaptation/addition.

2.2 CASE 4

Intention

Several requirements from different parties had been raised. But after combining every party's requests, the whole project is all about proving it is possible to have historical buildings renovated into a sustainable building with high energy performance standard. Judging by the amount of existing historical buildings in Europe and the high energy consumption they have, success of this piloting project illustrates that there is higher rate of return than new construction.

For the pride of place, the new owners had a very progressive idea of transforming this monument into a zero-energy house, which means that all energy consumed should be provided within the building. More specifically in this case, sustainability means to work with natural materials, reduce energy demand and generate energy from renewable sources. Besides, since the old extension was of poor structural condition and of limited monumental value, the owners wanted it to be demolished in order to make room for a new extension which provides a bigger kitchen and a bright dining room overlooking the garden.

Another tough party, the monument committee was very critical about retaining the monumental quality. The local regulation required that the looking from the street as well as the historical building structure and elements should be kept, so that the renovation would not interfere the atmosphere of the street, or cover the characteristic of the house. There were also demands for possibility to reverse back to original condition without leaving any traces behind on the historical structure.

The municipality wanted this project to be a pilot for other existing old buildings in the area. They believed that the experience from this project could provide information about what techniques can be applied in a similar situation, and also how different parties' knowledge and needs could be brought together. A glass 'power house' containing the power plants* in sight of the public was expected. It is also been planned to install the new installations in it, where the whole system would be visible from the street and everyone can see how much electricity is produced and how much is consumed by the building. In this way, it entitles the project educational function. It would make people thinking about how to deal with monuments in relation with sustainability.

* The major energy system, including the water tanks, heat-pump, and several electricity meters. But without the PV panels and solar collectors, since they were planned to be installed on the roof so that already visible from outside the building.

Process & Result

September 2008, the municipality put the house on sale but with a special promise that the house will go to whoever could come up with the most sustainable renovation concept in combination with a reasonable offer. They were in favor of the idea from one ambitious couple, to renovate the house into the first energy-neutral monument* in the Netherlands. With the energy concept developed by OPAi and planning form Zecc, the clients won the bid.

Before renovation, the villa required quite a lot of maintenances, and the indoor climate was not suitable to live in, yet the traditional character of the architecture was kept quite well. The front side of the house had several stately rooms where daily life was carried out, whilst a historically valuable staircase was seated at the backside.

*Probably the first energy neutral monument in the Netherlands and even in the world.

Inside the house, all original elements still presented in good condition. The wood frames were preserved well by a thin layer of paint; old glass ventilation slats provided plenty of

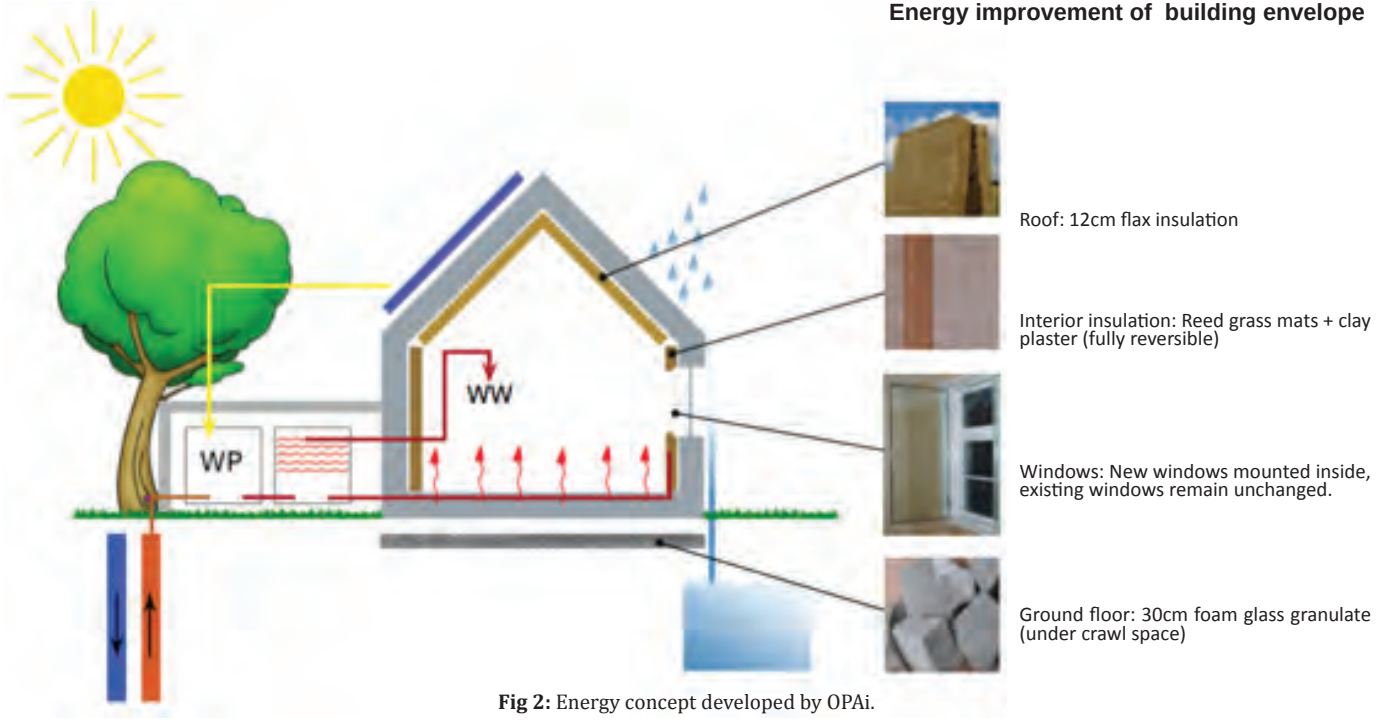


Fig 2: Energy concept developed by OPAi.

2.2 CASE 4

fresh air; the radiators betrayed a change in time; the existing chimneys were fallen into disuse. All profiles spoke for the history of the house and clearly indicated that the house had several different habitants[2)].

> *It was a challenge for us to achieve a high energy performance while adhering to the conditions of this brief. Especially when you think that most new buildings today – where this level of ambition would be far easier to realize – are far from energy-neutral.* [3)]

At the beginning of this project, OPAi developed the energy concept for the clients. To achieve the energy neutral goal, the villa needed to be insulated with natural insulation materials to reduce energy consumption, and heat as well as electricity should be provided by solar collectors and PV panels installed on the roof.

Then Zecc Architect made the specific design. They integrated the energy concept into the existing villa, made it adapt to the wishes of the future residence, at the same time fulfill the requirements from the monument committee. The big challenge for the architects was that for each and every intervention, they had to find a careful balance between the heritage quality of the building and the new energy concept. There was no ready-made answer and should opinions change in the future, all interventions could be ‘removed’. Several seminars and negotiations were held between clients, architects, municipality and monument committee to solve conflicts during this period, eventually all interested parties came to an agreement.

When it came to the construction phase, the first step was to demolish the old extension in the backside of the house and put up a new prefabricated cellar to make room for new energy installations. Above the cellar, new extension was built to fulfill the clients' desire for a better connection with the garden. The architect called it a metaphor for "the old mansion is 'fed' with new energy"[4)].

“High-technique” installation is located in the cellar under the new extension, including buffer tanks in which hot water is stored, and a heat pump which connects to a ground heat exchanger. The buffer tanks are the store center of the system, which can be heated up by two different heat sources.

One of them is heat collected by solar collectors installed later on the new extension’s flat roof. The vacuum tube collectors convert sunlight into heat and heat up medium gas (temperature can reach above 100 ^{o}C). Then heated medium gas transfers heat to the

tanks through a heat exchanger. A sensor is used to determine whether it is possible and necessary to heat the water in the buffer tanks.

The other heat source is the geothermal drawn by the ground source heat pump. When there is higher demand for heating (during the winter, for example), and solar collectors could not provide enough heat, the heat pump will be put into service. The heating agent goes through a closed circuit embedded in the soil to a depth of 65 meters, and brings back absorbed geothermal to warm up the building. The electricity needed by the heat pump will be produced by PV panels installed on the original pitched roof facing the garden*.

Then the heating system and a second skin were built behind the front and side façade, to hide energy-related measures from the street. Through this method, the monument committee's requirement about keeping the building's appearance from the street is fulfilled. At the backside, where the new extension stands, insulation was fitted outside the building, in order to keep the original staircase intact.

Fig 3: Integrated energy plan (Source: Energieneutraal Monument)

*On sunny days, this energy is supplied to the public network and on dark days energy will be extracted from the public network.

2.2 CASE 4

Enormous amount of energy is consumed to compensate heat losses in old historical buildings, so the first step to achieve energy-neutral goal is to reduce energy demand by insulating the building. The challenges here lie in the material and technique used:

- Use durable materials, so as to save energy not at the expense of natural resources;

- The application must be reversible, so that the monument remains untouched, so that new insights, new materials and techniques can be applied in the future;

- The application must be healthy, allow the house to “breathe” and will not cause any condensation which would lead to rot beam-ends.

To deal with the occasion, following energy measures were applied:

-Insulating the roof from inside with 12 cm hemp wool;

-Insulating the floor with foam glass (derived from recycled glass);

-Insulating the front and side façade from the inside and the rear facade from outside with clay plaster and wood-fiber board* (in some places wall heating pipes).

Insulation materials used here (hemp wool, wood-fiber board) are natural and “breathable”. Other materials (clay plaster, foam glass) were either recycled material or with very low embodied energy. Bricks from the demolished extension were crushed and reused in the finishing plaster on the rear facade, to give this new layer a similar hue with the original brick wall.

Secondary glazing was fitted on the new “skin”. Together with the original windows, this double glazing combination works as natural ventilation. Cold air from outside goes through the gap beneath original windows and enters the cavity between the old and new skins. Here cold air is preheated and slowly rises. Then heated air enters the living space via hidden grilles above the secondary (new) windows. The outlet air is discharged centrally via the bathroom. This solution has considerably reduced the amount of pipe-work, hence the monumental character of the dwelling has not been affected. The only place where the second skin was applied outside the original façade is on the rear façade. This façade is not used to ventilate the building.

Warm water (35 ^{o}C) is running in the pipes embedded in walls (some area in floor) to heat the house, so called the system low temperature wall (floor) heating. Owing to this wall heating system, the solar collectors could not only provide most of the building’s daily hot

*This is an old method of post-isolation commonly used in half-timbered houses in Southern Holland and Germany. First a thin layer of clay is applied on the existing wall, then wood-fiber panels; these are sealed with clay and finally smoothened with another thin layer of clay. Since the clay could be flushed off the wall, this process is completely reversible.

water use, but also sometimes be used for low temperature heating. They become the key for the energy-neutral goal. The more the collectors provide, the less heat from other source needed, hence the less energy is consumed.

What also deserves to be mentioned is the shower-heat recovery. This technique is something between insulation and installation: cold fresh water will go through two meters long spiral pipe and be pre-heated by drained shower water before it coming to the shower faucet.

After all extension and insulating construction were finished, solar collectors and PV panels were installed on the roof despite the objection from the monument committee. Only with these panels, the ambition for an energy-neutral monument could be achieved. Fortunately, they are completely hidden from the street.

The glass power house was not realized due to limited budget, but other measures have been taken to substitute the educational function it was supposed to have. A website dedicate to the project was put on line to explain every detail of the project. Interviews and conferences about the project had been held, during the renovation work. Articles and short films were spread through media, and an opening ceremony facing the public had taken place when they finished the renovation.

