



CIB NEWS ARTICLE

International Council for Research and Innovation
in Building and Construction

Providing a global network for international exchange and cooperation in research and innovation in building and construction, in support of an improved building process and of improved performance of the built environment.

February 2011

Around the Task Groups and Working Commissions

W119 - Customised Industrial Construction

Introducing New Working Commission

CIB Working Commission, W119 on "Customised Industrial Construction" has been established as the successor of former TG57 on Industrialisation in Construction and as a joint CIB-IAARC Commission. Prof Dr Ing Gerhard Girmscheid, ETH Zurich, Switzerland (Coordinator of the former TG57) and Prof Dr Ing Thomas Bock, Technische Universität München, Germany are the appointed Coordinators of this Working Commission.

Scope and Objectives

Industrialisation in Construction will become more customer oriented. Systems for adaptable manufacturing and robot technologies will merge the best aspects of industrialisation and automation with aspects of traditional manufacturing. Concepts of mass customisation can be implemented via the application of robots in prefabrication processes, on site in service. Drivers for such concepts are:

- the potential of such advance construction technologies to enable new business opportunities for the construction industry in order to deliver more efficient and customised products and services
- the increasing changes in demographics, life styles, cities, economies that require personalised socio economic and socio technical processes and services to be more affordable.

Against this background the commission will focus on the following areas for international research:

- Industrialised customisation in automation and robotics in factories, on site and in building services
- Design for industrialised customisation
- Strategic deployment of industrialised customisation.

In the Annex of the News article those focus areas are described in detail.

The commission aims:

- to become the core of the world's leading international research community on Customised

Industrial Construction and how this impacts upon processes in architecture, construction and real estate

- to facilitate to bring in new knowledge and frontier technologies from various profession, including: ICT, Automation, Robotics, Mechanical Engineering, Mechatronics and Product-Service Engineering
- to expand the professional core competence in the construction industry.

Work Programme

During its first years the commission will have commission meetings each year in conjunction with major CIB and IAARC conferences. The commission aims to develop its own series of international conference and workshops.

The commission works through project groups that during its first years will focus on:

- production and publication of an R&D Roadmap
- development of new professional courses and curricula
- publication of handbooks for professionals.

Planned Output

The Commission's planned output will be:

- proceedings from annual conferences
- 2011: publication of a Roadmap for R&D in support of Customised Industrial Construction
- 2012: definition of a concept for an international course curriculum, supporting the deployment of new professional areas
- 2012: exploration of possibilities for an international Master Course, teaching network and /or certification system in support of Customised Industrial Construction
- 2013: publication for handbooks for aspects of Customised Industrial Construction.

Introducing the New Coordinator

Thomas Bock



Positions

Thomas is Professor for Building Realisation and Informatics at the Faculty of Architecture at the Technische Universität München.

Thomas' other academic positions include:

- Guest Professor, Low Cost Housing for Central America CIVCO, Costa Rica and transferring this concept to Honduras and Nicaragua to reduce high unemployment in Central America.
- Full Professor for Building Realization and Informatics at the Faculty of Architecture, Technische Universitaet Muenchen (TUM), Munich, Germany. Development of low cost housing systems, robotic and automation in construction, life cycle management in architecture etc.

His non-academic positions include:

- Head of Technology Transfer Centre of the "Steinbeis-Stiftung" for economic development, Stuttgart, Germany.
- Director and President of International Association on Robotics and Automation in Construction (IAARC). Executive Board ICIC International Construction Innovations Conference, Peoria – Illinois, USA

Personal Statement Thomas Bock

Future markets will require just on time response of adaptive production systems. Customized industrial construction can achieve this by frontier engineering sciences which breed innovations. These innovations are driven and amplified by globalization, closed loop resource utilization, transformation of technological potentials, environmental and demografic challenges. Global competition brought inflationary labour capacities resulting in decreasing labour costs. But to achieve welfare and culture any society needs sufficient income. To provide sufficient income for creating wealth and culture one has to be efficient. The demographic change requires even more efficient socio-economical and socio-technical processes to produce affordable built environment such as e.g. housing.

Half or more of total investment is allocated in built environment, infrastructure, and facilities, signifying the strategic importance of the construction sector.

The new W119 Customized Industrial Construction is tailored to offer solutions to the above mentioned challenges. The future construction sector will expand to new business fields by applying appropriate technologies from various disciplines. Its success will depend on its innovation leap ability of the complete value chain of the artefactual design, engineering and producing the built environment by embedding appropriate on site technologies with ICT, automation, robotics and services. The W119 CIC approach will create new markets, qualifications, skills and professions for ubiquitous implementation.

Additional Information

For additional information about the CIB W119 contact the Coordinators: Gerhard Girmscheid girmscheid@ibi.baug.ethz.ch and Thomas Bock info@br2.ar.tum.de.



