HOUSING and CONSTRUCTION news

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This issue

Editorial

Issues related to housing continuously interest all parties including the public, policy makers and academicians. Despite modernization and advancements in construction technology, the need to further improve and address appropriate technology for different requirements serves as the driving force to seek new solutions.

Contributors in this issue address important aspects of housing development. Topics covered include the development of the precast foundation system, application of rainwater harvesting and issues related to productivity in the construction industry.

Research and technology news will be featured regularly in this newsletter to keep readers abreast of the latest developments in research and technology on housing and construction.

Contributions from readers in the form of comments and articles are most welcomed.

Prof. Madya Ir. Dr. Mohd Salleh Jaafar

An Overview of Precast Foundations for Housing

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In situ concreting has been the most important job in all types of structures. Quality control, time factor, labour, weather and soil condition (for foundation) has always been debatable. Perhaps, these factors motivate the adoption of a precast system of construction. Precast foundation system is the most suitable alternative for mass scale construction particularly in residential schemes. Cost is usually the most important factor affecting the choice of foundation system and the nature of construction, but where rapid construction and quality assurance of construction are sufficiently important, these may be the factors which tip the scales in favour of precast foundation system. The housing industry is quite familiar with precast isolated foundation and precast concrete piles for several decades. In Malaysia precast pile system is a common foundation method. There are few innovative foundation systems which have become popular due to fulfillment of basic criteria and excellent performance for precast products. The most popular systems are briefly described in the paragraphs that follow :

Adjustable Foundations

The concept of using adjustable foundations for troublesome soil is not new in geotechnical engineering. Structures were built on adjustable foundations years ago, with the "adjustment" generally in the form of jacks. It has proved practical to use adjustable connections, where active permafrost may require periodic relieving of structures. This innovative design is too expensive for modest structures such as single-family residences but it does illustrate the principles of successful design against

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large amounts of settlement in unstable ground.

Prefabricated Pads

Usually consists of prefabricated pads laid side by side, and made continuous socketed beam at top which in turn supports the columns. Some researchers have also suggested a prefabricated system for footings consisting of beam and slab elements, jointed at site.

Anchor Panel System

The Anchor panel system is for crawl-space perimeter foundation construction, resulting in stronger anchorage, faster installation, improved disaster mitigation, increased durability, and lower cost. It enjoys an indisputable cost-efficient benefit in simply utilizing the (required) perimeter-enclosure-surface itself as the perimeter support and structural bracing system (figure 1).

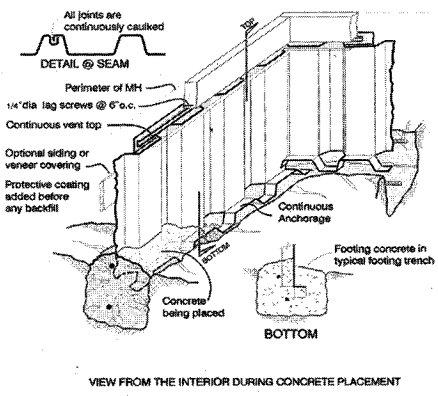

Figure 1: Details of Anchor Panel System

Precast Wall System

One product that continues to generate interest is the state-of-the-art precast wall and foundation system developed by Superior Walls of America. The Superior Walls System consists of pre-cast, studded concrete walls. The ready-to-finish wall panels feature built-in plumbing and electrical access holes. Skilled worker can install an average system in about five hours, in almost any kind of weather.

Precast Grade Beam System

The system is similar to a traditional drilled shaft and grade beam system; only exception is the precast grade beam. In this system drilled shafts are not filled with concrete until precast grade beam place on the location. The system is less labourious as one crane and two workers can install the grade beams.

Housing Research Centre has been involved in innovation of precast foundation system for housing. A research project on precast isolated foundations has been done recently. Precast or in situ casted concrete shell foundations are one of the best options when heavy loads required to be transferred on weaker ground conditions (figure 3). Shell foundations being more economical in the developing countries of the world; include countries of Latin America-in particular Mexico-Africa, the former Soviet Union and India. Felix Candela in 1953, designed the modern shell footing, a hypar footing for the Mexico City Customs House. The system is successfully in practice in India for multi storey residential projects.

