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New life for a peat barn as a house and workshop

Lifecycle Number 3 – a timber and earth building that conserves more resources than it consumes

Photo: Malte Fuchs

Fig. 1 "Torfremise", West elevation seen from the road

Saved from demolition and destruction

In autumn 2005, Stefanie and Emmanuel Heringer were working together with a group of local craftsmen, the architects and engineers Ziegert Roswag Seiler and Anna Heringer in Bangladesh on the "School Handmade" project when news arrived from Germany of the imminent demolition of a peat storage barn in Kolbermoor to make way for a new building development. At the time, Emmanuel Heringer, who is a basket weaver, was using the building to store his willow rods due to its aerated structure.

The site of the spinning mill on which the building stood was to be redeveloped, and the historical "Torfremise" (peat barn), despite being a comparatively rare type of building, was not deemed worthy of preservation. While still in Bangladesh, the idea was born to dismantle and remove the building from the site in order to save the building and its timber members from incineration.

After their return from Bangladesh, the owners together with various helpers, took apart the buildings in February 2006, recovering some 90 m^3 of wood. Thanks to its reversible construction – a mortice-and-tenon construction held together with wooden pegs – the disassembly was relatively straightforward. It was also possible to recover all the floorboards and slats from the facade. Carpenters marks on the structure suggest that the building had already been re-

Fig. 2 Dismantling and removal of the building from the spinning mill site in Kolbermoor

Photo: Stefanie and Emmanuel Heringer

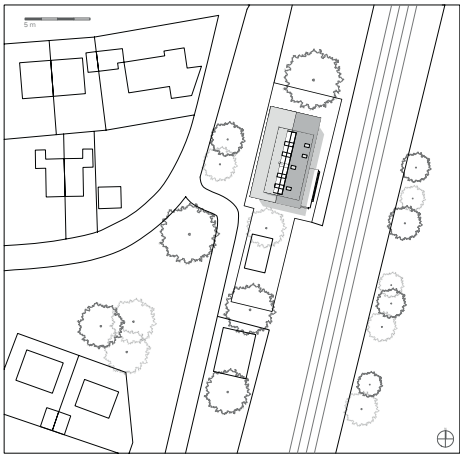


Fig. 3 Site plan and local context

Photo: Malte Fuchs

Fig. 4 Torfremise in the local context of the former railway station

located twice before. The original building probably had two storeys and was longer than it had been in Kolbermoor. Originally the open, barn-like building was used to dry and store slabs of peat dug from the Rosenheim basin. Peat was used as fuel for heating and firing, for example to extract salt by boiling saline water. No information is available on how the building was used in the interim period. Only a single entry in the archives of a local history museum towards the end of the 19th century points to its relocation to the site of the spinning mill. After the dismantling, the timber was put into storage, and later moved to a second store to save costs.

A dendrochronological examination of the timber suggests that the wood was felled some time around 1810. The rough-hewn surface of the beams – the product of an axe rather than a saw – confirm this. The barn is therefore around 200 years old.

Re-erection in Schechen – A new home

Two years later, in 2008, the owners found a suitable site for their new home and workshop in Schechen near Rosenheim. The local council had acquired a strip of land along the railway lines including the abandoned railway station, and declared it a mixed-use area within the bounds of the village suitable for trades and crafts. This status also allows the combination of working and living. The site was therefore a suitable location to re-erect the Torfremise as a workshop and home, with a total gross floor area of 700 m^2 split over two storeys.

A planning application was submitted in the same year for the re-erection of the Torfremise and its conversion through the introduction of a new building. A warehouse and toilet building on the railway site, although scheduled for demolition by the council, was retained, repaired and repurposed by the new owners for use as a basket weaving workshop.

In 2011, the historical timber members of the Torfremise were repaired by carpenters and the historical structure re-erected. The building, which stood previously on strip foundations, was placed on a new foundation slab large enough for the workshop and living areas. The raised insulated section of roof, under which the heated sections of the buildings would be, was also constructed at this point in time.

In its material composition and arrangement, the Torfremise forms a new ensemble parallel to the railway embankment together with the railway station and its outbuildings.

The redevelopment of this site within the bounds of the village also consciously aims to counteract the typical pattern of settlement fragmentation caused by building industrial estates and business parks outside localities. As such, the project avoids the need for new infrastructure.