You can find more information on the activities of CIB W119 in the CIB online Database "Commissions": see [here](#). In the shown search engine type "W119" in the field "Commission number" and press "Find records".



Annex: Focus Areas for International Research in Support of Customized Industrial Construction

Industrialized Customization in Architecture

The significance of industrialized production is gaining momentum originating from the level of materials, parts and pieces culminating in the final assembly of whole structures and buildings. Modern manufacturing technologies allow since the 1970s to customize the production of buildings and its components in order to respond to esthetic demands of a unique architectural design: the former schism between rationalized mass production and individual character of buildings has been overcome. As soon as the customer has designed his dream house using VR technologies the Toyota production system manufactures just in time and in sequence the necessary sub-modules of the house. Even though each house is automatically produced, it has his own characteristic design. Industrially produced houses are affordable, customized and rapidly available. By applying modern manufacturing technologies, we can improve the efficiency of resources to achieve a sustainable economy. Major Japanese house makers have already introduced zero waste concepts in housing.

Keywords: Mass Customization off site, Factory Production, Logistics and Factory Networks, Production Layout and Strategies, Systems and Technologies

Logistics/ Site Automation and Robotics

In many industrial sectors, we commonly use information and communication technologies, automation and robotics. Those countries that are characterized by high labor cost, labor shortage, adverse working conditions, high occupational disease, accident and death rates, excessive claim management, lack of skilled labor, insufficient construction quality, construction time – cost overrun, limited immigration, lack of natural resources, high land prices, high interest rates, etc. use advanced manufacturing technologies for staying competitive. In construction most civil engineering sites progressed from mechanization to automation such as tunneling, dam, bridge and road construction. Since early 1980s first construction robots had been tested and applied at selected sites. Since early 1990s automated building construction sites had been tested and implemented. In the first decade of 21st century humanoid robots and exoskeletons were developed and tested on the site. The first decade of 21st century ended with the first automated disassembly of two high-rise buildings in center Tokyo. The systematic deconstruction achieved 90 % resource efficiency, which will be paramount for solving future challenges on limited resources on an ever crowded planet.

Keywords: Mass Customization on site, Site Automation, Site Robotics, Site Logistics for

Automation, Systems and Technologies, Automation and Robot oriented Site Management

Service Science through Automation and Robotics

Future buildings will provide more services. Bill Gates today announces the era of service robotics and estimates that service robotics as part of assisted environments will undergo a similar fast and rigid development as the spread of personal computers in private and economic areas since the nineties. Already in 1961 Joe Engelberger wondered if relegating robotic technologies to only industrial applications makes any sense: "The biggest market will be service robots." Today robots and distributed robotic subsystems actually start to permeate our every day surrounding home/town environment enhancing it with a multitude of services and additional performances. Performance oriented buildings lead organizational structures multiplying the possibilities of customization and user adaptation, continuous and commercial services and automation and robotic assisted living.

Keywords: Mass Customization of performance oriented environments, Automation and Robotic assisted Living, Service Robotics, Personal Assistance

Automation and Robot Oriented Design

Since ancient times, mankind invented tools to save time and efforts. Those new tools resulted in new processes and products. The steam engine triggered an industrial revolution in factories and mobility. The car unfolded its customizable mobility when it became more than just a horse car-rage fitted with a combustion engine and became a ubiquitous vehicle through the road network. When the first construction robots were developed in Japan, they copied typical tasks of construction workers. The advantage of construction robots was unfolded as soon as the perimeters in construction such as management, planning, design, detailing, logistics, training, education, quality, attitude, skills, formation, business relations, etc. adjusted to the new tool of the construction robot. The notion of AROD or Automation and Robot Oriented Design supports not only the efficient use of construction robots but also helps to improve the productivity, efficiency, quality of conventional construction methods. This focuses on design, structure and composition issues and can be related to factory automation on-site automation and Automation and Robotic assisted Living.

Keywords: Design and Buildings Structures Enabling efficient use of Automation and Robotics, Modularization, Product Structure, Building Information Modeling



Automation and Robotics Deployment Strategies

The deployment of automation and robotics in construction creates new socio-technical and socio-economic systems. The implementation of new concepts and technologies in construction processes and building systems thus ask for a high degree of methodology, systems engineering, strategy, management and organization. As a strategic tool for a successful deployment of innovative process and product structures, customized prefabrication, construction automation and robotics, intelligent built living environments and complex research and development outcomes, we can use automation and robot oriented project management strategies. However, for social acceptance we need also frontier scientific, cybernetic and sustainable methods as well as socio-communicative and human-machine communication research. ARDS focuses on business processes, management, and socio-economic and socio-technical aspects and can be related to factory automation, on-site automation and Automation and Robotic assisted Living.

Keywords: innovative business processes, automation and robot oriented management, human-machine communication, socio technical aspects, socio-economic aspects, history of automation and robotics