



Universität of Natural Resources and  
Life Sciences  
Institute of Structural Engineering

## High performance refurbishment Case studies from Austria

Ready for nZEB?  
IngREes International Conference on nearly Zero Energy Buildings  
24<sup>th</sup> January 2018, Praha

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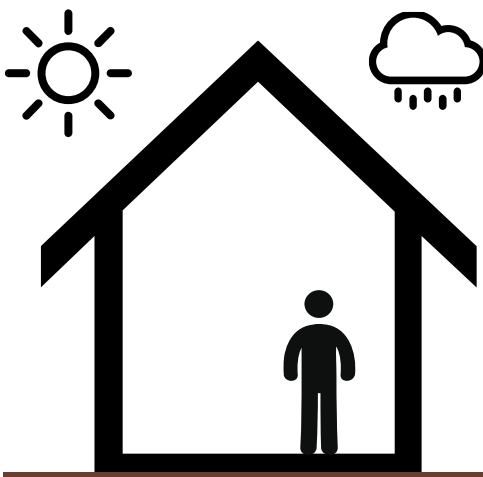


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### WHAT WE ARE AIMING FOR...

human shelter in an economically, ecologically and socially sound way



- High internal comfort
- Spaces based on need and use

but also...

- Adequate use of (local) resources
- Zero CO<sub>2</sub> buildings
- Buildings which produce rather than consume energy

HIGH PERFORMANCE REFURBISHMENT  
CHALLENGES

**Requirements are constantly changing.**

**Requirements towards architecture are changing with changing societies.**

*"The renovation, which is not an improvement is a deterioration"* (Adolf Loos)  
> Refurbishment of old buildings is a building heritage and preservation issue

*"Form follows function"* (Louis Sullivan, School of Chicago) > works for new buildings

*"Function follows form"* > mostly true for old buildings (existing framework conditions must be considered)

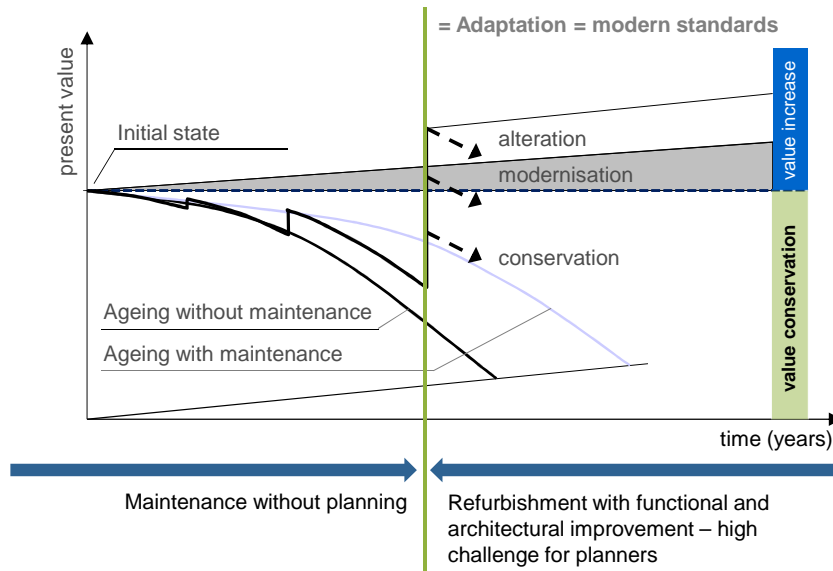
*"Architecture should be respectful"* (Charles Moore)

HIGH PERFORMANCE REFURBISHMENT  
CHALLENGES

**WHO will pay for it?**

**WHO will benefit of it?**

## HIGH PERFORMANCE REFURBISHMENT VALUE CONSERVATION + RENEWAL



## HIGH PERFORMANCE REFURBISHMENT COURSE OF ACTION

There are no *recipes* for high performance refurbishment actions.

