

Scientific attendance of the planning process of the timber construction projects „Mühlweg“



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timber construction projects "Mühlweg"**

Report (short version)

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1 Objective

The city of Vienna has initiated a new focal point in public housing by promoting timber construction and timber/massive construction through advertising a competition amongst property developers. These construction methods constitute a novelty in the area of multi-story housing in Vienna. The combination of timber elements with concrete elements is a seminal way of building, especially in urban environments. The advantages make clear why timber construction will play a greater role in the future: High-grade pre-fabrication along with short-time construction periods, minor construction material moisture and ecological aspects.

Because there are almost no experiences available regarding timber construction in combination with massive construction in urban areas, the city's municipality dpt. 50 has assigned the Holzforschung Austria to support the three winning teams during the planning period. The objective was to become integrated in the design process as soon as possible and to provide the longtime experience as a testing and inspection institute in case of specific questions arising regarding the field of timber construction. This support assures a high standard of quality of these pilot schemes. Additionally the abidance by the juries obligations as well as the development of the projects during concept, submission and planning of execution was to be documented and evaluated.

2 Project analysis

The three winning projects are very different in concept. The following describes all relevant alterations until up to the state of planning of execution. The analysis is carried out from a outsiders point of view.

2.1 Site A (Kaufmann/BWS)

Supporting components from the first story upwards are carried out in massive wood. Raw elements are mounted and completed on site. For the first time in multi story housing ceilings are done in wood without suspended ceilings, which is the greatest challenge on this site regarding sound insulation of the ceiling and the construction of joints in order to eliminate conduction of sound along building components. External walls are carried out as pre-manufactured timber frame components.

There are no relevant variations from the plans that were submitted for the competition, which can be traced back to very accurate planning in an early stage as well as good teamwork. Small changes of the layouts were conducted along with provisions to optimize certain aspects such as sound insulation.

in the documents submitted in the competition the cladding was designed to consist of locust panels to be in compliance with the requirements of the cities building regulations. §99 (3) stipulates that the exteriors of buildings with more than two stories have to be highly fire resistant (B1). Because of the possibility of discolorations of the suitable native woods (oak, locust) and low availability alternative materials for the cladding were sought after. The results of a recent research project carried out at the Holzforschung Austria show that a fire-retarding sealing with a projection of 15 cm, which will be implemented in the planning of execution, satisfies the requirements. This alteration allows for applying more economical products while at the same time improving fire protection.

2.2 Bauplatz B (Riess/Arwag)

Here a concrete core was planned to provide space for sanitary rooms as well as the staircases and access to the apartments. The timber construction was to be docked onto that by means of pre-fabricated modular room elements. The greatest challenge here was the planning of suitable details to connect these modules to the massive core. Apart from alterations that were made according to certain desires the building owner articulated regarding typology of the apartments, constructive changes were also made.

The estimates of costs performed during the tendering procedure could not be abided by which resulted in using laminar components instead of three dimensional modules. The executors were arguing transportation problems - because of the width of 4,5 m - as well as concerns involving the assembly as reasons against the modules. This shows a certain need for optimizing modular building methods, which could be a great alternative provided that high grade pre-fabrication and finished surfaces are done off site in the factory. A constructive modification into this direction is comprehensible from a ecological point of view.

The original oak cladding was changed in the process of detailing. It was considered for a while to do the claddings in larch, similar to site A. Presently small format fiber cement panels are considered. The building owner cites concerns regarding the missing acceptance of a unevenly discolored wooden cladding as reason.

2.3 Site C (Dietrich-Untertrifaller/BAI)

Two novelties in the area of public housing were combined on this site: For the first time the exterior walls are executed as massive wood components that are highly pre-fabricated. Moreover the buiding is conceived to fulfill passive house standard. As a result of a change in the team members - bankruptcy of the HVACR company - certain delays occurred. It was noticed in the course of the tendering procedure that the proposals made by two of the general contractors "builder and HVACR" and "timber construction and claddings" by far exceeded the estimations of costs carried out during the process of the

competition. For this reason cost-cutting measures acceptable for the end user had to be sought after. At the same time the Quality of the design submitted for the competition were not to be affected more than necessary. Cost-cutting potentials were realized by reducing volume in the basement. This was made possible by optimizing spaces in the parking lot and the cellars. Furthermore the HVACR was enhanced and detailing of the timber construction was optimized.

