Revitalization of Historical Apartment Houses

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ABSTRACT: An old apartment house dedicated to revitalization was built in 1903. It is a detached house, built on a plan of a rectangle. It has three over-ground storeys with an entrance from the ground level, partially usable attic, and a cellar. Construction of the building is traditional: masonry walls, timber or solid floors, timber rafter framing, roof covered with ceramic tile and roofing paper. The major repair of the building was conducted in 2003 by the MOJ DOM Housing Enterprise. After it the building regained its former splendour. A very interesting architecture of the old building was also an inspiration to build nearby a very similar new apartment house. Description of the building technical state, course of repair works, ways of reconstruction of its structural and architectural elements, and also modern functional solutions introduced during the repair, as well as some notes about a new “twin” house, are presented in a paper.

1 INTRODUCTION
1.1 Historical review

An old apartment house was built in 1903 by the order of Carl Schmidt. The building was designed by the well-known architect Richard Mohr in a style that joins Secession and neo-baroque. The building was situated in one of the most prestigious city districts of the time of its erection and also of today. It is a detached house, built on a plan of a rectangle. It has three over-ground stories (ground floor and two stories), an attic, partially used for apartments, and a cellar. The building has an entrance from the ground level, leading to one, centrally situated steel staircase, of the stringer type. Over the staircase there is a steel and glass sky-light and two small courtyards situated on both sides of the staircase providing additional illumination. Building construction is typical for the time of its birth. Walls and foundations are made of brick, ceilings above the cellars are solid, of the Klein type or in the form of segmental barrel vaults laid on steel beams. Floors between storeys are wooden with sound boarding or made from prefabricated concrete slabs. Rafter framing is wooden, most commonly consists of bidding rafters and rafters. Roof is covered with roofing-tile on its oblique parts, and its central part is flat, covered with roofing paper. The building had very rich outside decoration – rustication, balconies, cupolas, and dormer-windows (Fig. 1 and 2).
Figure 1: General view of the building front façade – archival design.

Figure 2: General view of the building side façade – archival design.
2 TECHNICAL STATE OF BUILDING CONSTRUCTIONAL ELEMENTS

2.1 Foundations

The foundations of the building are made of common burnt brick on cement-lime mortar with 30 cm step-like offsets on both sides. Foundation depth is about 90 cm beneath the level of cellar floor. There is no underground water in that level. Foundations were in good technical state, without any cracks that could be a sign of building settlement. Cellar walls had no horizontal or vertical insulation installed. Building vertical cross-section is presented in Fig. 3.

![Building cross-section – archival design.](image)

2.2 Main bearing walls

Building structural system is longitudinal with outside and parallel to them inside walls working as main bearing walls. The walls are made of common burnt brick on cement-lime mortar. The thickness of the walls is between 70 cm in the cellars and on the ground floor, and up to 27 cm on attic level. At the time of the revising of building technical state the walls were generally in a quite good technical condition. Only decorative elements, external plaster and flashing work which had become got some damaged. The wall brick became corroded and humid mostly in the cellars. General view of building state before the revitalization is presented in Fig. 4 & 5.

2.3 Floors

The floors situated above the cellars are of a solid construction. They are Klein slabs or segmental barrel vaults based on steel beams. Generally these floors were humid, and the steel beams, brick vaults and their pointing were corroded on the surface. The development of surface corrosion was not very big and no complete corrosion of the intersection of the steel beams intersection occurred.

The floors between the storeys were of different types. The attic floor was wooden, with sound boarding. The floor was in rather poor technical condition because of saturation with
moisture, and later, biological corrosion caused by the water penetrating from the leaky roofing.

The floors over ground and first storey were of the two classical constructions: Klein slabs (Mielcarek 1947) of 15 cm thickness with steel reinforcing flat bars (Fig. 6) or Wygasch concrete slabs (Fig. 7), reinforced with steel wires and flat bars (Fig. 8). Both slabs are based on steel beams. They were in quite good condition. However, some parts of the floors were wooden and their technical state was poor, because of typical biological corrosion effects.
2.4 Roof

The roof structure was wooden, mostly built of rafters and bidding rafters, distinguished by the fact that from all the sides of the building, the hipped roof end is slanted, covered with roofing-tile (Fig. 9), while further back, is flat and covered with roofing paper. Within the correctly secured roof slopes, most of the wooden elements were in a very bad condition. They were generally deeply damaged by larvae of wood borer (woodworm larvae) and needed a complete replacement. The roof structure was in pre-failure condition.