Refurbishments can be clustered in three potential categories >

1. The total refurbishment
2. The hidden refurbishment
3. The dialogue old and new

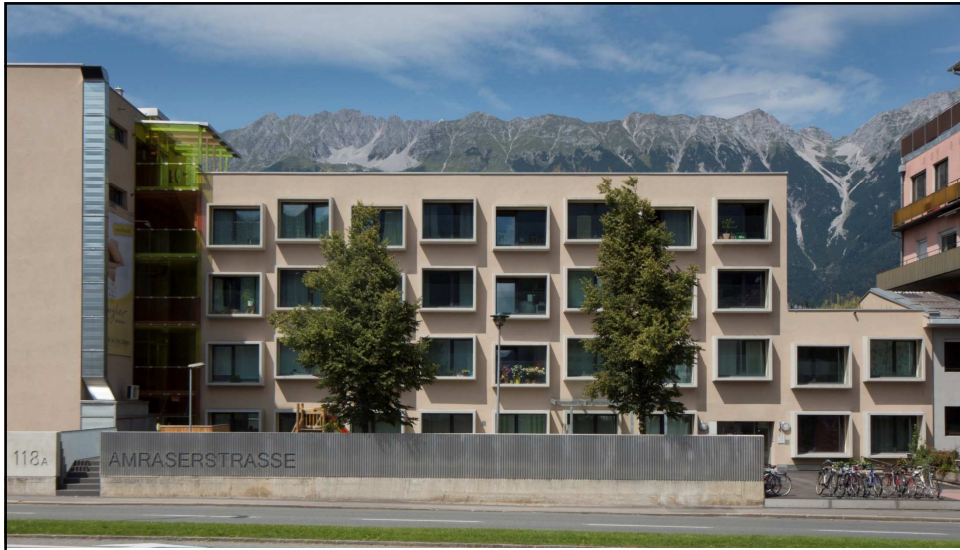


**HIGH PERFORMANCE REFURBISHMENT**  
**1. THE TOTAL REFURBISHMENT**

**The refurbishment is such, that only a new building can be seen**

**Modern new built quality with the advantage of the utilization of older and existing building parts (e.g. thermal mass, basement,..)**

**More ecological and in most cases more economical than demolition, but at the cost of a much higher planning level**



**CASE STUDY 1 > STUDENT HOME (ETHOUSE-Award 2015)**

Project: Trientlgasse 44, Innsbruck | Built / Refurbished: 1960/2013

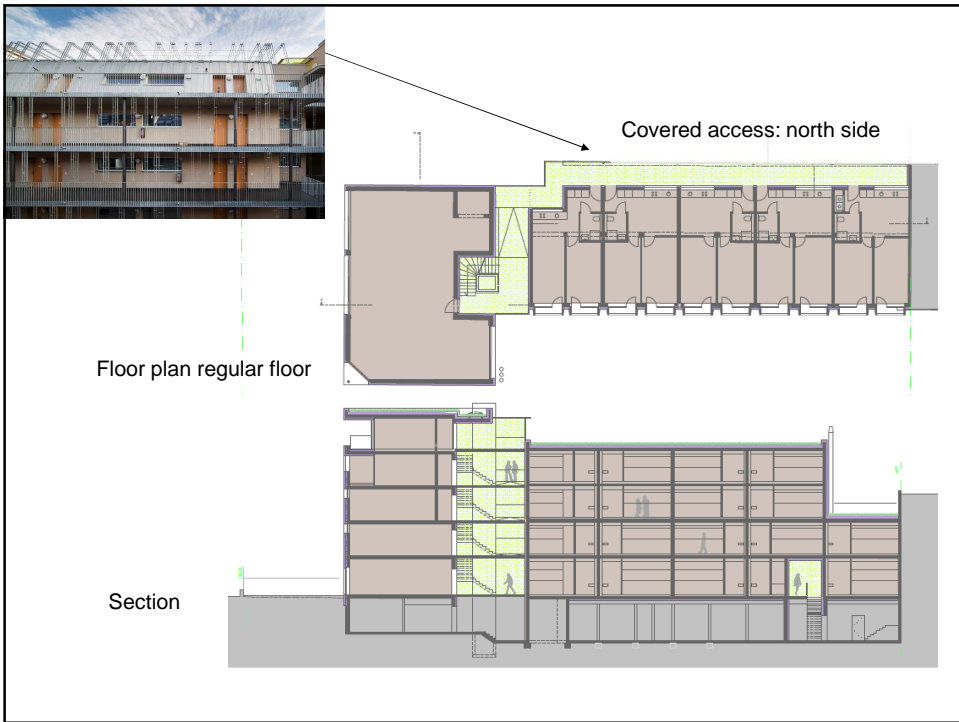
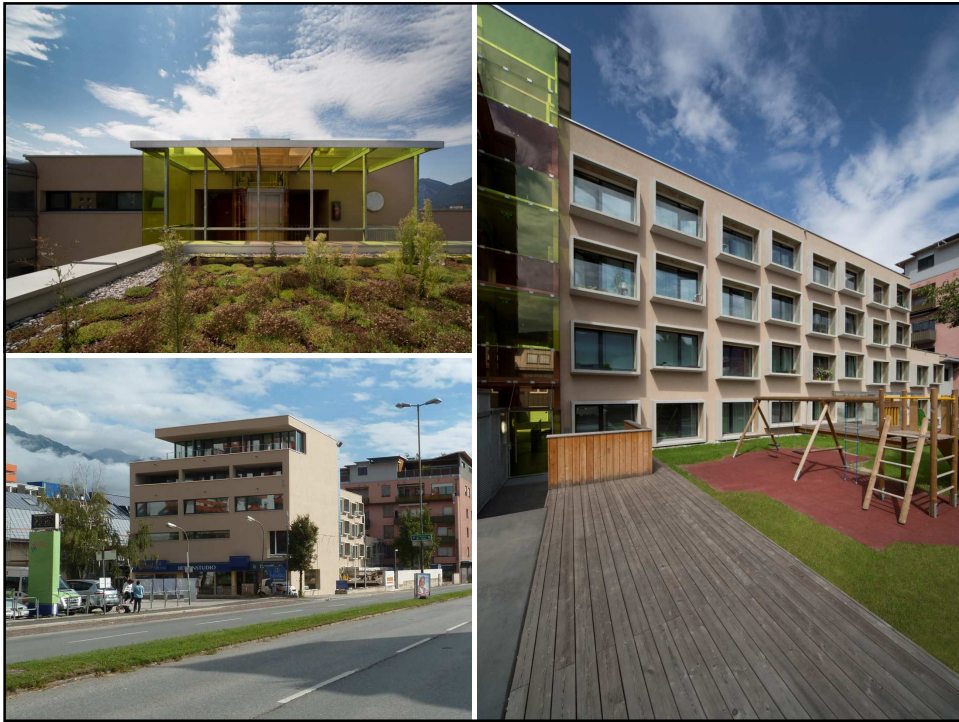
Architecture: U1 Architektur, Innsbruck | Client: Ärztekammer Tirol

