Deep Renovation of Historic and Listed Buildings

Alexandra Troi – Eurac Research (IT)
Rainer Pfluger – University of Innsbruck (AT)
IEA Solar Heating and Cooling Research Co-operation Workshop
Wien, 5th June 2019
Around the world
Partners & programmes

TASK SHARING
Twenty-two institutions from eleven different countries. Task59 will benefit from the expertise and previous experiences that the different partners will bring to the project.
There is a need

e.g. in Europe

<table>
<thead>
<tr>
<th>dwellings %</th>
<th>dwellings n°</th>
<th>people</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1919</td>
<td>14.3%</td>
<td>30 million</td>
</tr>
<tr>
<td>1919-1945</td>
<td>28.4%</td>
<td>25 million</td>
</tr>
<tr>
<td>&lt; 1945</td>
<td>12.1%</td>
<td>55 million</td>
</tr>
<tr>
<td>1919-1945</td>
<td>65 million</td>
<td>66 million</td>
</tr>
<tr>
<td>1919-1945</td>
<td>120 million</td>
<td></td>
</tr>
</tbody>
</table>

Dwellings for EU-27
area of the circle proportional to number of dwellings yellow and orange slices as indicator for historic buildings

before 1919
1919-1945
Vision

Conservation of historic buildings and climate protection is not an antagonism

Historic buildings will survive if maintained as living space. Energy efficient retrofit is useful for structural protection as well as for comfort reasons - comfort for users and “comfort” for heritage collections.

Understand the building and find the right solutions
Now is an important moment

In the last 10 years, a shift could be observed, from “\textit{don’t touch our buildings}” to “\textit{let’s find the right solutions together}”

**DRIVERS**
- 2010 EPBD 2010/31/EU
towards NZEB, exemption for listed buildings
deep renovation rate of 3\% for public buildings

**OBSERVED INITIATIVES**
- 2013 ICOMOS established
  Scientific Committee for Energy and Sustainability
- 2017 CEN standard 16883
  Improving the energy performance of historic buildings

\textbf{TASK 59}
Definitions / scope

**Historic buildings** according EN 16883 all buildings with elements “worthy of preservation” which can be buildings of all types & ages, not just listed/protected buildings

**NZEB** according IEA SHC Task 40 | EBC Annex 52 as equalized energy balance is reached by bringing together architectural design, energy efficiency and local use of renewable

**Lowest possible energy demand** – heritage value as constraint, but not only, additional parameters like comfort & economic feasibility

**Solar renovation** as a holistic approach, reducing the energy demand and providing energy from the sun (daylight, passive & active solar)
Holistic approach – Solar renovation

① **REDUCE DEMAND**
② **PROVIDE FROM SUSTAINABLE SOURCES**

Whole range of solar!
- Daylighting
- Passive solar energy
- Solar thermal
- Photovoltaics
- Hybrid
Solar energy in historic buildings & deep renovation

Villa Castelli
Lago di Como

Energy concept:

1. Low energy demand: 18kWh/m²a
2. High solar gains: ~30%
3. Covered by ground source heat pump with electricity from PV
Proposed Task Structure

A. Knowledge Base
B. Multidisciplinary planning process
C. Conservation compatible retrofit solutions
D. Demonstration and dissemination
A – Knowledge Base

Task lead: e7 / Austria

INSPIRATION
to trigger the demand

LEARNING
from the experience

DETAILS
for a deeper understanding
Deep Renovation of Historic and Listed Buildings

IEA Solar Heating and Cooling Research Co-operation

Alexandra Troi, Rainer Pfluger
Improving of historic windows
Conservation, comfort and energy saving

» Restauration/conservation of historic windows/parts
» Additional glass layers/windows at the inside (ventilated cavity), new technology: thin glass (2/10/2 or 2/8/2/8/2)
» If no historic window remaining: reconstruction as a thermal high efficient box-type or composite window
Internal insulation –
High comfort and reduction of transmission losses

» „Robust Internal Insulation“ EU-projekct RIBuild
» Driving rain protection – solutions
» Visual inspection (Cracks, Salt, rising damp...)
» Beam end solutions

3EUNCULT NMS Hötting, Remmers IQ-Therm
(Source: Gerald Gaigg)

3EUNCULT Final report
(Source: Sören Peper, PHI)
High efficient HVAC and control
Building services tailor-made for historic buildings

» HRV-Ventilation with reduced ductwork by active overflow ventilation strategy
» Wall integration
» Controlled natural ventilation
» Simulation based control, sensor network etc.

Herrenhaus Brünnengut, Bern (CH)
Active overflow (Source: Erich Keller AG)
Heritage conservation and renewable energy – a cultural challenge for our CO2-neutral future

» Roof integration, visual aspects
» MPP-tracking per module
» Mounting
» Colours, reflection, surface quality
Summary and Outlook

» IEA-Report on solutions and research results
» Link to best practice examples
» Link to reference solutions
» Online solutions repository in ATLAS - project
Heritage conservation and renewable energy – a cultural challenge for our CO₂-neutral future
See you in autumn?

16.-17. October 2019

Hofburg Vienna
European Congress on the Use, Management and Conservation of Buildings of Historical Value

16.-17. October 2019
Hofburg Vienna
→ Keynote
→ Dedicated session
Thank you for your attention

www.iea-shc.org