2.5 Staircase

Masonry vault stairs were found in the cellar, while above the structure of the flights of stairs was light steel, with wooden stair treads. These flights of stairs were based on solid staircase landings made of a Klein slab on steel beams. The condition of steel structure was good, except cracks on some of the Klein slabs. Staircase was closed from above with a steel and glass skylight (Fig. 10).
3 REVITALIZATION AND REPAIR ASPECTS

3.1 General ideas of revitalization

After making a detailed overhaul of the deteriorated building from the beginning of the 20th century, it was stated that bearing elements of its traditional structure, id solid brick walls and solid floors, were in quite good condition. However, the great part of its wooden elements, id wooden floors, roof rafting and also roof covering were in very bad condition. Decision of proceeding with building revitalization was made because of the building architectural and historical value, its prestigious situation, and demand on real estate market. The developer took also a decision of constructing nearby another apartment house, similar to the old one.

Before design process and building repair were commenced, the archival documentation, stored in formerly German construction archives, was carefully examined. Based on these papers, it could be stated whether an object was rebuilt or extended during its life and how the functional and spatial arrangement was changed. Some structural analyses were also conducted, especially for designing new roof elements and also bearing capacity of foundations, main walls, and floors. The general idea of revitalization was to create a very luxurious apartment house, with modern functional arrangement but without destructing the building original outside Secession and neo-baroque style.

3.2 Foundations

Calculations proofed that all building foundations were generally designed with great safety factors and have rather significant strength reserves. However, because of the lack of any insulations and ideas of dedicating cellars for exploitation, horizontal insulations were done by resin injection, and in very rare cases the most damaged brick foundations were being strengthened by injections or by the placement of concrete. Vertical insulation was then made by using modern mineral materials and from inside renovating plasters were put on the walls.
3.3 Floors above cellars

In that case the repair procedures consisted of exchanging the most damaged floor brick fragments, strengthening the existing steel beams, and also cleaning and applying anticorrosion protection. In some cases for strengthening of brick vaults carbon sheets were applied. During the repairs, the cellars were dried, and the brick vaults were pointed. In the case of vault surface damage, strengthening work was done using appropriate substance, and the vaults also were pointed. There were also put an acoustic and thermal insulations, and finally new marble floors (Masłowski and Spiżewska 2000).

3.4 Higher storeys floors

The floors between the higher storeys were mostly made as Klein brick slabs or Wygasch RC slabs (Fig. 6, 7, 8). As they were in quite good condition only insulation layers were changed and new stone floors placed down. Some parts of wooden floors were badly destructed by saturation with moisture, and later, biological corrosion. Because of that and the fact that load capacity of these beams was too low to transfer live loads, there have been a few serious ceiling failures. In that case the floors were changed by, typically used in renovated old buildings, solid floors made of reinforced concrete monolithic slabs based on steel beams.

In cases of well preserved wooden floors, especially with good bearing beams, it was decided not to replace them with solid floors, but to use them as elements of reinforced rib-slab floors (Godycki-Ćwikła and Mielcarek 1997, Rubin-Jończy et al. 1997). It was designed that an existing wooden floor would be hung to the concrete rib-slab by using steel hangers that would guarantee the cooperation between floors of two different materials. The concrete ribs were conducted along the both sides of wooden beams, and a 5 cm reinforced plate was then made directly on the new insulation made of hard styrofoam. The calculations of load-bearing capacity and limit states of deflection and cracking were checked.

3.5 Roof

Roof structural elements were seriously deteriorated by biological corrosion caused by leaks in the gutters and roof work. These structures were completely demolished and in that place a new structure was erected, combining steel and wood elements (Fig. 11 & 12).
3.6 Headers

All cracked bow brick headers were strengthened by using steel keys while flat headers were strengthened by introducing steel beams. From the inside the cracked headers were strengthened by using steel plates braced to the walls by using special glue anchors.

4 CONCLUSIONS

In case of revitalization of historical apartment buildings it is important to save as much as possible of the original structural substance of the building under repair. In the presented example about 70% of the old structure was saved.

New houses erected nearby the restored ones should harmonize architecturally with the historical ones. The good example, in Authors’ opinion, of such a perfect coexistence is presented in Fig.13.

![General view of the new and the revitalized “twin” buildings.](image)

Figure 13: General view of the new and the revitalized “twin” buildings.

REFERENCES