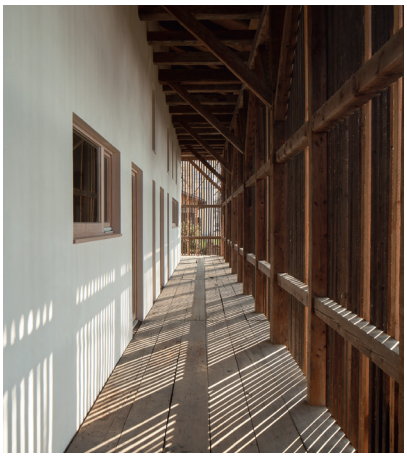


Photo: Malte Fuchs

Fig. 5 House-in-house: the volume of the new insertion protudes beyond the frame of the old building
Fig. 6 Gallery walkway between the historic envelope and the new insertion

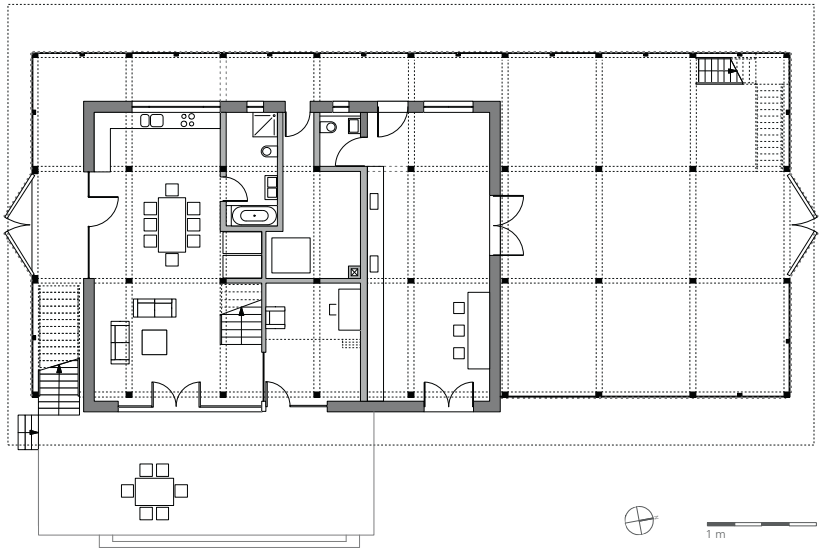


Fig. 7 Ground floor plan showing house-in-house arrangement. Separate living and working areas in one building.

New in old – a house in a house

In close collaboration with the owners, a new use concept was developed and worked up into a design. The intention was to incorporate both living and working within the framework of the barn. To modify the historical construction as little as possible and make its structure visible, all new walls were set apart from the existing structure. On the west and south sides of the building, the new external walls were placed between the axes of the supporting posts so that the distinctive diagonal braces between the posts and beams remained visible. This results in a walkway between the skin of the new building and the envelope of the old that connects the separate living and working areas. On the east facade, the external wall of the new building protudes beyond the plane of the historical building envelope.

The insulated section of the roof is placed above the rafters of the old roof, making it is visible from outside as a marker of the bounds of the new insertion. Inside, the historical construction remains visible.

In the new heated section of the building, a large living area has been arranged facing south on the ground floor. The heart of the interior is a 4.20 metre high open living space around which the other living spaces and bathroom are arranged. A large door on the south face marks the entrance of the historical passage through the building. This space opens via generous glazing onto a terrace and the garden beyond to the east. The childrens' rooms are on a gallery slung between the existing structure.

Photos: Stefanie and Emmanuel Heringer

Fig. 8 Living room and kitchen on the ground floor
Fig. 9 Living room on the upper floor

Fig. 10 External walls of the new insertion as a highly-insulated skin

The basket-weaving workshop adjoins to the north on the ground floor with the unheated workspaces and store beyond, which in turn is accessible from outside via the historical slatted doors.

On the upper floor is a second apartment illuminated from above by a central glazed strip along the ridge. This apartment can be reached separately via a stair on the outside gallery, or internally via a stair from the ground floor apartment. This apartment is likewise dominated by a large living and kitchen area. Cube-like blocks inserted into the floor plan contain two rooms and the bathroom and are illuminated and ventilated via skylights and horizontal glazing on the tops of the blocks.

