

English Summary

In the building an increasing interest is found in precast products. Along the timber-frame construction represents a large competitive advantage thanks to the widely industrial prefabrication of walls, grounds, covers and roofs. These are manufactured in the plant with all elements like doors and windows up to the surface finish and only are composed on the building site and are connected with each other.

Thus, the time for their construction on the construction site can be reduced in order to use machines and staff in the most efficient manner. The production occurs widely independent of weather and with the application of manufacturing supported by CAD-CAM with large dimensional accuracy and high material efficiency. A high prefabrication degree increases the value added in the own work and can reduce the production costs. In order to tap the full potential of these advantages, all assembly sections should be integrated into the prefabrication as far as possible. Nowadays, this is widely possible for constructive removal elements and Fill ins. The purpose of the research project is to allow a high prefabrication degree at the same time as large flexibility also for the house-engineering installations.

Also in the area of the house-engineering installations there is a huge number in precast and adaptably useable components, beginning with private connection unities, heat producers, aeration installations, distribution and heating registers, over to sanitary objects and outlet unities. Nevertheless, the conduction of the single components only occurs on the construction site. This increases the construction time and rising coordination expenditure and often to conflicts due to the necessity of producing in different plants. A big part of the construction defects in the area of the house-engineering installations appears in the management guidance. Nearly two thirds of the construction defects go back to planning and execution mistakes. Nevertheless, an extensive integration of the conduction into the components of the building is hard to realize. The mostly middle-class organized wood-prefabricated building companies barely dispose of suitable technical personnel for the mounting of the house-engineering installations. A collaboration with companies in the seat of the enterprise as subcontractors seems doubtful, since these can only rarely meet the service requirements of the building on site. Beside the installation the necessary flexibility plays an important role especially for house-engineering installations. Flexibility is necessary to fulfill the inhabitants' different wishes openly, to be open and receptive towards new house technology products whose developing cycles become shorter and shorter and to renew and redevelop installations, whose life spans are relatively short in the building area. The costs for the actualization of the house-engineering installations are very high – let alone for renovations. An adaptable system could optimize the architectural costs as well as the costs for maintenance and renovation. It could also reduce the disturbanc-

es for the inhabitants due by maintenance and reparation.

This research project in installation management develops an integrative total concept in order to meet these requirements. In comparison with conventional methods of installation, this concept offers a large amount of advantages such as simplification of the planning process, secure fire, warmth and sound protection solutions for building technology, time savings due to a high degree of prefabrication, widely non destructive component exchange, a rise of the high-class standard by prefabrication as well as easy biodegradability and recycling. Besides, the draft includes all media in a residential building. The distribution of heat, air, hot, cold and operating water - as well as drain pipes. Electric cables for alternating and three-phase currents as well as low volt systems are taken into consideration as well as data lines for communication, audio, video and control. Additionally, fuel pipes are installed, such as gas lines, solar and photovoltaic routes, for example, which only come in vertical positions within the house. Besides, the installation system developed within the scope of this research project meets the specific requirements of the timber-frame construction and its actors. Since the construction of houses requires the inclusion of a huge number of media in a minimum amount of space, we will focus on multistory house building in timber-frame construction.

Because especially in the early planning phase problems can be avoided and determining conditions for an adaptable, precast installation system can be created, the research results are summarized into a planning guide. In this guide basic concepts and bases of the prefabrication, the flexibility and the house-engineering installations with its requirements concerning fire protection, sound protection and warmth protection are described in the introduction. Planning and arrangement guidelines present the possible positions in the building and in the residential unit, the necessary place for the installation guidance as well as the possible materials and details for engineering which is safe with regards to fire, sound and warmth. Furthermore, six basic principles explain the draft for adaptable, precast house-engineering installations:

- a central route guidance contains all and disposal services in a vertical shaft.

This continues in an apartment-central horizontal management guidance in the single units.

- During their integration into the building the installations are separated decoupled to a great extent from the supporting frame and extension elements. A pipeline route in constructive or slightly alterable extension elements is avoided. Circuits and pipes are reversibly connected.

- all routes are permanently accessible. Thanks to a suitable position in the building and easy possibilities of opening the sheeting, the servicing as well as the future removal and installation is possible without interference of the adjoining

ing components.

- additional place reserves allow an easy mounting and future extensions within the scope of the existing circuit routes.
- preconditioned hollow cavities which are lined in the plant with suitable materials for the fire protection, sound protection and heat protection and which integrate mounting support as well as necessary gradients then require only an insertion of the pipes and conduction on the construction site. Thanks to this, the prefabrication degree and the execution quality can be increased.
- the application of precast technology components simplifies and accelerates the mounting. These are easily added and removed and able to be flexibly connected to the routes. These technology components allow the greatest possible adaptation to the wishes of the users concerning form and function.

These basic principles are illustrated on the basis of prototypically to developed installation modules for a multistory pattern building. Besides, solutions are shown for a vertical installation shaft, a horizontal route guidance in the ground as well as a distribution in the wall and in the cover. Architects, professional level and construction executive companies receive a planning instrument with which they can provide adaptable, precast installations individually for their building and adapt it according to their specific requirements. Thanks to the draft, dry bricklayers' or carpenters' installation guidances according to the requirements of the building and its inhabitants as well as the capacity or the technical competence of the respective master builder. These can reach from provided space for the installation guidance in the components without conduction, over pipe or technology components up to precast technology modules which already contain all factory-made management and technology components and which can simply be connected to the building site with Plug and Play.

With the help of the guide the integration of the installation guidance is already allowed in early planning phases in the building draft. This should serve to increase the planning quality and execution quality, to raise the prefabrication degree and to form sustainable installations.

Even if the guidelines focuses primarily on the requirements of new multistory apartment buildings, the basic principles can be adapted to other areas. Thus, sustainable installation concepts are realizable for the renovation or conversion of detached houses, office and administration buildings.