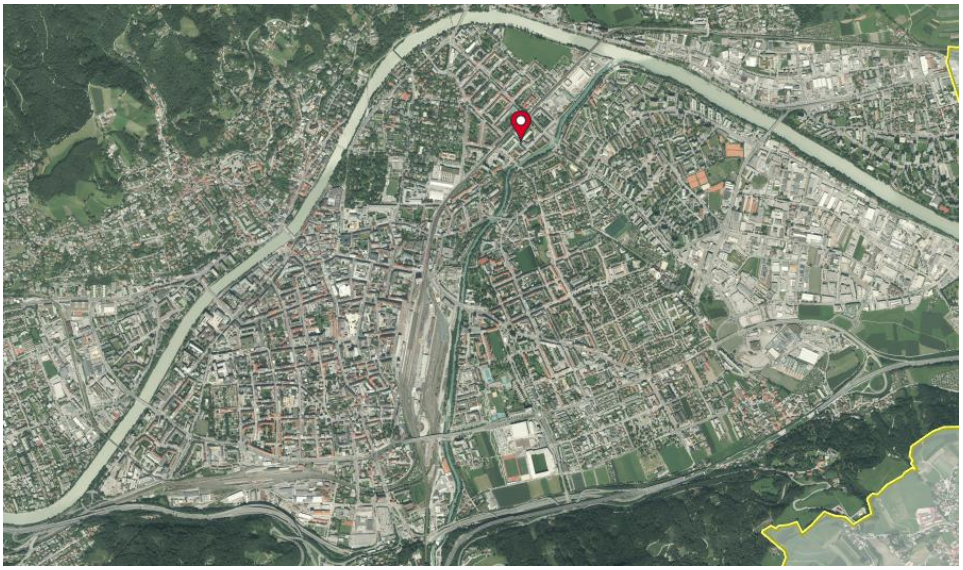
Factsheet

BEST_IIG_Sillblock

SINFONIA stands for "Smart INitiative of cities Fully cOmmitted to iNvest In Advanced large-scaled energy". This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 609019

PROFILE

Name and address	BEST 3 | "Sillblock" - Sebastian-Scheel Straße 18-18b		
Map	 Source: http://city-map.innsbruck.gv.at		
Description	A social housing complex, built in 1940, has been refurbished whilst people were still living in the building. Single-stove ovens were exchanged against electric panels but gas heating was maintained where existing from before. A PV-plant on the roof was installed to enable some amount of energy self-supply. Decentralized ventilation systems were implemented in 1/3 of the flats. In addition, several additional improvements to the building have been incorporated in the refurbishment process, such as new balconies and elevators.		
Ownership	Innsbrucker Immobilien IIG		
Gross conditioned	2,115 m²	**Treated floor area (TFA) (PHPP²)**	1791 m²
Number of	34		
Heating demand (EPC[1])	*BEFORE RENOVATION*	*193,3 3 kWh/m²*a*	
	TARGET/AFTER RENOVATION	*19,7 kWh/m²*a*	
Heating demand	*BEFORE RENOVATION*	*151 kWh/m²*a*	

[1] Energy Performance Certificate according to the Austrian Institute of Construction Engineering

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(PHPP[2])	*TARGET/AFTER 1st STEP*	*31 kWh/m²*a*
	TARGET/AFTER *RENOVATION*	*18 kWh/m²*a*
Overall savings	Current state (before completion of ventilation & heating system)	> 60%
	After completion of ventilation & heating system	> 80%

Main lessons learnt

The comprehensive refurbishment of a building is a combination of energy solutions and improvements for user comfort. Investments have to balance these two aspects in an optimal way. As such, challenges are of financial, technical and social character.

In respect to tenants, the burden of noise, dust and intrusion into personal space, as well as disturbance of daily routines, is enormous. Permanent dialogue and crisis management demand special abilities of a building manager.

Finding optimal and cheap solutions with less interference into the building structure is especially important concerning ventilation and heating systems. It requires a repeated revision in the planning process. Here, a centralized heating system was given up in favor of exchanging single ovens with single electricity heating devices, fed by house owned PV. Also only 1/3 of the apartments have been equipped with ventilation systems – only those which were empty and those where the arrangement of tubes could be implemented without major interference with the building structure (all the flats on the top floor, where tubes are now led through the attic).