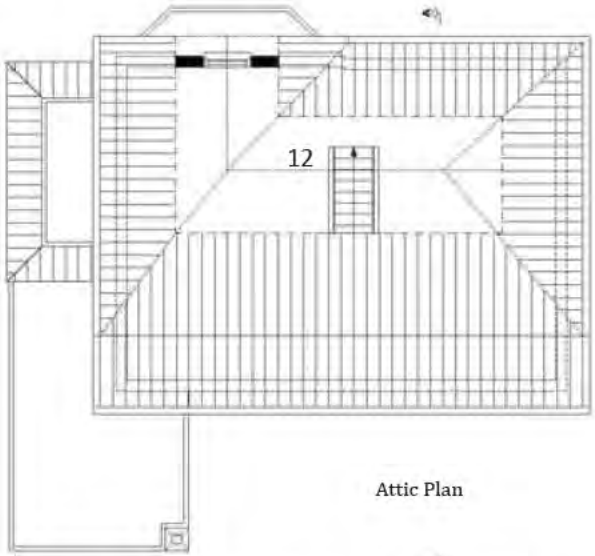
Fig 4: Solar panels on the rear roof (Source: Energieneutraal Monument)

2.2 CASE 4

Before Renovation

Ground Floor Plan

Second Floor Plan



Attic Plan

Legend

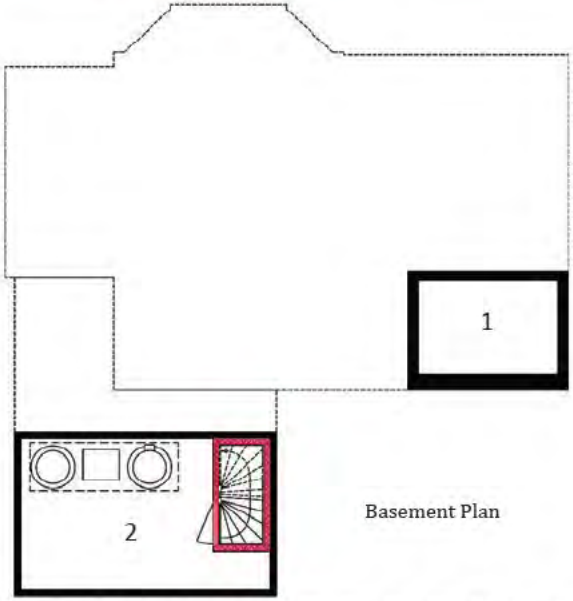
1:Existing basement
2:Basement installations
3:Hall
4:Living room
5:Lounge
6:Conservatory
7:Kitchen
8:Dinning room
9:Terrace
10:Bedroom
11:Solar collectors
12:Storage
13:Bathroom

(Zecc, 2009)

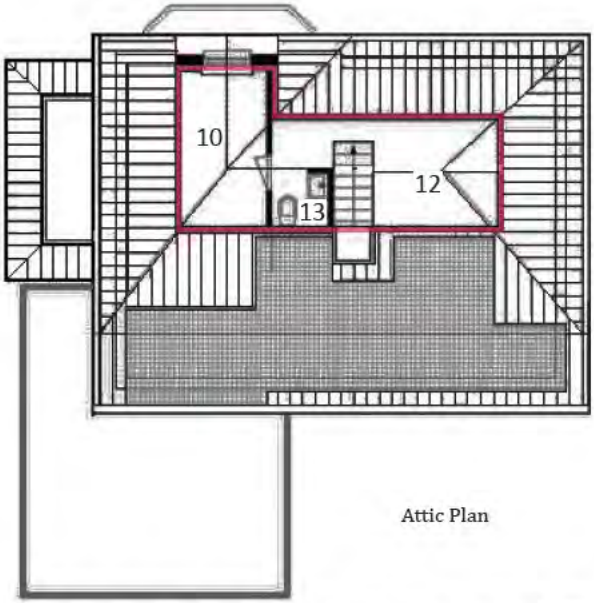
After Renovation

Ground Floor Plan

Second Floor Plan



Basement Plan



Attic Plan

2.2 CASE 4

Before Renovation

Legend

1:Existing basement
2:Basement installations
3:Hall
4:Living room
5:Lounge
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10:Bedroom
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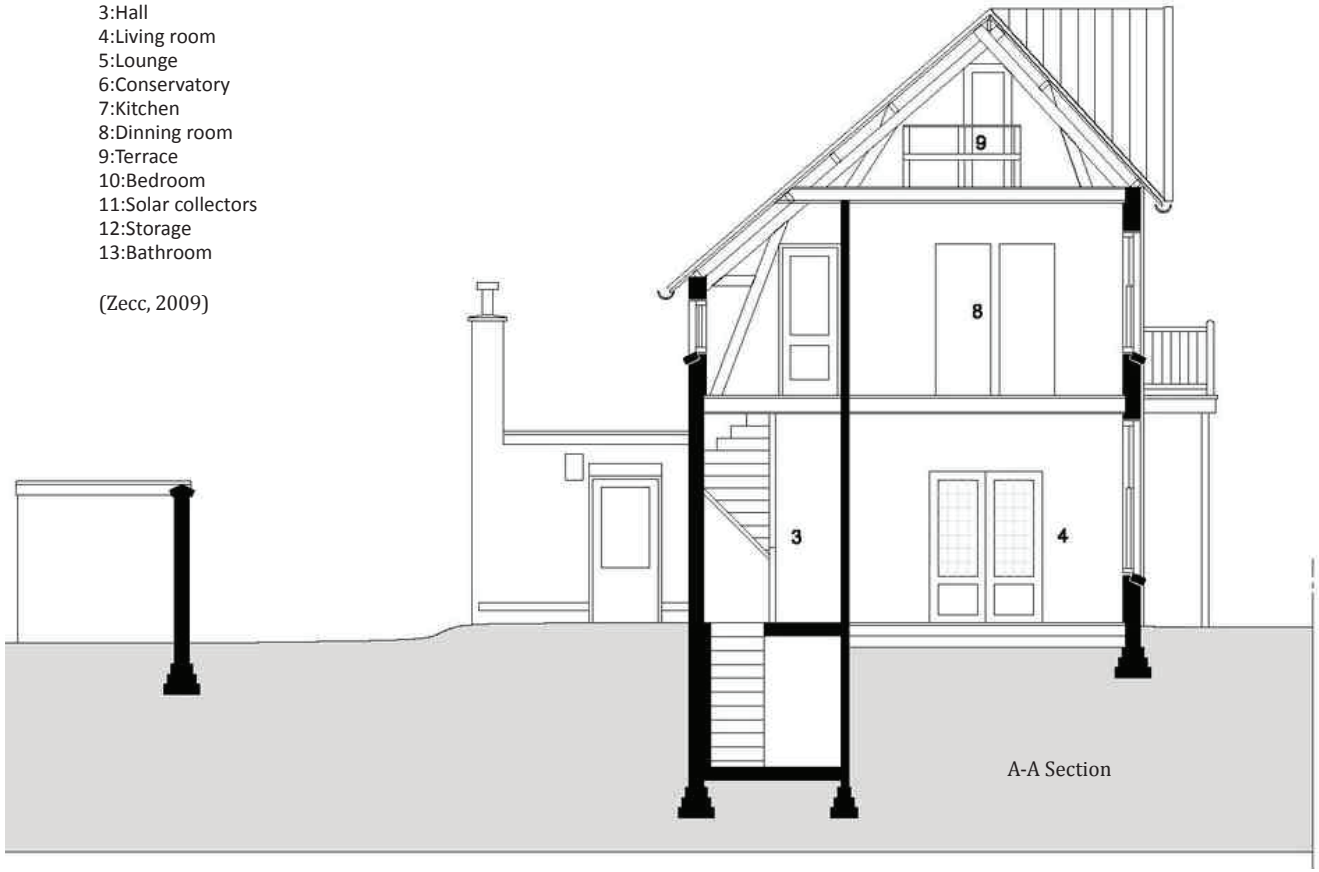
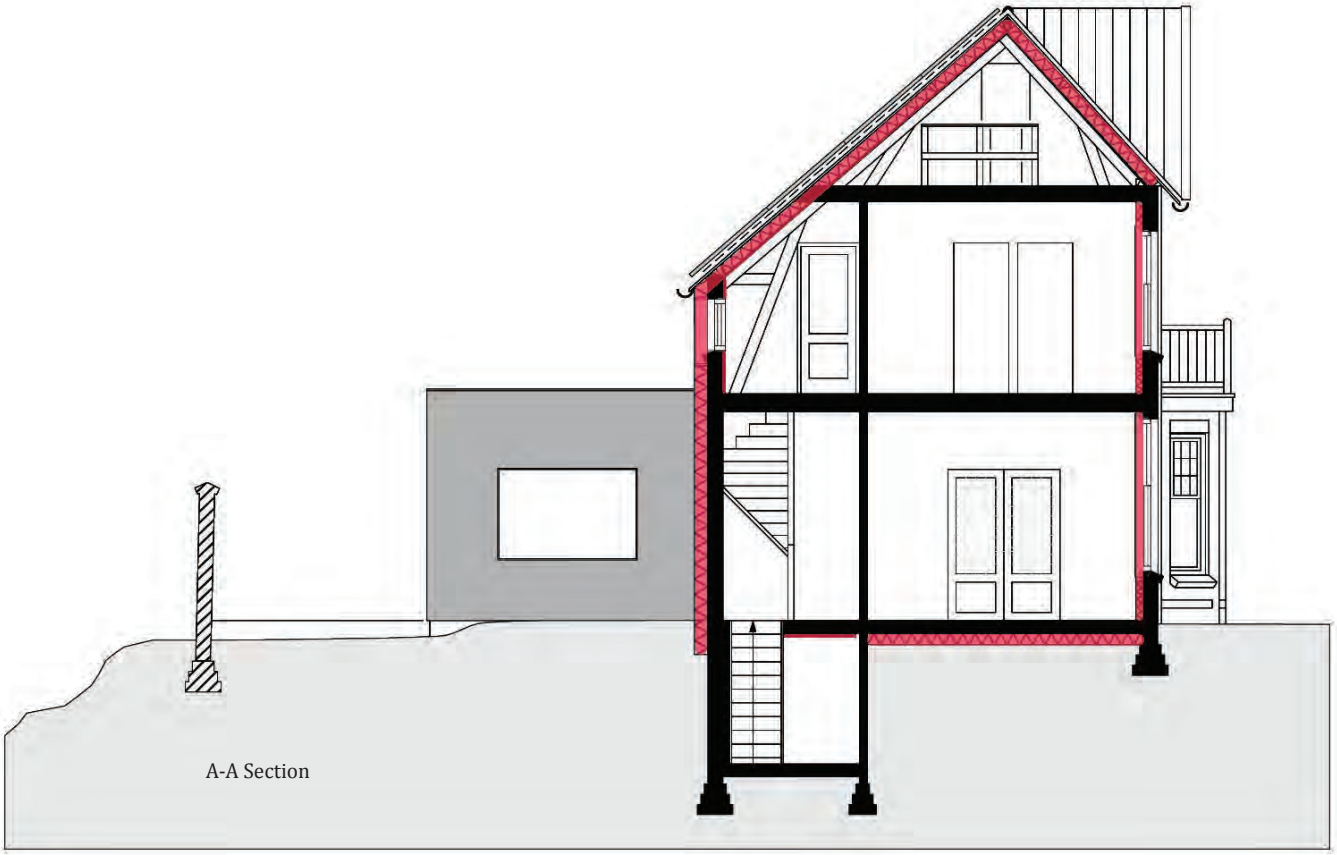
(Zecc, 2009)