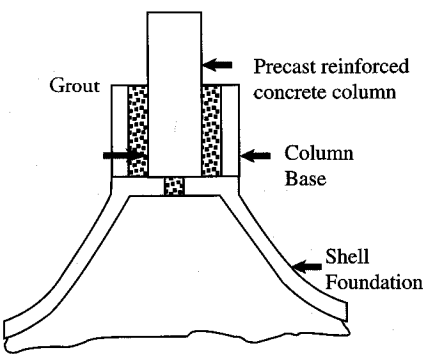

Figure 3: Precast shell foundation with reinforced concrete column

While shell foundation have been cast in situ in the majority of instances, the advantages of the shell, in terms of its lightness and the consequent transportability are best exploited in precasting. Such precast shell footings can be cast in inverted wooden or concrete moulds. Whether the construction is in situ or precast, it is important to ensure that there is prefect contact between the footing and the core soil at all points on the footing-soil interface.

The future intentions of HRC are in the adoptability of precast shell type foundations for the housing. A research is being planed for this as in urban areas mostly potential housing sites would be on weaker soil conditions. A traditional system of foundation might work but time and economy are challenging factor. The research will consist of two tasks; one is numerical analysis and modeling the behavior of shell foundations in weak soil conditions and second will be verification in laboratory modeling. It is expected that research will unveil the insight behaviour of soil foundation interaction, which will lead to the design guidelines for such type of foundations.

A question that might be asked is, why shell foundations are not attempted even when they are known to be economical. The answer to this question does not lie in technology, but perhaps in the human psyche, which resists change even when the change is known to be to one's advantage. In a scenario of this kind, it is to be fervently hoped that future efforts in developing countries will place shell foundations in a more favorable perspective and that they will enjoy wider acceptance.

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Situation and Scenario for Rainwater Harvesting in Housing

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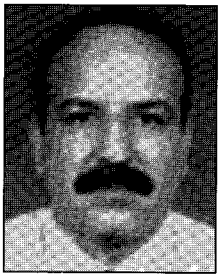
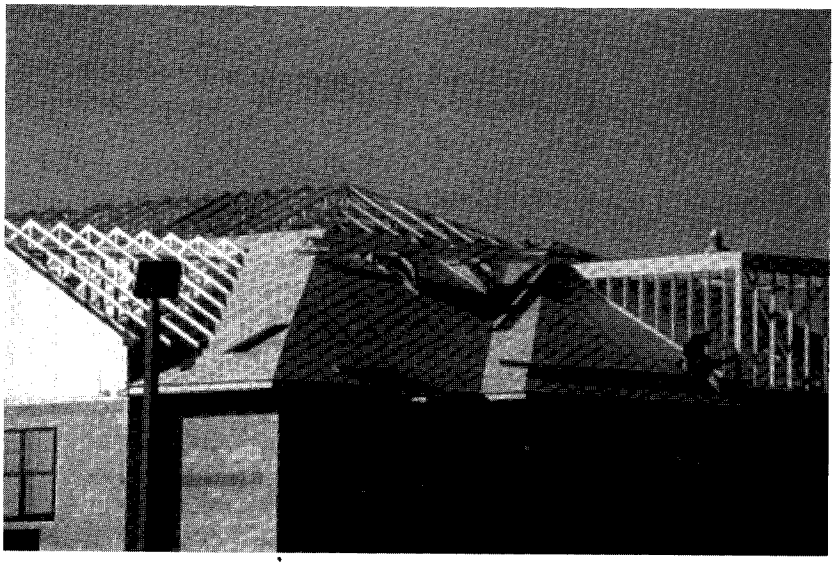
The collection of rainfall on the roof of buildings for later use is a simple concept. Since the harvested rainwater is independent on any centralized system, it is self-sufficient and the resources can be conserved. Collecting rainwater is not only conserving water but it conserves energy. Rainwater harvesting has environmental advantages since it reduces the erosion, waterways degradations and flooding, which are caused by runoff from impervious cover such as pavement and roofs as some rain is instead captured and stored. The components of rainwater harvesting system are catchment area (roof), gutters and downspouts, leaf screens and roofwashers, storage tanks, delivering pipe system with pump, water treatment unit in case that the harvested rainwater will be used for washing clothes, dishes etc. Many countries around the world are still promoting the usage of harvested rainwater for potable and non-potable uses e.g. USA, Germany, Australia, China, and Japan.



Rainwater harvesting and utilization in housing systems can help the public during drought periods and also reduce increasing demand on the public water supply. Based on the advantages, it is important to have a rainwater collection and utilization system in future housing schemes. This system is considered as supporting system to the normal water supply system and as an alternative when a treatment unit is made available.