After refurbishment, it takes a long while until frustration of the tenants about the building process is substituted by happiness about their newly insulated building and reduced heating demand. Proper usage of a passive house requires intensive communication with the tenants who are advised to change their lifestyle in order to reach optimal energy savings (no long-term tilting of windows, or T-shirts in winter with heating above 25°C). Also, reaching optimal usage (self-supply) of the PV-electricity during daytime takes time since electrical devices have to adapt to usage habits.

[2] Passive House Planning Package

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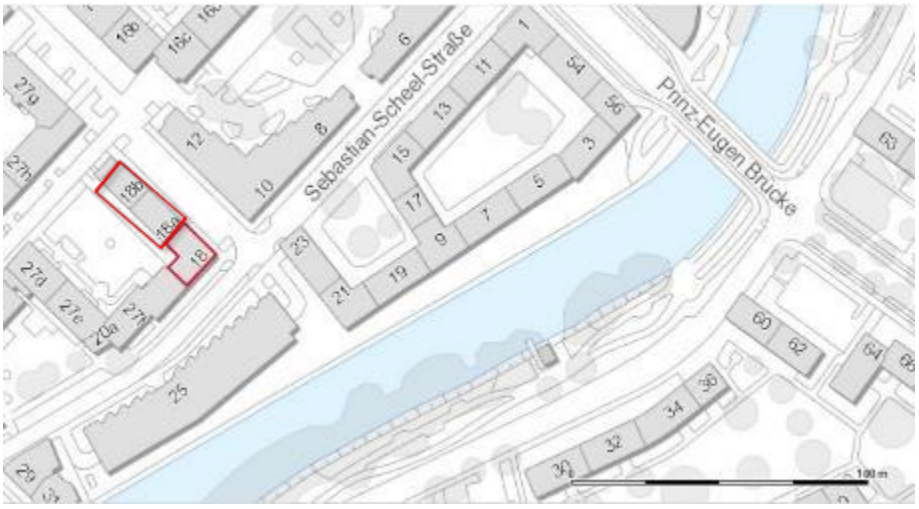
1 - DESCRIPTION BEFORE REFURBISHMENT

Detailed implantation of the building(s)	 Source: http://city-map.innsbruck.gv.at 

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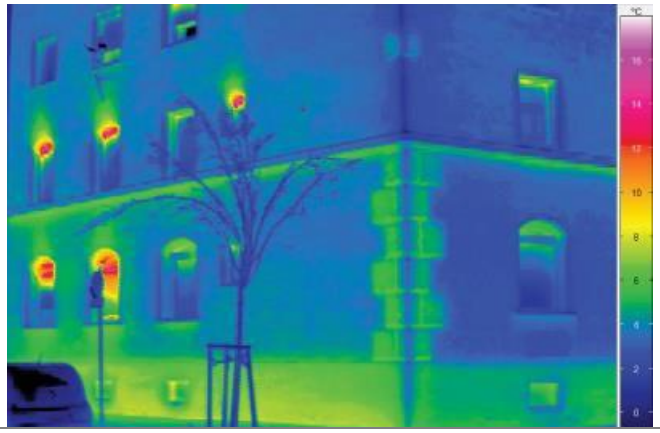
Building envelope	Sillblock is a typical building block constructed in the second half of the 20th century with related challenges in regard to insulation, thermal bridges of loggias, electric cables, low performing windows, poor roofs and dug out cellars, etc.  

Technical system	Decentralised heating system with gas, electricity, oil, wood – several single ovens.
Thermal imaging before refurbishment	
Energy performa	Category E

2 - REFURBISHMENT CONCEPT

Concept	A full refurbishment of the building envelope, the heating system and air ventilation was planned. As accompanying

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	measures, disability access through elevators and new balconies (thermally decoupled) should be implemented.
Energy solutions	• Replacement of old heating systems by a centralised heating system was planned (but finally not implemented); • Removal of all single ovens. • Integration of solar electricity • Installation of a centralised ventilation system
Performances targets	Reduction of total energy consumption by more than 60%.