A-A Section

After Renovation



A-A Section

2.2 CASE 4

Before Renovation

(Zecc, 2009)

Front

Right

Rear

Left

(Zecc, 2009)

After Renovation

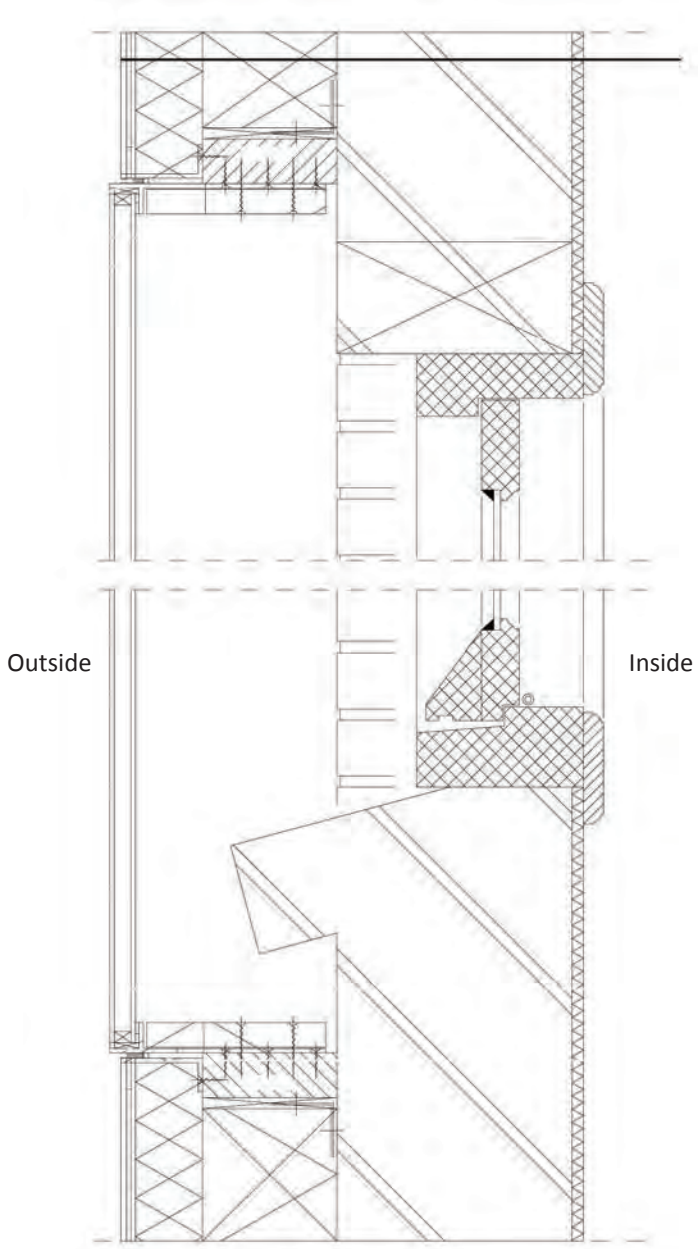
Front

Right

Rear

Left

2.2 CASE 4



Detail Drawing of Rear Facade
(from inside to outside)

Finishing layer
Smeared layer
Masonry (existing)
HSB wall with flax insulation
Insulation: 60 mm STO-Wood Wool Sheet
Reinforcement mortar: STO-Level Uni
Reinforcement fabric: STO-Glass Fibre mesh
Intermediate layer: StoPrep Miral
Finishing plaster : Sto Miral Nivell F mixed with crushed brick

(Zecc, 2009)

Pic 2: Street View


PHASE 4
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4


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5


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6

2.2 CASE 4


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8


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2.2 CASE 4

Pic 3-6: View from side
Pic 7-10: View from back
Pic 11: Second glaze inside the facade
Pic 12: Hall way
Pic 13: New opening
Pic 14: Back facade

2.2 CASE 4

Sustainability Analyses

Environmental sustainability:

- ☻ Energy efficiency in operation
- ☻ Material, waste and pollution
- ☻ Energy Quality
- ☻ Management

Energy efficiency in construction

Water efficiency

This project introduce renewable energy such as solar energy as well as geothermal. The energy quality is much better than using fossil fuel. The project takes great effort to control the heat flow through its borders, not only well insulating but also reusing the heat in sewage. These thorough measurements are the guarantee for energy-neutral goal. But since the project is fairly new, the exact running energy report is not achieved yet. There are monitoring devices. Perhaps after one or two years, there will be a follow up report about if the energy-neutral goal is fulfilled in reality.

Reusing the bricks from the old extension would be a brilliant idea if the whole crushing work could take place on the site instead of transporting bricks to the factory and then bring the powder back to the site. In the practice of this project, transporting energy consumed definitely compromised the benefit gained by reusing material. But one has to admit that room for improvement is also a precious outcome of such a frontier project.

Social Sustainability

- ☻ Quality of life
- ☻ Social cohesion
- Diversity
- Equity

Before the renovation, the house was in poor situation, lacking of maintenance, very cold indoor climate during winter, basically not suitable to live in. The renovation got the main part restored and extended towards the garden to fulfill the clients' wish to have a better connection with the natural surroundings. By using organic insulation materials, introducing natural ventilation elements and applying other energy-relating technique the indoor climate has been dramatically improved. A better and healthier living space was realized through this process.

Several parties were involved in the project, this situation encouraged them to communicate and exchange their knowledge, eventually yielded mutual understanding and agreement. The experiment was crucial to the architects and the client and of great importance to the municipality and authorities.

To draw public attention was also part of the intention of this project. The municipality wanted to demonstrate even an old house like this could be converted into a sustainable residence; the clients wanted to promote their low-carbon life style. This common ground brought them together to the tough but fruitful process.

Other activities facing the public, such as seminars, interviews and opening, held during the project were not about seeking the limelight, but making people to start considering and taking act for a change.

2.2 CASE 4

Economic Sustainability

- ☻ Reduced operating cost
- ☻ Increased building value
- ☻ Reduced maintenance cost
- ☻ Tax benefits and incentives

Reduced construction cost

Productivity gains

Though the price for buying electricity from the grid is higher than selling electricity to the grid, there is still possible room for operation cost reduction. The house consumes much less electricity for heating and much less hot water for domestic uses than previous, these could contribute to the operating cost reduction, too.

During the process, the client received some financial assistance, including low-interest loan because the bank was very interested in the energy-neutral concept, subsidy for the installation of double glazing, founding form the municipality for the valuable knowledge gained in this project. Yet the clients got no subsidy for solar panels, because there was not enough funding for all applicants. The VAT for insulation materials was reduced from 19% to 6% in 2009, which was also great news to the client.

Since the fame of the house got elevated and the good amount of money and work invested in it, the price of the house is definitely much higher than before, yet the clients are not sure if their investment is economically profitable, especially given that selling the house is not a intention at present.

Cultural Sustainability

- Culture of sustainability
- Indigenous knowledge and traditional practices
- Architectural value
- Heritage conservation

In order to preserve valuable characters of the original design, a brilliant plan had been made. The functional division remains nearly the same in the main house: beautiful stately rooms in the front facing the street, with a dense hall and staircase at the back.

In order to get a high-quality connection with the garden, the architect decided to demolish the old extension and added a new extension right at the position, which is the bright dining room the client wanted.

The finish of the back façade is plaster with crushed bricks form the demolished extension, so the villa gets multiple faces, changing from traditional in the front to modern at the back.

Insulating the house requires careful consideration and sophisticated design. Reversibility is the key word here. By introducing a traditional technique, all measures applied could been removed, and the house could be restored to the original status without leaving any trace by changing vision in the future.

Zecc had weighted between the energetic concept and the monumental value of this specific building, and eventually came to a delicate balance. The front and side façade were insulated from the inside, so that the view from the street remains the same as before. While in the back, insulation was installed outside the existing façade, in order to keep the rich detailed historic corridor and staircase which is an important feature in the context.

The conservatory was kept uninsulated, partially because it is in the sunny side of the building. It used to be the solarium in winter and this function was kept. The other reason was the difficulty to insulate and plaster such a small room without harming abundant details in the windows and corners. Only the glass was replaced by new insulated glazing.

By making the secondary glazing bigger than the old wooden frames, part of the masonry of the original façade remains visible. The new insulation layer is kept visually separate from the monument. The additions are clearly readable in material and details. This creates a beautiful stratification of the historic house.

2.2 CASE 4

Comments

It is very difficult and requires tremendous effort to fulfill the requirements from variant perspectives in a complicated project like this, but Zecc did an extraordinary work. All decisions were made carefully after thorough consideration among possible alternatives. And from our point of view, this renovation achieved beautiful result at the end.

As a pilot project, it accumulated good amount of knowledge and intrigued public's interest and enthusiasm for sustainable renovation, which is also a triumph to both the client and the municipality.

The only way to achieve the energy neutral goal is to install solar panels and solar collectors on the backside, despite the objection from the monument committee, but we have to admit that it is not a elegant solution, both from a architect's perspective, as well as from heritage protection consideration.

Of course there were some trifles in this project which did not work exactly as they expected, and sometimes sustainability dilemmas emerged for them to overcome. Hope these could be precious lessons for their further practice, and also for other succeeding projects.

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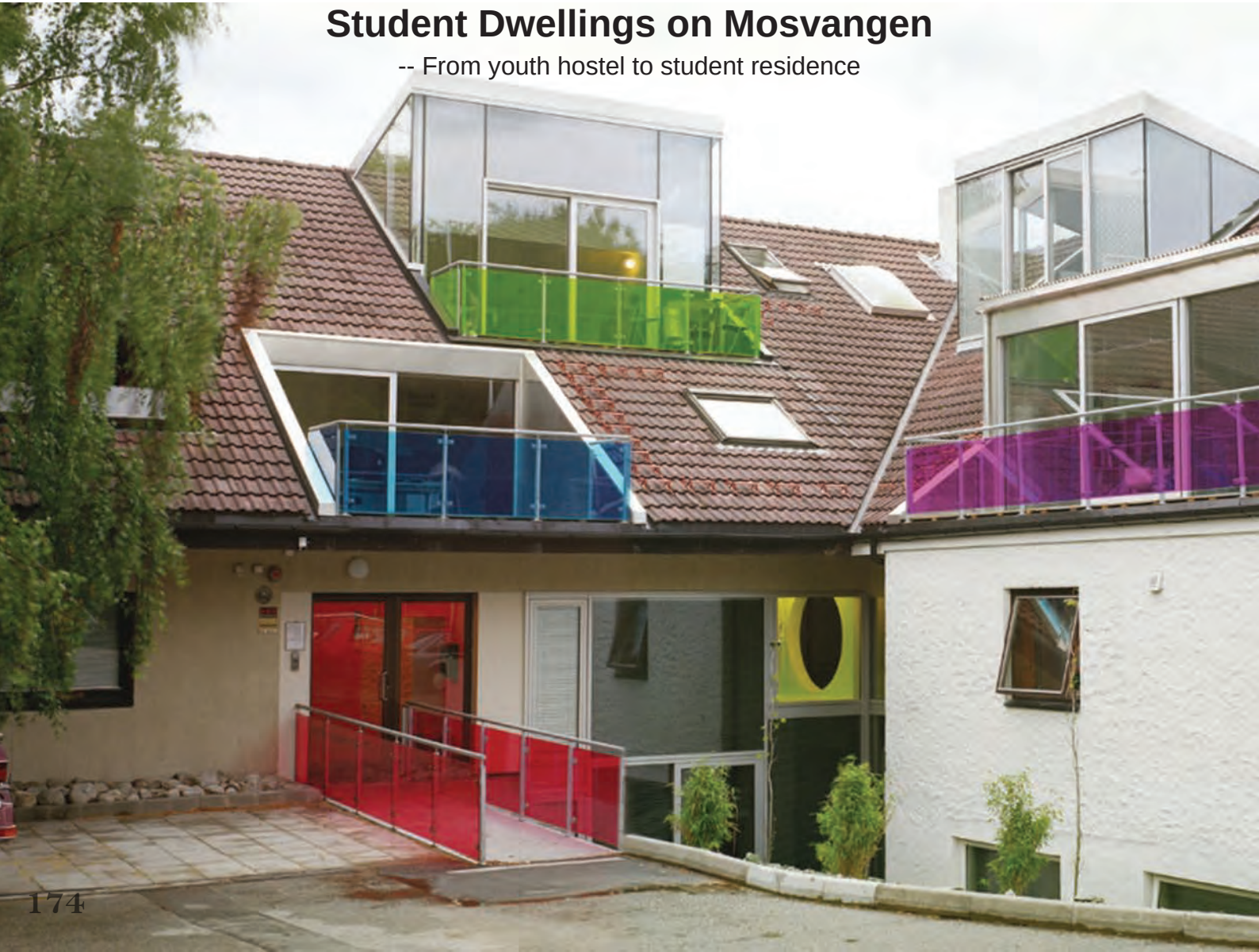
2.2 CASE 5