In Malaysia, and after the drought period in 1997 there are many trials to study the use of rain harvesting system in housing projects. The conducted research on the use of rainwater harvesting system to fulfill part of the demand of household is still in its infancy stages and many research centers are still doing research on this topic. For example, The Ministry of Housing and Local Government had proposed basic guidelines rainwater harvesting in 1999 and it is not enough for efficient and economical collection and utilization of the rainwater. Therefore, more research is required to improve the above guidelines. A full scale experiments need to be conducted to test the components of rainwater collection and utilization system.



The Housing Research Centre, Universiti Putra Malaysia will conduct a full scale research on a rainwater harvesting system including the laboratory experiments. The cost of the system is a major factor for the developers and a proper design for the system and its components will make the cost of this system optimum. This will promote the usage of the rainwater harvesting systems in housing projects and will contribute to solve the water shortage particularly in the dry season and for housing projects constructed in remote areas. So, special attention will be given to the economical in studying the full scale rainwater harvesting system. However, it is important to study the aesthetic of the rainwater harvesting system and this will be done through a serious coordination between the designer the architecture engineer. So, with this consideration the environmental design in housing projects will be improved.

PRODUCTIVITY INSIGHTS

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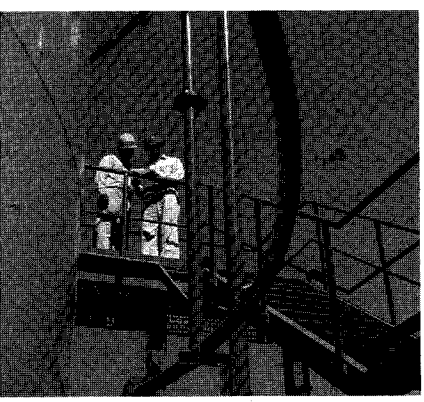
Definition of Productivity

The use of the word productivity was first mentioned in an article by the French Mathematician Quesnay in the year 1766. More than a century later in 1883, another Frenchman, Littre defines productivity as the "faculty to produce". The organisation for European Economic Cooperation (OEEC) [1950] provides a more comprehensive definition of productivity.

Productivity is the quotient obtained by dividing output by one of the factors of production. In this way it is possible to speak of the productivity of capital, investment, or raw materials according to whether output is being considered in relation to capital, investment or raw materials, etc.



In myriad studies, researchers have attempted to define precisely what is meant by productivity. Performance as applied to associated works is a broad term, encompassing four main elements, namely, productivity, safety, timeliness and quality. Productivity, which is measured primarily in terms of cost, with "satisfactory productivity" usually implies "work accomplished at a reasonable price to the customer and with a fair profit for the producer'.

Depending upon who is defining it, whether it is a construction engineer, industrial engineer, economist, accountant, manager, politician, or union leader, we will get a slightly different definition of the term productivity (Sumanth, 1984). However, if we closely examine the various definitions and interpretations of this term, three basic types of productivity appear to be emerging as explained below:

Partial Productivity is the ratio of output against each resource input separately. For example, output per manhour (a labour productivity measure), output per ton of material (material productivity measure) and interest revenue per dollar of capital)a capital productivity measure). This productivity indicator of manhours per square meter is commonly used in the construction industry at micro level because of the concentration of manhour needed to complete a specific task.

Total Factor Productivity (TFP) is the ratio of net output to the sum of associated labour and capital inputs. It measures the efficiency of utilisation of both capital and human resources. Higher TFP growth represents efficient utilisation and management of labour and capital resources necessary for the production of goods and services.

Total Productivity compares the total output against all resources input. It represents the joint impact of all the inputs in producing the output. Meanwhile input resources include labour, material, equipment, and capital.

Differences in Productivity, Production, Efficiency and Effectiveness

Quite often the terms productivity, production, efficiency and effectiveness are confused with each other. Many people think that the greater the production, the greater the productivity. This is not necessarily true. Let me clarify the meanings of the terms "production" and "productivity". Production is concerned with the activity of producing goods and / or services. Productivity is concerned with the efficient utilisation of resources (inputs) in producing goods and /or services (output).

If viewed in quantitative terms, production is the quantity of output produced, while productivity is the ratio of the output produced to the input(s) used.

Efficiency is the ratio of actual output attained to a standard expected output. For example, if output of an operator is 120 pieces per hour while the standard rate is 180 piece per hour, the operator's efficiency is said to be 120/ 180 = 0.667 or 66.7 percent.

