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Industrialized timber building systems for an increased market share – a holistic approach targeting construction management and building economics

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Abstract

Advancements of recently developed timber products and their application within the prefabrication process require construction management processes to be standardized and unified. These processes then need to be scientifically proven with cross-company references. Apart from technical developments, especially in terms of cost savings and standardization of building procedures, professionalization also plays a fundamental role in providing practical application for a long term success in the market. The current demand for the mass appeal of timber is accompanied by various economical key factors in addition to the question of technical standardized system components, which provide long term stability regarding costs, consistent quality, construction management optimization and sustainability. According to this research paper, the integration of a consistent data workflow during the planning, production, and installation process allows for a significantly shortened construction period with major on-site cost reduction as well as for a sustainable approach to delivering a holistic construction management system for timber. The identified criteria and surveyed fundamentals are used to create general construction management methods for the branch. Additionally the applicability was analyzed consistently to determine future potential and generate appropriate and integral timber building systems. Modern timber construction methods are especially suitable for prefabrication because of the material-specific properties, its sustainable performance, the possibilities in prefabrication and easier assembly under dry construction conditions. For this reason a high productivity combined with excellent quality in short installation periods provides verifiable arguments for best practice examples in the area of construction management of modern timber building systems.

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1. The holistic approach

Because modern timber construction has developed in recent years from a traditional niche market towards an industrial and large scale business, many decision makers are demanding extensive construction management and building economics basics for this specific material which have been scientifically verified and can be used to operate their business and carry out projects. Therefore, in addition to recent technical developments with a special focus on cost reduction and standardization of workflows, professionalization in the branch is an absolute necessity and plays a fundamental role in ensuring practical usability. The demand for the mass appeal of timber as a main building material is accompanied by the topic of technical system components, business economics key factors in the field of costs, and constant quality and optimization in construction management to provide long term stability. The central theme of a holistic and comprehensive industry and system investigation demands a clear structure on liability and a decision matrix in the implementation of timber construction projects. Therefore the question of standardized processes and production systems and their applicability in timber construction as well as existing process chains are at the forefront of the development and work on the recurring questions of system efficiency. Associated information interfaces need to be developed and implemented to ensure that the procedures are carried out appropriately. The research project “Industrialized timber construction – development & optimization of technical and economical timber construction system for the industrialized building with timber”, which provides the basis for this paper, was started in 2012/2013 at the Institute of Construction Management and Economics at Graz University of Technology and should provide basic information on this topic. This will offer industry professionals guidance in making successful decisions regarding industrialized timber construction from a building economic aspect point of view [1].

1.1. Point of departure – why now?

Modern timber construction, which is characterized by constant growth nationally and internationally, has evolved considerably in recent years, especially in technical terms. Numerous product innovations have helped timber grow from infancy to a well-established timber system on the market which can be implemented for the majority of large-scale buildings and which is radically different from the conventional timber construction known for centuries. Therefore, it is a logical conclusion and necessity that construction-related studies and construction management optimizations follow the technical developments.

The gaps in timber construction in terms of construction management or business economic aspects should be minimized and used to help to generate a benefit for this building system. The background and input parameters for usual costing systems within special timber construction systems are not as well established as they are for traditional building materials such as steel and concrete [2]. With the help of investigative studies, research projects, information focusing and appropriate communication tools, it is the main objective of the research field to generate a knowledge basis, apart from practical experience without cross-company reference, and form a respectable background on data which forms a reliable guide for construction with timber and managerial decisions.

1.2. The chance of timber construction systems

The topic of timber construction systems, in the broader sense “industrial building with timber”, and the possibilities of systematization and rationalization in the construction industry have always been a topic of discussion. Technological developments, the acute housing shortage after the world wars and the technical possibilities of serial prefabrication of individual construction and design elements have allowed planners and developers, especially during the last several decades, to develop new approaches to integrate the ideas of industrialized building components in conventional construction processes.

Although initial attempts of modular prefabrication and systematic manufacturing were performed more than 100 years ago, automated building processes are hardly established in Central Europe nowadays, regardless of the construction system or building material used. The emphasis in this analysis is thus based on the prefabrication of

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