



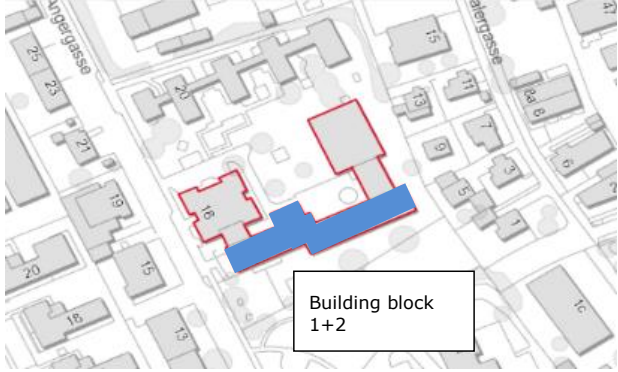
Factsheet

BEST_IIG_Angergasse



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 18 Volksschule – Angergasse 18		
Map	<p>City map highlighting the surface occupied by the demo site</p> <p>Source: http://city-map.innsbruck.gv.at</p>  <p>Building block 1+2</p>		
Description	<p>Within 12 weeks (mostly during summer holidays), 14 classes of the primary school Angergasse underwent a major refurbishment process. Measurements related to energy efficiency, general upgrading and accessibility have been implemented. Final work lasted until December 2016. Energy savings of 89 % (heat energy demand) were achieved.</p>		
Ownership	Innsbrucker Immobilien IIG		
Gross conditioned floor area	3073 m ²	Treated floor area (TFA) (PHPP²)	2050 m ²
Heating demand (EPC¹)	<i>BEFORE RENOVATION</i>	<i>119 kWh/m²*a</i>	
	<i>TARGET/AFTER RENOVATION</i>	<i>13 kWh/m²*a</i>	
Heating demand (PHPP²)	<i>TARGET/AFTER RENOVATION</i>	<i>20.2 kWh/m²*a</i>	

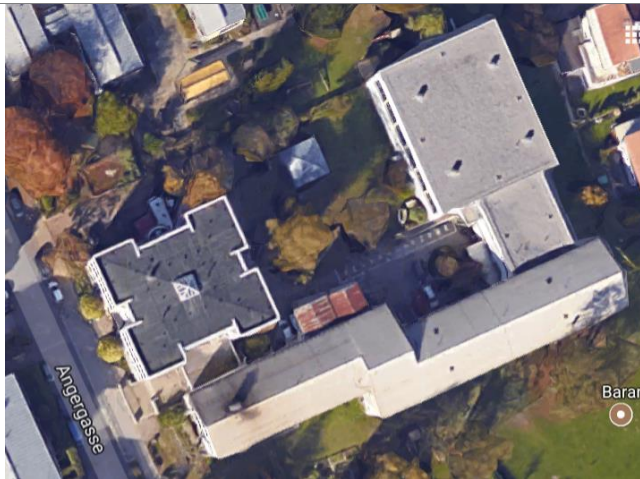
¹ Energy Performance Certificate according to the Austrian Institute of Construction Engineering

² Passive House Planning Package



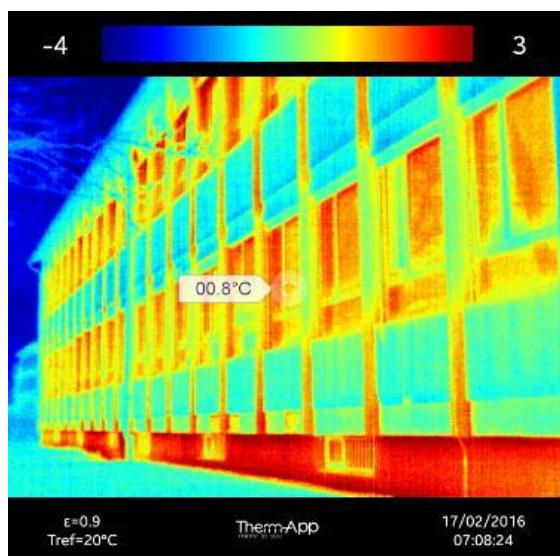
Overall savings	Current state after completion of the ventilation and heating system renovation	>80%
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1 - DESCRIPTION BEFORE REFURBISHMENT