Effectiveness is the degree of accomplishment of objectives. In other words, how well a set of results is accomplished reflects the effectiveness, whereas how well the resources are utilised to accomplish the results refers to the efficiency. Productivity is a combination of both effectiveness and efficiency, since effectiveness is related to performance while efficiency is related to resource utilisation.

HRC Activities and Achievements for the Year 2002

>>15 January 2002 : AQH Workshop

The National Workshop on Affordable Quality Housing was held at the Equatorial Hotel, Bangi, Selangor. It was a joint effort with The Institution of Engineers (IEM) and theme chosen for the workshop: 'Opportunities And Challengers in Affordable Quality Housing in Malaysia'. Datuk Seri Ong Ka Ting, was the officiating minister. Over 80 participants attended.

>>16 January 2002 : 1st. AQH Executive Meeting

AQH Executive Meeting - in conjunction with the workshop, first meeting among researchers involved with the National Programme on Affordable Quality Housing was held at the same venue. Nearly all team members involved in the programme attended the meeting/ discusssions.

>>15-17 February 2002 : Annual Retreat

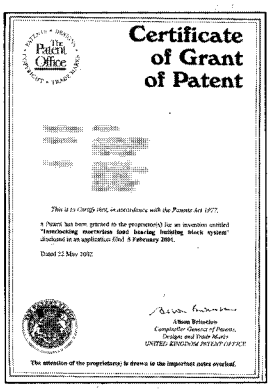
HRC 2002 Retreat/Annual General Meeting was held at the Riviera Bay Resort, Tanjong Kling, Malacca. Assoc.Prof.Dr.Waleed led the programme with the theme 'Research Foresight'.

>>19-21 February 2002 : Specialist Course

HRC had also successfully organised a 3-Day Specialist Course on Bridge Assessment And Rehabilitation at the Mines Beach Resort & Spa, Seri Kembangan, Selangor. Over 30 participants from both government and private sectors attended the course.

>>22 May 2002 : Putra Block Patent from UK

The Putra Block is a new innovative interlocking block system designed by HRC team members. The system was designed to satisfy the modular coordination requirement, the typical structural, production and constructional requirements. The system can be used for construction of load bearing walls up to five storey high. The block received a grant of patent from UK patent office in May 2002.


The Patent Office

Certificate of Grant of Patent

[redacted]

This is to Certify that, in accordance with the Patents Act 1977,

a Patent has been granted to the proprietor(s) for an invention entitled "Interlocking reactivious land bearing building block system" disclosed in an application filed 8 February 2001.

Dated 22 May 2002

Comptroller-General of Patents, Designs and Trade Marks
UNITED KINGDOM PATENT OFFICE

The attention of the proprietor(s) is drawn to the important notes overleaf.

>>1 August 2002 : HRC Moves Office

HRC moved to new office at Block E, Faculty of Engineering UPM. Since its establishment, HRC has received grants from various bodies including the Ministry of Housing & Local Government, Ministry of Science Technology & Environment and also the CIDB, Malaysia. The amount of research grants have increased to commensurate with research activities done and also to enhance the facilities of the centre.

>>5 August 2002 : 2nd AQH Executive Meeting

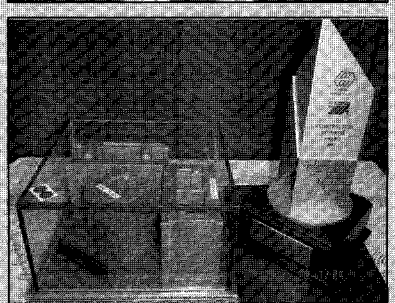
2nd Exec. Research Meeting of the National Research on AQH - meeting was hosted by UPM with participants from the 13 projects categories to discuss progress.

