

Rehabilitation of uncommon medieval timber structures

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Abstract

In the Middle-Ages the half-timbered construction was widespread in Europe. Living, business and craft houses were erected with wooden skeleton constructions which were filled with different materials. These constructions were maintenance-extensive, but buildings could be erected relatively quickly and in a low-cost way. Today, numerous medieval buildings of this type are preserved. During the rehabilitation of these buildings, which are mostly classified as historical monuments, there are special challenges to the engineer. The adaptation to contemporary building standards, the vulnerability of these constructions and the limited possibilities of a new use are the tasks for the planner. This contribution introduces experiences with the repair planning of half timbered houses with unusual structures. The text mainly refers to a former weaving mill from the year 1611 and a miner's house from the year 1583. The weaving mill is fitted with an unusual cantilever beam in the gable in order to achieve a larger space in the building on the straightened ground conditions. It was re-worked extensively in 2005. A local historic museum has been housed in this building since 1962. The miner's house is fitted with, what is for this period, an unusual roof truss. For this building, investigations for the development of a lasting use concept are currently being carried out.

Keywords: timber, rehabilitation, construction.

1 Bügeleisenhaus

1.1 History

The so called "Bügeleisenhaus" (iron house) was erected in 1611. In 1620 a building on the gable side was added. In the wood above the entrance the constructor's initials can be seen, combined with a trade mark.



Between 1771 and 1856 the house was used for the production of cloth on the weaving looms as well as being a habitat for living in. In the middle of the 19th century a butcher's shop was established on the ground floor. For this purpose some structural changes were carried out. The gable was slated, windows were enlarged and a bigger staircase was installed. Next to the entrance door a classicistic shop window arose. In addition, a horse stable was attached at the gable, which was almost 3.5 meters long. The house was renovated from 1956 to 1962 by the local history association. Except for the shop window and stairs, the structural alterations carried out by the butcher have been put back as they were.

A local historic and geographic museum has been installed in the "Bügeleisenhaus" since 1962 [2].

1.2 Damage

The gable of the half-timbered facade of the "Bügeleisenhaus" aligned to the southwest is highly stressed by occasional driving rain and wind. The former horse stable on the ground floor and the slate on the higher floors protected the gable in former times. This protection has been removed.

Only small recovery repairs at the gable could be carried out during the last decades, because of financial reasons. Rehabilitation to a greater degree did not occur by application of typical half-timbered materials, as for example the infills with a pumice-concrete stone. The timber joints were manufactured merely blunt with steel brackets or panicle ribbons. The roof connections of the gable could not be worked on due to the height.

The continued existence of the "Bügeleisenhaus" could be safeguarded by covering and single repairs again and again without eliminating the actual causes of the damage. The weak point of the house is formed by the threshold of the 2nd level. The damage at the cantilever arm was eliminated only by installing an intermediate piece. In the end this piece could not carry the loads.

In the last few years the damage has increased at the upper floor threshold so that the deformations and settlements could already become recognizable with the unaided eye. With that the stability of the building no longer guaranteed direct safeguards were required.

1.3 Safeguarding

Both sides of the building are fitted with cantilever beams. The pathway beside the building must be free of any columns because of fire protection reasons. For the change of the threshold a special construction was developed which avoided any disturbing elements in the pathway. This temporary construction safeguarded the removal of the old threshold and the integration of the new threshold while the construction could not stand in the traffic space of the bordering streets. In the removal of the threshold the gable was not allowed to sag more than a millimetre. To that a tie construction was chosen, which was through bolted with the timber construction of the 2nd upper floor. The pillars of the construction were set next to the corner of the building and also though bolted with it. Because of the geometrically necessary protrusion of the ties a