Detailed characteristics of the building	The building consists of 4 small complexes of buildings shaped like U. Building block 1+2 in the South were part of the refurbishment.
Plot map	 <p>Source: https://www.google.at/maps</p>
Building envelope	<p>Building block 1 and 2 had different types of outer wall construction:</p> <ul style="list-style-type: none"> • concrete (38cm); • reinforced concrete (20cm) plus mineral wool (3cm); • aerated concrete (5cm) plus reinforced concrete (25cm) and 3-layers plate (5cm); • or bricks (38cm). <p>Windows had U_w between 2.5 and 3.7 on average.</p>
Technical system	Natural gas for heating



Thermal imaging before refurbishment



Energy performance certificate

Category G


Other relevant technical aspects

Not applicable



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2 - REFURBISHMENT CONCEPT

<p>Concept</p>	<p>The school was refurbished to the Enerphit Passivehouse standard, including:</p> <ul style="list-style-type: none"> • Thermal insulation of walls (perimeter insulation, thermal insulation composite system (External Thermal Insulation Composite Systems (ETICS)) with 22cm EPS; • Drainage of the basement; • Insulation of the uppermost ceiling (35cm cellulosis); • Installation of triple-glazing windows (Uw 0,69-0,73).  <p>Additional measures:</p> <ul style="list-style-type: none"> • fire safety; • accessiblity (incl. preparation of elevator shaft); • functional improvements (daycare center, school kitchen).
<p>Energy solutions</p>	<ul style="list-style-type: none"> • PV-Installation on the roof (58kWp, around 364 m², 219 Solarwatt Blue 60P – glass-foil module);



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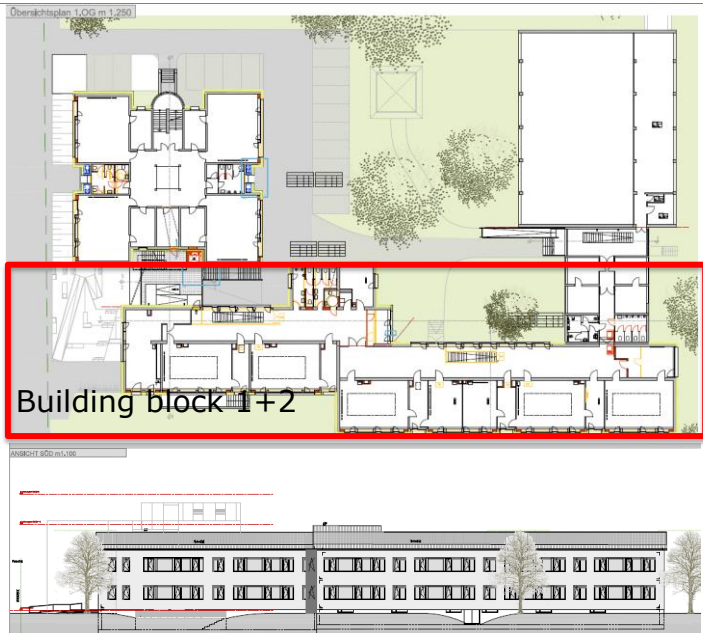
- Hydraulic compensation of the heating adjustments;
- LED-lightening systems in replacement of convectional light bulbs.

Performances targets	Total energy savings of about 80%
Financing model	100% public



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Layout plan



Envelope details

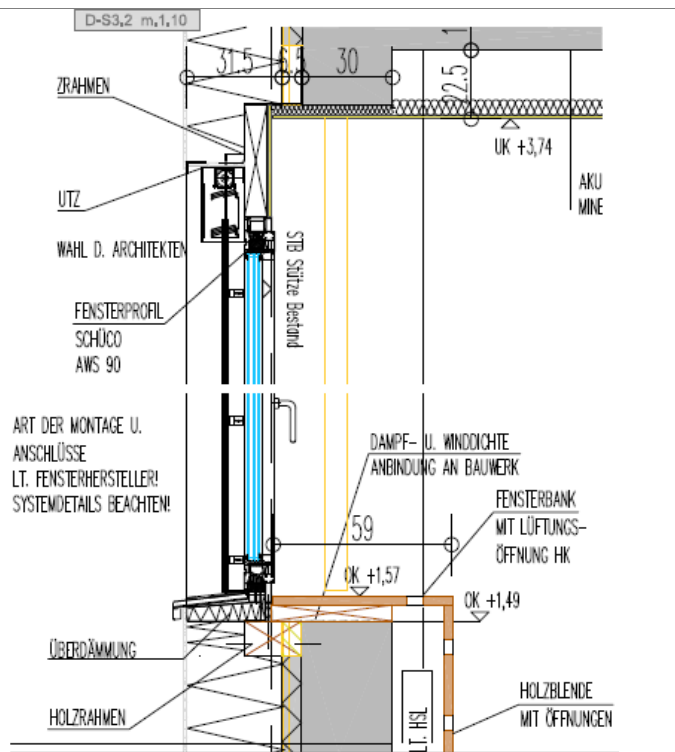
Envelope

As described above.



