

Zukunft Bau

STRUKTUR / GLIEDERUNG KURZBERICHT

Prefab Housing Study

Langfassung Titel: „Prefab Housing - Untersuchung von Produktionsprozessen im Hinblick auf Effizienzsteigerung und Kostensenkung für bedarfsgerechten Wohnraum“

Background

This study focuses on the analysis of industrial construction processes with a large percentage of prefabrication. The manufacturing methods are examined based on their potential to provide cost-efficient, affordable living space of high quality. With regards to the expected results, the study emphasizes the production of sub-systems, e.g. building structure, building services, façade and interior, and not the building in general. Representing state-of-the-art-manufacturing methods, building systems of which comprehensive data is available are subject of this research.

Subject of research

Compared to other industries, the productivity of the building segment has been stagnating for the past 25 years. Against this background, technical developments of the building sector have not been implemented to the same extent. The proportion of serial and mass production strategies is low, production in general is mainly performed manual and by hand. Continuous digitalization and automation is almost non-existent, and the integration of all trades into a small production network is still low. Thus, costs increase and a high amount of error rates are common on nowadays construction sites. This leads to high prices for construction and, as a result, rising costs for the housing market.

The analysis of the cost development in construction shows that the actual construction costs (KG 300) for the building have risen similar to the general price increase. Contrasting that, the costs for the technical trades (KG 400) have experienced a tremendous price increase. However, most striking is the significant increase of the ancillary (additional) building costs (KG 700) for planning and project development. With regards to our study, expanding standardization and prefabrication methods improves the overall-project quality and leads to a reduction of costs especially in this category. Contrasting that, an enormous amount of affordable living space is necessary to cover current and future demands. This research considers qualities that provide cost-efficient construction methods and quality increase by implementing prefabrication methods. The focus of this study is to improve production processes with regards to optimize and further develop process inherent potentials. Comparisons with other industries that operate on a similar scale can also be used to improve production methods. Building construction aspects as well as business parameters (investments, production costs, personnel, deployment, production times and logistics) are to be considered.

Four to six reference projects of selected manufacturers are subject of a uniform analysis of production times, cost shares and means of fabrication. In general, an on-site examination of a building is part of the data collection, as well as tours of the production facilities. Followed by expert interviews with planners and representatives that are involved in a company's processes, the data is reconstructed to provide a solid base for the final evaluation. Determined in a building schedule, building typology, scale and degree of standardization are described with regard to the individual production process. As a result of previous studies, it is crucial that the planning integration of the constructive sub-systems (or construction segments) is provided at the beginning of a project, promoting efficient prefabrication and (partial) automation.

Conclusion

The analysis of fabrication methods along with production and business strategies shows that the discussed potentials, e.g. an individualized component manufacture, increasing process efficiency, and higher quality standards are achieved. However, current market research demonstrates that conventional construction methods still prevail and predominate to a significant amount. While most of

the manufactures have established resourceful and well-organized working procedures that provide a high degree of standardized works and therefore, generate highly efficiency processes, the level of automation or digitalized workflows is still low. Thus, providing a holistic and integrative planning and production approach becomes a future goal of mostly all manufacturers.

Eckdaten

Short title: Prefab Housing Studie

Researcher / Project lead: TU Dortmund, Juniorprofessur Ressourceneffizientes Bauen, Jun. Prof. Dr.-Ing. Jutta Albus; DGJ Drexler Guinand Jauslin Architekten, Hans Drexler; IBA Thüringen

Overall costs: 58.448,88 € €

Federal subsidy share: 37.028,71 €

Procet period: 12 months

BILDER/ ABBILDUNGEN:

5 - 7 Druckbare Bilddaten als **eigene Datei** (*.tif, *.bmp, ...) mit der Auflösung von mind. 300 dpi in der Abbildungsgröße (z.B. Breite 10 - 20cm). Bilder frei von Rechten Dritter.

Bildnachweis jeweils:

Bild 1: Baupreisentwicklung (1999-2014): Analyse der Preisentwicklung für Bauleistungen gruppiert nach Kostengruppen der DIN 276

Quelle: Bezahlbar.Gut.Wohnen. Strategien für erschwinglichen Wohnraum; Dömer, Klaus; Drexler, Hans; Schultz-Granberg, Joachim; Berlin, 2016; basierend auf Architekturqualität im kostengünstigen Wohnungsbau. Baukosten senken - aber wie? Ein Arbeitsbericht aus der Baukostensenkungskommission; Neitzel, Michael, Geschäftsführer der InWIS Forschung & Beratung GmbH, Bochum, Kongress der Forschungsinitiative Zukunft Bau, Messe Bau München, 2015)

Bild 2: Gegenstand der Untersuchungen: Klassifizierung der Konstruktionsbereiche und Subsysteme
Eigene Darstellung Juniorprofessur Ressourceneffizientes Bauen

Bild 3: Bewertungsmatrix und Untersuchungsrahmen
Eigene Darstellung Juniorprofessur Ressourceneffizientes Bauen

Bild 4: Raumzellen-Fertigungsstraße der Firma ALHO
Eigenes Bildmaterial Juniorprofessur Ressourceneffizientes Bauen

Bild 5: Wandbauteil aus Massivholz der Firma Züblin Timber
@ Züblin Timber

Bild 6: Bewertung des Grades der Vorfertigung und Automatisierung in der Produktion
Eigenes Bildmaterial Juniorprofessur Ressourceneffizientes Bauen