HED before/after: 354 / 21 kWh/m<sup>2</sup>a | Improvement: 94%



Before refurbishment

After refurbishment







**CASE STUDY 2 > OFFICE / PRODUCTION (ETHOUSE Award 2011)**

**Project:** Betriebsgebäudes MCM Klosterfrau GmbH | **Built / Refurbished:** 1977/2010  
**Architecture:** gaupenraub +/- Architekturbüro | **Client:** MCM Klosterfrau Healthcare  
**HEB before / after:** 233 / 39 kWh/m<sup>2</sup>a | **Improvement:** 83 %



Before refurbishment

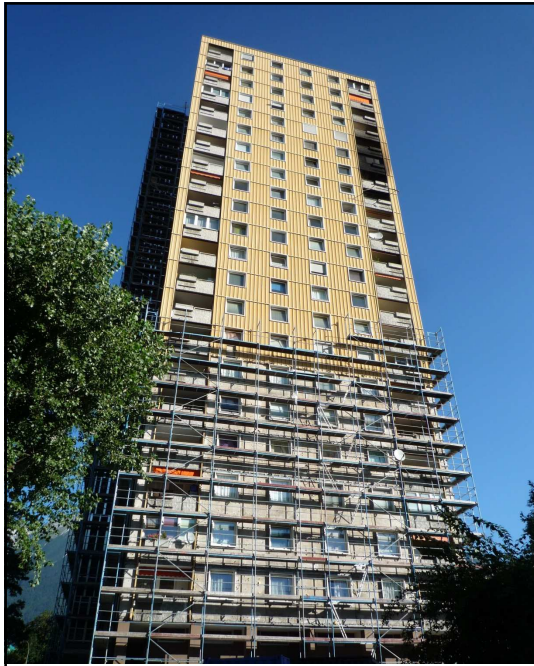
After refurbishment



### **CASE STUDY 3 > RESIDENTIAL BUILDING**

**Project:** Hochhaus Kajetan-Sweth-Straße 54 | **Built / Refurbished:** 1976/2011  
**Architecture:** Gsottbauer Architekten | **Client:** WEG Kajetan-Sweth-Straße 54  
**HEB before / after:** 77 / 20 kWh/m<sup>2</sup>a | **Improvement:** 74%