During the competition balconies were intended to be built in the second and loggias in the first and third story. Im Wettbewerb waren beim Bauplatz C im 1. und im 3. Stock Loggien und im 2. Stock Balkone vorgesehen. According to Viennese building regulations loggia space entirely counts for living area while balcony space cannot be taken into account. This unequal treatment for obvious reasons leads to every property developer striving after building as many loggias as possible, which results in certain architectural constraints. In the course of the projects further development all balconies were changed into loggias, by what an additional 160 m² subsidized living area was created. Because of the galzed lateral surfaces in the second story this has only little influence on the appearance.

3 Technical consulting of the project teams

Within the scope of this project the teams were offered technical consulting with regard to timber construction, carried out by employees of the Holzforschung Austria. Depending on the building sites different aspects had to be emphasized on. Primarily questions revolved around construction of the claddings, optimization of the assembly of building components, uncoupling conductive paths for sound, ensuring an airproof building envelope and possibilities of pre-manufacture respectively optimizing the assembly process on site. Experiences made during the institutes testing and inspecting activities as well as results achieved in the course of recent research projects were factored into the planning.

4 conclusion and future prospects

Among other things alterations made from the submitted plans for the competition to the planning of execution have been analyzed evaluated in the course of this project.

4.1 Reasons for alterations

The quality of the winning projects generally was very good. During further development and detailing of the projects certain alterations arised, however insignificant revisions can hardly be avoided and do make sense.

The analysis of the alterations that have taken place shows that the cause for them was always change requests articulated by the owners such as e.g. changed typologies of

layouts caused by the involvement of additional internal specialist departments, optimization and further development of the projects, new or changed team members, new contractors and more precise detailing over the course of time.

The requirements of the competition itself as well as the timber construction method can be excluded as reasons for the alterations mentioned above. Alterations regarding structural engineering occurred in both timber and massive construction. Basically insignificant alterations of e.g. particular layers of an assembly do not undermine the quality of a single component or the entire building.

the ecological properties required in the competition postulate extensive planning. Right from the start of planning done for the competition both a building physicist and a structural engineer were involved in the winning teams. An adaptation of the single faculties as early as possible reduces planning work at large. Modifications in well-rehearsed teams in the course of execution can sometimes cause disadvantages for the development of the project. A comparison of the three sites points out the importance of good cooperation.

The pilot projects show that professional attendance by means of a independent third party results in interesting impulses for the planning teams and improved quality for the buildings.folgewirkung

4.2 Future effects

By advertising a competition amongst property developers as well as comparable timber construction projects a growing demand for timber construction in urban areas was confirmed. The ecological advantages of the timber construction method in terms of outstanding qualities regarding energy and the low primary energy consumption show great potential for reducing CO₂-emissions within communities. In his dissertation Merl cites calculations that compare the current status of apartment and office buildings in Vienna in 2001 and a scenario, in which all buildings with five stories or lower are built in timber construction in compliance with building regulation. This measure would reduce CO₂-emissions from about 400.000 to about 221.000. According to Merl the scenario investigated would make a contribution to the climate protection program of the city of Vienna (reduction of emission of greenhouse gases of 2 million tons per year) of about 10 %. In addition to that the reuse and recycling of scrap wood contributes to a reduction of lumbering.

From today's point of view there not enough businesses capable of offering timber construction systems for large developments with about 100 apartment units, even with

the atmosphere of departure at hand. The fact that developers prefer general contractors for organizational reasons is a handicap for many timber construction enterprises at this time. The relatively large fraction of massive construction and HVACR still discourages medium sized enterprises. While the production costs of timber construction are above those of massive construction, the timber constructions lower consequential costs are not considered well enough. When it comes to massive timber construction more industrialization and a higher state of pre-manufacture - as is in the area of timber frame construction - will be necessary to compete with massive construction in large developments.

With pilot project just as this one as well as by rewarding architectural prizes like e.g. "wienwood 05" the "Viennese timber construction" also attracts the attention of states with a long time timber construction tradition. Especially multi-story-housing in combination of timber and massive construction is establishing itself as a new market in Vienna. Similar to the Bavarian pilot project the "Viennese timber construction housing" stands as a national respectively central European role model.

External attendance during the building process is indispensable in order to assure the high quality standards. The three pilot projects exhibit great differences when it comes to handling the material combination, the timber construction method itself and the construction of the cladding. Comparing the three buildings during their course of utilization would give new insights regarding the use of wood in urban areas.