Computer supported design of industrial buildings made of precast concrete

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Summary

This paper describes the development of a software tool for the rapid design of industrial buildings using precast elements. Production issues and limitations as well as structural aspects are considered during all phases of the design process making sure that the design is “precast-compatible”. The software operates on a knowledge base which can be adjusted to the specific wishes of a designer and/or a precast supplier.

Keywords: Parametric design, industrial buildings, precast concrete, knowledge based system.

1. Introduction

Every construction project is unique. If precast elements are to be used within a project these elements must often be customized for the unique geometry of the building and this often leads to laborious and expensive tailor-made solutions.

In order to maximize the benefit from the advantages of prefabrication regarding time and costs it is recommendable to consider production issues and limitations during all phases of the design already.

The goal of the research project which is described in this paper was to develop a software tool which allows the rapid design of industrial buildings which are “precast-compatible”. The software tool supports a top-down design approach starting with the overall dimensions of the building. The next step is the definition of the individual structural members. In this step the system only displays those members from its database which fulfill the structural requirements in the specific case so that the user cannot choose a member which is not suitable from a structural point of view. In order to make sure that the chosen member also fulfills the economical requirements concerning the production the database only contains those standard members which fulfill these requirements. On the other hand the user can edit the database any time and can add additional members and customize the database for the specific product range of a certain plant. Finally the connections between the individual members are defined.

One problem in such a system of course is to handle changes. If for example the span of the building is changed at a later stage of the design all structural members and their connections are checked whether they are still suitable. Those members which do not fulfill the structural requirements anymore are highlighted and can be changed by the user again choosing from a list of members which fulfill the new structural requirements.

The system allows for a very rapid design of industrial buildings using precast members and makes sure that only those elements are chosen which guarantee structural safety and an economical production at the same time.

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