Student Dwellings on Mosvangen

-- From youth hostel to student residence



2.2 CASE 5

Brief

Location:	Henrik Ibsens gt. 23, Stavanger, Norway
Client:	SiS - Samskipnaden in Stavanger (Student Welfare Service)
Architects:	Helen & Hard AS, Stavanger
Advisory:	Multiconsult | Simex AS | Teknisk byrå AS
Main contractor:	NCC Construction AS
Renovation type:	from youth hostel to student residence
Original built:	1930
Completion of renovation:	Jul 2003
Area of construction:	950m^2
Cost:	ca. 13 MNOK, ca. 1700 Euro/m^2
Award:	50 best Norwegian buildings since 2000

Pic 1: The main entrance.
Pic 2: Bird-view of the site.

2.2 CASE 5

Background

Mosvangen student residence is converted from a former youth hostel which located in between the city center of Stavanger and the University of Stavanger. It is very close to lake Mosvatnet and Stavanger Camping Mosvangen where welcomes tourists every summer.

Stavanger city is commonly referred to the "Petroleum Capital of Norway" [1]. The oil industry came after 1969* has helped with the development of the city in all means, as well as a modern center of education and research. And it was selected as the "European Capital of Culture 2008", with the concept of “Open Port” - the region and its people was supposed to be even more open and inclusive towards art, ideas and opportunities. [2] Stavanger has several schools for the expatriate community and one university - the University of Stavanger with about 8,000 students [2] . To be of service to students in Stavanger, the local welfare and service organization SiS - the client of this project - exists as an independent organization. SiS manages student accommodation, a kindergarten, health services, cafeterias, a sports center and a book shop. Furthermore, it provides financial support to several student organizations. [3]

SiS was in need of more student flats, so they got the property of the former youth hostel Mosvangen Gjestehus - the original building was from 1930 and has been rebuilt in several stages. SiS's first idea was to tear down the building and build new dwellings on the site. They changed their plan after architects from Helen & Hard AS (H&H) has proposed to do a transformation to the old house.

* In 1969, an oil strike was reported in the North Sea.

Architects

Helen & Hard AS (H&H)

Stavanger, www.hha.no

H&H was founded in 1996 by Siv Helene Stangeland and Reinhard Kropf. Today, the company has a youthful staff drawn from different countries. The office is dedicated to challenging the traditional relationship between architecture and its environment, through continued experimentation and research on sustainability. Working across a range of typologies, scales and locations [4].

All projects of H&H have sustainability as a goal, while they address all different aspects of sustainability like passive-house standard, recycling and reusing, inhabitant participation, cultural heritage preservation, etc. Especially, when getting up to social sustainability, they think a lot about space for interaction and also take input from the end-user during design and building process. The result is sometimes unpredictable, and the process looks experimental which needs more efforts from the architects, but with the contributions from users the product becomes more solid. One could learn more about how H&H understand sustainability and how they work on it from their philosophy on their website.

2.2 CASE 5

Intention

We proposed to renovate it because we think it's a better way of using resources and the students would get more unique and bigger flats. --Interview with H&H [5].

Student Association wanted to test out new living arrangements for students. Of the 19 student apartments with size from 22 to 60 m^2, most apartments intended for couples. [6]

The problem was that the original building volume was too deep and inappropriate for the new purpose. So the initial task was to create better lighting and living conditions. How to integrate waste elements into the new architectural design, meanwhile, to give each new apartment unique special characters, was another task, which could be called an experiment or innovation because it differs from common student dwelling design.

Pic 3: Before and after renovation.
Pic 4: Exterior photo.

3 © H&H

2.2 CASE 5

Process & Result

Demolition and new construction, was set up at the beginning of this project as one option for the client, against the option of recovery and rebuilding of the existing facility. Rebuilding tends to open up for improvisation and unusual solutions. The challenge lies in the transformation process and how the discarded come into the game again. The architect's recommendation along with estimate costs for the two options, leaded to the decision of rebuilding. Cost calculations, which were calculated by an entrepreneur who used standard calculation numbers, showed that it will be more expensive to demolish and build new than to transform the existing building. [5)]

The original building materials were concrete and masonry in the walls, and wood for the floors and roof. They have been persevered, researched and integrated to the new design. The ground has been excavated, the building has been hollowed out, cut, volumes have been added, and the ceilings have been lifted. All new interventions were highlighted with bright colors or contrasting materials to the old house's white plaster. Building elements such as windows, doors, staircases, floorboards and concrete slabs have been transferred and reused elsewhere in the house. Extra insulation was put inside the roof and all exterior walls, and new windows got better U-value, for better thermal performance of the house.

Architects were asking around the area for different spent materials. They went back with the information then improvised with the material. When working with reuse, architects have to improvise during the process, and be aware that unpredictable results. They gave some compromises along the way. They point out that it was necessary to be in the process and all construction meetings to reach a good result. As a result of designing with recycling:

> *Rails in the entrance hall are made from laser-cut sheets from the metallurgical industry, and the lighting elements as reused directional lights from derelict cars. The emerald garden is fashioned out of industrial slag from the smelting works at Sauda.* [7)]

The house got its distinctive style from those recycled materials.

Pic 5: Construction photo. The roof was lifted and opened for terraces. © H&H

2.2 CASE 5

Thanks to the transformation of the large gable roof with new openings and recessed terraces towards south and west, several apartments got two levels, consisted with kitchen, living room, bedroom and terrace on the south or west roof. Lighting condition was improved very much. The roof originally was a heavy and closed character, while after rebuilding, it became accessible and a representative image of Mosvangen. Large volume enabled the spatial solution that provides each apartment different characters. The interior was designed after different mottoes. Now the 19 student apartments with size from 22 to 60 m^2, are provided for singles, couples and shared housing. (see Fig 1, Fig 2)

> *A new spatial occupation and partitioning of the building has made it possible to create 19 unconventional apartments, such as a tower apartment of three floors, cockpit apartments with roof extensions and patios, the Big Brother apartment with its open plan living room extending into a communal entree, a party apartment in the basement, an apartment with an emerald garden...* [7)]

We saw Mosvangen renovation on H&H's web site the first time, and it was attractive. It attracts people not by any odd assemblage, non-high-tech monster, but colorful railing panel strewed over the pitched roof like an old house blooming from the inside. It is not a standard image of student housing and commented as positive in Judith's thesis [7)]. We have visited Mosvangen in March 2011. It was smaller than our expectation that actually was just one end of a block of student dwelling. The main part of the block is called Mosvangen 1 and the renovated part is Mosvangen 2. But the 8-year-old face lifting was still exciting that brings freshness to the block. The craft of the original facade was fascinating to see which tells the history of the building.

Pic 6 - 9: Photos of central common space. Hand rails made from recycled laser-cut sheets are the most attractive character in the communication space. Together with the rough wall surface and recycled car lights, the whole space stands as a vibrant industrial style .