Before refurbishment



Photos: Markus Bstieler

After refurbishment

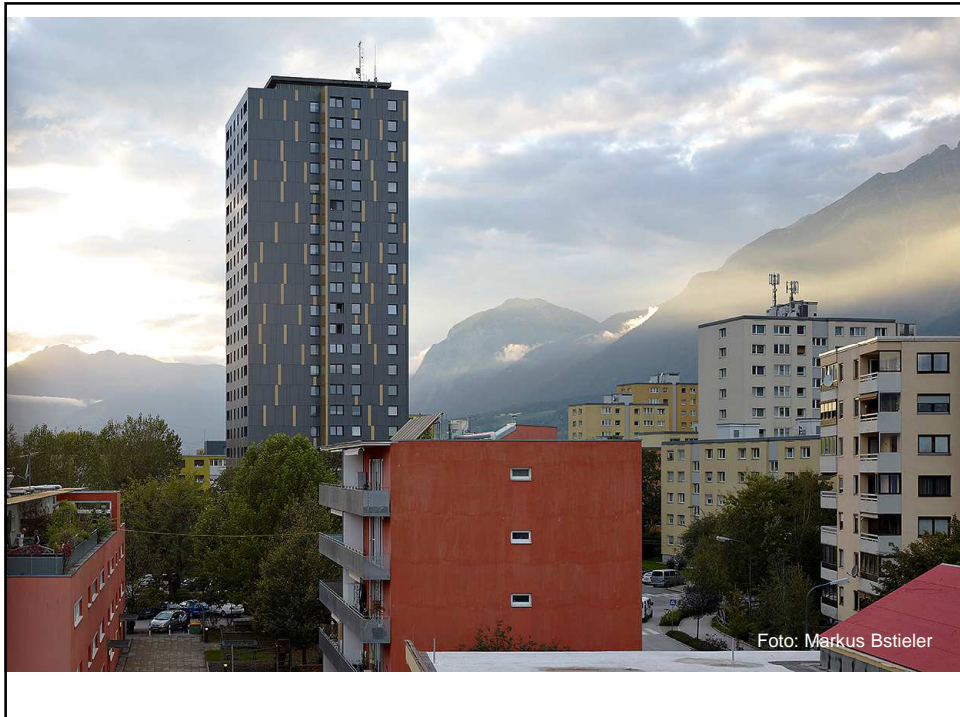


Foto: Markus Bstieler



**CASE STUDY 4 > RESIDENCE AND OFFICE OF (ETHOUSE Award 2013)**

Project: Energieautonomes Stadthaus Wels | Built / Refurbished: 1965/2013

Architecture: PAUAT Architekten ZT GmbH | Client: Private

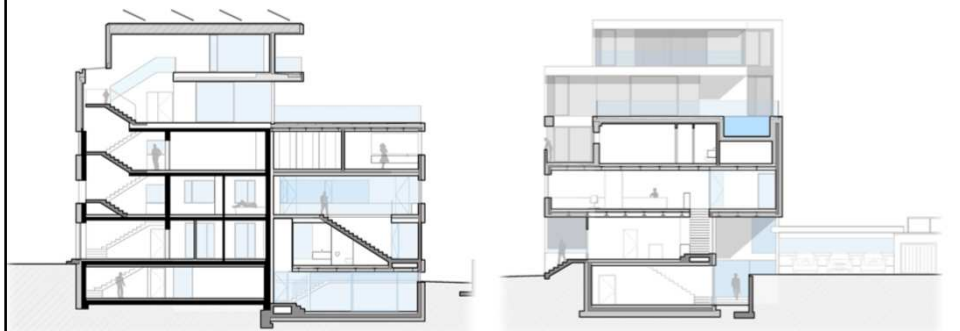
HEB before/after: 150 / 8 kWh/m<sup>2</sup>a | Improvement: 95%



Before refurbishment

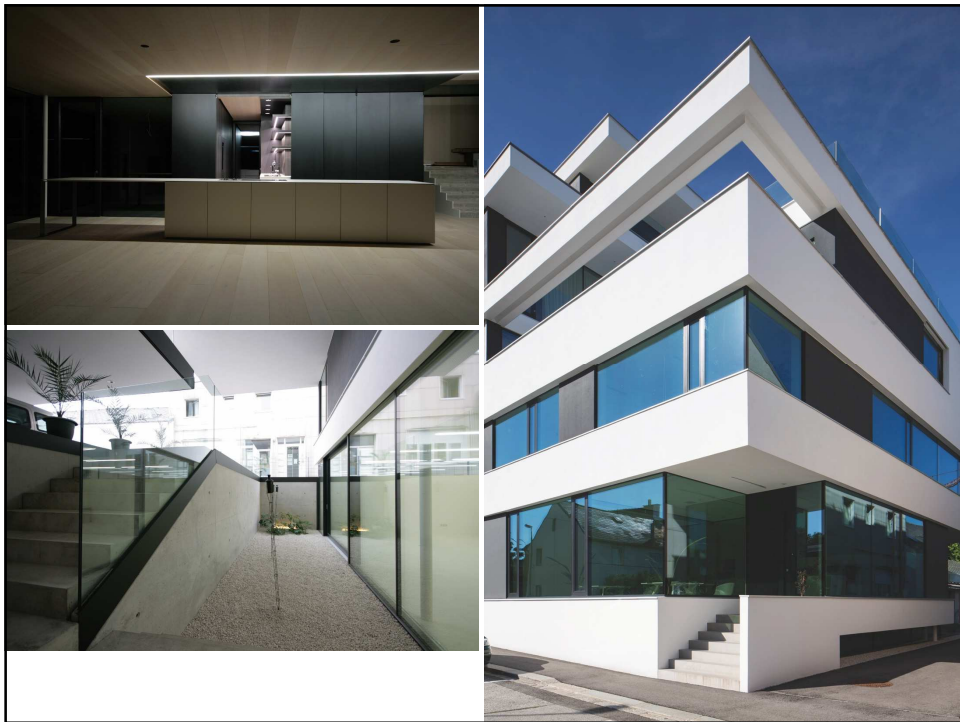
During refurbishment

After refurbishment



Section

Section [Source: PAUAT Architekten]





