FORSCHUNGSPROJEKT

Timber construction project „Mühlweg“ – scientific monitoring of production

HOLZ FORSCHUNG AUSTRIA

Timber construction project "Mühlweg"

Scientific monitoring of production

Short report

HFA-No.: F188/2006

Promoted by MA50

Project management:
DI Dr. Martin Teibinger

Authors:
DI Dr. Martin Teibinger
DI Franz Dolezal
Ing. Rupert Fitl

Vienna, December 2006

1 Preface

By amendment of 2001 the building code of Vienna was modified to make way for the establishment of multistory buildings carried out as timber as well as mixed timber and massive construction. In regard to multi-story apartment building in Vienna these building methods are novelties. The city municipality has provided three lots in the 21st district in the course of a competition among building developers in order to encourage this building method in an urban context. Especially here the combination of both timber and massive building elements represents a groundbreaking method of building since it features the the benefits of pre-fabrication and with it shorter construction periods. In addition to this, minimized residual moisture and a head start in the field of ecology are all well known advantages of timber construction that will play a prominent role in the future of urban apartment building.

The Holzforschung Austria, an institution engaging in this field intensely for the past few years, was assigned by the city municipality dept. MA 50 to support the winning teams technically, since there are generally only little experiences in existence regarding mixed timber and massive building methods in a larger scale.

2 Problem

In the course of a project promoted by "Wohnbauforschung" the three winning teams were attended to by the Holzforschung Austria during planning. These prestigious pilot projects are supposed to represent a trend-setting alternative to conventional residential building in Vienna, while carried out at the highest quality level and at moderate cost. In order to assure high quality standards the companies assigned with the timber construction works and their subcontractors were to be advised at the best possible rate.

Especially in the east of Austria timber construction is not widely spread when it comes multi-story residential building. While the three timber construction companies under contract - "Schertler Alge", "Sohm Holzbau", KLH/Kulmer" - are from Styria and Vorarlberg respectively and therefore do have experiences in timber construction, the interaction between all building trades such as plumbing, electricians etc. and their subcontractors, many of whom not familiar with timber construction and it's specifics at a necessary degree, poses problems.

In order to assure workmanship in the required quality on site acoustic measurements of dividing walls, ceilings and the building envelope were carried out. By means of these investigations insufficient construction solutions in sensitive areas such as joints and ducts were detected early in the process and could be redeveloped easily.

3 Realization phase

The work carried out in the course of this project is divided in the following areas:

- Scientific / technical support und supervision of manufacture and assembly trades having an impact on the timber construction
- Tightness of the building envelope
- Sound insulation of dividing building elements

The quality and the amount of the work during realization is heavily dependent on the willingness and cooperation the developers and their teams show, but also on the documentation provided. Different levels of insight regarding the development of the three projects are possible. Therefore the results of the inspections and the effects of the technical support are summarized anonymously in section 4 of the German full version of the report. The results of the examination of the building envelope's tightness are shown at the same place in section 5, those of the sound insulation properties in section 6. Owing to the paramount importance of the subject those sections are supplemented by a short analysis of literature regarding the respective issue.

3.1 Scientific / technical support und supervision of manufacture and assembly trades having an impact on the timber construction

This area comprises the support and supervision of all manufacture and assembly trades having an impact on the timber construction during realization. At least two comprehensive inspections per object regarding construction, building physics and structural analysis were carried out. In addition a checkup on process planning concerning above aspects took place.

3.2 Tightness of the building envelope

Random examinations of this aspect were carried out by means of measurements (so called blower-door measurement) with an additional infrared-thermography analyzing the relevant details of the construction.

3.3 Sound insulation of dividing building elements

The subsonic noise properties of dividing ceilings and the airborne sound properties of dividing walls were examined on the basis of one sample apartment per object.

4 Summary and outlook

By order of "Wohnbauforschung" the three pilot projects arisen from the competition "Timber and Mixed Timber/Massive Construction" among developers were accompanied and supervised technically during realization by Holzforschung Austria. In addition to this scientific / technical support and inspection of manufacture and assembly trades having an impact on the timber construction, examinations concerning the sound insulation properties of dividing building components and realization of the building envelope were carried out.

In the context of inspections the quality and moisture content of the timber used, the choice of building materials, the assembly of building components were checked, as well as the compliance with requirements regarding building physics, structural analysis and realization on site. Alongside building regulations the expertise of specialists in fields such as building physics or structural analysis provided a basis for this. Since the willingness to cooperate has been shown at varying degrees from case to case, accordingly the monitoring of the respective objects could not be carried out with equal insight. Examinations and inspections took place as random checks.

Detected aberrations were pointed out to the contractors and redevelopments were worked out in the team. A great portion of aberrations were caused by subcontractors, many of whom do not show the necessary know how for timber construction. For example electricians, who do not know the purpose of a dividing wall making up a fire cut can easily cause harm for the entire timber construction industry when their cable routing is carried out in a faulty way.

The examinations of the sound insulation properties of the dividing building component were carried out by Holzforschung Austria and "TGM", all results have been within the boundaries of statutory requirements. By means of technical support during the erection phase faulty designs influencing the sound insulating performance in a negative way were detected early in the course. In the present case deficient fastening of sound-absorbing beddings and ducts through dividing building components were mended.

The objects on lot A and B were spot tested with respect to the tightness of the building envelope using a so called blower-door device. The more extensive measurements concerning lot C that were necessary because of the passive-house standard applied there were not part of the project at hand, but were carried out by order of the developer. All results were in compliance with the requirements, however some touching up was necessary sporadically. These corrections were then applied to all apartments, not only the ones examined.

During the accompanying support of the projects that took place from planning to completion the results of current research projects as well as the experiences from inspections were taken into account. By means of external mentoring and supervision defective designs caused by workmanship, routine-blindness and problems with communication between the individual trades, as they appear in the entire construction industry, have been avoided. It has been found noticeable that the subcontractors lack certain know how concerning timber construction to some extent.

Recapitulating it can be said that three high-quality building projects have been realized as a result of the coaction of well organized planning teams, professional timber construction companies and the accompanying support provided by the Holzforschung Austria. The city municipality of Vienna has put into action an urban timber construction project that is one-of-a-kind in Europe and by doing so has given direction to a way for residential housing to evolve in the urban periphery.