6 © Erieta Attali

8 ©H&H

2.2 CASE 5

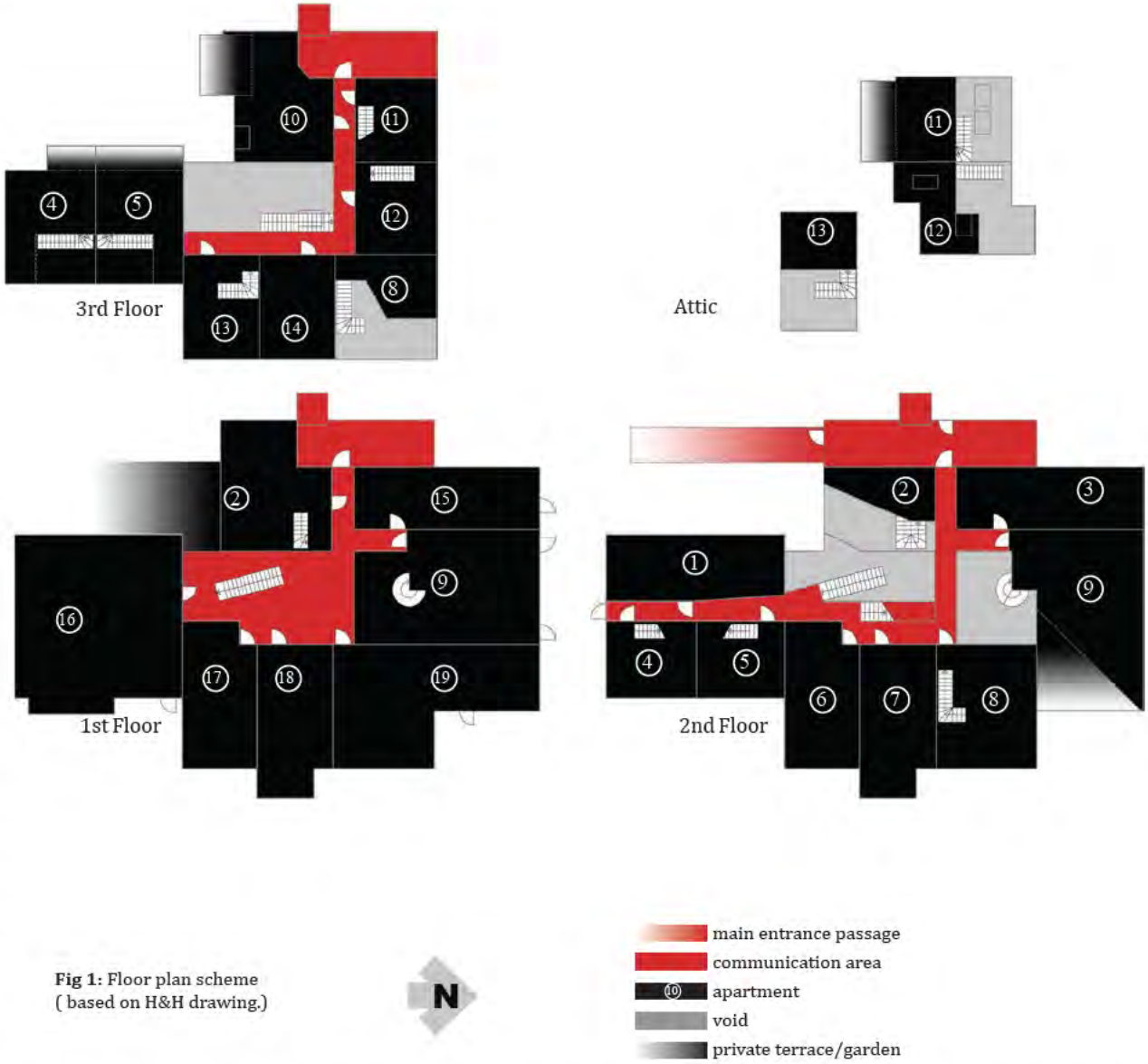
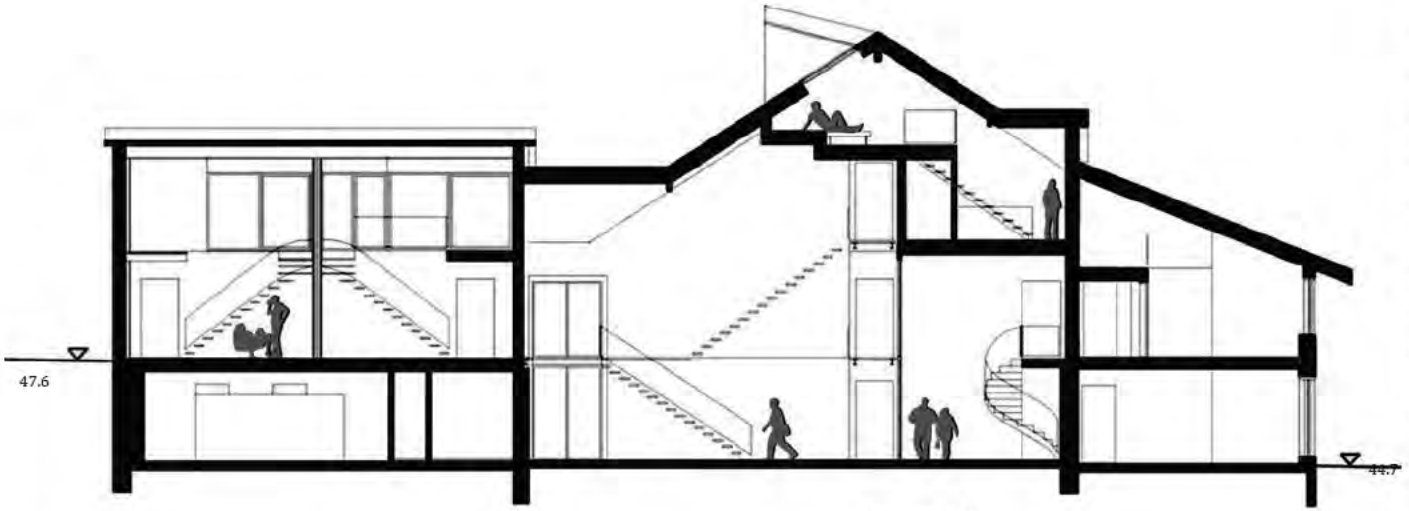
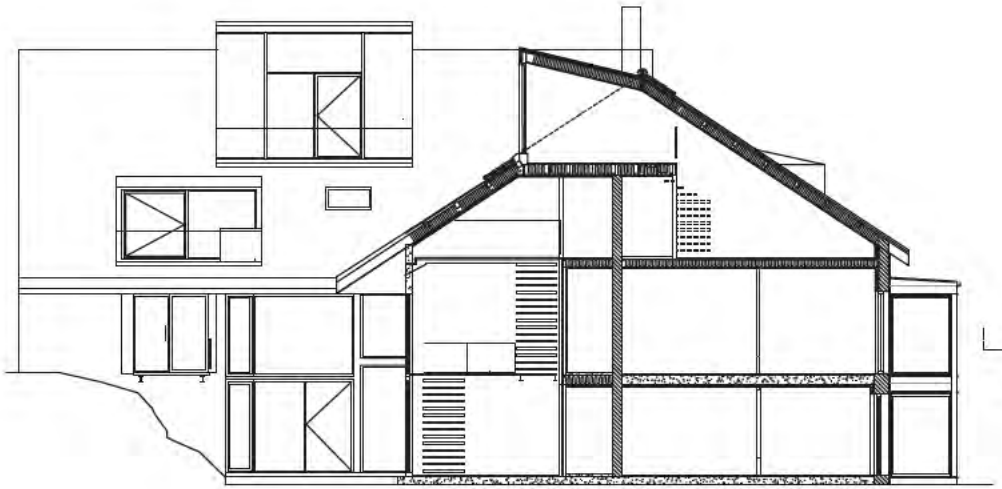


Fig 1: Floor plan scheme
(based on H&H drawing.)



Section A-A



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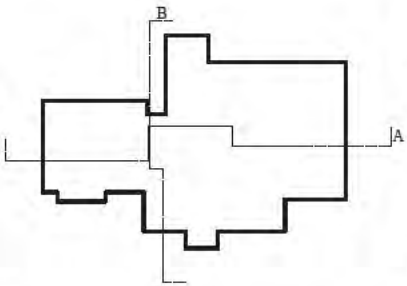

Fig 2: Sections (H&H, 2011)

2.2 CASE 5


10 © H&H


11 © H&H


12 © H&H


13 © H&H

Pic 10: Balcony on the roof.
Pic 11: Emerald garden flat.
Pic 12: Double height kitchen.
Pic 13: Big brother flat.
Pic 14: Top floor bedroom.
Pic 15: Kitchen as communication hub.
Pic 16: Computer room.
Pic 17 - 22: living rooms.

2.2 CASE 5

Sustainability Check List

Environmental sustainability

- ☻ Energy efficiency in construction
- ☻ Energy efficiency in operation
- ☻ Material, waste and pollution

Management

Water efficiency

Persuade the client to keep and renovate the old house, was the first good try of H&H. Demolish and construct new would pay huge environmental cost. That's why reuse of existing buildings has better environmental sustainability in most of the cases. Together with reuse of building parts and other waste material in the renovation, this project gave a good utilization of materials and energy. When reusing materials, not only energy cost for extraction and manufacture was cut down, but also energy for transportation was largely reduced, because all recycled materials were from either the site or local area in this case. For taking care of the environment by recycling, this project was selected into the project base of NAL|Ecobox*. [8)]

Some new material was added, for the structural change and interior decoration. They are mainly timber, for structure, steel and glass, for the new roof openings, that are recyclable and easy to disassemble. New terraces and skylights on the roof made the form of the house more complex, which leaded to a worse building shape coefficient. But this is reasonable in this case, since space and lighting were the main issue when adapting to the new use.

To achieve a better indoor temperature with less energy consumption in a long term, extra insulation layers were added to the roof and exterior wall, windows with better U-value were chosen to replace the old. But the architects didn't follow up the project after renovation, and we did not get contact with the client, unfortunately. We got no energy data like heating cost in operation, and not be able to assess the performance this time.

* NAL|Ecobox is a self-reliant unit of the National Association of Norwegian Architects (NAL).
The Ecobox Project Base presents a broad range of environmental building and plan projects throughout Norway. There are more than 140 reference projects in the project base and it is available for anyone interested to use.

Pic 23: Preserved original facade.
© Wenxuan Zhang

2.2 CASE 5

Social

- ☻ Quality of life
- ☻ Diversity
- ☻ Equity
- ☻ Social cohesion

> *The possibility for personalisation and individual adjustments in flats was mentioned as an important element for achieving a feeling of home. Living in satisfactory housing was regarded as an important part of one's general satisfaction... Institutionality in student housing was generally seen as a negative aspect, both in the qualitative and the quantitative investigation...* [9)*]

In this project, all 19 apartments have different sizes - relatively spacious - and unique floor plans that optimizing the utilization of space and light.(see Fig 3) They are more like family flat that most of them contain living room for social meeting, some even have terrace which normally not been thought of a necessary part of student house. It is quite out of the ordinary student residence and far from institutional, which gives the physical guarantee of a housing satisfaction and a home experience. Tenants of Mosvangen are on average older than of other student dwellings. There are not only students live in Mosvangen; some tenants live with their family members. [9)] These situations differ from common student residence that shows the good compatibility of Mosvangen.

Social interaction is always important especially for student who probably left his old social network for study. To some extent, projects like Mosvangen help with building social cohesion. In one way, Mosvangen supports the variety within student group by offering various sorts of apartments, so that students don't have to live in an institutional room without any personality. In another way, it promotes the equity between student group and other social groups, that students also have the possibility to live in a homelike apartment as others, and developing their social interaction while enjoy their living.

Though Mosvangen provides space for both private and social life within the apartments, but it will be even greater if more common spaces for social meeting could be squeezed. Now the common space is mainly communication area including staircase and corridors. (see Fig 4, 5). Overall, this project cared about different social values that is commendable.

* Quoted from Judith Thomsen's thesis from 2008, where she conducted qualitative interviews and a quantitative survey of students, together with three Norwegian student dwelling case studies that includes Mosvangen.

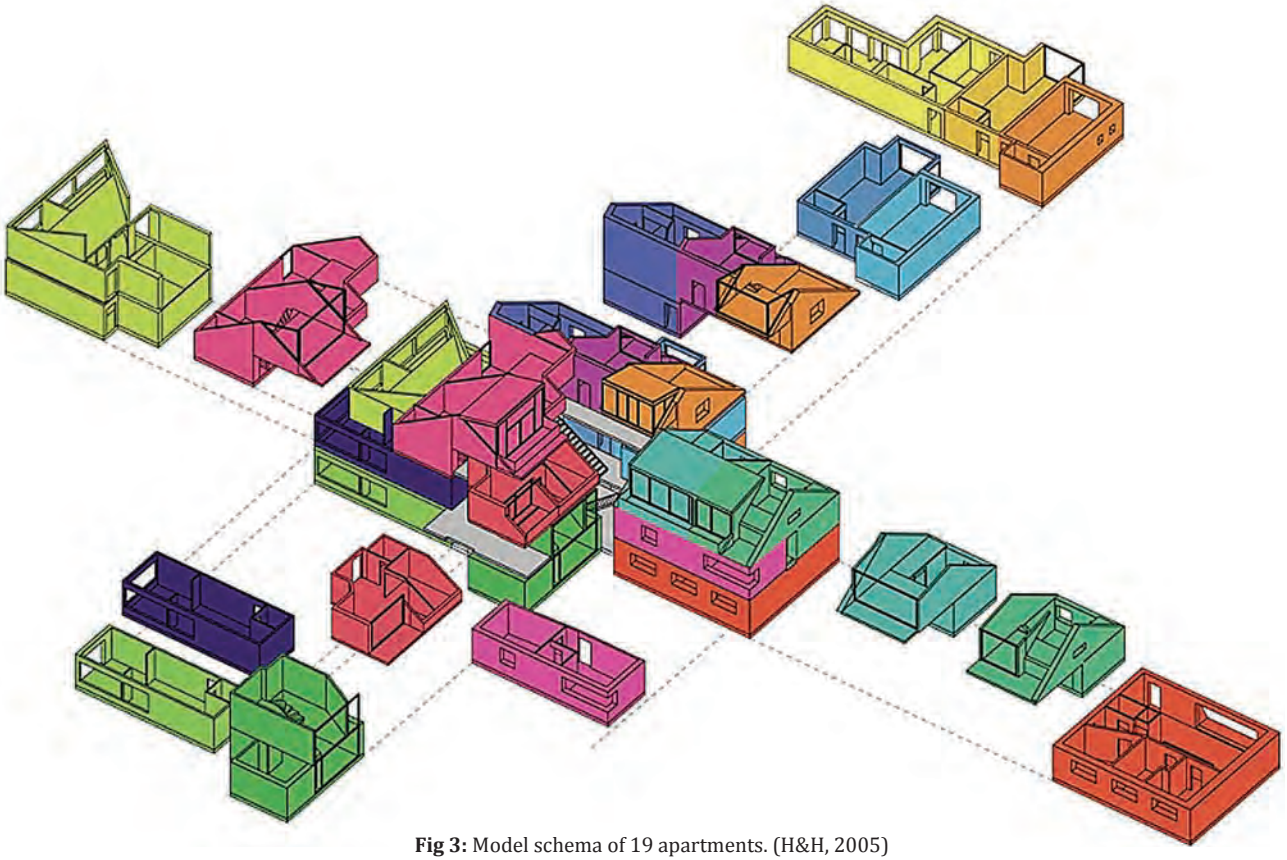

Fig 3: Model schema of 19 apartments. (H&H, 2005)

