



IEA ECBCS Annex 50  
Prefabricated Systems for Low Energy Renovation of Residential Buildings

## Approaches to the problem of the occupied building site

Ecosan '07  
Weiz, Austria, October 10-12, 2007

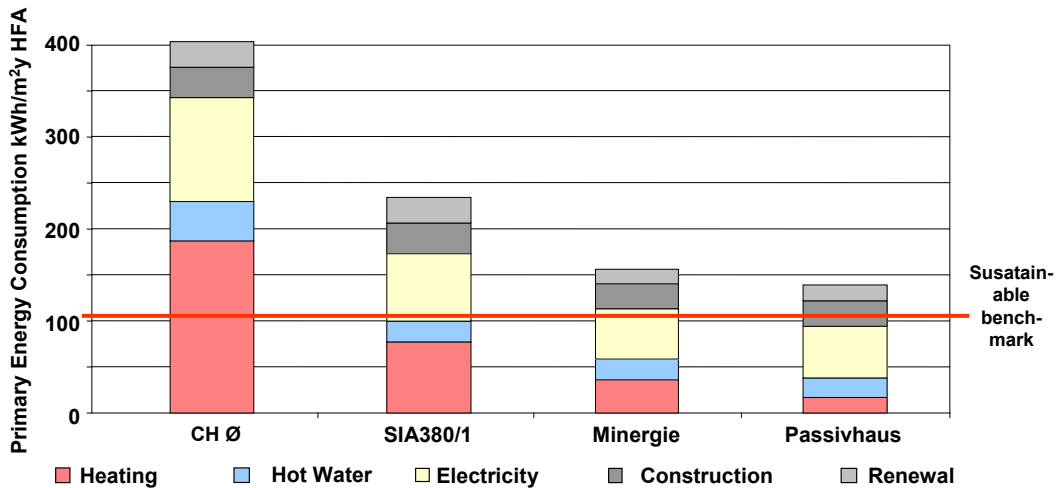
Mark Zimmermann, Empa



Materials Science & Technology

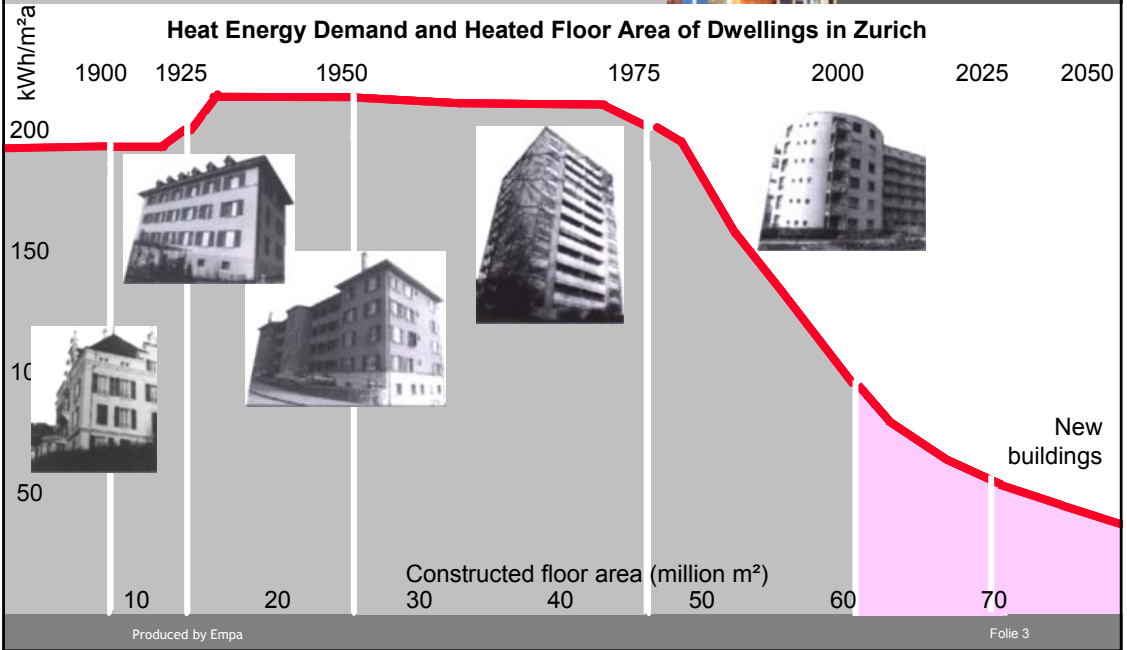


## Energy needs of different building standards



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## Prefab Retrofit of Buildings



