

## **My impression of Sekisui Heim M1**

Thomas Bock

Professor Dr.-Ing./Univ. Tokio

Lehrstuhl fuer Baurealisierung und -informatik

TU Muenchen, Germany

My first encounter with M1 took place at IIT in Chicago 25 years ago during my Fulbright scholarship, when I saw a brochure of Sekisui Heim M1. This inspired me to go to Japan in 1984 to do a study on industrialization and robotics in construction, under the guidance of Professor Uchida at the University of Tokyo. There I met Katsuhiko Ohno and visited several Sekisui Heim factories and building sites.

### **Historical significance of the M1 System**

Le Corbusier once stated that “it is impossible to wait for the slow collaborations of the successive efforts of the excavator, mason, carpenter, joiner, tiler and plumber; houses must go up all at once, made with machine tools in a factory with moving conveyor belts, assembled as Ford assembles cars.” In 1919 he commented that the housing industry must make a great effort to encourage manufacturers of housing components to produce their products on a mass-production basis. Walter Gropius believed that more, better and cheaper houses could be built by utilizing industrialized processes. He was involved with Konrad Wachsmann in an effort to manufacture a prefabricated paneled house by the General Panel Corporation of California in the 1940s. This project, like Buckminster Fuller’s Wichita house, was an attempt to utilize the latest technological manufacturing capability.

### **Planning and design diversity**

Katsuhiko Ohno and Sekisui Chemical Co., Ltd. took these ideas even further in the 1960s by successfully combining the best of handmade and factory made production and created "mass customization." Whereas conventional prefabrication resulted in buildings of monotonous design, the Sekisui Heim M1 system had not only the highest degree of prefabrication but also the highest degree of design variability.

The parts for one house can be selected from a total of 2 million pieces, allowing a very high degree of design flexibility. This advantage was the basis for the successful marketing of over a half million houses.

### **Pioneering industrialized production in the housing industry**

Katsuhiko Ohno and Sekisui Chemical Co., Ltd. developed the Sekisui Heim M1, made of compact prefabricated box units, 90% of which could be finished in the factory, thus allowing design flexibility and diversity.

The idea for the development of the Sekisui Heim M1 was its greater economy, speed of erection, higher quality due to factory manufacture and assembly, and a reduction of on-site construction. Before the invention of the Sekisui Heim M1, the simplest form of prefabrication was the use of standard, commercially available components in the construction of a traditionally made building, commonly referred to as open building-systems. The other notion of prefab is more commonly associated with the mass production of large parts of a building. In order to be beneficial it therefore required a large degree of continuity of appearance, and ultimately, monotonous looking building forms. However, these building developments were the motivation for mass use of components and for dimensional coordination. This made the development of mass production possible, as once the component design was complete and the manufacturing process established, mass production of components by an automated machine process eliminated the need for some skilled craftsman who produced one-of-a kind components. This resulted in the reduction of tolerances in the manufacture of certain building components, which in turn reduced human error.

The introduction of Sekisui Heim M1, which utilized the mass production of components and factory assembly, led directly to high quality, lower cost housing.

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## **Curriculum Vitae**

Thomas Bock

**16.02.1957**

Born in Freiburg Germany

**1977–1983**

Civil Engineering (2 Years) and architectural studies University Stuttgart, Germany

**1978**

Planing and testing of a mobile canal blockage by a 5-chamber tube at the Institute für Leichte Flächentragwerke

(Prof. Frei Otto)

**1979**

ateliers Jean Prouve, restauration planning of: “ maison du peuple in Clichy“ , Paris, France,

**1981–1982**

Fulbright scholarship IIT

(Illinois Institute of Technology) Chicago/USA. Thesis: “Multi Use High Rise Building for Downtown Chicago” (Prof.

Myron Goldsmith, Prof. Fazlur Khan)

Best USA thesis award of Harvard University in Boston

**1982–1983**

Space station design at Prof. Larry Bell, Environmental Center University of Houston und NASA

DAAD scholarship (german academic exchange service)

Wooden multifamily dwelling , Freiburg, Germany

**1983–1984**

business/apartment building in RC in Barcelona, Spain

**1984–198**

9Monbusho scholarship,

University of Tokio "Kogaku hakushi"

**1989**

"Chercheur" (=researcher)at "CNRS"(Centre nationale recherches et sciences) in Paris, France (April–October)

**1989 (Oct.)–97(Sep.)**

Associate professor for Automation in construction management at the civil engineering faculty of University

Karlsruhe Germany

**1990–97**

establish technology transfer centre for Robotic in construction

**1990**

Stationary masonry robot

**1991**

consultant for commssion of european communities Generaldirection XIII

**1992**

Precast Concrete panel multifunctional production unit

**1994**

Mobile heavy duty robot "ROCCO" ESPRIT 3 6450

**Since Nov. 97**

Chair (full) professor for building realization and informatics at the architecture faculty of TU Muenchen (Munich)

**2000**

Gold medal of academy of construction and architecture in Moscow

Evaluator of China research grants council (since 2000)

**2001**

Member of the russian academy of sciences in St. Petersburg

**2002**

Member of belorussian academy of computer science

**2003**

Evaluator of National council of engineering sciences of Canada

**2003**

Honorary professor of Nowocherkassk University of southern Russia

**2004**

Director of the NPO for prefabrication research association, Wiesbaden, Germany

**2005**

Member of Russian Academy of Construction

Several research projects totalling 2 mio Euro on rapid construction systems, robotics,

Teleconstruction sponsored by EU, federal research ministry, construction ministry, over 200 publications in english, german, french, japanese and russian... etc.

Member of editorial boards : automation in construction (Elsevier), Jesa (Hermes, France), Bauinformatk (Bauverlag), Robotica (University of Cambridge), Civil engineering and Management, Strategic property Management

Editor of own scientific series on construction management and technology at Fraunhofer Society for applied research in Germany

April, 2005, Munich, T. Bock