2.2 CASE 5

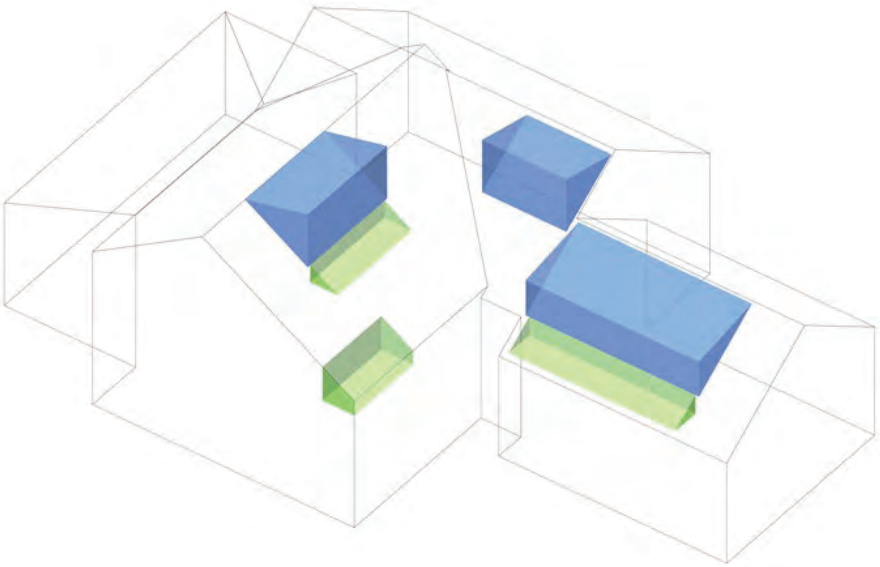

Fig 4: Roof balcony scheme. (H&H, 2005)

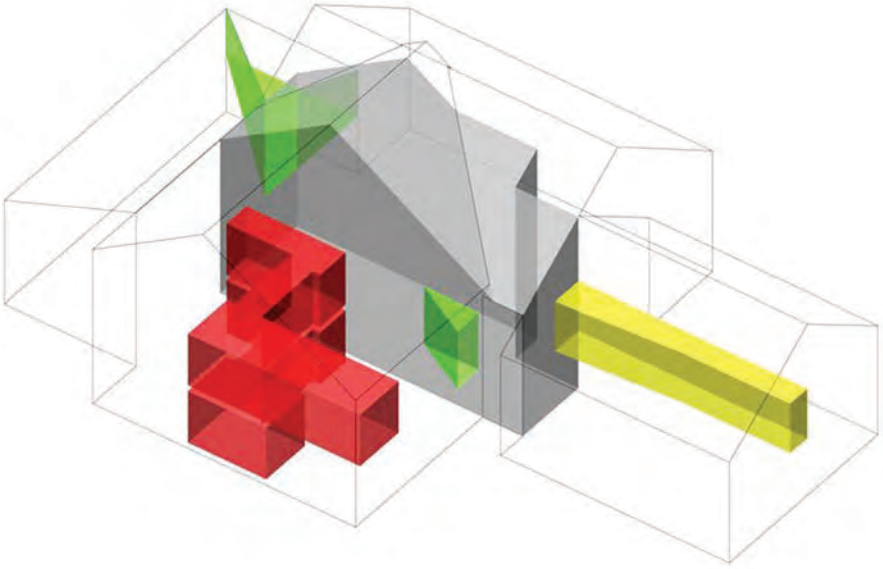

Fig 5: Common space scheme. (H&H, 2005)

Economic

- ☻ Reduced construction cost
- ☻ Reduced operating cost
- ☻ Increased building value
- Reduced maintenance cost
- Tax benefits and incentives
- Productivity gains

Construction budget is crucial for every project, this time it leaded the client to renovation. We haven't read the original cost calculation comparing report; therefore got no idea with how long time was calculated and how much would be saved by renovation. The overall cost for construction was 13 million NOK according to the report of the constructor NCC in 2002[10]. About 1700 Euro/m^2 is not cheap.

What is clear is that the reuse of building structure and elements saved money for both material shopping and transportation. In addition, the project got some funding from the state because it was about student welfare. [5]

After added insulation layer and optimized day lighting, energy cost in operation of the student house would be cut down. Though it is not always the case that renovation is cheaper than new construction, but in a long run and also considering the environmental cost, renovation is normally a better option.

After renovation, Mosvangen became a popular accommodation site for student because the lively and friendly atmosphere it has and of course the capacious apartments. It is no longer just an old hostel but almost the brand of student residence in Stavanger. Student housing rent gets subsidy from the Norwegian state as well, so Mosvangen got great cost performance.

2.2 CASE 5

Cultural

- ☻ Architectural value
- Indigenous knowledge and traditional practices
- Heritage conservation
- Culture of sustainability

Architectural value was well addressed and achieved in this renovation. It was among the list of “50 best Norwegian buildings since 2000” in 2006.[11)] *

From the exterior, new elements with bright colors were added to the original facade with big contrast. The composition of materials and forms reduced the feeling of institutional, to the opposite, was considered interesting and "atypical". The new facade gives the building a recognizable face, which means people identify with the property that not just a place to sleep. [12)]

Apartments of Mosvangen are spacious that many of the flats have more than one storey, hence adding the vertical dimension. More space brought more adaptability for different tenants. As one could see from the model scheme, all 19 apartments are unique and try to occupy every little usable space inside and outside the building structure. The innovative space division stands out from the traditional student residence design.

Design of space on the border was emphasized in this project. It is small space that easily been ignored but very important for connections and relations in between like indoor and outdoor, private and public. Various relations between indoor and outdoor area, in this case the terraces and private entrances, provide different levels of privacy and more personal choices, that promotes the notion of privacy and individuality. Entrance is the border of the property; it was designed as an atrium, which students could use as meeting place and semi-private zone. In the other way, these border spaces contribute to the joyful spatial environment.

* As the only student in the country was Mosvangen dormitory in 2006 ranked among Norway’s top 50 buildings since 2000. Jury assessed Norwegian architecture award was the fifth in the series is a collaboration between the National Museum and the magazine “Byggekuns”.

Pic 24:
Clearly distinguish between new and old facades.
© H&H

2.2 CASE 5

Comments

Both the process and the result of this renovation project are remarkable.

The architects were involved in the construction for a very long period since the many unpredictable issues came with recycled material. On one hand, it asks for extraordinary effort from the architects; On the other hand, it brings more vagaries, and the result would be a pleasant surprise. Last but not the least, recycle and reuse of structure or elements could reduce environmental impact enormously. Design with recycling is worth to try.

Mosvangen is a small project but not a simplex. One would not understand the building with a simple glance, but more curiosity rising. Well-designed common area and the 19 distinct apartments composed in the old structure. Variety is the spice of new life in the old house.

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PART3 CONCLUSION & REFLECTION

CONCLUSION

3.1 Conclusion

Followed is a table of summary of sustainability check list results of the five cases. As one could read from the case studies and from this table, all projects took care of the four domains of sustainability, while they approached sustainability from different angles. Cilli project has paid great attention to cultural and economic aspects, because the architects, who are also the clients, really appreciate the local traditions while thought simplified construction is the way to sustainable; Boschetsrieder settlement project has got very good results on environmental and cultural aspects, proved by the fact that the monument became exemplary energy efficient building with restored original appearance; One extraordinary feature of HAKA project is the effort they've put on social sustainability, while the supply-driven design with recycled material is amazing, too; Energy-neutral monument is another example of energetic renovation on historical heritage, while the involvement of renewable energy and the concept of reversibility are its highlights; Social and cultural

Table 1: summary of sustainability check list results.

ASPECTS	ENVIRONMENTAL SUSTAINABILITY						ECONOMIC SUSTAINABILITY						SOCIAL SUSTAINABILITY				CULTURAL SUSTAINABILITY				☻ SUM
ITEMS	Management	Energy efficiency in construction	Energy efficiency in operation	Energy quality	Water efficiency	Material, waste and pollution	Reduced construction cost	Reduced operating cost	Reduced maintenance cost	Increase building value	Tax benefits and incentives	Productivity gains	Quality of life and well-being	Equity	Diversity	Social cohesion	Culture of sustainability	Heritage conservation	Indigenous knowledge and traditional practices	Design value	20
Boschetsrieder Residential Estate			☻		☻	☻		☻	☻	☻	☻		☻			☻		☻	☻	☻	12
Birg Mich Cilli !		☻	☻			☻	☻	☻	☻	☻			☻		☻		☻		☻	☻	12
Recycled Office HAKA Building		☻				☻	☻			☻		☻	☻	☻		☻	☻	☻		☻	11
Energy-neutral Monument in Netherland	☻		☻	☻		☻		☻	☻	☻	☻		☻			☻	☻	☻	☻	☻	14
Student Dwellings on Mosvangen		☻	☻			☻	☻	☻		☻		☻	☻	☻	☻	☻				☻	12

aspects have been focused in Mosvangen student residence project, that colorful life is hosted in the recycled old house now.

Most cases get 12 credits out of the total 20. We are aware of the simplicity of our check list system and its limits, that the results can't be taken and compare directly; Higher credits doesn't mean a more sustainable project.

The items in our check list are the points one need to pay attention to when conducting a sustainable renovation project. As shows in the table, "Material, waste and pollution", "Increase building value", "Quality of life and well-being", "Design value" are the items that every case has targeted and reached. They are possibly the most basic, easy-to-reach, and effective tasks, that we suggest to be placed in the first place of consideration of sustainable renovation projects.

Generally speaking, integrated solution for sustainable renovation is absolutely achievable, and there are various approaches to achieve it, just like what people did in these cases. Intentions at the beginning and the results in the end vary among projects. But an adequate result should always be comprehensive. Actually there are many measures that affect more than one factors, either synergetic or opposition.