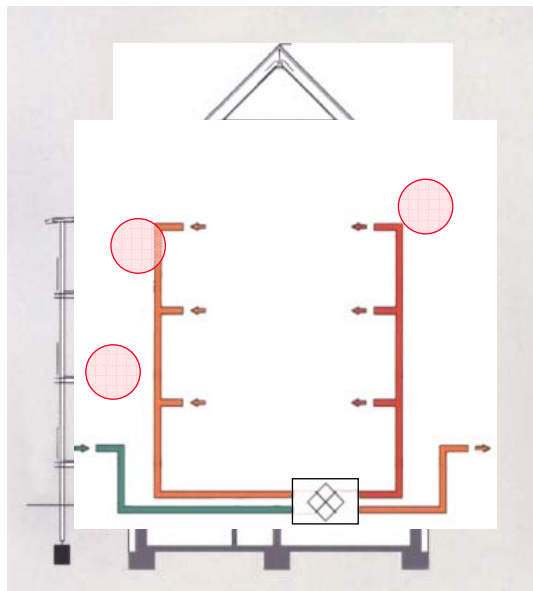
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## Prefab Retrofit of Buildings



### Traditional Renovation

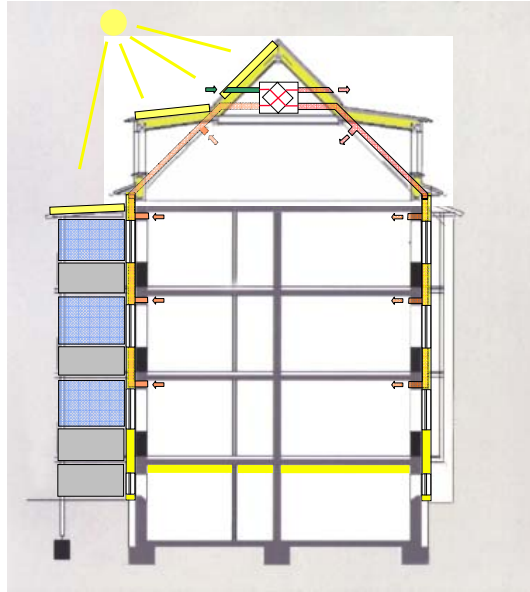
- hardly future oriented
- too many technical compromises
- too many craftsman involved
- poor coordination on site
- low quality level
- inefficient construction processes





### Prefab Building Renovation

- Whole building concept
- no technical compromises
- few companies involved
- well coordinated modules
- quality assurance
- rapid construction processes



Renovation project Magnusstrasse Zurich, arch. K. Viridén

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## Prefab Retrofit of Buildings



### Energy consumption before and after renovation

	Old building	New building	Renovation Magnusstr.
Heating	600	230	68 MJ/m <sup>2</sup>
Hot water	130	125	9 MJ /m <sup>2</sup>
Electricity	120	100	55 MJ /m <sup>2</sup>
Total (final energy)	850	455	132 MJ /m <sup>2</sup>



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## Prefab Retrofit of Buildings



Vacuum Insulation Panels VIP





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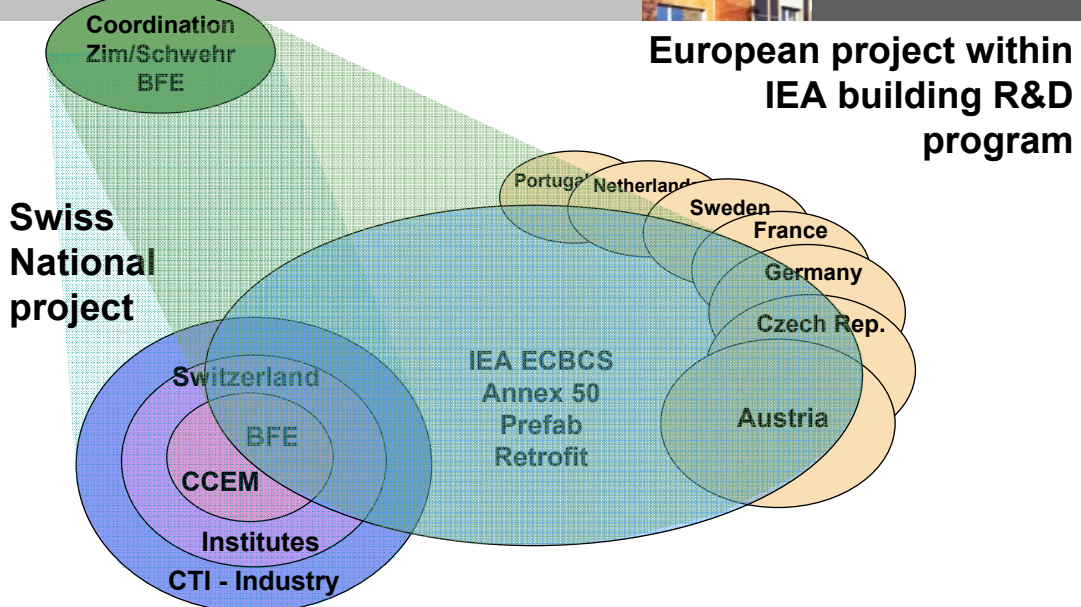
Prefab Retrofit of Buildings