**HIGH PERFORMANCE REFURBISHMENT**  
**2. THE HIDDEN REFURBISHMENT**

**The refurbishment is such, that the building stays as it is**

**The modernization is barely visible from the outside**

**The application is mostly for high quality refurbishment in listed areas  
and / or listed buildings**





**CASE STUDY 5 > RESIDENTIAL BUILDING VIENNA (ETHOUSE Award 2015)**

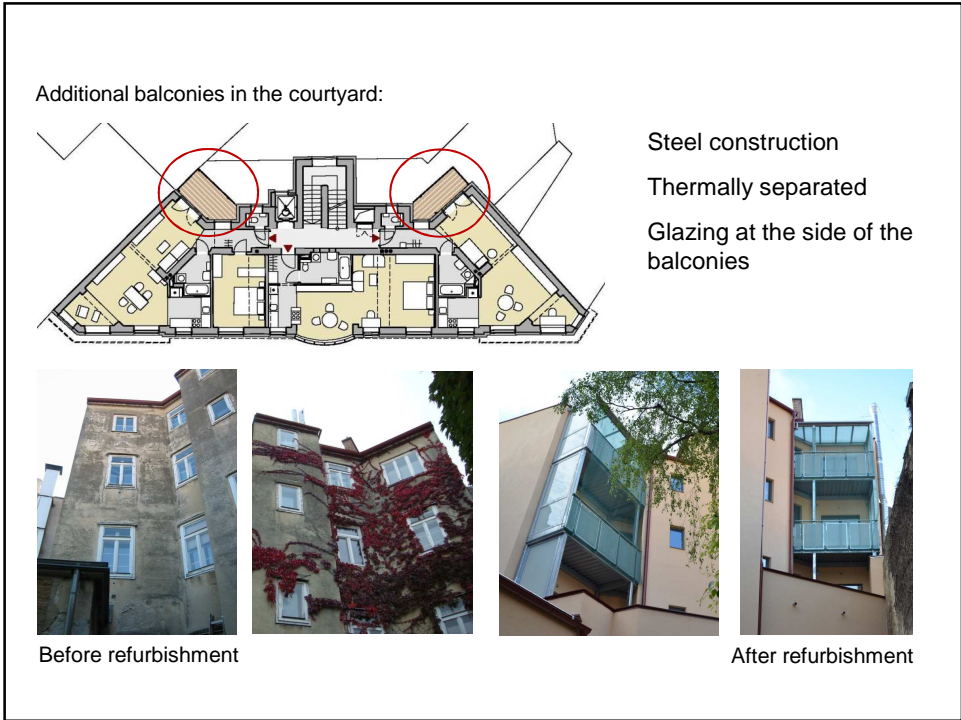
Project: Breitenfurterstrasse 242 | Built / Refurbished: 1928/2014

Architect: Treberspurg & Partner ZT GmbH | Client: Wiener Wohnen

HEB before / after: 204 / 22 kWh/m<sup>2</sup>a | Improvement: 92%









**CASE STUDY 6 > SINGLE FAMILY HOUSE (ETHOUSE Award 2011)**

Project: Energie Plus Haus Weber | Built / Refurbishment: 1900/2011  
 Architecture: Architekten Ronacher ZT GmbH | Client: Arch. Ronacher  
 HEB before / after: 145 / 10 kWh/m<sup>2</sup>a | Improvement: 93%



Before refurbishment



During refurbishment



During refurbishment



After refurbishment





**CASE STUDY 7 > RESIDENTIAL BUILDING (ETHOUSE Award 2009)**

Project: Tschechenring, Felixdorf | Built / Refurbished: 1878/2010

Architecture: DI Günter Spielmann, Stadtbau GmbH | Client: Wien Süd

HEB before / after: 198 / 32 kWh/m<sup>2</sup>a | Improvement: 62 %



# 3

## HIGH PERFORMANCE REFURBISHMENT 3. THE DIALOGUE OLD AND NEW

**Architectural dialogue between old (listed) parts of the building and new (contemporary) architecture**

**Biggest challenge in terms of planning and architecture**

**Can achieve interesting results which could increase the value of the building much more than a comparable substitute of the building**