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Windows



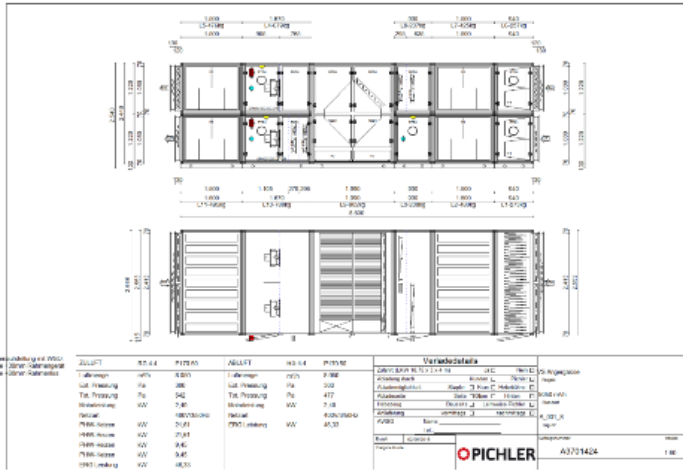
Technical system

Mechanical ventilation

Comfort ventilation system with heat recovery
 School: Pichler RG 4.4, air volume flow 8050 m³/h with 87% heat recovery
 Kitchen: Pichler RG 2.2, air volume flow 2600 m³/h with 89% heat recovery



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Ausführung mit PV-System		PV-System		PV-System		PV-System		PV-System	
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Electric renewable integration

Installation of a PV system on the roof. Characteristics are as below:

- Nominal power: 58.035 kWp or 363 m2 module area
- Mounting type: Roof mounted parallel
- Elevation: 574 m a.s.l.
- Model: Power reduction for consumers



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3 - IMPLEMENTATION

Stakeholders involved	
Contracting authority	IIG - Innsbrucker Immobilien GmbH & Co KG
Project manager	DI Walter Aistleitner, IIG
Architect	DI Michael Schafferer, Architect
Technical system designer	Ingenieurbüro A3
Windows supplier	Huter&Söhne Weithaler

Costs and financing	
Refurbishment costs	4,33 M€ including general function improvements such as accessibility, after-school-care club, and lunchroom.
Financial resources	IIG, plus public subsidies for various energy efficiency measures through Austrian federal environmental support schemes and the EU

Implementation planning	
1 - Signature consortium agreement	2015
Description of step	
Start of refurbishments	05-2015



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Completed refurbishments

12-2016

Work progress

Important points of refurbishment process and short description

- The main challenge was the short refurbishment time during the school summer holidays;



- Replacement of windows and implementation of the insulation material on the façade in 2016;



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- Ventilation system already installed during the summer 2016.

4 - DESCRIPTION AFTER REFURBISHMENT

Photos of the building after refurbishment



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Thermal imaging after refurbishment																																																			
Envelope characteristics	As indicated in the concept description																																																		
Technical system	As indicated in the concept description																																																		
Renewable energy sources	Total production of solar energy in 2017: 59.283,33 kWh Share of self-sufficiency: Within a test period from 1/17 to 4/17 the solar fraction has been determined and was about 42%. Surplus electricity is fed into the public grid.																																																		
Energy efficiency certificate	<table border="1"> <thead> <tr> <th></th> <th>HWB^{sk}</th> <th>PEB^{sk}</th> <th>CO₂^{sk}</th> <th>f_{GEE}</th> </tr> </thead> <tbody> <tr> <td>A++</td> <td></td> <td></td> <td></td> <td>A++</td> </tr> <tr> <td>A+</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>A</td> <td>A</td> <td></td> <td></td> <td></td> </tr> <tr> <td>B</td> <td></td> <td>B</td> <td>B</td> <td></td> </tr> <tr> <td>C</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>G</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		HWB ^{sk}	PEB ^{sk}	CO ₂ ^{sk}	f _{GEE}	A++				A++	A+					A	A				B		B	B		C					D					E					F					G				
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(EPC ³)	
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