>>9 September 2002 : MOU with CIDB

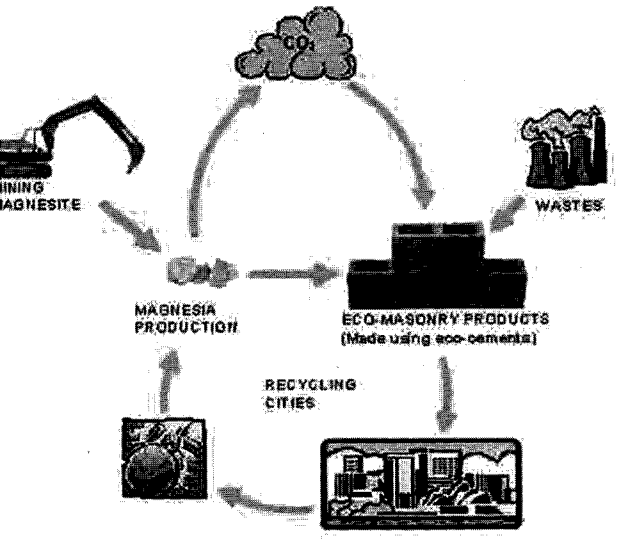
MOU signing at The Mines Exhibition Centre, Seri Kembangan - The AQH project has also received grant from the CIDB, Malaysia for the amount of RM2.59M signed by Dato' Hj. Abdul Rahman, with the Deputy Vice Chancellor (Academic) representing UPM in the ceremony.

>>13 September 2002 : CIDB R&D Award

2nd Research and Development Construction Industry Award, held at Nikko Hotel Kuala Lumpur - the R&D award was given to the group of researchers who demonstrated excellence and creativity in the design, development and commercialization of technologically significant innovations. HRC was represented by Prof. Abang Abdullah, Assoc.Prof.Ir.Dr.Mohd Razali, Assoc.Prof.Dr.Waleed and Assoc.Prof.Ir.Dr.Saleh.



The TecEco Technology (http://www.tececo.com)

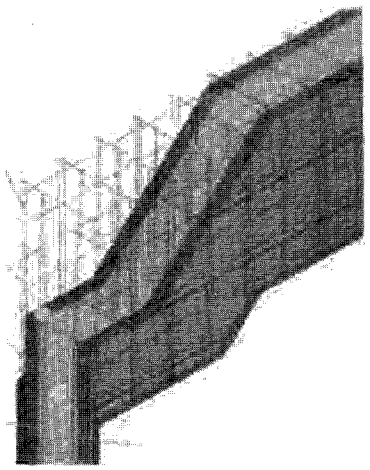


Sustainable Cities

TecEco have developed and applied for international patents for a new materials technology with two main applications-carbonated eco-cements containing magnesite and a high proportion of recycled industrial materials and modified hydraulic cements containing brucite.

Eco-cements are the building material of the future. Many formulations are recyclable, sustainable in every way and contain large quantities of wastes as well as magnesia produced from magnesite found all over the world. The TecEco eco-cement technology is useful because it offers partial solutions for global warming, climate change, cost effective housing for the masses and global waste problems. Offering a technology providing cheap housing and utilising large quantities of waste to less privileged countries is far more attractive than trying to limit emissions.

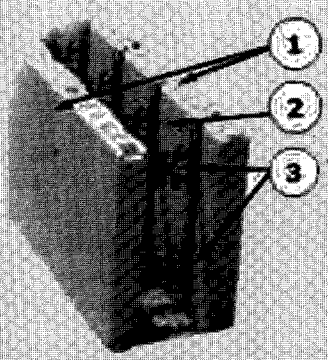
Sismo Building Technology (http://www.sismo.be/flash/home.html)



Sismo building technology is based on formwork system. The Sismo building system is designed by using software SIS-CAD according to the architect building plans. The SISMO formwork system is called as modules. The modules are made by the SISMO production station according to the exact specifications of the architect. The modules are lightweight, no heavy machinery is needed to put the modules in the desired position. The modules are joined together by iron rings to create a wall. By using a metal 'stapler' it is easy and quick to assembled the modules. The modules are joined and supported by scaffolding (support beams), it is time to add the structural filling materials. The space between the insulation strips of the modules is filled with concrete. Planning with the SISMO building system simplifies the industrial production of the module and its on-site assembly which increases the productivity and the cost efficiency even more.

Nudura –Intergrated Building Technology (http://nudura.com)

Nudura is the new generation of ICF (Insulated Concrete Form) technology. Nudura's double insulation protection is a high-performance expanded polystyrene building form made for erecting concrete walls. Nudura's innovative hinged webs ensure safe, damage-free delivery. Nudura forms also have accurate interlocking appendages for easy and quick assembly, and are structurally strong to withstand the weight and fluid pressure of the concrete poured inside. The insulating capacity of expanded polystyrene combined with the structural strength and thermal mass comfortable and more energy efficient than typical residential walls. In various tests, Nudura walls have met and in many cases exceeded statutory building codes.