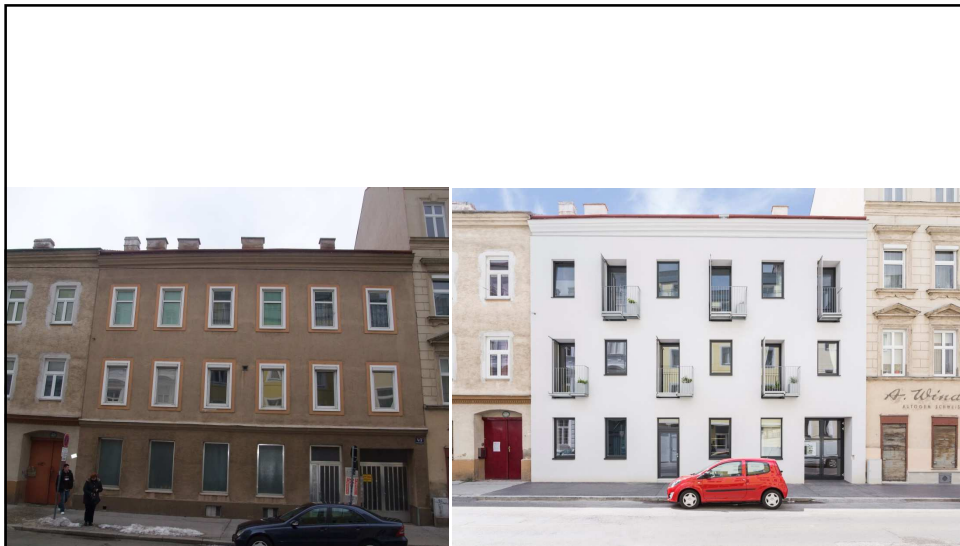


**CASE STUDY 8 > RESIDENTIAL BUILDING in VIENNA**

**Project:** Klopstockgasse 47 | **Built / Refurbished:** 1890/2015

**Architecture:** Architekt DI Martin Wurnig | **Client:** Privat

**HEB before/after:** 144 / 10 kWh/m<sup>2</sup>a | **improvement:** 93%



Before refurbishment

After refurbishment



**CASE STUDY 9 > RESIDENTIAL BUILDING (ETHOUSE Award 2014)**

**Project:** Kaiserstrasse 7, Wien | **Built / Refurbished:** 1904/2014

**Architecture:** Kronreif\_Trimmel & Partner Architektur

**Client:** Kongregation der Mission vom heiligen Vinzenz von Paul

**HEB before/after:** 132 / 26 kWh/m<sup>2</sup>a | **Improvement:** 80%







**CASE STUDY 10 > TOWN HALL (LISTED BUILDING)**

**Project:** Das offene Amtshaus Ottensheim | **Built / Refurbished:** 1500/2010

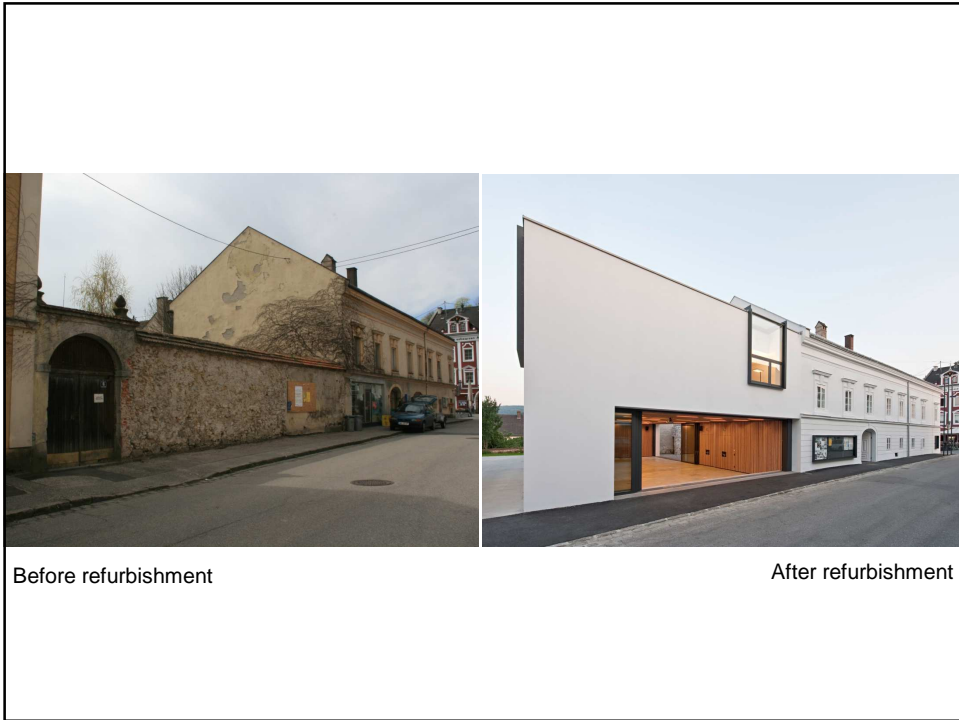
**Architecture:** Sue Architekten ZT KG | **Client:** Verein zur Förderung d. Infrastruktur der Marktgemeinde Ottensheim & CO KG (Ulrike Böker, Bürgermeisterin)

