Refitting, Reorganization and Use for New Purposes with Prefabricated Construction Elements Based on the Fast-Connector-System

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***Abstract*— Topics such as reorganization, use for new purposes and refitting gain more and more significance in the building sector. The stock of existing buildings often suffices concerning quantity and amount of space. Usually there is a solid basic substance, which demands only a repair of surfaces and above all an actualization of the technical building equipment. Since varying uses and the constantly changing dwelling need require floor plan rearrangements again and again, the primary goal is to realize modern and flexible floor plans with high-quality installation economically in both commercial as well as in house building.**

***Index Terms*— fast-connector, installation, prefabrication, refitting, reorganization, subsystems, technical instrumentation**

I. Introduction

FUNDED by the "Federal Ministry of Education and Research" (BMBF), a joining system called "fast-connector" was designed and optimized at the Chair for Realization and Informatics in Construction of the Technical University of Munich, combining force-fit joining and simultaneous connection of all incurring installation between building panels. It provides a maximum level of prefabrication und preinstallation and makes new developments as well as reconstructions and increases much more efficient.

Fig. 1. EnerCon

First of all, any type of installation can now be prefabricated, and second, interior fittings are completed in factory as well. This fact allows delivery of ready made surfaces and therewith the minimisation of the on-site construction period, also during restoration. This connector (UniCon) was meanwhile enhanced by the company Fischerwerke, whereby a complete rage of products was developed, consisting of PowerCon (statics), EnerCon (electrical installation) and AquaCon (sanitary installation).

II. Installation and Prefabrication

On the one hand it concerns the installation within the building structure: Since the "fast-connector" provides a hundred per cent surface-finished prefabrication and simultaneously a standard interface to adjoining elements, a concentration of the vertical installation in a statically not effective high-tech element is self-evident. This element can be refitted or exchanged if necessary separately and in shortest time. In contrast the complexity of the preinstallation in the statically effective and room composing elements rises hardly.

On the other hand the grade of prefabrication on the part of the suppliers of subsystems increases: the complete application of this technology also demands the mounting of the "fast-connector" interface for technical equipment components such as heating, kitchen or sanitary elements. To merge this step into existing production lines only slight modifications have to be made. The prefabrication and/or preinstallation in the factory will accomplish highest level, the ready-made subsystems can be replaced or supplemented in shortest time on-site.

III. Integrated Planning

The current succession project, also funded by the BMBF, focuses on the rationalisation potentials in prefabrication by developing integrated design and crafts based on the "fast-connector" technology. Topics such as flexibility, sustainability and future upgrades reflect in sophisticated preinstalled components:

Fig. 2. Central installation element

Concerning restoration and modification two basic approaches have to be generated: first the improvement of new designs regarding future restoration and expandability, second the restoration and increase itself of conventional old building substance.

The integrated use of all potentials of this innovative technology, also regarding potential modifications and complements, has influence on all phases of a new building, starting with design, fabrication, ending with on-site erection. Building design marks the key position, because at this point most of the decisions concerning the complete chain are made.

Mainly the conduit should be reorganized according to the system. To avail all benefits of this new system, the optimization of installation schemes is more useful than ever. Centering all rising mains and circuits in one central installation element, as well as attaching all functional rooms, allows a compact automated installation without front-walls and offsets, saving mainly time as well as connector pairs, wiring and pipework during fabrication. Additionally it forces a definite system for potential completion and altering. Therefore contingent modification plans should result in suitable dimension of the installation as well as in useful positioning of future necessary hand-over points right from the start. If however an update of the installation device becomes necessary, the option of exchanging the compact technical element absolutely independent from the other parts of the building is given through prognostic planning.

Especially the electrical installation is becoming a central topic. While in conventional prefabrication ductwork is installed, the fast connector allows complete installation in perfect work environment, providing high quality and upgradeable building automation components. This means a huge head start compared to conventional building equipment, and it transfers an additional part of the added value into the producing company.

IV. Function Modules

Beside the function of extensive components like wall-, ceiling- and roof-elements, the fast connector can be used for technical equipment, as well as for interior fittings. First prototypes of function modules for bathroom and radiation had been developed, which save most of the time for installation, maintenance and altering. By the use of standardised positioning of the connectors, it will be possible to exchange single modules quick, clean and competitive even after decades, including change of use and expandability.

Fig. 3. UniCon-equipped heater

V. Reorganization and Modernisation

For modernisation of conventional buildings several gradations arise: At a complete deconstruction except for the static structure attaching a prefabricated installation element spanning several storeys seems ideal, offering all required technology and hand-over points using UniCon-interface. From this point, prefabricated interior-building elements, as well as discrete function modules, can be supplied quickly and easily in each storey.

But also during rebuilding of single stories or units with UniCon-equipped prefabricated parts, modern completion of interiors as well as high-quality installation can be realized in shortest time. Beside the supplementary addition of completely installed functional elements, it is also possible to

add convenience-elements like a conservatory or a pergola later.

Another application is the increase of old substance through additional floors. Not depending on the original way to construct, as far as the bearing capacity of the substructure can handle the additional load, it is possible to attach completely prefabricated and preinstalled storeys made of large building elements. Here the completion of interior and installation is also organised after the fast connector principle, similar to a new construction with this system:

With the use of the fast connectors in wall and ceiling modules, it is necessary to look out for a more stringent order of setting up, compared to construction of a conventional prefabricated building. To provide a faster positioning without grinding allowance and to prevent interchanging of similar walls, the position of each single wall is clearly defined by variable composition of installation feet on the subjacent floor or ceiling boards. It results in a kind of coding, whose allocation and measurement also is a part of the planning process.

Also here it is possible, beside the maintenance through the sufficient dimensioned installation-asset, to retract or attach an installation element that reaches several storeys; this applies also for the development-structure.

VI. Conclusion

Through the possibility to transfer the interior fittings away from the inefficient and weather dependent construction site into the factory, a high degree of time reduction and costs reduction can be reached. Less tolerance, cut up and defects as well as constant and ergonomic working conditions, short ways and optimized warehouse bearing provide a decisive competitive advantage to the wood building. Based on producer independent subsystems and processes developed in this project it is possible, by concentration of operations in factory as well as by automation of the fabrication-lanes, to realise a more efficient, computer-aided fabrication, without narrowing the desire of the constructer, neither for individuality nor for specific solutions.

Fig. 4. On-site erection of a preinstalled element

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