Nudura is fast and easy to build with. Nudura's large pre-assembled units come to site in compact, protected bundles that easily unfold for use. Nudura technology precisely locks together to build high performance walls for homes quickly and efficiently.

Registration Form

International Conference on Industrialised Building System (IBS2003)

9-11 September 2003

Kuala Lumpur, Malaysia

Name : . . . . . .

Title : . . . . . .

Organisation : . . . . . .

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Submission of abstract / full paper

Title of Paper: _____

(please tick appropriate area) :

- ☐ Innovations on IBS
- ☐ Structural Analysis and Design
- ☐ System Development (superstructure, substructure and jointing system)
- ☐ Modular Coordination
- ☐ Design Codes and Standards
- ☐ Government Policies
- ☐ Construction Methods and Problems
- ☐ Development of New Materials
- ☐ Architectural Aspects and Design
- ☐ Environment Issues and Social Aspects
- ☐ Legal and Financial Issues
- ☐ Robotic and Automation
- ☐ Studies on Labour Reduction &Quality Enhancement
- ☐ Smart and Intelligent Features

Payment

Conference Fees: RM500 or US$150 to be made made payable to the Bendahari Universiti Putra Malaysia. Payments by check or money order to be addressed to the Conference Secretariat.

Conference Secretariat

All correspondence to the conference should be addressed to :

Secretariat, IBS2003
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Faculty of Engineering
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MALAYSIA

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Fax: 00603 - 89413402
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9-11 September 2003 – Kuala Lumpur, Malaysia

International Conference on Industrialised Building System (IBS 2003)

Global Trends in Research, Development and Construction

Email: msj@eng.upm.edu.my *or* suf@eng.upm.edu.my
http ://www.eng.upm.edu.my/hrc/ibs2003

In Conjunction with
CIDB International Construction Week

Background

The construction industry has for many years maintained the time-tested but labour intensive traditional approach in construction and investing little in research and development. As the K-economy enters its stride into the new millennium, technological advances shall play a major role in changing the competitive work environment in the construction industry. Concurrently, as the demand for production and quality increases, the construction industry must indulge itself in innovations and be supportive of new technological techniques in construction. It is believed that the implementation of Industrialised Building System (IBS) in most countries have endured the high expectations from consumers.

Hence, the International Conference on Industrialised Building System shall be an opportunity for the sharing of experiences in areas related to research, development and construction.

Organisers :

CIDB MALAYSIA

Construction Industry Development Board (CIDB), Malaysia

HOUSING RESEARCH CENTRE
Affordable Quality Housing

Housing Research Centre, Universiti Putra Malaysia

Objectives

The objectives of IBS2003 shall be to provide a platform for the interaction amongst experts, researchers, designers, builders, developers and policy makers from all over the world for appraisal of latest developments in Industrialised Building Systems and for the indentification of further programmes for the propagation of industrialized construction as the preferred mode of quality construction.

Call For Papers

We invite papers related to the following areas on IBS:

- Innovations in IBS
- Structural Analysis and Design
- System Development (Super Structures, Substructures and Jointing systems)
- Modular Coordination
- Design Codes and Standards
- Construction Methods and Problems
- Development of New Materials
- Architectural Aspects and Designs
- Government Policies
- Environment Issues and Social Aspects
- Legal and Financial Issues
- Robotics and Automation
- Studies on Labour Reduction & Quality Enhancement
- ICT in Construction
- Smart and Intelligent Features

Submission of Abstracts

An abstract of 300- 500 words should be submitted to the Conference Secretariat together with the registration form shown below. Please indicate clearly the title of papers, author (s)' names, affiliation, addresses and fax or e-mail address for correspondence.

Registration Form on page 7

Important Dates

Submission of abstracts:
31 Mac 2003
Submission of full papers:
31 May 2003
Notification of acceptance of full paper:
30 June 2003

Proceedings

The Proceedings will be published and made available to all delegates at the conference. Only fully paid authors will have their papers published in the proceedings.

Language : English will be the official language of the conference

Registration Fee

Registration fee for the conference is RM500 or US$150. Payment should be paid to the conference secretariat before 30 June 2003. The fee will cover a copy of the conference proceedings, admission to technical sessions, conference banquet, lunches and coffee/tea during session breaks and a technical site visit.

Supported by :

Ministry of Housing and Local Government (KPKT)

Institution of Engineers, Malaysia (IEM)

Real Estate and Housing Developer Association (REHDA)