**HEB before/after:** - / Existing building 147, Annex 46 kWh/m<sup>2</sup>a



Before refurbishment

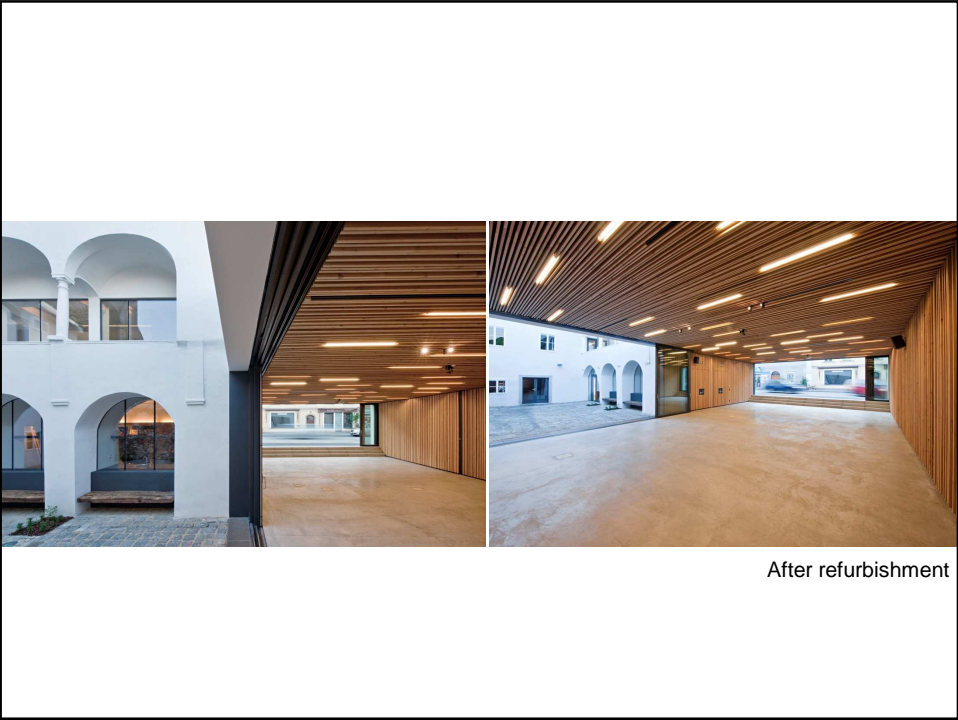
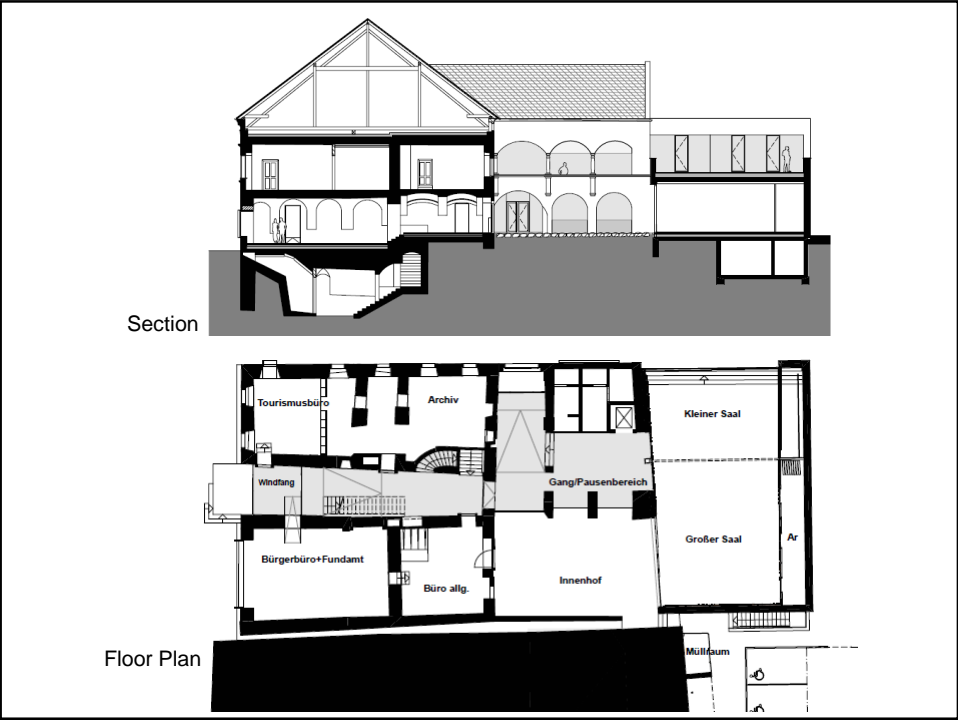
After refurbishment



