SFH Zeyer in Ostermundigen CH

PROJECT SUMMARY
Renovation and addition exceeding Swiss Minergie-P Standard. Use of Solar thermal, PV and geothermal.

SPECIAL FEATURE: PV primary energy production exceeds total energy consumption for heating, warm water and appliances!

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ENERGY CONCEPT:
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OWNER: Priska + Christian Zeyer

IEA – SHC Task 37
Advanced Housing Renovation with Solar & Conservation

SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Before

After

BACKGROUND

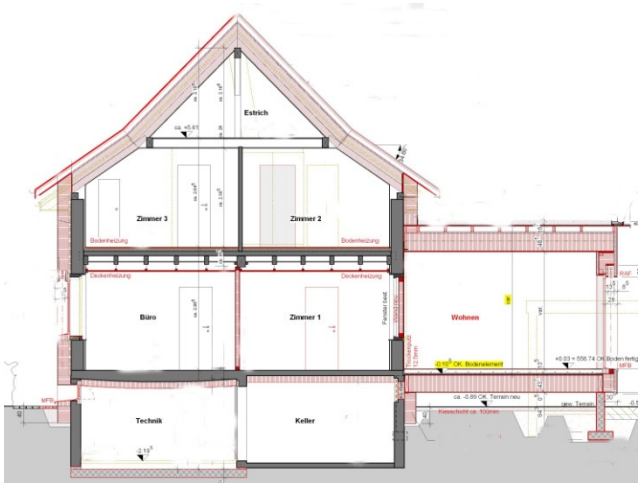
Old house completely renovated and new living, kitchen and entry areas added. New geothermal heating, heat recovery ventilation, installed, solar collectors and roof integrated pv panels. Result: a modern house achieving highest energy standard.

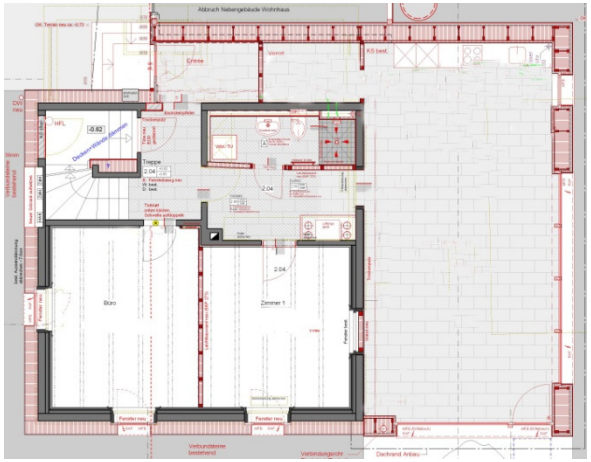
SUMMARY OF THE RENOVATION

Existing wall insulation stripped away and replaced with 2 160mm layers of polystyrol as a "compact façade". New roof trusses added to the roof to create a 420 mm void for cellulose insulation.

Vacuum insulation used over window roll blind boxes and on the floor where no cellar.

New addition is wooden construction with large windows for light and passive solar gain. 80 mm poured concrete floor increases the passive solar usability. Also, ventilation system with heat recovery distributes passive solar heat throughout the house.





