Serial Renovation of an University Building
Bruno-Sander-Haus – outPHit observer project

Point cadrage : conférence Rénovation 29/3
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Site Plan (University of Innsbruck, Austria)
Existing Building
IR-Thermography (Thermal Bridges!)

Source: AB Timber Construction
Anton Kraler
Existing facade construction

Source: Master Thesis Manuel Dragašchnig, BSc
The challenges and how to solve

- **Construction year:** 1980
- **Poor insulation:** External insulation + new windows
- **Thermal bridges:** External insulation
- **Low airtightness:** Airtightness layer
- **Bad air quality:** HRV Ventilation system
- **Overheating in summer:** External shading

- **Refurbishment during operation of the building (University):** Prefabricated elements!

**Solution: outPHit**

before 156 kWh/m²a after: 22,4 kWh/m²a < 25 kWh/m²a  
(Passive house standard for refurbishing: EnerPHit)

Bruno-Sander-Haus,  
Source: UIBK
Cross section (10 storey building) offices, seminar rooms, labs

Airthightness and thermal insulation
Mounting variants of prefabricated facades depending on static requirements and geometry

1. **Load down** poor static Foundation necessary Modules not replaceable

2. **Suspended** fixed bearing at the top: Tensile forces

3. **Curtained (preferable)** Modules replaceable

4. **Put on** Remoove old facade Modules replaceable

Source: C. Le Levé, dissertation, UIBK 2020
Assembly of Curtained prefab. Elements

Facade Connector developed by UIBK

Sherpa Efco for timber frame construction

Source: C. Le Levé, dissertation, UIBK 2020
Facade bearing

Facade bearing mounted at the concrete elements, adjustable in three dimensions compensate for tolerances

Section A-A

Section B-B

Source: Master Thesis Manuel Dragaschnig, BSc
Prefab. timber elements in a high-rise building: How to solve fire safety?

In principle, the use of combustible materials, including wood, are not covered by the applicable legislation. However, the OIB guideline 2 "Fire protection" allows a deviation, provided that it can be demonstrated that the same level of protection is maintained!

Research of University of Innsbruck (Unit Timber Construction): Simulation and fire tests about encapsulation of timber elements

- Fire Resistance Class from outside to inside: EI 90-ef(i←o).
- Continuous double planking
- Single planking not sufficient for 90 minutes fire resistance
Prefab. timber elements in a high-rise building: How to solve fire safety?

Continuous double planking

Temperature distribution within the construction calculated by dynamic simulation after 90 minutes expose to fire from the outside.
Fire safety by double-layer gypsum fiber board

Encapsulation

Encapsulisation by double-layer gypsum fiber board from outside, fire from inside by concrete elements of the existing building

Source: Master Thesis Manuel Dragaschnig, BSc
Architectural design (Student Theses)

Combination of PV-panels and conventional facade cladding

Source: Julian Höck
EnerPHit-renovation of University Building in 2014 (Faculty of technical sciences)

After renovation

Energy reduction by a factor of 9

Specific heat demand before renovation: >180 kWh/m²a
After EnerPHit-renovation: < 20 kWh/m²a
Rendering of facade design similar to the EnerPHit-Building of the Faculty of Technical Sciences

Source: Sven Stiefel
Architectural design (Student Theses)

Source: Isabelle Limberger

Prefabricated elements with transparent/opaque parts

Source: Clemens Berresheim
Architectural design (Student Theses)

Facade integrated PV-panel

Source: Esra Agcakoc

3-Dimensional Facade structure and Building integrated PV BIPV

PV-sliding shutters

Source: Simon Rudiger
Architectural design (Student Theses)

Prefabricated Elements

Exploded drawing of prefabricated elements, Different layer, statics and windows included

Source: Elias Spitaler, UIBK
Summary

outPHit Observer Project Bruno-Sander-Haus
High energy efficiency: EnerPHit-Standard < 25 kWh/m²a
Prefabication with timber elements:

- Refurbishing during ongoing operation of the building
- High quality, low cost
- Fire protection by encapsulated timber
- Roof and facade integrated PV
Find out more?
Visit us on outphit.eu

Any questions?
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