Before refurbishment

After refurbishment





**HIGH PERFORMANCE REFURBISHMENT  
CONCLUSIONS**

**BEFORE THE START >**

**In depth analysis of the existing building (structural, thermal, building physics,...)**

**Assessment of all defects (also functional shortcomings)**

**Definition of goals and strategy for the refurbishment (incl. cost assessment, duration, relocation,...)**

**Development of a holistic refurbishment concept**

**Development of plans**

**Tender**

**Accompanying socio-economic project for the occupants and other stakeholders (especially with bigger and complex projects)**

**Construction**

**Hand over and accompanying measures (monitoring,...)**

**HIGH PERFORMANCE REFURBISHMENT  
CONCLUSIONS**

**WHY A HOLISTIC REFURBISHMENT CONCEPT IS ESSENTIAL FOR HIGH PERFORMANCE REFURBISHMENT >**

**Sometimes it is not possible to carry out all actions at once (cost, relocation issues,..) BUT a holistic refurbishment concept ensures a step by step process**

**The refurbishment concept should include:**

**Functional improvements**

**Increasing the potential for densification**

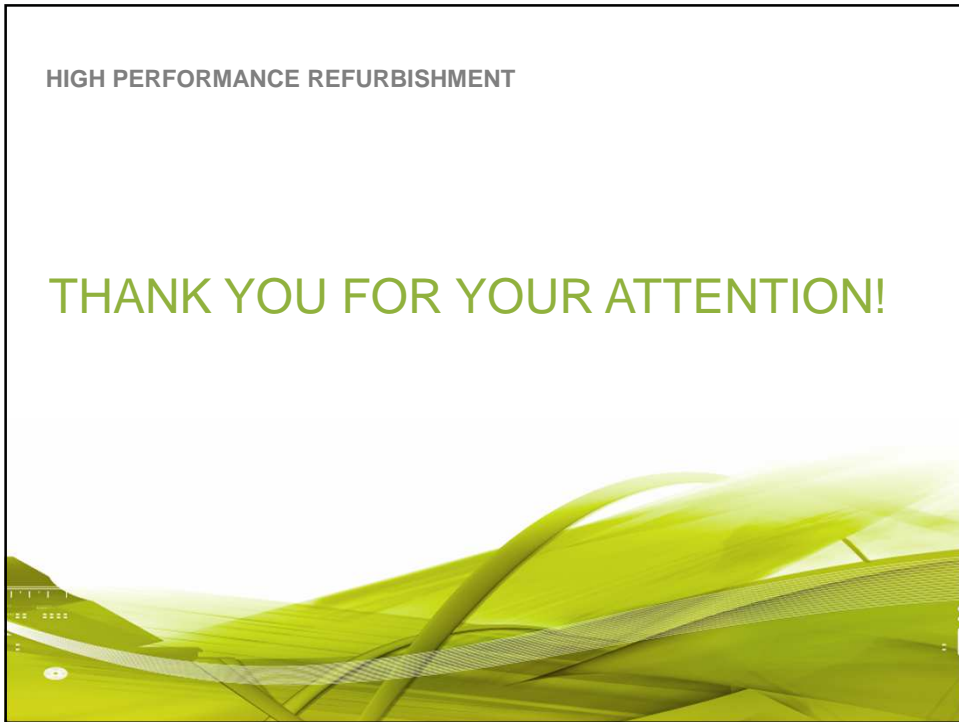
**Thermal and energy related improvements**

**Cost proposal including funding opportunities**

**Holistic measures provide the potential for high performance solutions and ensure an increase in comfort, architecture and value !**

**HIGH PERFORMANCE REFURBISHMENT**

**THANK YOU FOR YOUR ATTENTION!**



**HIGH PERFORMANCE REFURBISHMENT  
ACKNOWLEDGEMENTS**

This presentation is based on a talk given on 10.03.2016 by Martin Treberspurg in the framework of the Sanierungstage 2016 in the Architekturzentrum Wien

Most of the examples are submissions and / or winners of the ET HOUSE AWARD (<http://ethouse.waermedaemmsysteme.at/>)