Ground floor

Roof Upsi framing

Wall exterior insulation

CONSTRUCTION

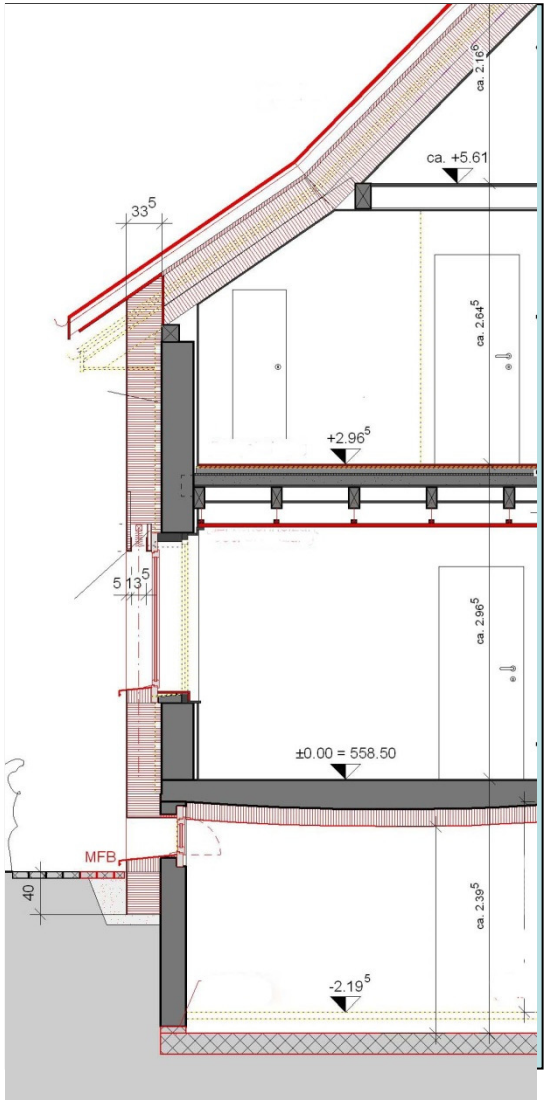
Roof construction	*U-value: 0.1 W/(m²·K)*
Roof tiles	
Wood battens	30 mm
Counter wooden battens	60 mm
Under-roof panels	35 mm
Cellulose fiber Upsi-T300mm)	420 mm
Wooden roof rafters	120 mm
Vapor barrier	
Interior finish	
Total	685 mm

Wall construction	*U-value: 0.1 W/(m²·K)*
(interior to exterior)	
Wooden board paneling	15 mm
Wooden battens	30 mm
Masonry wall (existing)	300 mm
Polystyrol	320 mm
Exterior plaster	10 mm
Total	675 mm

Basement *U-value house to earth: 0.10 W/(m²·K)*

Ceiling	
Concrete slab	200 mm
Polyurethane	160 mm

Foundation	
Walls	300 mm
Exterior Styrofoam to 400 m depth	280 mm



Existing roof rafters

Sealing the vapour barrier

Blowing in cellulose

Roof construction

Existing roof covered with vapour barrier glued to wall vapour barrier.
Above existing roof new wooden trusses with wooden fiber deck. Cellulose (Isofloc) blown in the void.
New wooden bats carry roof tiles or roof-integrateed pv.

Solar:

Roof-integrated PV system with 6.6 kWp
5 m² solar thermal collectors on stand

Ventilation ducts

Radiant suspended ceiling

Vacuum insulation panels VIP on floor

Summary of U-values W/(m²·K)

	Before	After
Attic floor	1.2	0.10
Walls	1.0	0.10
House to ground	0.9	0.1
Windows	2.5	0.8*

* Varies by window size from 0.6 to 1.2

BUILDING SERVICES

- Intake fresh air is warmed and humidified by an enthalpy heat-exchanger which recovers room humidity as well as heat (nominal 90% efficient)

- Heat delivered to by radiant ceilings ground floor rooms, radiant floors of 1rst floor rooms. Supply temperature 30 °C by -8 °C ambient
- Heat produced by a heat pump coupled to a 150 m deep borehole

- Solar thermal collectors are mounted on stands on the house addition

RENEWABLE ENERGY USE

PV roof integrated: 6.6 KWp
Solar collectors: 5 m²

ENERGY PERFORMANCE

Space + water heating (primary energy)*
Before: 164 kWh/m²
After: 34 kWh/m² **
Reduction: 80 %
Net Energy Production 10 kWh/m² ***

* Swiss Standard: SIA 380/1: 2001
** New living area after the renovation 30 % larger
*** Primary energy balance. PV output > heating, hot water and appliance energy consumption.

INFORMATION SOURCES

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