An office space above the workshop has a section of glazed flooring to illuminate the workshop below. As on the ground floor, this adjoins a smaller storage area for "short" sections of willow rod.

Seen from the road, the immediate impression is of a historical building and its slatted facade. Where slats needed to be replaced, new material has been used to differentiate it from the old building. The historical slatted portals and flaps on the upper storey have been retained. On the east facade facing the railway lines, the new house-in-house is clearly legible, its wall projecting out beyond the envelope of the old building. The white clay plaster of the new building contrasts with the oiled timber structure of the peat

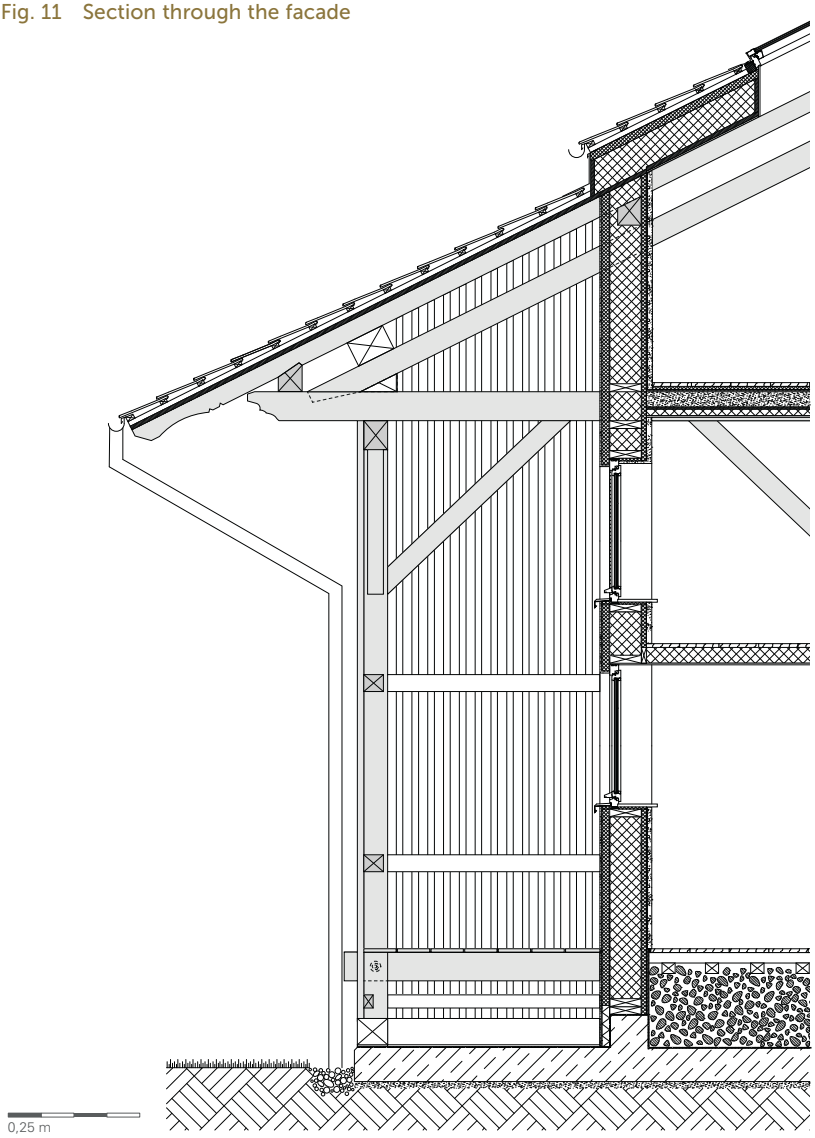
barn. The ground floor level corresponds to the elevated height of the historical floorboards and the height difference is bridged by ramps to the entrance portals and a terrace to the garden.

The aesthetic quality and craftsmanship of the project is influenced strongly by its owners, both of them creative craftspeople and teachers. One can see this in the special care taken to replace only those sections that have been damaged, the sensitive fitting of repairs, the way new insertions have been made and in the steel inlays that transfer the load from the new galleries into mortices in the historical structure. Much of the project was undertaken by the owners themselves together with friends and helpers. The work and precision of the master blacksmith (Stefanie) and the carpenter and basket weaver (Emmanuel) can be seen in the details. These sensitivities are also apparent in the choice of surface materials, the connection between new and old and the tasteful fitting out of the interiors.

