Reconstruction and Revitalization of Peter Behrens' "Berolinahaus" (at Alexanderplatz 1 in the center of Berlin – Germany)

Oskar-Henri PEKOLL
Managing Director
GuD Consult Group
Berlin, Germany
pekoll@gudconsult.de

Oskar-Henri Pekoll , born 1967, received his civil engineering degree from the Technical University of Vienna in 1992.

Ralf GLASENAPP
Project Manager
GuD Consult Group
Berlin, Germany
Ralf.Glasenapp@tu-berlin.de

Ralf Glasenapp, born 1976, received his civil engineering degree from the Technical University of Berlin in 2002.

Summary

During a reconstruction phase of Alexanderplatz in the center of Berlin in the early 1930s, the famous architect Peter Behrens designed the building "Berolinahaus", which till now gives the place its unique appearance and is therefore a listed building. The high-rise building has a reinforced concrete skeleton-frame structure, which was really innovative and one of the first at all at the time of its construction.
Now a new concept with retail stores in the lower four floors and office space in the upper floors was created to revive the "Berolinahaus".
The method of shifting loads from the existing static system to the new construction in the lower levels, while the upper four floors are still intact, is presented. The complexity of the design and its application, while minimizing deformations, time and costs, is shown by ambitious constructions based on a structural analysis in special construction phases.

Keywords: reinforced concrete, storey frame, global load balance, holding structure, steel composite structure, horizontal bracing

1. Introduction

The "Berolinahaus" with its exposed location at Alexanderplatz 1 in the center of Berlin has been the focus of the square from its construction and opening in 1932, in combination with the Alexanderhaus designed by Peter Behrens as well, as a focal group of buildings. The building, which had originally been designed as office and business premises, was damaged by fire during the World War II, but had already been returned to its former use by 1950, after a phase of restoration. In 2004 an investor decided to revitalize the building based on a new utilization concept in consideration of the protected, historic structure and to shift it more than ever into the center of the square. To this end the lower four levels of the building from the basement to the 3rd floor were remodeled in accordance with today's demands on a shopping center and the upper levels were converted into high-class offices. As the renters had already signed their contracts before planning started and the opening date of the shopping center had already been determined, a design with a static concept needed to be established, which sustained the requirements of the future tenants as well as a short-term conversion within the cost frame of the budgets.

2. Structural design

The existing structural framework from the 1930s designed as three-bay storey frame with 8 upper levels as skeleton-frame structure and a two-level basement box footing as solid construction of reinforced concrete.

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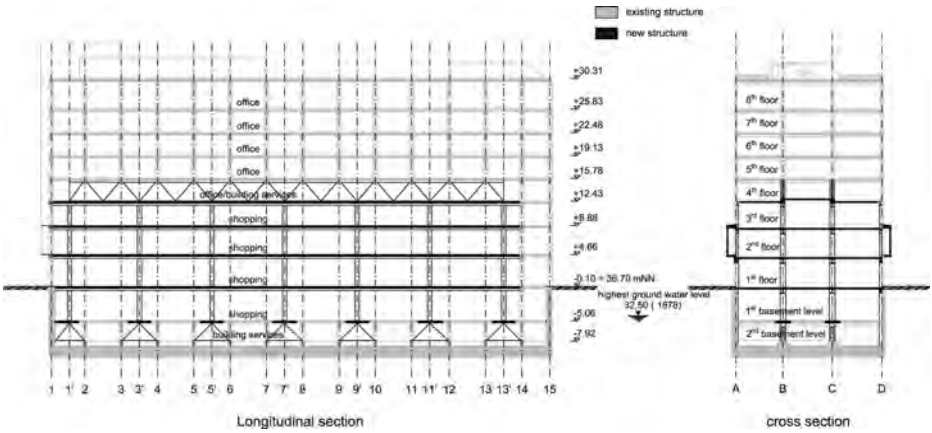

Fig. 1: Structural design of the reconstruction

As can be seen in Fig. 1 the new structural design results from the requirements of a modern use as sales location with a spacious support grid. To this end the support grid has been doubled from the 1st basement level to the 3rd floor, whereas the upper levels remained unaltered. The increase of the support grid was made possible by a holding structure in the 4th floor. Here the vertical loads of the upper levels were transferred to the double support grid of the planned sales area. For this purpose the required holding beams in the two interior support axes B and C were executed as a static design-engineered, idealized framework structure. In order to preclude extensive strengthening measures to the existing base plate, the spacious support arrangement of the structural design in the 2nd basement level has been returned again to the originally existing support grid with the existing load transfer points of the base plate. In addition the original, global load balance had to be referred to, in order to prevent a greater stress in terms of existing serviceability on the base plate, which is surrounded by pressing groundwater. Thus a "light steel composite structure" was chosen for the intermediate ceilings and supports to be built, to be able to activate sufficient load reserves for the use of the sales areas.
At the southwesterly corner of the building a subway tunnel runs under a part of the building. For supporting the façade supports in this area projecting, riveted solid-web girders of steel with concrete casing with a height of up 1.80 m were found.
Owing to the new concept for the structural framework of the dissolved or shifted support structure, the direct vertical bearing forces for safeguarding the beams against lifting due to the intended removal of the existing supports in the first floor have been omitted. The loads of the new supports between the existing supports have to be re-coupled to the cantilever beams in such a manner that not only the static balance and thus the stability of the cantilever against overturning is warranted, but also only minimum additional deformations in the course of the shifting of the load are permissible, because of the fitness for use.

3. Conclusions

The idea of the structural design resulting from the use the building is put to, governed the complete planning and execution phase of all persons involved in the project.
The challenge consisted of finding a suitable design for the complex boundary conditions and to finally implement it with very little lead-time for planning purposes. Here it was shown that the structural design constitutes a well-balanced, economic solution and has contributed to the success of the project.