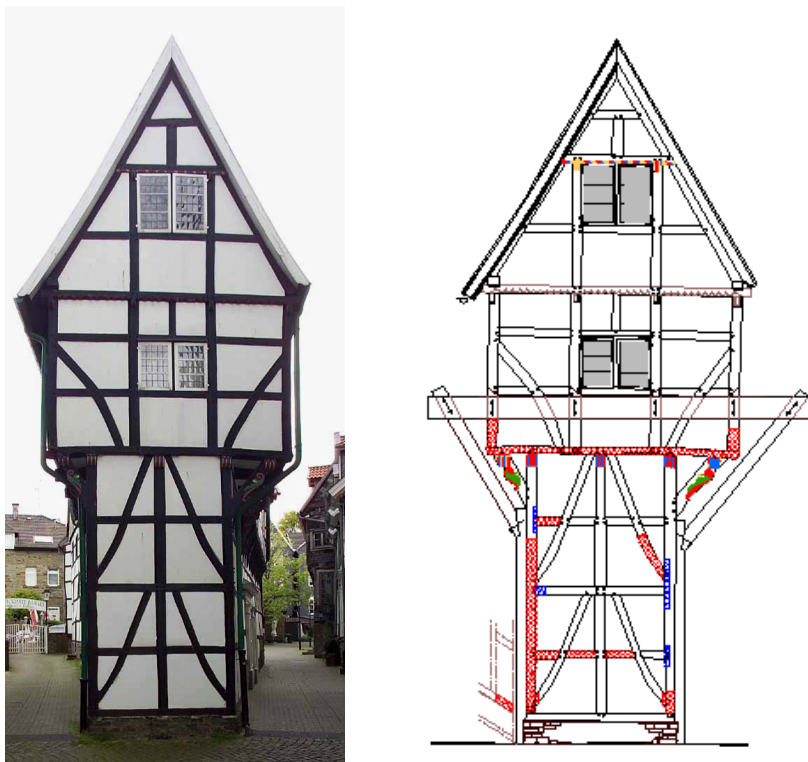


Figure 1: Picture and drawing of the façade with temporary supporting structure and map of damage.



Figure 2: Condition of a bracket and detail of the temporary supporting structure.

composite lumber of 12/34 cm was necessary. The construction was though bolted with steel bolts of 26 mm diameter.



Figure 3: Façade after rehabilitation.



1.4 Structural analysis

After determination of the load assumptions it became very clear that the existing profile of the threshold of 14 cm was not sufficient to carry the loads. To install a solid system it was necessary to rehabilitate the brackets and strengthen the braces in the 2nd floor in order to bring down loads from the upper parts into the inner construction. After these measurements a threshold with the height of 16 cm could be allowed. Without these supporting measures a profile of 28 cm would have been necessary. This would have changed the appearance of the timber construction dramatically.

1.5 Rehabilitation

After installing of the threshold considerations were made in such a way, to case the gable with slates due to the high driving rain load and to protect the gable thus permanently, it was seen that this would result in comprehensive protection but as a consequence the appearance of the “Bügeleisenhaus” would be affected.

Architect, builder and monument conservationists were however conscious that a repair without additional measures would raise maintenance expenditure that could not be financed through the local history association. After long discussions it was decided to fit the gable with some graded lid roof boards following the formerly available façade planking. It could be guaranteed that all the rain would not run down the façade, but can drain at the bottom side of the boards freely. Additionally, rainwater pipes and the roof construction have been reworked [3].

2 Schuck's house

2.1 History

Schuck's house in Obermoschel was erected in 1582/83, in the early period of the local mercuric mining industry. Its actual name refers to the family which inhabited the house around 1900. The carved window consoles are especially noticeable. The consoles show a mask and a miner's head. The third head might be that of a manager [5]. Schuck's house is today one of the oldest houses in the area of Rheinland-Pfalz.

The Land Bureau for the Conservation of Historic Monuments in the town of Mainz already carried out conservation work for the colours of the exterior and inside walls as well as of the floors in 1981 and 1983. In the year 2004 Lorenz Frank wrote a report in which he investigated the history of the individual building sections [1].

The 1st upper floor still has a representative room (1.04). In this room extensive colour settings are still preserved. It is presumed that this painting is part of the first composure from the 16th century.





Figure 4: Façade of Schuck's house.



Figure 5: The ceiling of the reprehensive room.

2.2 Construction

Schuck's house does not have any constructive building separation to the neighbouring houses. The rooms and floors of the buildings developed historically and merge without clear structure into each other. Thus these constructions do not correspond to the valid building laws and orders for noise control and thermal insulation. Nevertheless, an adaptation to the valid right is to be refused because of conservatory aspects. The building structure is a distinctive component of the monument.

A characteristic of the building is the roof construction above the room 1.04. The ceiling was hung under a suspension structure running diagonally through the building so that the room could remain pillar-free. Such suspension structures were uncommon at the erection time of this house.



Figure 6: Roof truss.

2.3 Rehabilitation

The town of Obermoschel currently plans the reactivation of the building. Unfortunately, financial resources are currently not available sufficiently for that task. Because of this the DBM plans to start a prototype rehabilitation with one single room [4].

The problem with the rooms that merge into the neighbouring buildings can be solved only by combining these buildings into an ensemble. Regretfully, the capital for the acquisition of the neighbouring buildings is currently not available by the municipal administration.

3 Conclusion

The rehabilitation and reactivation of historical building substance does not include the external appearance of the buildings only. Also the structure is an important component of the house history and deserves dignified consideration. Adaptations to current safety standards, new uses and longer maintenance intervals must be examined carefully.

References

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