Envelope details

Roof to wall insertion section (thermal bridge)	Triple-glazing windows with building-integrated PV 5Wh shading element. Insulation of the attic floor with a 40 cm-thick layer of cellulosic.
Ground to wall section (thermal bridge)	Additional wood-wool thermal insulation of the lowest story ceiling (17.5cm).
Wall to fenestration section (thermal bridge)	Thermal insulation of façade (22cm EPS) and thermal insulation of inner yard (12cm PU). Perimeter insulation in a range of 6 -14 cm.

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Technical system

Mechanical ventilation	Centralised ventilation systems were installed. However only 1/3 of the apartments are equipped with ventilation systems: only those which were empty and those where the arrangement of tubes could be implemented without major interference with the building structure (so all the flats on the top floor, where tubes are now led through the attic)
Electric renewable integration	Installation of a PV system on the roof. Characteristics are as bellow: Nominal power: 17,34 kWp PV array area: 113,1 m² Module type: Solarwatt Inverter Type: AE Conversion Mounting type: Roof mounted parallel Elevation: 574 m a.s.l. Tilt: 38° Azimuth angle: 225 °/135°

3 - IMPLEMENTATION

Stakeholders involved

Contracting authority	IIG - Innsbrucker Immobilien GmbH & Co KG
Project manager	DI Walter Aistleitner
Architect	din-a4 Architekten
Technical system designer	HSL planning – Alpsolar Klimadesign electric planning – Zösmayr Elektrotechnik
Windows supplier	Internorm

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Costs and financing

Refurbishment costs	Not applicable
Financial resources	Most of the works were financed by IIG, using rental reserves accumulated from previous years. The monthly rent is on average 3.56 €/m2*month and was not increased for this project. The operational costs are (without heating and electricity) about 1.58€/m²*month. In addition to IIG's investment, the refurbishment is co-financed by the European Union. Payback period: 10 years (using an interest rate of 3 months Euribor + 0,43 %)

Implementation planning

1 - Signature consortium agreement	2014
2 - Start of refurbishments	05-2015
3 - Completed refurbishments	11-2016

Work progress

Important points of refurbishment process and short description	You may find here three pictures of the construction process showing some steps of the external and internal refurbishment process. It shows activities of the façade insulation, of preparation and implementation of the ventilation system.

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4 - DESCRIPTION AFTER REFURBISHMENT

Architectonic concept	
Detail of balcony/elevator solution	

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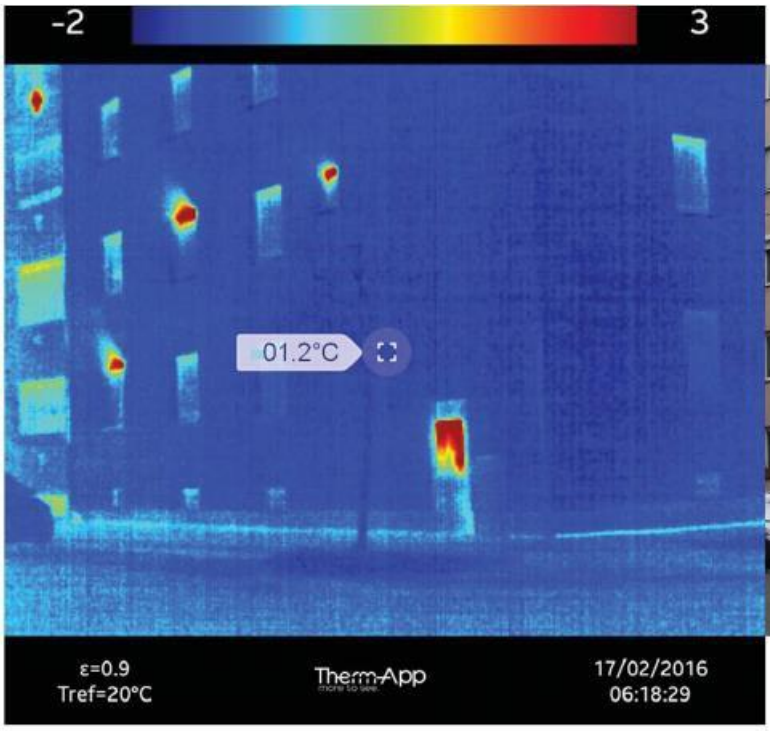
Thermal image after insulation	Before: see above 
Envelope characteristics	• Facade insulation: 22cm Expanded Polystyrene (EPS), U-value 0.15; • Roof cellulose 40cm, U-value 0.1 -0.12; • Ceiling basement U-value 0.26; glazing Ug 0.5 and Uw 0.66; • Shading built into the window; • Flanking insulation: 12 cm for reduction of thermal bridges; • Balconies thermally uncoupled. The construction of the balconies is performed in cross laminated timber (CLT) for floor and ceiling, and steel columns. • The existing roof has been checked statically for photovoltaics and for solar thermal energy.
Technical system	Electric installation works and installation of ventilation systems have been properly done. Elevators have been fully completed. Six empty dwellings have been retrofitted completely and have been re-settled after refurbishments. Additionally, some tenants have agreed on monitoring of the energy use, and of the electricity consumption, as well as of the air quality. Due to tenant's refusal to implement a central heating