Environmental sustainability

When heading environmental sustainability in a renovation project, energetic improvement is the principle task that holds true. It is commonly approached by sealing and insulating the building envelope so as to reduce energy consumption on heating, cooling and ventilation. Another way is updating building facilities, equipment and household appliances to energy efficient ones. Meanwhile, energy issue is very much related to economy, that energy efficient building needs bigger initial investment normally, while costs less in operation than tradition building; It brings subsidy and award money in some cases.

There are other ways helping with reducing the environmental impacts of a building, such as reusing building structure, building elements and other material, simplifying and optimizing construction process, choosing eco-friendly building material, or introducing renewable energy, etc. Among these, recycle and reuse are broadly applied in cases we studied, so called supply-driven design, which normally reduces renovation cost but request more effort from the architects.

Not only the way of construction, but also how it could be disassembled could affect the

CONCLUSION

environmental sustainability aspect. As a temporary installation, project HAKA building not only focuses on the energy and material consumed in construction, but also considers thoroughly with further possibilities, especially after the mission of the installation completed. It sets up a good example for other similar projects, and we believe it could also be a reminder to architects to bring the consideration for demolition into the design phase.

Water efficiency was considered in most cases but not gained very much attention. Updating sanitary fittings and kitchen fittings are the common methods used for reducing water consumption. But more advanced water recycling system or rain-water collecting system are not installed in any of these cases. One of the reasons might be the limits on structural alternations and financial restricts, or some time it need too broad plans on the surrounding landscape, like when designing a natural water processing system. Another possible explanation could be that none of the cases we investigated is in drought or water-deficient area. That's why some of the projects (the neutral-energy monument for example) considered water process system in the project plan but after weighting between this issue with others, they drop the idea in realization phase. The water efficient issue will be more important in projects located in drought or water deficient areas.

To the opposite of new constructed energy efficient buildings, renewable energy is not commonly fetched in renovation projects - only 1 in 5 cases has introduced solar energy - owing to big change it requires to the energy system and the appearance of the building, both of which are troublesome for heritage renovation projects. It is not easy, but possible, to reach zero-energy goal as the case Energy-Neutral monument did.

Social sustainability

Better social impacts from the process of a renovation project, could be achieved by cooperation and communication among stakeholders, taking consideration from various aspects while promoting mutual understanding among them. Architects played a key role in sustainable renovation projects which we studied. In a few cases, the client have a very clear idea about the sustainability goal, while most of the time, the architects are the most goal-oriented party regarding sustainability issues, as well as the pushing hands behind

the ideas of integrated sustainable solutions. It is the architects' understanding of sustainability defines the sustainability goal and by which means to realize it. We are delighted and inspired to see that more and more architects are making sustainable solutions in much more conscious and sophisticated manner.

Renovation projects with social responsibility could also create jobs for the society, especially offering simple labor work to the disadvantaged groups. The great impacts of job opportunity on society benefit and personal values are commonly acknowledged; moreover, manual labor contributes to sustainable renovation in several ways, which often calls for redistribution of the construction cost, possibly to win reduction in total expenditure, and brings unique handcraft to the architecture.

Lift the standard of living is a direct mean to contribute to social cohesion, that been commonly discussed in renovation projects. Tenants would become happier for their house and their life quality been cared by others; in some cases they had possibility to cut down their living expense, perhaps enjoy or edify by their living environment. They can feel stronger sense of identity, even be proud of their neighborhood in a few cases.

One issue left from all five cases is the accessibility problem. None of the cases solved this problem comprehensively in their renovation. The cause of this is that changes to the original building structure were very much constrained by the heritage protection ordinances or the economic allowance. Stairs are hard to remove while elevators are hard to add. There is always weighing and trade-offs when working with multi disciplines, accessibility was compromised in these cases. Another reason for these unsolved accessibility issue might be that in other European countries, accessibility has not been recognized as an important problem, as in Sweden.

But we must point out that there are sustainability aware parties in renovation projects, like the exploitation team in HAKA building. They are more aware of social impact of their project and more willing to take social responsibility. The emergence of these parties will definitely encourage sustainable design and promote sustainable behavior in a society.

CONCLUSION

Economic Sustainability

Besides the influences on cost by approaching ecologic and social sustainability as mentioned above, the main economic advantages of a renovation project would be that the reuse of existing building structure is sometimes cheaper than the combination of demolish and new construction. The property value got increased in most of the cases; and renovation projects get tax benefits or incentives from government or institutions in some countries. But in some cases, the cultural heritage value possessed a more important position over other issues, where the renovation have to be conducted with super consciousness and innovative solutions, then the cost would exceed the normal level – it is always the procedure of weighing the pros and cons, perhaps compromise, before coming to decision. Of course brilliant solutions would cost a little bit more money or time or both than conventional ones, but these investments will be repaid either in a long-term scope or in a bigger picture.

Cultural Sustainability

Cultural sustainability stands in a great position in all five cased, that exists in either conservation and innovative creation or both. Preserving historical heritage, cultural features or traditional knowledge and practices are with great significance for renovation projects. At the same time, with a brilliant design, the building could achieve new architectural value from the renovation. The creation could be the interesting coexists of the old structure and new inserts, or distinctive space or details that developed with recycled materials for instance. On the other hand, culture of sustainability is another innovation one could give to old buildings, in terms of cultivating users or promoting of living or running business in a more sustainable way. Since not many cases paid attention to this measure, so we think it worth to develop more.

Most of the time, the requirement of heritage preservation prevents big structural alternations, therefore, accessible design is not easy to achieve. Accessibility as a hot potato among different aspects, asks for more money input as well. It ended up as sacrifice in most cases - in the only public building of our five cases, new lift was mounted; while all the residential projects left the problem unsolved.

3.2 Reflection

Limitation on further application

There are uncountable different approaches towards sustainability for renovation, emerging from different contexts. As a result, to obtain an all-purpose formula from studying several model projects in order to apply it in future renovation is impossible. Furthermore, applying the measure we mentioned in case studies need to be carefully verified: technical measures, such as reusing materials or insulating the building, could be transplanted in different countries and achieve similar result, while measures aiming at social and cultural sustainability, such as hiring ex-convicted labor, is hard to apply. The difference of social background and local condition between the original and target project must be considered. More specifically, it is more convenient to apply explored measures in other European countries to Sweden, than to apply them in China, where social system and cultural values are so distinct.

Undetected social impacts

It seems like that even though this thesis paid attention to social aspect of sustainability, not much features regarding social sustainability are revealed. There are two assumptions we made:

- Impacts of social measure take longer time to arise than environmental or economic measures; since we chose very recent projects, the social impact might not yet start to emerge.
- Effect feed-back for measures regarding environmental and economic sustainability is easy to obtain, while to what extend the project is affecting the society and culture remains unreachable without thorough and extensive social investigation.

In both condition, there are social impacts (expected or unexpected) remain undetected.

Unaccomplished intention

When we conducted the questionnaire before interviews, there were some sections designed for users and managers, hoping that we could get more feedback on how the renovation measures work in real condition. Yet due to the pressed time we have and the possible language barrier, we didn't manage to carry that part out. If we have sufficient time and resource for that, we might be able to make the case studies even more comprehensive.

REFLECTION

Further development

It ismpossible to exhaust all feasible methods of sustainable renovations, yet we would like enrich our work with abundant satisfactory projects in the future, and if possible, build a database of sustainable renovation projects for people who are interested in this topic.

Fantasy

It's hard to give credits on sustainability to different cases and let them compete and get a "winner". When analyzing sustainability of different cases using our check-list in this thesis, it's mainly discussion about qualities and properties in different aspects. It is somehow possible to quantify sustainability within its different aspects, i.e. using CO_2 reduction and energy demand to judge environmental sustainability; using satisfaction marks to assess social sustainability. So it would be possible to compare cases within one area, for example compare $S_{social1}$ with $S_{social2}$. But when coming to the overall credits of sustainability, there are cross discipline questions. It will not be a simple addition of scores of different components, that

$$S_{sustainability} \neq S_{environmental} + S_{social} + S_{economic} + S_{cultural}$$

There must need some kind of "weight coefficients"- could be "α" - to different aspects which gained according to environmental, social, economic and cultural situations of different context, which is so far beyond our ability to solve. That's why we can't say any of our studied projects is more sustainable than the others.

An idealistic scenario for this dilemma is to study the trade-off between different components of sustainability and find a convention method between each other, like the weight coefficient; Of course a more comprehensive and authoritative check-list of sustainability is necessary, too. By then people will be able to evaluate projects simply – quite similar to when assessing with LEED or BREEAM system – and get the final sustainability score through some formula like

$$S_{sustainability} = \alpha_{environmental} S_{environmental} + \alpha_{social} S_{social} + \alpha_{economic} S_{economic} + \alpha_{cultural} S_{cultural}$$

The work must be much more complicated than our imagination here to really make the formula work, but we are looking forward to see if anyone could develop such a system to simplify the evaluation work. One day, it will be so clear the proportion of different aspects in sustainability in one project, and the globe sustainable score that comparable with other projects.

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Case 1

Pic 1: Bird view of the settlement. © Sascha Kletzsch

Pic 2: Photos from the 50s'. © Georg G. Brunnwieser

Pic 3, 4: Photos from the 50s'. The settlement was famous at the time. Some of its photos were published as postcards. © K+P

Pic 5: Appearance of Block 6 after the first renovation in the 1980s. © A Hert

Pic 6: Appearance of Block 5 after the first renovation in the 70s'. © A Hert

Pic 7: The third star house built up in 2006. © Jingjing Song

Pic 8: Appearance of Block 6 after the first renovation in the 70s'. © A Hert

Pic 9: Photo from the 50s'. © K+P

Pic 10: The appearance changing. © K+P

Pic 11, 13: Before and after renovation. © K+P

Pic 12, 14: Before and after renovation. © Wenxuan Z.

Pic 15: Construction photo of facade renovation. © K+P

Pic 16: Mineral foam insulation in the bicycle storage. © Wenxuan Z.

Pic 17: Mineral foam insulation in the corridor of basement. © Wenxuan Z.

Pic 18: Construction photo of roof renovation. The roof cover was opened and cleaned for reinforcement and insulation. © K+P

Pic 19: Bird-view of one renovated block. The roof looks almost the same as the original, except some ventilation fittings added on. © K+P

Pic 20: Roof edge detail - above wavelike balconies. © Jingjing Song

Pic 21: Facade detail photo. © Wenxuan Z.

Pic 22: Exterior wall foot detail photo. © Wenxuan Z.

Pic 23: Roof edge detail - corner. © Wenxuan Z.

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Pic 24: Window frame detail photo. © Jingjing Song

Pic 25: Windows of the staircase. © Jingjing Song

Pic 26: Windows on the facade. © Jingjing Song

Pic 27: The appearance changing of building entrance. © K+P

Pic 28: Detail photo of preserved original window handle. © Wenxuan Z.

Pic 29: Detail photo of original window frame installed with new glass. © Wenxuan Z.

Pic 30: Detail photo of handrail produced by traditional technique. © Wenxuan Z.

Pic 31: Inside the staircase. © Wenxuan Z.

Pic 32: Construction photo of interior. © K+P

Pic 33, 34, 36: Photos after renovation of the white facade and balconies. © Wenxuan Z.

Pic 35: The building looks elegant and the area is full of peace in the snow. © K+P

Pic 37: West perspective photo of Block C after renovation. © Sascha Kletzsch

Pic 38: Kids playing in the area. © K+P

Pic 39: South perspective photo of Block A and B after renovation. © K+P

Pic 40: Block C in the winter. © K+P

Case 2

Pic 1: North facade photo.