Soltag project by Velux, Copenhagen Denmark

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Prefab Retrofit of Buildings



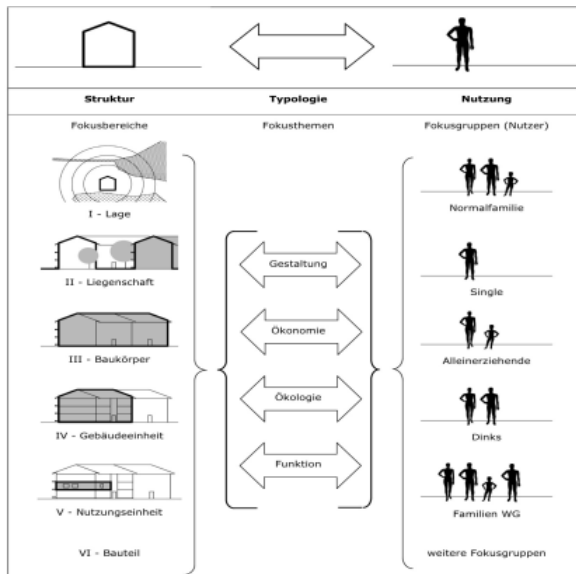


## Agreed general project outline

- Project addressing researchers, design teams, building industry and building owners
- Focus on typical European apartment blocks
- Intended energy consumption: 30-50 kWh/(m<sup>2</sup>-year) for heating, cooling and hot water
- Building envelope renewal applying to a large extent prefabrication technologies
- Sloped and flat roof solution, cladding systems and compact façades
- Some demonstration buildings monitored and evaluated