Building in lifecycles – wood and earth

The new or additional external walls that define the thermal envelope of the heated section of the building have been constructed using traditional means, continuing the tradition of the building. To begin with timber stud walls were constructed of solid timber. These support some of the loads of the new functions. The historical structure of the historical timber construction was analysed and tested for structural stability as part of a diploma project, which was able to prove the loadbearing performance of the historical timber connections. The structure of the original Torfremise is able to support the principal loads without the need for visible means of reinforcement, and therefore remains to this day the primary structure of the building.

Fig. 11 Section through the facade



DACHAUFBAU (von innen nach außen)

Dachsparren (Bestand)	
Gipsfaser-Platte	1,2 cm
Schalung	2,0 cm
Windpappe/Dampfbremse	
Balkenlage bzw. Wärmedämmung	24,0 cm
Unterdach Holzweichfaser	6,0 cm
Konterlattung 10,0 x 4,0 cm	4,0 cm
Lattung 6,0 x 4,0 cm	4,0 cm
Dachziegel	

FUSSBODENAUFBAU (von oben nach unten)

Holzboden Tanne geseift	2,9 cm
Trittschalldämmung Holzweichfaser	2,2 cm
OSB-Platte auf Bestandsbalken	1,8 cm
Splittschüttung	11,5 cm
Blindboden Schalung	1,8 cm
UK/Holzweichfaserdämmung	5,0 cm
Gipsfaser-Platte	1,2 cm

WANDAUFBAU (von innen nach außen)

Innenputz Lehm mit Wandheizungssystem	4,0 cm
Holzweichfaserplatte	4,0 cm
Ständer KVH/Holzfaserdämmung	24,0 cm
Holzweichfaserplatte	6,0 cm
Außenputz Lehm (weiß)	1,5 cm

FUSSBODENAUFBAU (von oben nach unten)

Holzboden Tanne geseift	2,9 cm
Traglattung	8,0 cm
Unterkonstruktion	8,0 cm
Schaumglasschotter	57,5 cm
Abdichtung Bitumen-Schweißbahn	
Bodenplatte Stahlbeton	26,0 cm
Sauberkeitsschicht	5,0 cm

The new stud walls were clad in situ (i.e. not from prefabricated elements) with wood fibreboard on both sides and filled with wood-fibre blow-in insulation. In certain areas, wall heating pipes were fixed to the interior face and embedded in clay plaster. The large projecting eaves and protective slatted wood facades made it possible to plaster the external face of the new building with a white YOSIMA facing plaster. This plaster is also used for internal surfaces of the external walls and the surfaces of the internal stud walls and their earth block infill. The white clay facing plaster defines the aesthetic appearance of the new insertion, contrasting with the exposed structure of the oiled timber structure.

Pine floorboards sourced from domestic forests have been used for the floors, soap-treated to lighten them and reduce their intensity.

Care was taken throughout to construct the entire building shell and fittings as a reversible, recyclable construction made as far as possible of natural building materials. In the event of later alterations, all recovered materials are either re-usable or recyclable. Likewise, at the end of the building's useful lifetime, the materials can be returned to nature.

Resource efficiency and renewable energy usage

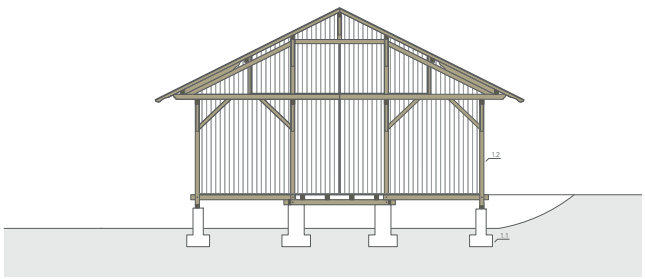
With U-values of between 0.10 and 0.15 W/m²K and triple-glazed windows, the building has a highly-insulated and airtight external skin of a similar standard to a near-zero-energy building. The vapour permeable wall construction and hygroscopic properties of the materials mean that the surfaces regulate indoor air humidity. Brief but intensive airing twice a day is sufficient to entirely obviate the need for mechanical ventilation (see also the article "Reducing the need for mechanical ventilation through the use of climate-responsive natural building materials"). The bathrooms are deliberately located on the outside walls for natural illumination and ventilation.