Pic 2: South facade photo - before renovation. © Peter Haimerl Architektur

Pic 3: Cilli in 1970s. Stills from Drei sind einer zuviel. ©Drei sind einer zuviel, 1977

Pic 4, 5: Situation of Cilli been “abandoned” before the renovation. © Peter Haimerl Architektur

Pic 6: The living room before renovation. © Gero Wortmann

Pic 7: The living room before renovation. © Peter Haimerl Architektur

Pic 6-14: Details of the original farmhouse after vicissitudes. © Peter Haimerl Architektur

Pic 15: The wood structure. © Peter Haimerl Architektur

Pic 16: The living room ceiling was missing before renovation; therefor the form work and concreting were easier in this part of the house. © Gero Wortmann

Pic 17: In order to reach the kitchen a comfortable height, was dug the soil over a meter deep. © Peter Haimerl Architektur

Pic 18, 19: During construction: The exterior walls were supported, as they serve in the concreting of new cube inside as permanent form work. © Peter Haimerl Architektur

Pic 20-23:

Construction inside the house. © Peter Haimerl Architektur

Pic 24: In winter, close the wooden cover of openings on the ceiling of the concrete cubes; while they could be opened in summer, supplying natural ventilation. © Jutta Görlich

Pic 25 - 32: Jutta's artistic photos. With clothes and stuff found in Cilli before renovation, performing with Cilli after renovated © Edward Beierle

Pic 33: Foam glass gravel. © Misapor

Pic 34: The new kitchen with a minimalist look. © Jutta Görlich

Pic 35: The new kitchen with a minimalist look. © Peter Haimerl Architektur

Pic 36: The bedroom. © Gero Wortmann

Pic 37: New concrete and old wood elements, both have simple finishing, set en example of minimalism. © Peter Haimerl Architektur

Pic 38 - 41: The outside appearance of Cilli was preserved almost as it was in the 70s'. While inside the new concrete cubes, the historical traces were framed, supported and protected by the new structure. © Peter Haimerl Architektur

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Case 3

Pic 1: Street view of the HAKA building. © Ralph Kämena

Pic 2: Aerial view of HAKA Building. @ Suzanne Fischer

Pic 3: Original Elements of HAKA building. © fotorob, Flicker

Pic 4, 12, 14, 16: Original Elements of HAKA building. © Studio Roffert

Pic 5, 10, 18: Original Elements of HAKA building. © DSA Rotterdam

Pic 6, 8: Original Elements of HAKA building. © Project Website

Pic 7, 11, 17: Original Elements of HAKA building. © Jan1968, Flicker

Pic 9: Original Elements of HAKA building. © Studio Roffert

Pic 13: Original Elements of HAKA building. © Suzanne Fischer

Pic 19: Main entrance with vertical TL-lamps. © Ralph Kämena

Pic 20: Reception desk, side. © Ralph Kämena

Pic 21: Reception Desk, front. © Ralph Kämena

Pic 22: Reception Desk, back. © Ralph Kämena

Pic 23: Pantry from second hand greenhouse elements. © Ralph Kämena

Pic 24: Platform and storage space. © Ralph Kämena

Pic 25: Working space is raised by stair-like elements. © Ralph Kämena

Pic 26-28: Meeting room made from social housing doors. © Ralph Kämena

Pic 29: Exhibition benches in the exhibition room. © Ralph Kämena

Pic 30: Acoustic wall divides a big space into two parts: the exhibition-room and the auditorium. © Ralph Kämena

Pic 31: Auditorium. © Ralph Kämena

Pic 32: Auditorium benches and podium. © Ralph Kämena

Pic 33: Podium, benches and acoustic wall. © Ralph Kämena

Pic 34: Stacked clothing organized in colour. © Ralph Kämena

Pic 35-36: Acoustic wall could work separately or work as a whole. © Ralph Kämena

Case 4

Pic 1: The new kitchen. © CornBread Works

Pic 2: Street View © CornBread Works

Pic 3-6: View from side © CornBread Works

Pic 7-10: View from back © CornBread Works

Pic 11: Second glaze inside the façade © CornBread Works

Pic 12: Hall way © CornBread Works

Pic 13: New opening © CornBread Works

Pic 14: Back facade © CornBread Works

Case 5

Pic 1: The main entrance. © H&H

Pic 2: Bird-view of the site. © SiS Bolig

Pic 3: Before and after renovation. © H&H

Pic 4: Exterior photo. © H&H

Pic 5: Construction photo. The roof was lifted and opened for terraces. © H&H

Pic 6, 7: Photos of central common space. Hand rails made from recycled laser-cut sheets are the most attractive character in the communication space. Together with the

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rough wall surface and recycled car lights, the whole space stands as a vibrant industrial style. © Erieta Attali

Pic 8- 9: Photos of central common space. Hand rails made from recycled laser-cut sheets are the most attractive character in the communication space. Together with the rough wall surface and recycled car lights, the whole space stands as a vibrant industrial style. © H&H

Pic 10: Balcony on the roof. © H&H

Pic 11: Emerald garden flat. © H&H

Pic 12: Double height kitchen. © H&H

Pic 13: Big brother flat. © H&H

Pic 14: Top floor bedroom. © H&H

Pic 15: Kitchen as communication hub. © H&H

Pic 16: Computer room. © H&H

Pic 17 - 22: living rooms. © H&H

Pic 23: Preserved original facade. © Wenxuan Z.

Pic 24: Clearly distinguish between new and old facades. © H&H

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Introduction

Fig 1: Annual population growth rate of Europe 2001-2006 (source: Eurosats, 2007)

Fig 2: Global construction spending and growth (source: David Langdon, 2005)

Fig 3: Three Pillars of sustainable development (based on Brundtland Report, 1987)

Fig 4: Four types of Well-being (source: New Zealand Ministry for Culture and Heritage, 2006)

Fig 5: Energy consumption in building life (source: UNEP, 2007)

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Fig 5: Common space scheme. (H&H, 2005)

ATTACHMENT

Interview Questionnaire (Prototype)

Interview of architects

1. General understanding and situation of sustainable renovation

What's your (team's) understanding of sustainable construction? What's the characteristic or essence?

Is there any guideline for your work? What's your (team's) working philosophy?

Is there any certification systems or standard you mainly work with? (BREEAM, LEED, other national or local standard?)

How much of your work is in renovation?

How many of the renovation projects have sustainability as a goal?

For how long did you engage in sustainable renovations?

If the client does not want sustainable goals – do you try to persuade them? If yes, with what arguments?

Where could people get the knowledge and competence in sustainable renovation? What is your experience?

How do you continue to learn in the field? Course, practical work….?

Is there any team in your office who is working specifically on sustainability? Or does everybody in the office bear sustainability in mind?

What are the main drivers/hindrances for sustainable renovation? Customer/client demand, user demand? Costs? Working methods and ideals in the sector? Regulation? Subsidy from the government? Advocating from environment-protection NGOs?

2. Project XXX

Any cooperation partners? What kind of competence do they have?

What was your strategy towards sustainable renovation?

What kind of value did you stress? (Guide the talk to what we are interested in: social/cultural values, design, integrated solution…)

What kind of quality or value was important to keep in the existing structure?

- o Social aspects (image, common memory…)
- o Cultural aspects (heritage, identity, architectural value…)
- o Economic aspects (reuse structure, components, material…)

What kind of new quality or value did you want to create? And what could be realized after the renovation?

- o Social aspects (securities, accessibility common memory, regulation, help vulnerable groups, promote sustainable life style etc.)
- o Cultural aspects (heritage, , identity, architectural value)
- o Environmental aspects (energy saving, recycled/recyclable…)
- o Technology aspects (availability, maintenance, integrated solution, upgrade of ventilation / heating / cooling / fire system…)
- o Economic aspects (exchange value…)

What was your thinking about materials?

- o Technology aspects (availability, maintenance, integrated solution)
- o Cultural aspects (heritage, identity, architectural value…)
- o Environment aspects (embodied energy, reusable, LCA…)

What was your thinking about energy?

- o Environmental aspects (renewable, zero/plus energy…)
- o Technology aspects (efficiency, availability, maintenance, integrated solution…)
- o Economic aspects

How did you achieve accessibility?

Is there anything you wanted for the renovation but did not do/get?

- o Social aspects (user participation, security, accessibility, regulation, social interaction, equality, helping vulnerable groups, sustainable life style etc.)

- Cultural aspects (heritage, common memory, identity, architectural value)
- Environment aspects (renewable energy, recycled/recyclable material, LCA …)
- Technology aspects (availability, maintenance, integrated solution, upgrade of ventilation / heating / cooling / fire system…)

Did you compromise any issue for the other? How did you weight in between? To what degree could one issue give way?

Was there any other problem? How did you solve it?

Has it any green building certification? Any award?

What do the media say about this project? Did you follow up the project? Have you got any feedback from the clients and occupants?

- Social aspects (interaction, security, accessibility etc.)
- Economic aspects (cost, investigation, occupancy rate, repay…)
- Environment aspects(energy saving, recycled/recyclable material, LCA …)

How do you evaluate this project?

Does the project fit your understanding of sustainable construction?

What results are you satisfied with, and what results are not satisfactory? Why?

What do you know about water, energy or other costs of the building before and after the renovation?

Any other issue related to this project that is interesting to discuss?

Did you involve yourself in or have you heard about any other innovative sustainable renovation-projects? What are the high lights?

According to your experience, how could different qualities/values within a design-project be taken care of at the same time? (how to get integrated solution)

Any tips for other practitioners?

Questions for Users & Owners

For the owners:

What is your motivation for the renovation? (Law or regulation? Personal experience? Functioning reason? Economic? The architectural aesthetics?)

What was your expectation and what is the realization of the renovation?

- Social
- Cultural
- Environmental
- Technical
- Economic

What is the direct benefit from the renovation? (Increased price, better indoor climate, attraction, etc.) And what actions during the renovation helped to achieve it?

We found quite a lot of considerations about social-cultural qualities and values in this renovation project, what kind of payback are you expecting from them?

According to your experience, how do different qualities/values influence each other? How do you balance them?

What's the best result after the renovation? Any unexpected results or consequences?

Did you get any comments from others about this renovation project?

- Social
- Cultural
- Environmental
- Technical
- Economic

ATTACHMENT

For the users

Were you familiar with this building before the renovation?

What is different now? Do you like the change?

Do you need to pay for the renovation (where comes the initial investment)?

Is the rent increased after the renovation? How does it impact your daily life?

If it is up to you, how much you are willing to pay for the renovation?

Do you feel comfortable when staying in the building? What makes you feel so?

- Social (Easy atmosphere, interesting space, good interaction between habitants…)
- Cultural (cultural atmosphere…)
- Environmental (view of nature, natural light…)
- Technical (Proper temperature & humidity, adjustable system…)
- Economic

Which part of the building do you spend most of your time? Do you like there? Why?

Which part you like the most in the building?

Where do you meet other people? And where do you like to have your break?

Did you find out any inconvenience, what was the cause?

What further improvements could be made in the building?

- Social aspects (securities, accessibility, regulation, help vulnerable groups, promote sustainable life style etc.)
- Cultural aspects (heritage, common memory, identity, architectural value)
- Economic aspects (cost, investigation, repay…)
- Environment aspects(energy saving, recycled/recyclable material, LCA …)
- Technology aspects (availability, maintenance, integrated solution, upgrade of ventilation / heating / cooling / fire system…)