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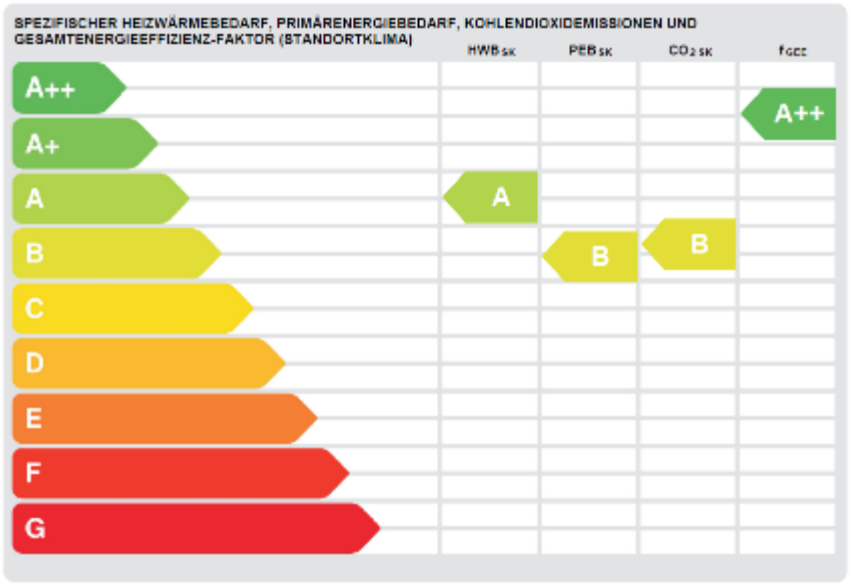
	system, only single stove ovens were exchanged with electric heat panels. All flats heated with gas were kept as they are.
Renewable energy sources	The PV installation has a capacity of around 17,34 kWp. This electricity can be used for personal consumption (off-grid system) or can be fed into the public electricity network (grid-connected system). There are power inverters with 0,5 kW for each flat, linked to two PV modules each. So far, for a test-period between June and November 2017, own domestic consumption rate resulted in around 56%. Excess electricity is fed into the grid. This domestic renewable energy consumption could be improved if electrical devices (especially hot water boilers, washing machines etc.) were fed by the PV mainly during daytime (sunshine hours).
Energy performance after refurbishment	Calculated energy consumption per m2 of total used conditioned floor area of about 40 kWh/m²*a. (EPC) was reached, and electricity savings of 30% are foreseen.

Energy efficiency certificate **(EPC[3])**	

5 - PERFORMANCE MONITORING

[3] Energy Performance Certificate according to the Austrian Institute of Construction Engineering

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Monitoring System	A public tender has been performed for purchasing the monitoring equipment, calibrating and installing it at the refurbished buildings. Tenants had to agree to the monitoring (13 flats were monitored). Variables measured are temperature, humidity, CO_2, total electricity and heating/warm water energy consumption. Additionally, in six selected flats electricity use of household devices were measured in combination with individual energy consultation through the Passive House Institute.

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