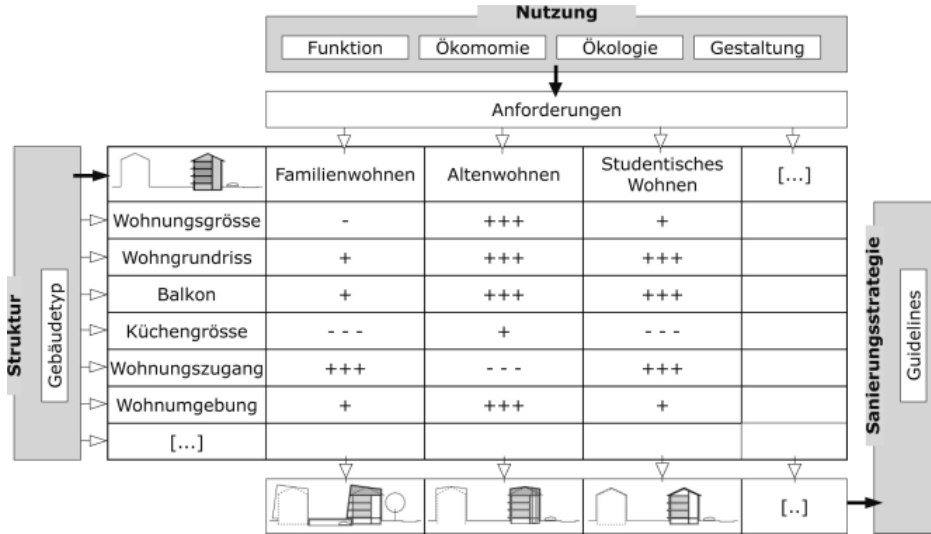


## Building typology

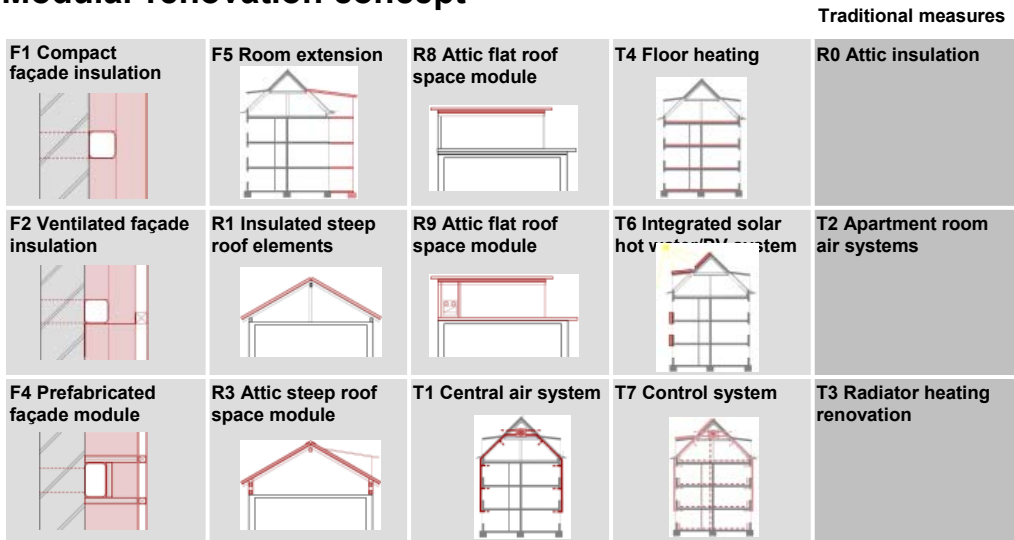




# Building type evaluation



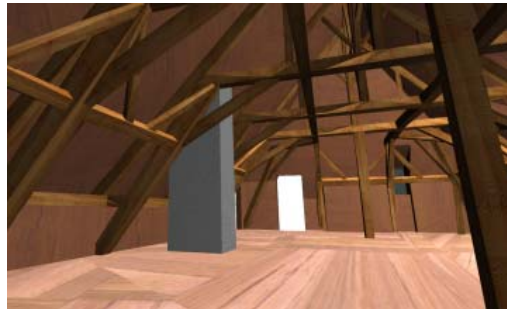
# Modular renovation concept







### 3D Measurement Techniques by University of applied sciences Northwestern Switzerland, Institute for Geomatics



CAD Model (Details)  
Wildenstein Castle (Bubendorf, Canton BL)



### 3D Measurement Techniques are a key technology for prefabrication



Photogrammetry using GPS-guided Model ... or Laser Scanning

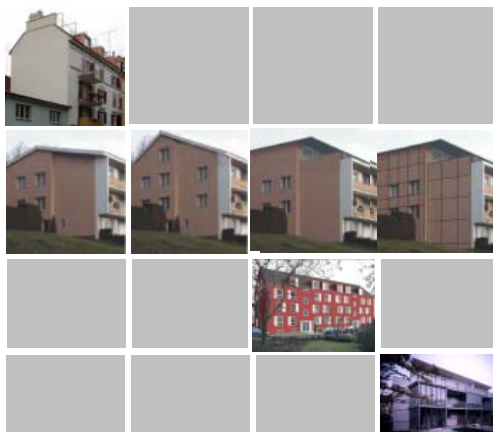


### Vision of Retrofit Advisor

#### Existing Situation



#### Retrofit Design Options









Retrofit advisor

Economic, ecologic, social evaluation  
Documentation of retrofit solution



## Products

- 
**Building upgrade concept** documenting typical solutions for pre-fabricated roofs with integrated HVAC components and for façades
- 
**Guidelines** for system evaluation, design, construction process and quality assurance
- 
**Retrofit advisory tool** to support the decision process of investors
- 
 Set of evaluated and **optimized building products and components** that ensure highest standard of energy efficiency
- 
 Retrofitted and documented **demonstration buildings**
- 
**Synthesis report** for a broad audience, demonstrating the potential of prefabricated retrofit



## Time Schedule

Subtask	Prep. Phase 2006	Working phase			
		2007	2008	2009	2010
<b>Work package A:</b> Typology + concepts					
<b>Work package B:</b> Renovation modules for façades, roofs, HVAC					
<b>Work package E:</b> Monitoring, dissemination					