In addition to exploiting passive solar gain through the windows, warm water collectors are used for heating. The remaining heating demand, required primarily on overcast days in winter, is covered by a wood-burning stove in which waste material from the basket weaving workshop and wood from the owners' own wood can be burnt. In terms of heating, the building is therefore largely climate-neutral.

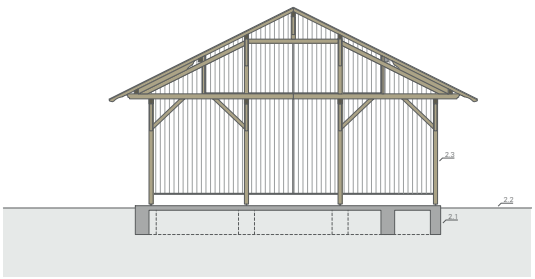
With the exception of the concrete foundation slab, the building conserves more resources than it con-

Fig. 12 Building transformation and energy concept

Existing building prior to demolition



Re-erection at a new location



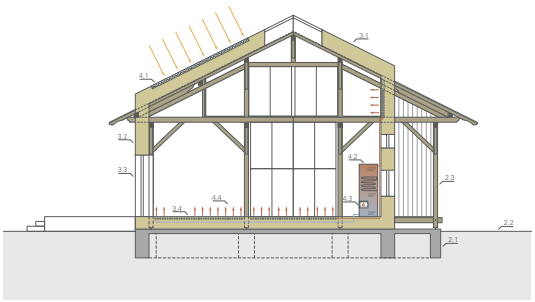
1 Bestand vor der Demontage
1.1 Fundamente
1.2 Historischer Holzbau

2 Wiedererrichtung am neuen Standort
2.1 Neue Gründung und Bodenplatte (Stahlbeton)
2.2 Neues Gelände
2.3 Wiedererrichtung historischer Holzbau

3 Integration Niedrigenergiehaus
Hochdämmende diffusionsoffen Gebäudehülle aus regenerativen Rohstoffen (Holz, Holzfaser-Dämmung, Lehm)
3.1 Aufdopplung Dach U-Wert: 0,15 W/m²K
3.2 Außenwand U-Wert: 0,13 W/m²K
3.3 Holzfenster Dreifachverglasung U-Wert: 1,0 W/m²K
3.4 Bodenaufbau gedämmt, U-Wert: 0,1 W/m²K

4 Regenerative Wärmeversorgung
4.1 Warmwasserkollektor
4.2 Schichtenspeicher
4.3 Stückholzheizung
4.4 Flächenheizung zur Wärmeverteilung

Introduction of a nearly zero-energy house-in-house powered and heated by renewable energy sources



Photos: Stefanie and Emmanuel Heringer

Figs. 13-15 Completion of the interiors with clay plaster; Workshop in the former store and toilet building

sumes. It is comprised predominantly of a re-used timber structure. This step alone stands in stark contrast to the typical demolish-and-replace mentality of the fossil fuel age. There is no reason why the structure cannot be re-used again in future lifecycles. The introduction of a new, contemporary function – living and working in a single building – has been undertaken using timber and earth, in effect continuing the tradition of the building with modern means. The materials used store CO_2 and can be returned to nature at the end of their useful lifetime. What is more likely, especially given the increasing scarcity of resources, is that these materials will not be disposed

of but will continue to be used in future lifecycles, as they were in previous centuries.

The use of solar energy for heating with the wood-burning stove as backup means that the building is almost entirely climate- and carbon-neutral. The use of an optional photovoltaic system would provide enough power for the year so that entire operation of the building would be supplied by energy from renewable sources.

The disassembly, reassembly and conversion, the materials used and the methods employed for its construction and fitting out all stand in the tradition of the original building. The project demonstrates the potential of using natural building materials, simple means and low-tech – most notably no mechanical ventilation – as a way of living in the future. Given the still-prevalent throwaway mentality of this post-fossil-fuel age, the historical building of the Torfremise and its central characteristics offer us a model for building in the future.